LIKELIHOOD INFERENCE IN AN AUTOREGRESSION WITH FIXED EFFECTS: SUPPLEMENTARY MATERIAL

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Tables 1 to 3 below present simulation results for the same design as in the main text, but for a more extensive range of parameter values and sample sizes. We ran a full factorial design with

$$N = 100, 250, 500, 1000, 2500, 5000, 10000;$$
$$T = 2, 4, 6, 8, 16, 24;$$

and

- in the first-order autoregression (Table 1),
$$\rho_0 = .8, .9, .99; \qquad \psi = 0, 1, 2;$$
- in the second-order autoregression (Table 2),
$$\rho_0 = \begin{pmatrix} .6 \\ .2 \end{pmatrix}, \begin{pmatrix} 1 \\ -.2 \end{pmatrix}; \qquad \psi = .3, 1, 2;$$
- in the first-order autoregression with a covariate (Table 3),
$$\theta_0 = \begin{pmatrix} \rho_0 \\ \beta_0 \end{pmatrix} = \begin{pmatrix} .5 \\ .5 \end{pmatrix}, \begin{pmatrix} .9 \\ .1 \end{pmatrix}, \begin{pmatrix} .99 \\ .01 \end{pmatrix}; \qquad \gamma = .5, .99; \qquad \psi = 0, 1, 2.$$

We ran 10,000 replications at each design point.

Table 1. Simulation results for the first-order autoregression

				bias			std			$\text{ci}_{.95}$		
N	T	ψ	ρ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
100	2	0	.5	−.142	—	−.747	.267	—	.153	.819	.921	.000
100	2	1	.5	.027	—	−.373	.266	—	.141	.903	.934	.090
100	2	2	.5	.019	—	.111	.166	—	.113	.946	.945	.880
100	4	0	.5	.008	−.039	−.295	.141	.148	.066	.924	.926	.004
100	4	1	.5	.016	−.053	−.139	.124	.164	.067	.945	.928	.327
100	4	2	.5	.001	−.016	.071	.064	.082	.056	.946	.936	.684
100	6	0	.5	.008	−.032	−.147	.091	.082	.051	.952	.920	.131
100	6	1	.5	.002	−.048	−.073	.068	.096	.049	.952	.914	.580
100	6	2	.5	−.001	−.021	.043	.044	.063	.041	.945	.930	.744
100	8	0	.5	.001	−.026	−.085	.056	.057	.042	.953	.918	.400
100	8	1	.5	−.001	−.040	−.045	.048	.070	.040	.943	.907	.730
100	8	2	.5	−.001	−.023	.028	.036	.051	.034	.946	.930	.812
100	16	0	.5	.000	−.019	−.021	.028	.030	.026	.944	.902	.841
100	16	1	.5	−.001	−.027	−.013	.027	.035	.025	.947	.879	.899
100	16	2	.5	−.001	−.023	.009	.023	.032	.023	.944	.893	.902
100	24	0	.5	.000	−.018	−.010	.021	.022	.020	.943	.878	.907
100	24	1	.5	−.001	−.023	−.006	.020	.025	.020	.948	.852	.926
100	24	2	.5	.000	−.020	.004	.019	.024	.018	.943	.869	.925
100	2	0	.9	−.144	—	−.551	.265	—	.151	.821	.925	.014
100	2	1	.9	−.094	—	−.472	.267	—	.153	.845	.923	.050
100	2	2	.9	−.006	—	−.288	.270	—	.145	.884	.931	.323
100	4	0	.9	−.083	−.483	−.294	.127	.413	.073	.843	.730	.006
100	4	1	.9	−.044	−.537	−.227	.126	.455	.072	.879	.748	.055
100	4	2	.9	.013	−.150	−.085	.126	.266	.066	.922	.900	.648
100	6	0	.9	−.051	−.283	−.203	.086	.210	.051	.858	.691	.006
100	6	1	.9	−.020	−.383	−.145	.085	.245	.049	.904	.645	.080
100	6	2	.9	.011	−.128	−.029	.082	.151	.044	.944	.864	.837
100	8	0	.9	−.033	−.191	−.154	.066	.127	.039	.876	.669	.008
100	8	1	.9	−.009	−.283	−.104	.067	.166	.038	.914	.576	.124
100	8	2	.9	.008	−.113	−.008	.059	.106	.033	.949	.815	.890
100	16	0	.9	−.003	−.077	−.072	.038	.043	.022	.925	.572	.041
100	16	1	.9	.002	−.130	−.043	.037	.061	.021	.944	.381	.324
100	16	2	.9	.000	−.082	.008	.023	.050	.017	.958	.583	.869
100	24	0	.9	.001	−.050	−.041	.027	.025	.015	.951	.478	.157
100	24	1	.9	.001	−.083	−.024	.023	.034	.015	.952	.274	.514
100	24	2	.9	.000	−.068	.007	.015	.033	.012	.943	.365	.854
100	2	0	.99	−.144	—	−.506	.265	—	.151	.821	.925	.034
100	2	1	.99	−.135	—	−.495	.267	—	.153	.821	.918	.043
100	2	2	.99	−.125	—	−.475	.266	—	.150	.827	.929	.053
100	4	0	.99	−.087	−.773	−.258	.123	.474	.073	.835	.651	.023
100	4	1	.99	−.082	−.771	−.249	.123	.475	.072	.839	.656	.027
100	4	2	.99	−.068	−.737	−.229	.123	.472	.072	.849	.675	.049
100	6	0	.99	−.060	−.587	−.174	.082	.276	.050	.839	.447	.022
100	6	1	.99	−.056	−.584	−.167	.080	.272	.049	.852	.448	.029
100	6	2	.99	−.042	−.550	−.145	.080	.279	.049	.871	.493	.075
100	8	0	.99	−.046	−.472	−.132	.062	.198	.038	.847	.280	.022
100	8	1	.99	−.043	−.469	−.125	.061	.193	.038	.850	.281	.033
100	8	2	.99	−.028	−.434	−.104	.060	.198	.037	.881	.337	.098
100	16	0	.99	−.025	−.255	−.068	.031	.081	.020	.843	.034	.020
100	16	1	.99	−.020	−.254	−.061	.031	.080	.020	.867	.033	.045
100	16	2	.99	−.009	−.227	−.043	.030	.080	.019	.910	.057	.213
100	24	0	.99	−.016	−.172	−.047	.021	.047	.014	.857	.003	.019
100	24	1	.99	−.012	−.173	−.040	.021	.047	.013	.873	.004	.055
100	24	2	.99	−.003	−.150	−.024	.021	.046	.012	.920	.009	.358

Notes: Data generated as $y_{it} = \rho_0 y_{it-1} + \alpha_i + \varepsilon_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, and ψ the degree of outlyingness of the initial observations y_{i0}. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval ($\text{ci}_{.95}$) of adjusted likelihood ($\widehat{\rho}_{\text{al}}$), Arellano-Bond ($\widehat{\rho}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\rho}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 1. Simulation results for the first-order autoregression (cont'd)

				bias			std			$\text{ci}_{.95}$		
N	T	ψ	ρ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
250	2	0	.5	−.125	—	−.750	.203	—	.095	.819	.926	.000
250	2	1	.5	.036	—	−.375	.204	—	.089	.924	.942	.003
250	2	2	.5	.008	—	.109	.096	—	.071	.956	.951	.672
250	4	0	.5	.013	−.017	−.295	.110	.097	.043	.932	.937	.000
250	4	1	.5	.005	−.023	−.140	.078	.106	.042	.954	.938	.051
250	4	2	.5	.001	−.006	.072	.040	.053	.036	.945	.945	.385
250	6	0	.5	.002	−.013	−.147	.055	.051	.033	.960	.937	.004
250	6	1	.5	.000	−.019	−.072	.041	.063	.031	.951	.940	.261
250	6	2	.5	.000	−.008	.044	.028	.040	.026	.947	.941	.508
250	8	0	.5	.001	−.011	−.085	.035	.037	.027	.950	.939	.078
250	8	1	.5	.000	−.017	−.043	.030	.045	.026	.945	.931	.515
250	8	2	.5	.000	−.009	.029	.023	.033	.022	.947	.943	.644
250	16	0	.5	.000	−.008	−.021	.018	.019	.017	.948	.933	.708
250	16	1	.5	.000	−.011	−.012	.017	.022	.016	.951	.924	.856
250	16	2	.5	.000	−.009	.009	.015	.021	.015	.945	.923	.864
250	24	0	.5	.000	−.007	−.009	.013	.014	.013	.948	.920	.866
250	24	1	.5	.000	−.009	−.005	.013	.016	.013	.947	.909	.906
250	24	2	.5	.000	−.009	.004	.012	.015	.012	.947	.915	.906
250	2	0	.9	−.123	—	−.549	.200	—	.094	.823	.926	.000
250	2	1	.9	−.075	—	−.474	.200	—	.094	.856	.928	.000
250	2	2	.9	.009	—	−.289	.204	—	.091	.909	.934	.056
250	4	0	.9	−.062	−.276	−.292	.096	.329	.046	.850	.810	.000
250	4	1	.9	−.026	−.369	−.227	.097	.398	.046	.892	.804	.000
250	4	2	.9	.016	−.056	−.082	.096	.164	.042	.940	.927	.384
250	6	0	.9	−.037	−.150	−.202	.064	.148	.031	.874	.808	.000
250	6	1	.9	−.008	−.242	−.144	.067	.200	.031	.906	.759	.001
250	6	2	.9	.008	−.054	−.029	.058	.094	.027	.952	.913	.739
250	8	0	.9	−.022	−.096	−.153	.050	.089	.025	.886	.803	.000
250	8	1	.9	−.001	−.172	−.103	.051	.126	.024	.929	.716	.003
250	8	2	.9	.004	−.051	−.008	.038	.067	.021	.955	.881	.879
250	16	0	.9	.001	−.036	−.071	.029	.029	.014	.939	.765	.000
250	16	1	.9	.003	−.074	−.043	.026	.042	.013	.955	.589	.051
250	16	2	.9	.000	−.041	.008	.014	.032	.011	.954	.759	.817
250	24	0	.9	.001	−.023	−.041	.018	.016	.010	.958	.716	.005
250	24	1	.9	.000	−.045	−.024	.014	.024	.009	.957	.517	.191
250	24	2	.9	.000	−.037	.007	.009	.023	.008	.950	.597	.777
250	2	0	.99	−.123	—	−.504	.200	—	.094	.823	.926	.000
250	2	1	.99	−.116	—	−.496	.200	—	.095	.827	.924	.000
250	2	2	.99	−.102	—	−.476	.199	—	.095	.839	.932	.000
250	4	0	.99	−.067	−.764	−.256	.094	.466	.046	.840	.665	.000
250	4	1	.99	−.063	−.758	−.249	.093	.470	.046	.845	.673	.000
250	4	2	.99	−.049	−.695	−.227	.092	.465	.046	.866	.701	.000
250	6	0	.99	−.047	−.582	−.173	.061	.276	.031	.848	.460	.000
250	6	1	.99	−.043	−.580	−.166	.063	.278	.031	.849	.467	.000
250	6	2	.99	−.030	−.514	−.145	.062	.277	.031	.873	.539	.001
250	8	0	.99	−.036	−.458	−.131	.046	.196	.024	.848	.296	.000
250	8	1	.99	−.031	−.463	−.123	.046	.195	.024	.862	.297	.000
250	8	2	.99	−.019	−.407	−.103	.046	.194	.024	.887	.374	.002
250	16	0	.99	−.018	−.240	−.067	.023	.080	.012	.857	.041	.000
250	16	1	.99	−.014	−.251	−.061	.023	.081	.012	.876	.031	.000
250	16	2	.99	−.004	−.208	−.042	.023	.080	.012	.913	.084	.015
250	24	0	.99	−.012	−.157	−.046	.016	.044	.008	.858	.005	.000
250	24	1	.99	−.008	−.168	−.039	.016	.047	.008	.881	.004	.000
250	24	2	.99	−.001	−.136	−.024	.016	.044	.008	.932	.017	.063

Notes: Data generated as $y_{it} = \rho_0 y_{it-1} + \alpha_i + \varepsilon_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, and ψ the degree of outlyingness of the initial observations y_{i0}. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval ($\text{ci}_{.95}$) of adjusted likelihood ($\widehat{\rho}_{\text{al}}$), Arellano-Bond ($\widehat{\rho}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\rho}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 1. Simulation results for the first-order autoregression (cont'd)

				bias			std			ci$_{.95}$		
N	T	ψ	ρ_0	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$
500	2	0	.5	−.106	—	−.750	.162	—	.067	.833	.927	.000
500	2	1	.5	.033	—	−.375	.168	—	.063	.931	.953	.000
500	2	2	.5	.004	—	.108	.067	—	.051	.952	.950	.400
500	4	0	.5	.012	−.008	−.295	.088	.069	.030	.946	.942	.000
500	4	1	.5	.003	−.010	−.139	.053	.076	.030	.958	.943	.002
500	4	2	.5	.000	−.003	.072	.028	.038	.025	.949	.946	.125
500	6	0	.5	.001	−.006	−.146	.038	.037	.023	.955	.943	.000
500	6	1	.5	.000	−.010	−.072	.029	.045	.022	.954	.943	.056
500	6	2	.5	.000	−.004	.044	.020	.028	.018	.947	.946	.243
500	8	0	.5	.000	−.006	−.085	.025	.026	.019	.946	.941	.002
500	8	1	.5	.000	−.008	−.043	.021	.032	.018	.948	.939	.246
500	8	2	.5	.000	−.005	.029	.016	.023	.015	.951	.949	.431
500	16	0	.5	.000	−.004	−.021	.012	.014	.012	.951	.939	.509
500	16	1	.5	.000	−.006	−.011	.012	.016	.011	.949	.936	.781
500	16	2	.5	.000	−.004	.009	.010	.015	.010	.948	.940	.807
500	24	0	.5	.000	−.004	−.009	.009	.010	.009	.947	.933	.791
500	24	1	.5	.000	−.005	−.005	.009	.011	.009	.949	.929	.887
500	24	2	.5	.000	−.004	.004	.008	.011	.008	.947	.929	.887
500	2	0	.9	−.107	—	−.550	.164	—	.067	.826	.931	.000
500	2	1	.9	−.060	—	−.475	.164	—	.067	.864	.930	.000
500	2	2	.9	.012	—	−.290	.169	—	.065	.913	.945	.002
500	4	0	.9	−.052	−.157	−.292	.078	.258	.033	.851	.861	.000
500	4	1	.9	−.018	−.227	−.226	.080	.320	.032	.900	.854	.000
500	4	2	.9	.013	−.026	−.082	.076	.115	.030	.951	.937	.135
500	6	0	.9	−.030	−.082	−.201	.053	.112	.023	.872	.870	.000
500	6	1	.9	−.001	−.147	−.143	.055	.153	.022	.924	.834	.000
500	6	2	.9	.005	−.028	−.028	.041	.066	.020	.957	.933	.601
500	8	0	.9	−.016	−.052	−.153	.041	.065	.018	.892	.868	.000
500	8	1	.9	.003	−.104	−.102	.043	.094	.017	.933	.802	.000
500	8	2	.9	.001	−.027	−.008	.025	.047	.015	.961	.915	.864
500	16	0	.9	.002	−.019	−.071	.023	.020	.010	.944	.852	.000
500	16	1	.9	.002	−.042	−.042	.019	.031	.009	.957	.740	.001
500	16	2	.9	.000	−.023	.008	.010	.023	.008	.954	.845	.731
500	24	0	.9	.001	−.012	−.041	.013	.011	.007	.960	.828	.000
500	24	1	.9	.000	−.025	−.023	.010	.017	.007	.957	.699	.024
500	24	2	.9	.000	−.021	.007	.006	.016	.005	.950	.756	.638
500	2	0	.99	−.107	—	−.505	.164	—	.067	.826	.931	.000
500	2	1	.99	−.102	—	−.497	.163	—	.067	.831	.928	.000
500	2	2	.99	−.090	—	−.476	.164	—	.067	.842	.932	.000
500	4	0	.99	−.056	−.748	−.256	.076	.474	.033	.839	.671	.000
500	4	1	.99	−.054	−.756	−.248	.076	.474	.032	.844	.681	.000
500	4	2	.99	−.039	−.640	−.226	.076	.489	.032	.864	.727	.000
500	6	0	.99	−.040	−.560	−.172	.050	.273	.022	.851	.475	.000
500	6	1	.99	−.033	−.579	−.164	.050	.279	.022	.857	.474	.000
500	6	2	.99	−.022	−.469	−.144	.050	.271	.022	.884	.577	.000
500	8	0	.99	−.030	−.442	−.130	.038	.192	.017	.845	.310	.000
500	8	1	.99	−.025	−.459	−.123	.038	.194	.017	.860	.296	.000
500	8	2	.99	−.014	−.367	−.103	.038	.190	.016	.884	.425	.000
500	16	0	.99	−.015	−.218	−.067	.019	.077	.009	.852	.055	.000
500	16	1	.99	−.010	−.240	−.060	.019	.080	.009	.878	.040	.000
500	16	2	.99	−.002	−.180	−.042	.019	.074	.008	.924	.125	.000
500	24	0	.99	−.010	−.137	−.046	.013	.042	.006	.852	.011	.000
500	24	1	.99	−.006	−.161	−.039	.013	.046	.006	.886	.005	.000
500	24	2	.99	.001	−.116	−.023	.013	.041	.006	.936	.034	.002

Notes: Data generated as $y_{it} = \rho_0 y_{it-1} + \alpha_i + \varepsilon_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0,1)$, $\varepsilon_{it} \sim \mathcal{N}(0,1)$, and ψ the degree of outlyingness of the initial observations y_{i0}. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval (ci$_{.95}$) of adjusted likelihood ($\widehat{\rho}_{\rm al}$), Arellano-Bond ($\widehat{\rho}_{\rm ab}$), and Hahn-Kuersteiner ($\widehat{\rho}_{\rm hk}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 1. Simulation results for the first-order autoregression (cont'd)

				bias			std			$\text{ci}_{.95}$		
N	T	ψ	ρ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
1000	2	0	.5	−.090	—	−.750	.134	—	.047	.834	.930	.000
1000	2	1	.5	.027	—	−.374	.135	—	.044	.943	.954	.000
1000	2	2	.5	.001	—	.108	.046	—	.035	.950	.951	.116
1000	4	0	.5	.011	−.003	−.294	.068	.049	.021	.948	.951	.000
1000	4	1	.5	.002	−.005	−.139	.036	.054	.021	.957	.947	.000
1000	4	2	.5	.000	−.002	.072	.020	.026	.017	.952	.952	.009
1000	6	0	.5	.001	−.003	−.146	.026	.026	.016	.952	.951	.000
1000	6	1	.5	.000	−.005	−.072	.021	.032	.015	.949	.944	.001
1000	6	2	.5	.000	−.002	.045	.014	.020	.013	.950	.949	.046
1000	8	0	.5	.000	−.003	−.085	.017	.019	.013	.953	.947	.000
1000	8	1	.5	.000	−.004	−.043	.015	.023	.013	.948	.946	.047
1000	8	2	.5	.000	−.002	.029	.011	.017	.011	.949	.946	.164
1000	16	0	.5	.000	−.002	−.021	.009	.010	.008	.946	.939	.240
1000	16	1	.5	.000	−.003	−.012	.008	.011	.008	.952	.944	.640
1000	16	2	.5	.000	−.002	.009	.007	.010	.007	.946	.942	.699
1000	24	0	.5	.000	−.002	−.009	.007	.007	.006	.950	.942	.659
1000	24	1	.5	.000	−.002	−.005	.006	.008	.006	.949	.943	.845
1000	24	2	.5	.000	−.002	.004	.006	.008	.006	.952	.942	.854
1000	2	0	.9	−.090	—	−.550	.134	—	.048	.833	.933	.000
1000	2	1	.9	−.044	—	−.475	.135	—	.047	.874	.930	.000
1000	2	2	.9	.021	—	−.289	.142	—	.046	.925	.956	.000
1000	4	0	.9	−.043	−.079	−.291	.064	.194	.023	.853	.905	.000
1000	4	1	.9	−.008	−.119	−.226	.066	.234	.023	.909	.892	.000
1000	4	2	.9	.009	−.014	−.082	.057	.081	.021	.956	.943	.012
1000	6	0	.9	−.023	−.043	−.201	.044	.081	.016	.873	.909	.000
1000	6	1	.9	.002	−.079	−.143	.046	.110	.016	.926	.887	.000
1000	6	2	.9	.002	−.013	−.028	.028	.046	.014	.963	.943	.368
1000	8	0	.9	−.011	−.027	−.152	.034	.046	.012	.899	.911	.000
1000	8	1	.9	.005	−.058	−.102	.036	.069	.012	.937	.867	.000
1000	8	2	.9	.001	−.013	−.007	.017	.033	.010	.961	.930	.827
1000	16	0	.9	.002	−.010	−.071	.019	.015	.007	.949	.899	.000
1000	16	1	.9	.001	−.023	−.042	.013	.022	.006	.960	.840	.000
1000	16	2	.9	.000	−.012	.008	.007	.016	.005	.948	.895	.573
1000	24	0	.9	.000	−.006	−.041	.009	.008	.005	.961	.882	.000
1000	24	1	.9	.000	−.014	−.023	.007	.012	.005	.952	.814	.001
1000	24	2	.9	.000	−.011	.007	.005	.011	.004	.947	.846	.417
1000	2	0	.99	−.090	—	−.505	.134	—	.048	.833	.933	.000
1000	2	1	.99	−.085	—	−.497	.134	—	.047	.835	.931	.000
1000	2	2	.99	−.072	—	−.475	.135	—	.047	.846	.934	.000
1000	4	0	.99	−.048	−.735	−.255	.063	.463	.023	.841	.689	.000
1000	4	1	.99	−.043	−.743	−.248	.063	.468	.023	.845	.684	.000
1000	4	2	.99	−.030	−.546	−.226	.063	.456	.023	.873	.757	.000
1000	6	0	.99	−.032	−.534	−.172	.042	.269	.016	.840	.498	.000
1000	6	1	.99	−.028	−.561	−.164	.042	.274	.016	.858	.486	.000
1000	6	2	.99	−.015	−.391	−.144	.042	.261	.015	.888	.649	.000
1000	8	0	.99	−.025	−.405	−.130	.031	.185	.012	.848	.346	.000
1000	8	1	.99	−.020	−.444	−.123	.031	.192	.012	.861	.320	.000
1000	8	2	.99	−.009	−.297	−.102	.031	.177	.012	.904	.526	.000
1000	16	0	.99	−.012	−.185	−.067	.016	.068	.006	.848	.095	.000
1000	16	1	.99	−.008	−.227	−.060	.016	.078	.006	.881	.049	.000
1000	16	2	.99	.000	−.144	−.042	.016	.065	.006	.925	.208	.000
1000	24	0	.99	−.008	−.108	−.046	.011	.036	.004	.854	.040	.000
1000	24	1	.99	−.004	−.147	−.039	.011	.045	.004	.897	.010	.000
1000	24	2	.99	.001	−.090	−.023	.011	.035	.004	.942	.086	.000

Notes: Data generated as $y_{it} = \rho_0 y_{it-1} + \alpha_i + \varepsilon_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, and ψ the degree of outlyingness of the initial observations y_{i0}. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval ($\text{ci}_{.95}$) of adjusted likelihood ($\widehat{\rho}_{\text{al}}$), Arellano-Bond ($\widehat{\rho}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\rho}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 1. Simulation results for the first-order autoregression (cont'd)

				bias			std			$\text{ci}_{.95}$		
N	T	ψ	ρ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
2500	2	0	.5	−.075	—	−.750	.105	—	.030	.827	.924	.000
2500	2	1	.5	.015	—	−.375	.091	—	.028	.954	.956	.000
2500	2	2	.5	.001	—	.107	.029	—	.023	.950	.949	.001
2500	4	0	.5	.005	−.002	−.294	.044	.031	.013	.959	.947	.000
2500	4	1	.5	.000	−.002	−.139	.023	.034	.013	.951	.948	.000
2500	4	2	.5	.000	−.001	.072	.012	.016	.011	.953	.952	.000
2500	6	0	.5	.000	−.001	−.146	.016	.017	.010	.950	.947	.000
2500	6	1	.5	.000	−.002	−.072	.013	.020	.010	.950	.949	.000
2500	6	2	.5	.000	−.001	.044	.009	.013	.008	.948	.948	.000
2500	8	0	.5	.000	−.001	−.084	.011	.012	.008	.950	.951	.000
2500	8	1	.5	.000	−.001	−.043	.010	.014	.008	.950	.946	.000
2500	8	2	.5	.000	−.001	.029	.007	.011	.007	.951	.948	.006
2500	16	0	.5	.000	−.001	−.021	.006	.006	.005	.949	.951	.015
2500	16	1	.5	.000	−.001	−.012	.005	.007	.005	.951	.945	.314
2500	16	2	.5	.000	−.001	.009	.005	.007	.005	.953	.949	.409
2500	24	0	.5	.000	−.001	−.009	.004	.004	.004	.953	.951	.347
2500	24	1	.5	.000	−.001	−.005	.004	.005	.004	.950	.948	.706
2500	24	2	.5	.000	−.001	.004	.004	.005	.004	.948	.946	.732
2500	2	0	.9	−.074	—	−.550	.104	—	.030	.836	.928	.000
2500	2	1	.9	−.031	—	−.475	.106	—	.030	.877	.938	.000
2500	2	2	.9	.021	—	−.289	.109	—	.029	.939	.955	.000
2500	4	0	.9	−.033	−.033	−.292	.050	.128	.015	.852	.932	.000
2500	4	1	.9	.000	−.047	−.226	.053	.150	.014	.923	.924	.000
2500	4	2	.9	.004	−.004	−.082	.035	.051	.013	.961	.951	.000
2500	6	0	.9	−.016	−.018	−.200	.034	.053	.010	.877	.930	.000
2500	6	1	.9	.005	−.034	−.143	.036	.072	.010	.937	.923	.000
2500	6	2	.9	.000	−.005	−.028	.016	.029	.009	.952	.949	.062
2500	8	0	.9	−.006	−.011	−.152	.026	.030	.008	.903	.933	.000
2500	8	1	.9	.004	−.023	−.102	.026	.044	.008	.947	.919	.000
2500	8	2	.9	.000	−.005	−.007	.011	.021	.007	.951	.945	.711
2500	16	0	.9	.002	−.004	−.071	.013	.009	.004	.956	.933	.000
2500	16	1	.9	.000	−.010	−.042	.008	.015	.004	.956	.898	.000
2500	16	2	.9	.000	−.005	.008	.004	.010	.003	.952	.931	.234
2500	24	0	.9	.000	−.002	−.040	.005	.005	.003	.953	.929	.000
2500	24	1	.9	.000	−.006	−.023	.004	.008	.003	.952	.894	.000
2500	24	2	.9	.000	−.005	.007	.003	.007	.002	.949	.909	.099
2500	2	0	.99	−.074	—	−.505	.104	—	.03	.835	.930	.000
2500	2	1	.99	−.07	—	−.497	.105	—	.03	.836	.934	.000
2500	2	2	.99	−.054	—	−.475	.105	—	.03	.858	.928	.000
2500	4	0	.99	−.038	−.672	−.255	.049	.458	.014	.841	.696	.000
2500	4	1	.99	−.034	−.709	−.248	.049	.476	.015	.849	.688	.000
2500	4	2	.99	−.02	−.359	−.226	.049	.402	.014	.881	.818	.000
2500	6	0	.99	−.026	−.46	−.172	.032	.253	.01	.841	.549	.000
2500	6	1	.99	−.021	−.525	−.164	.032	.277	.01	.858	.515	.000
2500	6	2	.99	−.01	−.255	−.144	.033	.211	.01	.895	.751	.000
2500	8	0	.99	−.019	−.33	−.13	.024	.168	.008	.85	.437	.000
2500	8	1	.99	−.015	−.402	−.123	.024	.19	.008	.865	.364	.000
2500	8	2	.99	−.004	−.189	−.103	.025	.136	.007	.908	.672	.000
2500	16	0	.99	−.01	−.124	−.067	.012	.053	.004	.848	.242	.000
2500	16	1	.99	−.005	−.192	−.06	.012	.073	.004	.887	.098	.000
2500	16	2	.99	.001	−.085	−.042	.013	.044	.004	.935	.421	.000
2500	24	0	.99	−.006	−.066	−.046	.008	.025	.003	.856	.175	.000
2500	24	1	.99	−.002	−.116	−.039	.008	.039	.003	.899	.032	.000
2500	24	2	.99	.001	−.053	−.023	.008	.023	.002	.951	.275	.000

Notes: Data generated as $y_{it} = \rho_0 y_{it-1} + \alpha_i + \varepsilon_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, and ψ the degree of outlyingness of the initial observations y_{i0}. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval ($\text{ci}_{.95}$) of adjusted likelihood ($\widehat{\rho}_{\text{al}}$), Arellano-Bond ($\widehat{\rho}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\rho}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 1. Simulation results for the first-order autoregression (cont'd)

				bias			std			$\text{ci}_{.95}$		
N	T	ψ	ρ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
5000	2	0	.5	−.064	—	−.751	.086	—	.021	.831	.933	.000
5000	2	1	.5	.008	—	−.375	.063	—	.020	.957	.949	.000
5000	2	2	.5	.000	—	.107	.020	—	.016	.950	.948	.000
5000	4	0	.5	.002	−.001	−.294	.029	.022	.009	.965	.952	.000
5000	4	1	.5	.001	−.001	−.139	.016	.024	.010	.951	.948	.000
5000	4	2	.5	.000	.000	.072	.009	.012	.008	.950	.950	.000
5000	6	0	.5	.000	−.001	−.146	.012	.012	.007	.951	.954	.000
5000	6	1	.5	.000	−.001	−.072	.009	.014	.007	.951	.948	.000
5000	6	2	.5	.000	.000	.044	.006	.009	.006	.950	.951	.000
5000	8	0	.5	.000	−.001	−.085	.008	.008	.006	.947	.950	.000
5000	8	1	.5	.000	−.001	−.043	.007	.010	.006	.950	.949	.000
5000	8	2	.5	.000	.000	.029	.005	.008	.005	.946	.949	.000
5000	16	0	.5	.000	.000	−.021	.004	.004	.004	.949	.947	.000
5000	16	1	.5	.000	−.001	−.011	.004	.005	.004	.950	.949	.078
5000	16	2	.5	.000	−.001	.009	.003	.005	.003	.951	.951	.152
5000	24	0	.5	.000	.000	−.009	.003	.003	.003	.948	.948	.089
5000	24	1	.5	.000	.000	−.005	.003	.004	.003	.948	.949	.495
5000	24	2	.5	.000	.000	.004	.003	.003	.003	.949	.950	.550
5000	2	0	.9	−.064	—	−.551	.086	—	.021	.831	.933	.000
5000	2	1	.9	−.021	—	−.475	.089	—	.021	.887	.939	.000
5000	2	2	.9	.016	—	−.289	.088	—	.021	.942	.953	.000
5000	4	0	.9	−.027	−.018	−.291	.041	.091	.010	.858	.942	.000
5000	4	1	.9	.004	−.024	−.225	.044	.106	.010	.930	.940	.000
5000	4	2	.9	.001	−.003	−.082	.023	.036	.009	.962	.948	.000
5000	6	0	.9	−.011	−.008	−.200	.028	.037	.007	.886	.945	.000
5000	6	1	.9	.005	−.017	−.143	.030	.052	.007	.945	.938	.000
5000	6	2	.9	.000	−.003	−.028	.012	.021	.006	.951	.945	.002
5000	8	0	.9	−.004	−.006	−.152	.022	.021	.006	.904	.939	.000
5000	8	1	.9	.003	−.011	−.102	.020	.032	.005	.954	.933	.000
5000	8	2	.9	.000	−.002	−.007	.008	.015	.005	.952	.948	.528
5000	16	0	.9	.001	−.002	−.071	.009	.007	.003	.960	.940	.000
5000	16	1	.9	.000	−.005	−.042	.005	.010	.003	.949	.928	.000
5000	16	2	.9	.000	−.002	.008	.003	.007	.002	.950	.940	.044
5000	24	0	.9	.000	−.001	−.041	.004	.004	.002	.951	.938	.000
5000	24	1	.9	.000	−.003	−.023	.003	.006	.002	.948	.919	.000
5000	24	2	.9	.000	−.002	.007	.002	.005	.002	.946	.931	.006
5000	2	0	.99	−.064	—	−.506	.086	—	.021	.831	.933	.000
5000	2	1	.99	−.060	—	−.498	.087	—	.021	.838	.931	.000
5000	2	2	.99	−.045	—	−.475	.087	—	.021	.858	.929	.000
5000	4	0	.99	−.032	−.591	−.255	.040	.443	.010	.841	.713	.000
5000	4	1	.99	−.027	−.655	−.247	.040	.474	.010	.861	.718	.000
5000	4	2	.99	−.015	−.212	−.226	.041	.316	.010	.881	.860	.000
5000	6	0	.99	−.021	−.368	−.171	.027	.232	.007	.841	.614	.000
5000	6	1	.99	−.017	−.466	−.164	.027	.269	.007	.862	.564	.000
5000	6	2	.99	−.006	−.148	−.144	.027	.151	.007	.903	.828	.000
5000	8	0	.99	−.017	−.246	−.130	.020	.142	.005	.839	.552	.000
5000	8	1	.99	−.011	−.349	−.122	.020	.183	.005	.869	.438	.000
5000	8	2	.99	−.002	−.110	−.102	.021	.096	.005	.918	.788	.000
5000	16	0	.99	−.008	−.078	−.067	.010	.039	.003	.844	.448	.000
5000	16	1	.99	−.004	−.151	−.060	.010	.062	.003	.891	.173	.000
5000	16	2	.99	.002	−.050	−.042	.011	.031	.003	.941	.624	.000
5000	24	0	.99	−.005	−.040	−.046	.007	.018	.002	.859	.381	.000
5000	24	1	.99	−.001	−.086	−.039	.007	.031	.002	.911	.089	.000
5000	24	2	.99	.001	−.031	−.023	.006	.016	.002	.954	.501	.000

Notes: Data generated as $y_{it} = \rho_0 y_{it-1} + \alpha_i + \varepsilon_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, and ψ the degree of outlyingness of the initial observations y_{i0}. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval ($\text{ci}_{.95}$) of adjusted likelihood ($\widehat{\rho}_{\text{al}}$), Arellano-Bond ($\widehat{\rho}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\rho}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 1. Simulation results for the first-order autoregression (cont'd)

				bias			std			ci$_{.95}$		
N	T	ψ	ρ_0	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$
10000	2	0	.5	−.055	—	−.750	.072	—	.015	.831	.931	.000
10000	2	1	.5	.003	—	−.375	.040	—	.014	.962	.950	.000
10000	2	2	.5	.000	—	.107	.014	—	.011	.953	.949	.000
10000	4	0	.5	.001	.000	−.294	.020	.015	.007	.958	.951	.000
10000	4	1	.5	.000	−.001	−.139	.011	.017	.007	.949	.948	.000
10000	4	2	.5	.000	.000	.072	.006	.008	.006	.950	.951	.000
10000	6	0	.5	.000	.000	−.146	.008	.008	.005	.951	.951	.000
10000	6	1	.5	.000	−.001	−.072	.006	.010	.005	.948	.952	.000
10000	6	2	.5	.000	.000	.044	.004	.006	.004	.950	.951	.000
10000	8	0	.5	.000	.000	−.084	.005	.006	.004	.948	.949	.000
10000	8	1	.5	.000	.000	−.043	.005	.007	.004	.950	.949	.000
10000	8	2	.5	.000	.000	.029	.004	.005	.003	.951	.952	.000
10000	16	0	.5	.000	.000	−.021	.003	.003	.003	.947	.947	.000
10000	16	1	.5	.000	.000	−.012	.003	.004	.003	.951	.946	.003
10000	16	2	.5	.000	.000	.009	.002	.003	.002	.951	.952	.015
10000	24	0	.5	.000	.000	−.009	.002	.002	.002	.953	.951	.003
10000	24	1	.5	.000	.000	−.005	.002	.003	.002	.955	.952	.214
10000	24	2	.5	.000	.000	.004	.002	.002	.002	.955	.952	.268
10000	2	0	.9	−.055	—	−.550	.072	—	.015	.831	.931	.000
10000	2	1	.9	−.013	—	−.475	.074	—	.015	.898	.947	.000
10000	2	2	.9	.013	—	−.289	.066	—	.014	.955	.949	.000
10000	4	0	.9	−.021	−.008	−.291	.034	.065	.007	.864	.945	.000
10000	4	1	.9	.005	−.012	−.226	.037	.076	.007	.936	.942	.000
10000	4	2	.9	.001	−.001	−.082	.016	.025	.007	.955	.948	.000
10000	6	0	.9	−.008	−.004	−.200	.023	.027	.005	.892	.947	.000
10000	6	1	.9	.004	−.009	−.143	.023	.037	.005	.950	.942	.000
10000	6	2	.9	.000	−.001	−.028	.008	.015	.004	.952	.951	.000
10000	8	0	.9	−.001	−.003	−.152	.018	.015	.004	.919	.946	.000
10000	8	1	.9	.001	−.006	−.102	.014	.023	.004	.961	.940	.000
10000	8	2	.9	.000	−.001	−.007	.005	.011	.003	.946	.946	.288
10000	16	0	.9	.000	−.001	−.071	.006	.005	.002	.961	.945	.000
10000	16	1	.9	.000	−.002	−.042	.004	.007	.002	.954	.941	.000
10000	16	2	.9	.000	−.001	.008	.002	.005	.002	.948	.946	.001
10000	24	0	.9	.000	−.001	−.040	.003	.003	.002	.955	.941	.000
10000	24	1	.9	.000	−.001	−.023	.002	.004	.001	.955	.939	.000
10000	24	2	.9	.000	−.001	.007	.001	.004	.001	.953	.941	.000
10000	2	0	.99	−.055	—	−.505	.072	—	.015	.831	.931	.000
10000	2	1	.99	−.050	—	−.497	.072	—	.015	.841	.928	.000
10000	2	2	.99	−.034	—	−.476	.072	—	.015	.868	.929	.000
10000	4	0	.99	−.027	−.461	−.255	.034	.406	.007	.842	.754	.000
10000	4	1	.99	−.022	−.565	−.248	.034	.459	.007	.856	.731	.000
10000	4	2	.99	−.010	−.101	−.226	.034	.215	.007	.891	.908	.000
10000	6	0	.99	−.018	−.259	−.171	.022	.189	.005	.847	.703	.000
10000	6	1	.99	−.013	−.390	−.164	.022	.251	.005	.869	.614	.000
10000	6	2	.99	−.003	−.078	−.143	.023	.107	.005	.910	.879	.000
10000	8	0	.99	−.013	−.160	−.130	.017	.110	.004	.846	.683	.000
10000	8	1	.99	−.009	−.275	−.122	.017	.161	.004	.873	.526	.000
10000	8	2	.99	.000	−.059	−.102	.018	.068	.004	.927	.852	.000
10000	16	0	.99	−.007	−.046	−.067	.008	.028	.002	.848	.635	.000
10000	16	1	.99	−.002	−.104	−.060	.009	.048	.002	.899	.326	.000
10000	16	2	.99	.001	−.027	−.042	.009	.022	.002	.948	.769	.000
10000	24	0	.99	−.004	−.022	−.046	.006	.013	.001	.860	.606	.000
10000	24	1	.99	−.001	−.056	−.039	.006	.023	.001	.917	.238	.000
10000	24	2	.99	.001	−.017	−.023	.004	.011	.001	.960	.691	.000

Notes: Data generated as $y_{it} = \rho_0 y_{it-1} + \alpha_i + \varepsilon_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0,1)$, $\varepsilon_{it} \sim \mathcal{N}(0,1)$, and ψ the degree of outlyingness of the initial observations y_{i0}. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval (ci$_{.95}$) of adjusted likelihood ($\widehat{\rho}_{\rm al}$), Arellano-Bond ($\widehat{\rho}_{\rm ab}$), and Hahn-Kuersteiner ($\widehat{\rho}_{\rm hk}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 2. Simulation results for the second-order autoregression

				bias			std			$\text{ci}_{.95}$		
N	T	ψ	ρ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
100	2	.3	.6	−.143	—	−.848	.262	—	.304	.822	.927	.029
			.2	−.349	—	−.742	.665	—	.807	.956	.945	.479
100	2	1	.6	−.146	—	−.844	.267	—	.167	.811	.914	.000
			.2	−.173	—	−.730	.285	—	.273	.879	.918	.047
100	2	2	.6	−.143	—	−.846	.265	—	.152	.819	.923	.000
			.2	−.139	—	−.733	.244	—	.180	.838	.923	.001
100	4	.3	.6	−.069	−.282	−.327	.122	.283	.065	.860	.781	.000
			.2	−.030	−.123	−.121	.098	.135	.093	.930	.810	.528
100	4	1	.6	−.001	−.044	−.204	.122	.121	.061	.920	.919	.050
			.2	−.001	−.022	−.051	.095	.091	.083	.949	.927	.786
100	4	2	.6	.009	−.011	−.005	.082	.064	.048	.954	.941	.953
			.2	.005	−.005	.073	.073	.065	.066	.955	.941	.731
100	6	.3	.6	−.035	−.153	−.206	.082	.137	.050	.896	.778	.008
			.2	−.017	−.074	−.086	.069	.078	.059	.933	.822	.552
100	6	1	.6	.007	−.037	−.111	.083	.074	.046	.945	.905	.287
			.2	.004	−.017	−.013	.066	.058	.056	.959	.932	.889
100	6	2	.6	.001	−.012	.026	.047	.045	.036	.951	.934	.915
			.2	.001	−.004	.086	.046	.045	.047	.944	.942	.475
100	8	.3	.6	−.015	−.101	−.144	.064	.088	.043	.923	.778	.056
			.2	−.008	−.052	−.066	.055	.056	.046	.946	.843	.608
100	8	1	.6	.006	−.033	−.071	.063	.055	.039	.956	.895	.501
			.2	.003	−.015	−.003	.052	.045	.044	.962	.931	.915
100	8	2	.6	.000	−.012	.027	.038	.038	.031	.940	.930	.883
			.2	.001	−.002	.075	.036	.036	.038	.944	.947	.432
100	16	.3	.6	.003	−.041	−.050	.037	.036	.028	.963	.793	.512
			.2	.002	−.025	−.030	.035	.031	.028	.963	.868	.780
100	16	1	.6	.000	−.024	−.024	.031	.030	.027	.950	.871	.826
			.2	.000	−.011	.001	.029	.028	.027	.949	.926	.933
100	16	2	.6	.000	−.011	.015	.025	.026	.023	.945	.922	.905
			.2	.000	−.003	.041	.024	.024	.025	.946	.945	.576
100	24	.3	.6	.000	−.029	−.024	.024	.025	.022	.952	.790	.767
			.2	.000	−.018	−.016	.024	.023	.022	.952	.872	.869
100	24	1	.6	.000	−.020	−.012	.022	.023	.021	.944	.858	.896
			.2	−.001	−.011	.000	.022	.022	.021	.950	.917	.942
100	24	2	.6	.000	−.012	.009	.020	.020	.019	.949	.909	.931
			.2	.000	−.003	.025	.019	.020	.020	.943	.942	.723

Notes: Data generated as $y_{it} = \rho_{01} y_{it-1} + \rho_{02} y_{it-2} + \alpha_i + \varepsilon_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, and ψ the degree of outlyingness of the initial observations $(y_{i0}, y_{i,-1})$. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval ($\text{ci}_{.95}$) of adjusted likelihood ($\widehat{\rho}_{\text{al}}$), Arellano-Bond ($\widehat{\rho}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\rho}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 2. Simulation results for the second-order autoregression (cont'd)

				bias			std			ci.95		
N	T	ψ	ρ_0	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$
100	2	.3	1	−.141	—	−.856	.263	—	.273	.822	.927	.016
			−.2	−.196	—	−.370	.572	—	.721	.965	.966	.591
100	2	1	1	−.145	—	−.860	.268	—	.146	.811	.914	.000
			−.2	−.102	—	−.381	.215	—	.227	.912	.921	.226
100	2	2	1	−.142	—	−.859	.265	—	.133	.819	.923	.000
			−.2	−.082	—	−.376	.158	—	.133	.856	.924	.035
100	4	.3	1	−.069	−.237	−.360	.117	.261	.059	.861	.802	.000
			−.2	.007	−.018	.009	.088	.084	.095	.962	.939	.810
100	4	1	1	.009	−.030	−.213	.114	.099	.053	.929	.929	.012
			−.2	.008	−.004	.013	.081	.079	.086	.963	.939	.823
100	4	2	1	.003	−.008	−.022	.059	.051	.037	.949	.942	.931
			−.2	.003	−.001	.061	.061	.060	.069	.946	.943	.712
100	6	.3	1	−.030	−.112	−.216	.076	.116	.047	.905	.815	.001
			−.2	.002	−.018	−.024	.063	.058	.060	.963	.928	.835
100	6	1	1	.008	−.025	−.105	.073	.062	.043	.954	.921	.271
			−.2	.004	−.001	.031	.054	.052	.056	.955	.941	.829
100	6	2	1	.000	−.009	.017	.038	.039	.031	.945	.940	.940
			−.2	.001	.002	.088	.041	.042	.045	.943	.945	.405
100	8	.3	1	−.008	−.067	−.137	.059	.072	.041	.937	.837	.052
			−.2	.003	−.014	−.029	.050	.045	.046	.964	.935	.830
100	8	1	1	.002	−.024	−.064	.051	.048	.037	.953	.911	.540
			−.2	.001	−.001	.026	.043	.042	.043	.945	.941	.851
100	8	2	1	−.001	−.009	.015	.033	.034	.028	.939	.934	.934
			−.2	.001	.003	.077	.033	.034	.037	.946	.943	.365
100	16	.3	1	.001	−.026	−.037	.030	.032	.027	.950	.868	.672
			−.2	.001	−.009	−.014	.029	.028	.027	.949	.932	.905
100	16	1	1	−.001	−.018	−.019	.027	.028	.025	.944	.903	.868
			−.2	.000	−.003	.010	.026	.026	.026	.948	.945	.919
100	16	2	1	.000	−.009	.004	.023	.024	.022	.944	.928	.951
			−.2	.000	.001	.038	.023	.023	.024	.949	.947	.597
100	24	.3	1	−.001	−.019	−.016	.022	.023	.021	.948	.867	.862
			−.2	.000	−.007	−.007	.022	.022	.021	.945	.935	.934
100	24	1	1	.000	−.015	−.009	.021	.022	.021	.945	.899	.916
			−.2	.000	−.004	.004	.021	.021	.021	.945	.945	.934
100	24	2	1	−.001	−.010	.002	.019	.020	.019	.948	.918	.946
			−.2	.000	.000	.022	.019	.019	.020	.945	.945	.771

Notes: Data generated as $y_{it} = \rho_{01} y_{it-1} + \rho_{02} y_{it-2} + \alpha_i + \varepsilon_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, and ψ the degree of outlyingness of the initial observations $(y_{i0}, y_{i,-1})$. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval (ci.95) of adjusted likelihood ($\widehat{\rho}_{\rm al}$), Arellano-Bond ($\widehat{\rho}_{\rm ab}$), and Hahn-Kuersteiner ($\widehat{\rho}_{\rm hk}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 2. Simulation results for the second-order autoregression (cont'd)

				bias			std			ci$_{.95}$		
N	T	ψ	ρ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
250	2	.3	.6	−.125	—	−.840	.199	—	.190	.822	.925	.000
			.2	−.296	—	−.721	.437	—	.504	.955	.931	.310
250	2	1	.6	−.122	—	−.844	.198	—	.106	.822	.920	.000
			.2	−.137	—	−.729	.201	—	.173	.874	.922	.001
250	2	2	.6	−.123	—	−.843	.200	—	.096	.826	.929	.000
			.2	−.117	—	−.728	.182	—	.114	.840	.927	.000
250	4	.3	.6	−.050	−.131	−.326	.092	.197	.041	.868	.864	.000
			.2	−.021	−.057	−.117	.068	.095	.058	.925	.882	.276
250	4	1	.6	.008	−.019	−.202	.094	.077	.039	.933	.934	.000
			.2	.004	−.009	−.049	.066	.058	.053	.957	.944	.701
250	4	2	.6	.003	−.004	−.006	.048	.040	.030	.956	.946	.949
			.2	.002	−.002	.073	.044	.041	.042	.952	.947	.476
250	6	.3	.6	−.022	−.072	−.205	.062	.091	.032	.900	.871	.000
			.2	−.010	−.034	−.083	.048	.053	.038	.936	.892	.269
250	6	1	.6	.008	−.016	−.109	.061	.047	.029	.954	.935	.027
			.2	.005	−.006	−.012	.045	.037	.035	.962	.941	.880
250	6	2	.6	.001	−.004	.025	.029	.028	.023	.948	.945	.834
			.2	.000	−.002	.086	.029	.028	.030	.951	.948	.129
250	8	.3	.6	−.007	−.046	−.143	.047	.058	.027	.928	.872	.000
			.2	−.002	−.023	−.065	.039	.038	.029	.951	.900	.293
250	8	1	.6	.004	−.013	−.071	.042	.035	.025	.965	.933	.157
			.2	.002	−.006	−.003	.033	.029	.028	.964	.943	.907
250	8	2	.6	.001	−.004	.026	.024	.024	.020	.944	.942	.761
			.2	.000	−.001	.076	.024	.024	.024	.944	.942	.092
250	16	.3	.6	.002	−.018	−.050	.024	.023	.018	.964	.879	.154
			.2	.001	−.011	−.029	.023	.020	.018	.963	.909	.582
250	16	1	.6	.000	−.010	−.023	.019	.019	.017	.950	.918	.683
			.2	.000	−.005	.001	.018	.017	.017	.949	.942	.932
250	16	2	.6	.000	−.004	.015	.016	.016	.014	.949	.940	.830
			.2	.000	−.001	.042	.015	.015	.016	.949	.949	.206
250	24	.3	.6	.000	−.012	−.024	.015	.016	.014	.950	.878	.544
			.2	.000	−.008	−.016	.015	.015	.014	.949	.915	.776
250	24	1	.6	.000	−.008	−.012	.014	.015	.013	.949	.909	.843
			.2	.000	−.005	.001	.014	.014	.014	.952	.938	.937
250	24	2	.6	.000	−.005	.009	.013	.013	.012	.949	.938	.890
			.2	.000	−.002	.025	.012	.012	.013	.946	.946	.440

Notes: Data generated as $y_{it} = \rho_{01} y_{it-1} + \rho_{02} y_{it-2} + \alpha_i + \varepsilon_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, and ψ the degree of outlyingness of the initial observations $(y_{i0}, y_{i,-1})$. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval (ci$_{.95}$) of adjusted likelihood ($\widehat{\rho}_{\text{al}}$), Arellano-Bond ($\widehat{\rho}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\rho}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 2. Simulation results for the second-order autoregression (cont'd)

				bias			std			ci.95		
N	T	ψ	ρ_0	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$
250	2	.3	1	−.124	—	−.864	.200	—	.170	.822	.925	.000
			−.2	−.169	—	−.393	.369	—	.449	.967	.948	.491
250	2	1	1	−.122	—	−.859	.199	—	.092	.822	.920	.000
			−.2	−.081	—	−.376	.146	—	.143	.905	.924	.049
250	2	2	1	−.123	—	−.859	.200	—	.082	.826	.929	.000
			−.2	−.069	—	−.378	.115	—	.081	.859	.927	.000
250	4	.3	1	−.048	−.103	−.360	.088	.176	.037	.869	.882	.000
			−.2	.004	−.008	.010	.057	.056	.060	.969	.949	.812
250	4	1	1	.012	−.013	−.212	.086	.063	.034	.945	.935	.000
			−.2	.005	−.001	.014	.053	.050	.055	.961	.944	.814
250	4	2	1	.001	−.003	−.022	.036	.032	.023	.951	.946	.881
			−.2	.001	.000	.060	.038	.038	.044	.949	.947	.539
250	6	.3	1	−.017	−.050	−.214	.057	.076	.030	.910	.892	.000
			−.2	.002	−.007	−.024	.041	.037	.039	.966	.943	.787
250	6	1	1	.005	−.011	−.104	.049	.039	.027	.961	.939	.020
			−.2	.002	.000	.031	.034	.033	.035	.952	.947	.753
250	6	2	1	.000	−.003	.017	.024	.025	.020	.948	.944	.897
			−.2	.000	.001	.088	.026	.026	.029	.948	.949	.081
250	8	.3	1	−.001	−.030	−.136	.043	.047	.026	.943	.897	.000
			−.2	.003	−.006	−.029	.033	.030	.029	.968	.940	.738
250	8	1	1	.001	−.009	−.064	.031	.030	.023	.959	.936	.186
			−.2	.000	.000	.026	.026	.026	.027	.949	.949	.765
250	8	2	1	.000	−.003	.015	.021	.022	.018	.946	.942	.892
			−.2	.000	.001	.076	.021	.022	.023	.944	.944	.057
250	16	.3	1	.000	−.011	−.036	.019	.020	.017	.952	.914	.389
			−.2	.000	−.004	−.014	.018	.018	.017	.946	.942	.846
250	16	1	1	.000	−.008	−.019	.017	.018	.016	.949	.933	.761
			−.2	.000	−.001	.010	.016	.016	.017	.952	.952	.888
250	16	2	1	.000	−.004	.005	.015	.016	.014	.950	.941	.935
			−.2	.000	.000	.037	.014	.015	.015	.947	.947	.254
250	24	.3	1	.000	−.008	−.016	.014	.015	.014	.950	.917	.756
			−.2	.000	−.003	−.007	.014	.014	.013	.948	.943	.911
250	24	1	1	.000	−.006	−.009	.013	.014	.013	.949	.927	.882
			−.2	.000	−.002	.005	.013	.013	.013	.950	.950	.926
250	24	2	1	.000	−.004	.002	.012	.013	.012	.949	.942	.944
			−.2	.000	.000	.022	.012	.012	.012	.949	.950	.542

Notes: Data generated as $y_{it} = \rho_{01} y_{it-1} + \rho_{02} y_{it-2} + \alpha_i + \varepsilon_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0,1)$, $\varepsilon_{it} \sim \mathcal{N}(0,1)$, and ψ the degree of outlyingness of the initial observations $(y_{i0}, y_{i,-1})$. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval ($\text{ci}_{.95}$) of adjusted likelihood ($\widehat{\rho}_{\rm al}$), Arellano-Bond ($\widehat{\rho}_{\rm ab}$), and Hahn-Kuersteiner ($\widehat{\rho}_{\rm hk}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 2. Simulation results for the second-order autoregression (cont'd)

				bias			std			$\text{ci}_{.95}$		
N	T	ψ	ρ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
500	2	.3	.6	−.104	—	−.845	.163	—	.134	.827	.928	.000
			.2	−.253	—	−.733	.331	—	.356	.952	.926	.142
500	2	1	.6	−.105	—	−.843	.163	—	.075	.830	.925	.000
			.2	−.114	—	−.730	.160	—	.122	.864	.924	.000
500	2	2	.6	−.104	—	−.843	.162	—	.067	.834	.927	.000
			.2	−.098	—	−.729	.147	—	.080	.843	.927	.000
500	4	.3	.6	−.040	−.067	−.325	.076	.144	.030	.867	.900	.000
			.2	−.017	−.030	−.116	.051	.071	.042	.922	.909	.079
500	4	1	.6	.012	−.009	−.202	.077	.056	.027	.942	.938	.000
			.2	.007	−.003	−.049	.051	.041	.037	.962	.950	.566
500	4	2	.6	.001	−.002	−.006	.033	.029	.021	.956	.947	.951
			.2	.001	−.001	.074	.032	.029	.030	.946	.946	.206
500	6	.3	.6	−.014	−.038	−.205	.050	.066	.022	.905	.908	.000
			.2	−.007	−.018	−.083	.037	.038	.026	.940	.919	.062
500	6	1	.6	.006	−.008	−.109	.047	.034	.021	.954	.937	.000
			.2	.004	−.003	−.012	.032	.026	.025	.968	.949	.862
500	6	2	.6	.000	−.002	.026	.021	.020	.016	.947	.948	.681
			.2	.000	−.001	.086	.020	.020	.021	.950	.946	.009
500	8	.3	.6	−.003	−.023	−.143	.039	.041	.019	.927	.912	.000
			.2	−.002	−.012	−.065	.030	.028	.020	.948	.920	.076
500	8	1	.6	.003	−.007	−.070	.030	.025	.017	.964	.940	.014
			.2	.001	−.003	−.002	.024	.020	.020	.960	.946	.911
500	8	2	.6	.000	−.002	.026	.017	.017	.014	.949	.949	.568
			.2	.000	.000	.077	.016	.016	.017	.952	.952	.004
500	16	.3	.6	.001	−.010	−.050	.017	.017	.013	.962	.909	.016
			.2	.001	−.006	−.029	.016	.014	.012	.961	.932	.316
500	16	1	.6	.000	−.005	−.023	.013	.014	.012	.953	.933	.459
			.2	.000	−.002	.002	.013	.012	.012	.948	.943	.932
500	16	2	.6	.000	−.002	.015	.011	.011	.010	.948	.946	.701
			.2	.000	.000	.042	.011	.011	.011	.951	.949	.028
500	24	.3	.6	.000	−.006	−.024	.011	.011	.010	.949	.914	.274
			.2	.000	−.004	−.016	.011	.011	.010	.949	.930	.618
500	24	1	.6	.000	−.004	−.012	.010	.010	.010	.949	.931	.741
			.2	.000	−.002	.001	.010	.010	.010	.949	.943	.932
500	24	2	.6	.000	−.002	.009	.009	.009	.009	.948	.942	.819
			.2	.000	−.001	.026	.009	.009	.009	.948	.946	.155

Notes: Data generated as $y_{it} = \rho_{01} y_{it-1} + \rho_{02} y_{it-2} + \alpha_i + \varepsilon_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, and ψ the degree of outlyingness of the initial observations $(y_{i0}, y_{i,-1})$. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval ($\text{ci}_{.95}$) of adjusted likelihood ($\widehat{\rho}_{\text{al}}$), Arellano-Bond ($\widehat{\rho}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\rho}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 2. Simulation results for the second-order autoregression (cont'd)

				bias			std			ci.95		
N	T	ψ	ρ_0	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$
500	2	.3	1	−.104	—	−.860	.164	—	.118	.827	.928	.000
			−.2	−.145	—	−.380	.274	—	.314	.965	.932	.379
500	2	1	1	−.105	—	−.859	.163	—	.064	.830	.925	.000
			−.2	−.068	—	−.377	.113	—	.101	.892	.923	.003
500	2	2	1	−.104	—	−.859	.162	—	.058	.833	.927	.000
			−.2	−.057	—	−.377	.091	—	.058	.855	.927	.000
500	4	.3	1	−.036	−.053	−.359	.072	.127	.027	.875	.911	.000
			−.2	.003	−.004	.010	.041	.040	.042	.971	.947	.799
500	4	1	1	.011	−.007	−.212	.069	.044	.024	.950	.944	.000
			−.2	.003	−.001	.014	.038	.035	.039	.960	.949	.802
500	4	2	1	.001	−.002	−.022	.025	.023	.017	.951	.947	.792
			−.2	.001	.000	.060	.027	.027	.031	.947	.949	.314
500	6	.3	1	−.010	−.025	−.213	.047	.055	.021	.911	.920	.000
			−.2	.001	−.004	−.025	.030	.027	.028	.965	.946	.708
500	6	1	1	.002	−.005	−.103	.033	.027	.019	.962	.948	.000
			−.2	.001	.000	.030	.023	.023	.025	.951	.947	.636
500	6	2	1	.000	−.002	.017	.017	.017	.014	.951	.947	.828
			−.2	.000	.000	.088	.018	.019	.020	.948	.948	.004
500	8	.3	1	.002	−.014	−.136	.036	.033	.018	.942	.927	.000
			−.2	.002	−.003	−.029	.024	.021	.020	.969	.945	.583
500	8	1	1	.001	−.005	−.063	.022	.022	.016	.952	.943	.022
			−.2	.000	.000	.026	.018	.019	.019	.949	.949	.629
500	8	2	1	.000	−.002	.015	.014	.015	.013	.950	.951	.816
			−.2	.000	.000	.076	.015	.015	.016	.952	.953	.001
500	16	.3	1	.000	−.006	−.036	.013	.014	.012	.944	.930	.127
			−.2	.000	−.002	−.014	.013	.013	.012	.952	.948	.762
500	16	1	1	.000	−.004	−.019	.012	.013	.012	.949	.943	.586
			−.2	.000	.000	.010	.012	.012	.012	.949	.950	.842
500	16	2	1	.000	−.002	.005	.011	.011	.010	.948	.942	.925
			−.2	.000	.000	.037	.010	.010	.011	.949	.949	.047
500	24	.3	1	.000	−.004	−.016	.010	.011	.010	.944	.928	.591
			−.2	.000	−.002	−.007	.010	.010	.009	.949	.946	.885
500	24	1	1	.000	−.003	−.009	.009	.010	.009	.949	.939	.824
			−.2	.000	−.001	.005	.009	.009	.009	.950	.948	.913
500	24	2	1	.000	−.002	.002	.009	.009	.009	.951	.945	.940
			−.2	.000	.000	.022	.008	.009	.009	.949	.947	.269

Notes: Data generated as $y_{it} = \rho_{01} y_{it-1} + \rho_{02} y_{it-2} + \alpha_i + \varepsilon_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0,1)$, $\varepsilon_{it} \sim \mathcal{N}(0,1)$, and ψ the degree of outlyingness of the initial observations $(y_{i0}, y_{i,-1})$. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval (ci.95) of adjusted likelihood ($\widehat{\rho}_{\rm al}$), Arellano-Bond ($\widehat{\rho}_{\rm ab}$), and Hahn-Kuersteiner ($\widehat{\rho}_{\rm hk}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 2. Simulation results for the second-order autoregression (cont'd)

				bias			std			ci$_{.95}$		
N	T	ψ	ρ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
1000	2	.3	.6	−.093	—	−.842	.134	—	.095	.831	.931	.000
			.2	−.207	—	−.728	.248	—	.253	.945	.933	.029
1000	2	1	.6	−.091	—	−.843	.134	—	.052	.833	.928	.000
			.2	−.096	—	−.729	.124	—	.085	.863	.930	.000
1000	2	2	.6	−.093	—	−.844	.136	—	.047	.825	.932	.000
			.2	−.086	—	−.730	.122	—	.056	.834	.932	.000
1000	4	.3	.6	−.032	−.035	−.325	.063	.105	.021	.862	.925	.000
			.2	−.014	−.016	−.116	.039	.051	.029	.920	.928	.005
1000	4	1	.6	.013	−.003	−.202	.062	.038	.019	.953	.949	.000
			.2	.006	−.002	−.048	.039	.029	.026	.964	.953	.368
1000	4	2	.6	.000	−.001	−.005	.023	.020	.015	.954	.950	.941
			.2	.001	.000	.074	.022	.021	.021	.950	.950	.030
1000	6	.3	.6	−.009	−.019	−.205	.041	.048	.016	.912	.930	.000
			.2	−.004	−.009	−.083	.028	.028	.019	.939	.936	.003
1000	6	1	.6	.004	−.004	−.109	.033	.023	.015	.963	.947	.000
			.2	.002	−.002	−.011	.023	.019	.018	.967	.950	.832
1000	6	2	.6	.000	−.001	.026	.015	.014	.011	.948	.946	.422
			.2	.000	.000	.086	.015	.014	.015	.946	.946	.000
1000	8	.3	.6	.001	−.012	−.143	.032	.030	.014	.941	.929	.000
			.2	.000	−.007	−.065	.023	.020	.015	.949	.933	.004
1000	8	1	.6	.001	−.003	−.070	.020	.017	.012	.963	.945	.000
			.2	.001	−.001	−.002	.016	.015	.014	.957	.946	.914
1000	8	2	.6	.000	−.001	.027	.012	.012	.010	.951	.948	.259
			.2	.000	.000	.076	.012	.012	.012	.943	.946	.000
1000	16	.3	.6	.000	−.005	−.050	.012	.012	.009	.957	.932	.000
			.2	.000	−.003	−.029	.011	.010	.009	.952	.936	.075
1000	16	1	.6	.000	−.003	−.023	.010	.010	.008	.948	.940	.184
			.2	.000	−.001	.002	.009	.009	.009	.947	.944	.928
1000	16	2	.6	.000	−.001	.015	.008	.008	.007	.953	.949	.481
			.2	.000	.000	.042	.007	.008	.008	.954	.954	.000
1000	24	.3	.6	.000	−.003	−.024	.008	.008	.007	.950	.932	.053
			.2	.000	−.002	−.016	.007	.007	.007	.954	.941	.364
1000	24	1	.6	.000	−.002	−.011	.007	.007	.007	.946	.937	.568
			.2	.000	−.001	.001	.007	.007	.007	.950	.948	.935
1000	24	2	.6	.000	−.001	.009	.006	.007	.006	.949	.947	.690
			.2	.000	.000	.026	.006	.006	.006	.950	.950	.014

Notes: Data generated as $y_{it} = \rho_{01} y_{it-1} + \rho_{02} y_{it-2} + \alpha_i + \varepsilon_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, and ψ the degree of outlyingness of the initial observations $(y_{i0}, y_{i,-1})$. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval (ci$_{.95}$) of adjusted likelihood ($\widehat{\rho}_{\text{al}}$), Arellano-Bond ($\widehat{\rho}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\rho}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 2. Simulation results for the second-order autoregression (cont'd)

				bias			std			ci$_{.95}$		
N	T	ψ	ρ_0	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$
1000	2	.3	1	−.092	—	−.859	.134	—	.085	.831	.931	.000
			−.2	−.120	—	−.379	.202	—	.225	.960	.935	.223
1000	2	1	1	−.091	—	−.859	.134	—	.046	.833	.928	.000
			−.2	−.057	—	−.378	.085	—	.072	.890	.930	.000
1000	2	2	1	−.093	—	−.859	.136	—	.041	.825	.932	.000
			−.2	−.051	—	−.376	.075	—	.041	.844	.933	.000
1000	4	.3	1	−.029	−.028	−.359	.060	.090	.019	.876	.935	.000
			−.2	.001	−.003	.011	.029	.029	.030	.969	.948	.791
1000	4	1	1	.008	−.003	−.211	.051	.032	.017	.960	.946	.000
			−.2	.002	.000	.013	.026	.025	.027	.956	.947	.782
1000	4	2	1	.000	−.001	−.022	.018	.016	.012	.948	.948	.589
			−.2	.000	.000	.061	.019	.019	.022	.953	.954	.096
1000	6	.3	1	−.005	−.013	−.214	.039	.040	.015	.916	.934	.000
			−.2	.001	−.002	−.024	.021	.019	.019	.967	.950	.583
1000	6	1	1	.001	−.003	−.103	.022	.020	.013	.957	.951	.000
			−.2	.000	.000	.031	.017	.017	.018	.948	.945	.439
1000	6	2	1	.000	−.001	.017	.012	.012	.010	.946	.949	.677
			−.2	.000	.000	.088	.013	.013	.015	.950	.948	.000
1000	8	.3	1	.004	−.008	−.135	.029	.024	.013	.954	.935	.000
			−.2	.001	−.002	−.029	.018	.015	.014	.965	.948	.358
1000	8	1	1	.000	−.002	−.063	.015	.015	.012	.954	.948	.000
			−.2	.000	.000	.026	.013	.013	.014	.947	.950	.409
1000	8	2	1	.000	−.001	.015	.010	.011	.009	.953	.948	.654
			−.2	.000	.000	.076	.011	.011	.011	.947	.950	.000
1000	16	.3	1	.000	−.003	−.036	.009	.010	.009	.947	.944	.010
			−.2	.000	−.001	−.014	.009	.009	.009	.947	.945	.599
1000	16	1	1	.000	−.002	−.019	.009	.009	.008	.948	.946	.316
			−.2	.000	.000	.010	.008	.008	.008	.947	.946	.752
1000	16	2	1	.000	−.001	.005	.007	.008	.007	.949	.949	.889
			−.2	.000	.000	.038	.007	.007	.008	.953	.951	.001
1000	24	.3	1	.000	−.002	−.015	.007	.007	.007	.952	.944	.342
			−.2	.000	−.001	−.007	.007	.007	.007	.950	.951	.811
1000	24	1	1	.000	−.002	−.009	.007	.007	.007	.946	.939	.690
			−.2	.000	.000	.005	.007	.007	.007	.949	.949	.874
1000	24	2	1	.000	−.001	.002	.006	.006	.006	.947	.947	.934
			−.2	.000	.000	.022	.006	.006	.006	.951	.951	.044

Notes: Data generated as $y_{it} = \rho_{01} y_{it-1} + \rho_{02} y_{it-2} + \alpha_i + \varepsilon_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, and ψ the degree of outlyingness of the initial observations $(y_{i0}, y_{i,-1})$. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval (ci$_{.95}$) of adjusted likelihood ($\widehat{\rho}_{\rm al}$), Arellano-Bond ($\widehat{\rho}_{\rm ab}$), and Hahn-Kuersteiner ($\widehat{\rho}_{\rm hk}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 2. Simulation results for the second-order autoregression (cont'd)

				bias			std			ci$_{.95}$		
N	T	ψ	ρ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
2500	2	.3	.6	−.074	—	−.843	.104	—	.060	.831	.931	.000
			.2	−.158	—	−.731	.168	—	.159	.931	.931	.000
2500	2	1	.6	−.075	—	−.843	.103	—	.033	.836	.931	.000
			.2	−.075	—	−.729	.094	—	.055	.855	.932	.000
2500	2	2	.6	−.076	—	−.844	.105	—	.030	.827	.935	.000
			.2	−.070	—	−.731	.093	—	.036	.836	.935	.000
2500	4	.3	.6	−.022	−.014	−.325	.048	.067	.013	.878	.946	.000
			.2	−.009	−.006	−.116	.028	.033	.019	.916	.944	.000
2500	4	1	.6	.007	−.002	−.202	.044	.024	.012	.953	.947	.000
			.2	.004	−.001	−.049	.026	.018	.017	.968	.951	.077
2500	4	2	.6	.000	.000	−.005	.015	.013	.009	.949	.949	.930
			.2	.000	.000	.074	.014	.013	.013	.950	.950	.000
2500	6	.3	.6	−.003	−.008	−.205	.032	.031	.010	.919	.939	.000
			.2	−.001	−.004	−.083	.021	.018	.012	.941	.942	.000
2500	6	1	.6	.001	−.002	−.109	.020	.015	.009	.963	.950	.000
			.2	.001	−.001	−.011	.014	.012	.011	.958	.951	.737
2500	6	2	.6	.000	.000	.026	.009	.009	.007	.949	.953	.062
			.2	.000	.000	.086	.009	.009	.009	.947	.947	.000
2500	8	.3	.6	.003	−.005	−.143	.025	.019	.009	.941	.948	.000
			.2	.002	−.003	−.064	.017	.013	.009	.957	.944	.000
2500	8	1	.6	.000	−.002	−.070	.012	.011	.008	.954	.946	.000
			.2	.000	−.001	−.002	.010	.009	.009	.949	.949	.908
2500	8	2	.6	.000	.000	.027	.007	.007	.006	.949	.950	.013
			.2	.000	.000	.076	.007	.007	.008	.950	.948	.000
2500	16	.3	.6	.000	−.002	−.050	.007	.007	.006	.951	.940	.000
			.2	.000	−.001	−.029	.007	.006	.006	.953	.947	.000
2500	16	1	.6	.000	−.001	−.023	.006	.006	.005	.951	.945	.007
			.2	.000	.000	.001	.006	.006	.005	.950	.948	.924
2500	16	2	.6	.000	−.001	.015	.005	.005	.005	.951	.952	.102
			.2	.000	.000	.042	.005	.005	.005	.944	.944	.000
2500	24	.3	.6	.000	−.001	−.024	.005	.005	.004	.948	.941	.000
			.2	.000	−.001	−.016	.005	.005	.004	.952	.945	.048
2500	24	1	.6	.000	−.001	−.011	.004	.005	.004	.950	.946	.206
			.2	.000	.000	.001	.004	.004	.004	.949	.947	.933
2500	24	2	.6	.000	−.001	.009	.004	.004	.004	.949	.948	.366
			.2	.000	.000	.026	.004	.004	.004	.949	.949	.000

Notes: Data generated as $y_{it} = \rho_{01} y_{it-1} + \rho_{02} y_{it-2} + \alpha_i + \varepsilon_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, and ψ the degree of outlyingness of the initial observations $(y_{i0}, y_{i,-1})$. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval (ci$_{.95}$) of adjusted likelihood ($\widehat{\rho}_{\text{al}}$), Arellano-Bond ($\widehat{\rho}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\rho}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 2. Simulation results for the second-order autoregression (cont'd)

				bias			std			ci$_{.95}$		
N	T	ψ	ρ_0	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$
2500	2	.3	1	−.074	—	−.859	.104	—	.053	.831	.931	.000
			−.2	−.093	—	−.377	.134	—	.141	.956	.931	.043
2500	2	1	1	−.075	—	−.858	.104	—	.029	.836	.931	.000
			−.2	−.045	—	−.376	.062	—	.045	.878	.931	.000
2500	2	2	1	−.076	—	−.859	.105	—	.026	.827	.935	.000
			−.2	−.041	—	−.377	.056	—	.026	.845	.935	.000
2500	4	.3	1	−.019	−.011	−.358	.047	.058	.012	.885	.945	.000
			−.2	.001	−.001	.010	.019	.018	.019	.968	.950	.747
2500	4	1	1	.003	−.001	−.211	.030	.020	.011	.959	.949	.000
			−.2	.001	.000	.014	.016	.016	.017	.956	.951	.702
2500	4	2	1	.000	.000	−.022	.011	.010	.007	.949	.949	.192
			−.2	.000	.000	.060	.012	.012	.014	.946	.949	.002
2500	6	.3	1	.001	−.005	−.213	.031	.025	.010	.931	.943	.000
			−.2	.001	−.001	−.024	.014	.012	.012	.969	.947	.309
2500	6	1	1	.000	−.001	−.103	.014	.012	.008	.952	.950	.000
			−.2	.000	.000	.031	.010	.010	.011	.951	.950	.118
2500	6	2	1	.000	.000	.017	.008	.008	.006	.948	.950	.290
			−.2	.000	.000	.088	.008	.008	.009	.947	.945	.000
2500	8	.3	1	.004	−.003	−.135	.021	.015	.008	.955	.950	.000
			−.2	.001	−.001	−.029	.012	.010	.009	.969	.947	.061
2500	8	1	1	.000	−.001	−.063	.010	.010	.007	.952	.945	.000
			−.2	.000	.000	.026	.008	.008	.009	.951	.949	.093
2500	8	2	1	.000	.000	.015	.007	.007	.006	.949	.951	.277
			−.2	.000	.000	.076	.007	.007	.007	.949	.949	.000
2500	16	.3	1	.000	−.001	−.036	.006	.006	.005	.951	.946	.000
			−.2	.000	.000	−.014	.006	.006	.005	.948	.949	.242
2500	16	1	1	.000	−.001	−.019	.005	.006	.005	.949	.948	.034
			−.2	.000	.000	.010	.005	.005	.005	.950	.951	.497
2500	16	2	1	.000	.000	.005	.005	.005	.004	.951	.950	.800
			−.2	.000	.000	.038	.005	.005	.005	.948	.946	.000
2500	24	.3	1	.000	−.001	−.016	.004	.005	.004	.949	.945	.038
			−.2	.000	.000	−.007	.004	.004	.004	.949	.948	.641
2500	24	1	1	.000	−.001	−.009	.004	.004	.004	.951	.947	.390
			−.2	.000	.000	.005	.004	.004	.004	.949	.951	.781
2500	24	2	1	.000	.000	.002	.004	.004	.004	.951	.949	.898
			−.2	.000	.000	.022	.004	.004	.004	.951	.950	.000

Notes: Data generated as $y_{it} = \rho_{01} y_{it-1} + \rho_{02} y_{it-2} + \alpha_i + \varepsilon_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0,1)$, $\varepsilon_{it} \sim \mathcal{N}(0,1)$, and ψ the degree of outlyingness of the initial observations $(y_{i0}, y_{i,-1})$. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval (ci$_{.95}$) of adjusted likelihood ($\widehat{\rho}_{\rm al}$), Arellano-Bond ($\widehat{\rho}_{\rm ab}$), and Hahn-Kuersteiner ($\widehat{\rho}_{\rm hk}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 2. Simulation results for the second-order autoregression (cont'd)

				bias			std			ci$_{.95}$		
N	T	ψ	ρ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
5000	2	.3	.6	−.064	—	−.843	.087	—	.042	.831	.931	.000
			.2	−.124	—	−.729	.125	—	.113	.926	.933	.000
5000	2	1	.6	−.063	—	−.843	.086	—	.023	.839	.930	.000
			.2	−.063	—	−.729	.077	—	.038	.853	.929	.000
5000	2	2	.6	−.061	—	−.843	.086	—	.021	.841	.928	.000
			.2	−.056	—	−.730	.076	—	.025	.844	.928	.000
5000	4	.3	.6	−.016	−.007	−.325	.040	.048	.009	.880	.944	.000
			.2	−.007	−.003	−.116	.022	.023	.013	.916	.946	.000
5000	4	1	.6	.004	−.001	−.202	.030	.017	.009	.959	.953	.000
			.2	.002	.000	−.048	.018	.013	.012	.966	.948	.004
5000	4	2	.6	.000	.000	−.005	.010	.009	.007	.948	.949	.890
			.2	.000	.000	.074	.010	.009	.009	.950	.948	.000
5000	6	.3	.6	−.001	−.004	−.205	.027	.022	.007	.922	.942	.000
			.2	.000	−.002	−.082	.017	.013	.008	.940	.948	.000
5000	6	1	.6	.000	−.001	−.109	.014	.011	.007	.952	.947	.000
			.2	.000	.000	−.011	.010	.008	.008	.952	.949	.595
5000	6	2	.6	.000	.000	.026	.007	.006	.005	.950	.951	.002
			.2	.000	.000	.086	.006	.006	.007	.952	.952	.000
5000	8	.3	.6	.003	−.003	−.143	.021	.013	.006	.949	.946	.000
			.2	.002	−.001	−.064	.014	.009	.006	.960	.945	.000
5000	8	1	.6	.000	−.001	−.070	.009	.008	.006	.954	.949	.000
			.2	.000	.000	−.002	.007	.006	.006	.948	.950	.892
5000	8	2	.6	.000	.000	.027	.005	.005	.004	.950	.951	.000
			.2	.000	.000	.076	.005	.005	.005	.947	.947	.000
5000	16	.3	.6	.000	−.001	−.050	.005	.005	.004	.950	.947	.000
			.2	.000	−.001	−.029	.005	.005	.004	.950	.949	.000
5000	16	1	.6	.000	−.001	−.023	.004	.004	.004	.950	.949	.000
			.2	.000	.000	.002	.004	.004	.004	.952	.951	.909
5000	16	2	.6	.000	.000	.015	.004	.004	.003	.950	.948	.005
			.2	.000	.000	.042	.003	.003	.004	.948	.949	.000
5000	24	.3	.6	.000	−.001	−.024	.003	.004	.003	.955	.950	.000
			.2	.000	.000	−.016	.003	.003	.003	.950	.948	.001
5000	24	1	.6	.000	.000	−.011	.003	.003	.003	.950	.945	.025
			.2	.000	.000	.001	.003	.003	.003	.949	.950	.928
5000	24	2	.6	.000	.000	.009	.003	.003	.003	.952	.951	.094
			.2	.000	.000	.026	.003	.003	.003	.948	.949	.000

Notes: Data generated as $y_{it} = \rho_{01} y_{it-1} + \rho_{02} y_{it-2} + \alpha_i + \varepsilon_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, and ψ the degree of outlyingness of the initial observations $(y_{i0}, y_{i,-1})$. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval (ci$_{.95}$) of adjusted likelihood ($\widehat{\rho}_{\text{al}}$), Arellano-Bond ($\widehat{\rho}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\rho}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 2. Simulation results for the second-order autoregression (cont'd)

				bias			std			$\text{ci}_{.95}$		
N	T	ψ	ρ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
5000	2	.3	1	−.064	—	−.859	.087	—	.038	.831	.931	.000
			−.2	−.074	—	−.377	.098	—	.100	.951	.934	.002
5000	2	1	1	−.063	—	−.859	.086	—	.020	.839	.930	.000
			−.2	−.037	—	−.377	.049	—	.032	.871	.929	.000
5000	2	2	1	−.061	—	−.859	.086	—	.019	.841	.928	.000
			−.2	−.033	—	−.377	.046	—	.019	.850	.927	.000
5000	4	.3	1	−.013	−.005	−.358	.040	.041	.008	.889	.948	.000
			−.2	.001	.000	.010	.014	.013	.013	.970	.949	.697
5000	4	1	1	.001	−.001	−.211	.020	.014	.007	.960	.953	.000
			−.2	.000	.000	.014	.011	.011	.012	.950	.951	.596
5000	4	2	1	.000	.000	−.022	.008	.007	.005	.949	.951	.020
			−.2	.000	.000	.060	.008	.008	.010	.949	.948	.000
5000	6	.3	1	.003	−.003	−.213	.026	.018	.007	.935	.945	.000
			−.2	.001	.000	−.024	.010	.009	.009	.969	.950	.090
5000	6	1	1	.000	−.001	−.103	.010	.009	.006	.946	.948	.000
			−.2	.000	.000	.031	.007	.008	.008	.946	.946	.010
5000	6	2	1	.000	.000	.017	.005	.005	.004	.950	.951	.040
			−.2	.000	.000	.088	.006	.006	.006	.951	.951	.000
5000	8	.3	1	.002	−.002	−.135	.016	.011	.006	.962	.946	.000
			−.2	.001	.000	−.029	.008	.007	.006	.968	.946	.002
5000	8	1	1	.000	−.001	−.063	.007	.007	.005	.952	.949	.000
			−.2	.000	.000	.026	.006	.006	.006	.951	.950	.005
5000	8	2	1	.000	.000	.015	.005	.005	.004	.952	.949	.045
			−.2	.000	.000	.076	.005	.005	.005	.950	.948	.000
5000	16	.3	1	.000	−.001	−.036	.004	.005	.004	.952	.949	.000
			−.2	.000	.000	−.014	.004	.004	.004	.951	.952	.040
5000	16	1	1	.000	.000	−.019	.004	.004	.004	.953	.949	.001
			−.2	.000	.000	.010	.004	.004	.004	.954	.953	.223
5000	16	2	1	.000	.000	.005	.003	.003	.003	.949	.949	.631
			−.2	.000	.000	.038	.003	.003	.003	.950	.949	.000
5000	24	.3	1	.000	.000	−.016	.003	.003	.003	.949	.951	.001
			−.2	.000	.000	−.007	.003	.003	.003	.949	.952	.377
5000	24	1	1	.000	.000	−.009	.003	.003	.003	.948	.949	.120
			−.2	.000	.000	.005	.003	.003	.003	.948	.949	.618
5000	24	2	1	.000	.000	.002	.003	.003	.003	.950	.950	.845
			−.2	.000	.000	.022	.003	.003	.003	.950	.949	.000

Notes: Data generated as $y_{it} = \rho_{01} y_{it-1} + \rho_{02} y_{it-2} + \alpha_i + \varepsilon_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, and ψ the degree of outlyingness of the initial observations $(y_{i0}, y_{i,-1})$. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval ($\text{ci}_{.95}$) of adjusted likelihood ($\widehat{\rho}_{\text{al}}$), Arellano-Bond ($\widehat{\rho}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\rho}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 2. Simulation results for the second-order autoregression (cont'd)

				bias			std			$\text{ci}_{.95}$		
N	T	ψ	ρ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
10000	2	.3	.6	−.054	—	−.843	.071	—	.030	.836	.928	.000
			.2	−.098	—	−.730	.092	—	.079	.914	.928	.000
10000	2	1	.6	−.054	—	−.843	.072	—	.016	.839	.932	.000
			.2	−.053	—	−.730	.063	—	.027	.849	.932	.000
10000	2	2	.6	−.054	—	−.843	.071	—	.015	.835	.923	.000
			.2	−.049	—	−.729	.063	—	.018	.840	.924	.000
10000	4	.3	.6	−.011	−.003	−.324	.033	.034	.006	.889	.946	.000
			.2	−.005	−.001	−.116	.018	.017	.009	.915	.947	.000
10000	4	1	.6	.002	.000	−.202	.020	.012	.006	.962	.950	.000
			.2	.001	.000	−.048	.013	.009	.008	.962	.949	.000
10000	4	2	.6	.000	.000	−.005	.007	.006	.005	.951	.952	.819
			.2	.000	.000	.074	.007	.006	.007	.950	.951	.000
10000	6	.3	.6	.001	−.002	−.205	.023	.015	.005	.929	.948	.000
			.2	.001	−.001	−.083	.013	.009	.006	.944	.952	.000
10000	6	1	.6	.000	−.001	−.109	.009	.008	.005	.954	.948	.000
			.2	.000	.000	−.011	.007	.006	.006	.953	.951	.370
10000	6	2	.6	.000	.000	.026	.005	.005	.004	.950	.950	.000
			.2	.000	.000	.086	.005	.004	.005	.954	.954	.000
10000	8	.3	.6	.003	−.001	−.143	.016	.009	.004	.951	.947	.000
			.2	.001	.000	−.064	.010	.006	.005	.958	.948	.000
10000	8	1	.6	.000	.000	−.070	.006	.005	.004	.953	.951	.000
			.2	.000	.000	−.002	.005	.005	.004	.949	.951	.878
10000	8	2	.6	.000	.000	.027	.004	.004	.003	.949	.949	.000
			.2	.000	.000	.076	.004	.004	.004	.950	.952	.000
10000	16	.3	.6	.000	.000	−.050	.004	.004	.003	.948	.950	.000
			.2	.000	.000	−.029	.003	.003	.003	.951	.947	.000
10000	16	1	.6	.000	.000	−.023	.003	.003	.003	.948	.946	.000
			.2	.000	.000	.002	.003	.003	.003	.950	.951	.886
10000	16	2	.6	.000	.000	.015	.002	.003	.002	.948	.948	.000
			.2	.000	.000	.042	.002	.002	.002	.953	.952	.000
10000	24	.3	.6	.000	.000	−.024	.002	.003	.002	.951	.946	.000
			.2	.000	.000	−.016	.002	.002	.002	.951	.950	.000
10000	24	1	.6	.000	.000	−.011	.002	.002	.002	.951	.949	.000
			.2	.000	.000	.001	.002	.002	.002	.947	.949	.919
10000	24	2	.6	.000	.000	.009	.002	.002	.002	.948	.948	.004
			.2	.000	.000	.026	.002	.002	.002	.951	.950	.000

Notes: Data generated as $y_{it} = \rho_{01} y_{it-1} + \rho_{02} y_{it-2} + \alpha_i + \varepsilon_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, and ψ the degree of outlyingness of the initial observations $(y_{i0}, y_{i,-1})$. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval ($\text{ci}_{.95}$) of adjusted likelihood ($\widehat{\rho}_{\text{al}}$), Arellano-Bond ($\widehat{\rho}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\rho}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 2. Simulation results for the second-order autoregression (cont'd)

				bias			std			$\text{ci}_{.95}$		
N	T	ψ	ρ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
10000	2	.3	1	−.054	—	−.859	.071	—	.026	.836	.928	.000
			−.2	−.059	—	−.376	.072	—	.070	.941	.929	.000
10000	2	1	1	−.054	—	−.859	.072	—	.014	.839	.932	.000
			−.2	−.031	—	−.377	.040	—	.022	.863	.932	.000
10000	2	2	1	−.054	—	−.859	.071	—	.013	.835	.923	.000
			−.2	−.029	—	−.377	.037	—	.013	.845	.924	.000
10000	4	.3	1	−.008	−.002	−.358	.033	.030	.006	.896	.947	.000
			−.2	.000	.000	.010	.010	.009	.009	.968	.949	.581
10000	4	1	1	.001	.000	−.211	.014	.010	.005	.953	.952	.000
			−.2	.000	.000	.014	.008	.008	.009	.951	.951	.420
10000	4	2	1	.000	.000	−.022	.006	.005	.004	.952	.953	.000
			−.2	.000	.000	.060	.006	.006	.007	.950	.951	.000
10000	6	.3	1	.003	−.001	−.213	.022	.013	.005	.941	.949	.000
			−.2	.001	.000	−.024	.008	.006	.006	.968	.951	.006
10000	6	1	1	.000	.000	−.103	.007	.006	.004	.951	.951	.000
			−.2	.000	.000	.031	.005	.005	.006	.952	.954	.000
10000	6	2	1	.000	.000	.017	.004	.004	.003	.950	.949	.000
			−.2	.000	.000	.087	.004	.004	.005	.952	.953	.000
10000	8	.3	1	.001	−.001	−.135	.011	.007	.004	.963	.948	.000
			−.2	.000	.000	−.029	.006	.005	.005	.962	.948	.000
10000	8	1	1	.000	.000	−.063	.005	.005	.004	.953	.951	.000
			−.2	.000	.000	.026	.004	.004	.004	.953	.951	.000
10000	8	2	1	.000	.000	.015	.003	.003	.003	.949	.949	.001
			−.2	.000	.000	.076	.003	.003	.004	.952	.953	.000
10000	16	.3	1	.000	.000	−.036	.003	.003	.003	.947	.952	.000
			−.2	.000	.000	−.014	.003	.003	.003	.948	.946	.001
10000	16	1	1	.000	.000	−.019	.003	.003	.003	.948	.946	.000
			−.2	.000	.000	.010	.003	.003	.003	.948	.950	.033
10000	16	2	1	.000	.000	.005	.002	.002	.002	.948	.948	.370
			−.2	.000	.000	.038	.002	.002	.002	.951	.951	.000
10000	24	.3	1	.000	.000	−.016	.002	.002	.002	.950	.947	.000
			−.2	.000	.000	−.007	.002	.002	.002	.951	.948	.112
10000	24	1	1	.000	.000	−.009	.002	.002	.002	.950	.947	.007
			−.2	.000	.000	.005	.002	.002	.002	.948	.950	.373
10000	24	2	1	.000	.000	.002	.002	.002	.002	.950	.950	.744
			−.2	.000	.000	.022	.002	.002	.002	.950	.950	.000

Notes: Data generated as $y_{it} = \rho_{01} y_{it-1} + \rho_{02} y_{it-2} + \alpha_i + \varepsilon_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0,1)$, $\varepsilon_{it} \sim \mathcal{N}(0,1)$, and ψ the degree of outlyingness of the initial observations $(y_{i0}, y_{i,-1})$. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval ($\text{ci}_{.95}$) of adjusted likelihood ($\widehat{\rho}_{\text{al}}$), Arellano-Bond ($\widehat{\rho}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\rho}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate

					bias			std			ci$_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
100	2	0	.5	.5	−.089	—	−.661	.267	—	.153	.845	.884	.001
				.5	−.025	—	−.168	.249	—	.191	.959	.940	.660
100	2	1	.5	.5	.017	—	−.416	.270	—	.146	.897	.915	.056
				.5	−.002	—	.005	.251	—	.205	.969	.956	.834
100	2	2	.5	.5	.026	—	.078	.181	—	.118	.946	.937	.904
				.5	−.010	—	−.022	.257	—	.258	.945	.942	.840
100	4	0	.5	.5	.013	−.094	−.248	.142	.118	.068	.932	.845	.028
				.5	.000	−.013	−.032	.127	.124	.121	.958	.942	.885
100	4	1	.5	.5	.011	−.070	−.127	.119	.104	.067	.943	.878	.394
				.5	−.004	.006	.013	.127	.124	.121	.951	.945	.906
100	4	2	.5	.5	.000	−.025	.076	.063	.062	.056	.943	.919	.646
				.5	−.004	.006	−.032	.127	.126	.128	.947	.946	.909
100	6	0	.5	.5	.003	−.065	−.116	.079	.069	.050	.956	.834	.282
				.5	.001	.000	−.001	.091	.091	.091	.947	.947	.918
100	6	1	.5	.5	.000	−.054	−.053	.061	.063	.048	.952	.858	.726
				.5	.001	.011	.010	.091	.091	.090	.948	.945	.923
100	6	2	.5	.5	−.001	−.026	.055	.042	.044	.040	.945	.905	.639
				.5	.001	.010	−.021	.092	.092	.091	.948	.945	.928
100	8	0	.5	.5	−.001	−.052	−.063	.051	.051	.041	.947	.820	.584
				.5	.001	.003	.004	.075	.075	.075	.944	.944	.927
100	8	1	.5	.5	−.001	−.047	−.026	.045	.049	.039	.941	.833	.842
				.5	.001	.011	.006	.076	.076	.075	.944	.942	.932
100	8	2	.5	.5	−.001	−.026	.041	.034	.037	.034	.940	.883	.685
				.5	.000	.010	−.015	.076	.076	.075	.943	.942	.931
100	16	0	.5	.5	−.001	−.037	−.011	.026	.027	.025	.944	.728	.903
				.5	.001	.007	.002	.048	.048	.047	.947	.947	.945
100	16	1	.5	.5	−.001	−.036	−.003	.025	.026	.024	.945	.738	.926
				.5	.001	.010	.001	.048	.048	.047	.947	.945	.946
100	16	2	.5	.5	−.001	−.027	.017	.022	.023	.022	.945	.787	.840
				.5	.001	.010	−.006	.048	.048	.047	.947	.944	.944
100	24	0	.5	.5	.000	−.032	−.003	.020	.020	.019	.944	.646	.929
				.5	.000	.008	.001	.037	.038	.037	.950	.945	.952
100	24	1	.5	.5	.000	−.031	.001	.019	.020	.019	.946	.655	.929
				.5	.000	.009	.000	.037	.038	.037	.950	.941	.952
100	24	2	.5	.5	.000	−.026	.010	.018	.018	.018	.944	.702	.887
				.5	.000	.009	−.003	.038	.038	.037	.951	.941	.953

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval (ci$_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\text{al}}$), Arellano-Bond ($\widehat{\theta}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; $10,000$ Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			ci$_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$
100	2	0	.5	.9	−.141	—	−.546	.267	—	.153	.817	.819	.018
				.1	−.009	—	−.030	.233	—	.192	.973	.976	.826
100	2	1	.5	.9	−.106	—	−.488	.268	—	.152	.836	.824	.042
				.1	.003	—	.022	.236	—	.197	.974	.976	.833
100	2	2	.5	.9	−.019	—	−.318	.270	—	.148	.880	.882	.257
				.1	.001	—	.046	.249	—	.213	.970	.957	.825
100	4	0	.5	.9	−.081	−.544	−.292	.126	.238	.072	.846	.349	.007
				.1	−.007	−.026	−.017	.122	.115	.113	.972	.943	.901
100	4	1	.5	.9	−.047	−.469	−.236	.126	.235	.072	.878	.432	.045
				.1	.001	.037	.017	.124	.115	.115	.974	.937	.903
100	4	2	.5	.9	.008	−.156	−.099	.126	.140	.067	.924	.762	.568
				.1	−.006	.032	.018	.129	.123	.121	.967	.938	.906
100	6	0	.5	.9	−.051	−.367	−.201	.086	.133	.050	.861	.191	.006
				.1	−.001	−.012	−.007	.090	.089	.086	.971	.943	.918
100	6	1	.5	.9	−.022	−.304	−.149	.085	.127	.049	.901	.293	.070
				.1	.003	.033	.016	.091	.088	.087	.968	.932	.918
100	6	2	.5	.9	.009	−.109	−.037	.082	.074	.044	.942	.680	.802
				.1	−.002	.028	.009	.094	.090	.090	.960	.934	.926
100	8	0	.5	.9	−.033	−.267	−.153	.066	.089	.039	.879	.120	.009
				.1	−.001	−.007	−.004	.075	.075	.073	.968	.941	.921
100	8	1	.5	.9	−.009	−.221	−.105	.066	.085	.038	.914	.207	.118
				.1	.001	.025	.012	.075	.074	.073	.966	.930	.925
100	8	2	.5	.9	.008	−.084	−.012	.060	.050	.033	.949	.600	.888
				.1	−.002	.022	.003	.077	.075	.075	.951	.933	.932
100	16	0	.5	.9	−.003	−.127	−.071	.038	.034	.022	.926	.025	.046
				.1	.000	.000	.000	.047	.048	.047	.966	.949	.938
100	16	1	.5	.9	.002	−.110	−.042	.037	.033	.021	.943	.054	.345
				.1	.000	.013	.005	.048	.048	.047	.957	.941	.941
100	16	2	.5	.9	.000	−.053	.008	.023	.022	.017	.955	.307	.869
				.1	.000	.013	−.002	.048	.048	.047	.947	.941	.943
100	24	0	.5	.9	.002	−.085	−.041	.027	.021	.016	.951	.009	.172
				.1	.000	.001	.001	.037	.038	.037	.955	.950	.946
100	24	1	.5	.9	.001	−.076	−.023	.022	.020	.015	.955	.018	.545
				.1	.000	.009	.003	.037	.038	.037	.950	.943	.947
100	24	2	.5	.9	.000	−.043	.007	.014	.015	.012	.948	.136	.841
				.1	.000	.009	−.001	.037	.038	.037	.950	.941	.951

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval (ci$_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\rm al}$), Arellano-Bond ($\widehat{\theta}_{\rm ab}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\rm hk}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			ci$_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
100	2	0	.5	.99	−.143	—	−.504	.267	—	.153	.816	.812	.041
				.01	−.003	—	−.005	.232	—	.195	.975	.979	.833
100	2	1	.5	.99	−.140	—	−.498	.267	—	.153	.817	.811	.043
				.01	.001	—	.010	.232	—	.195	.975	.980	.832
100	2	2	.5	.99	−.127	—	−.477	.268	—	.153	.825	.818	.057
				.01	.005	—	.025	.234	—	.197	.974	.976	.831
100	4	0	.5	.99	−.087	−.673	−.259	.122	.258	.072	.837	.242	.023
				.01	−.004	−.006	−.005	.121	.115	.113	.973	.952	.909
100	4	1	.5	.99	−.083	−.658	−.252	.122	.259	.072	.844	.256	.028
				.01	−.001	.021	.006	.121	.115	.113	.974	.945	.908
100	4	2	.5	.99	−.070	−.620	−.232	.122	.259	.072	.857	.283	.050
				.01	.002	.045	.015	.122	.115	.114	.974	.930	.904
100	6	0	.5	.99	−.062	−.493	−.175	.081	.152	.049	.839	.060	.019
				.01	.000	−.001	.000	.089	.089	.085	.970	.945	.922
100	6	1	.5	.99	−.057	−.477	−.168	.081	.152	.049	.847	.070	.026
				.01	.003	.022	.008	.089	.089	.085	.969	.941	.922
100	6	2	.5	.99	−.045	−.435	−.148	.080	.149	.048	.864	.101	.062
				.01	.004	.042	.015	.090	.088	.086	.970	.923	.921
100	8	0	.5	.99	−.047	−.380	−.133	.061	.104	.037	.843	.014	.019
				.01	.000	−.001	.000	.074	.076	.072	.969	.941	.926
100	8	1	.5	.99	−.042	−.366	−.126	.061	.104	.037	.853	.019	.030
				.01	.002	.018	.006	.074	.075	.072	.971	.935	.927
100	8	2	.5	.99	−.030	−.326	−.106	.060	.101	.037	.878	.037	.088
				.01	.003	.033	.011	.074	.074	.072	.971	.923	.927
100	16	0	.5	.99	−.024	−.202	−.068	.031	.041	.020	.851	.000	.019
				.01	.000	−.001	.000	.047	.049	.046	.974	.950	.941
100	16	1	.5	.99	−.019	−.192	−.061	.031	.041	.020	.869	.000	.043
				.01	.001	.010	.003	.047	.048	.047	.974	.945	.941
100	16	2	.5	.99	−.009	−.159	−.044	.030	.038	.019	.902	.001	.212
				.01	.001	.017	.005	.047	.048	.047	.972	.937	.943
100	24	0	.5	.99	−.016	−.138	−.047	.021	.023	.013	.858	.000	.017
				.01	.000	.000	.000	.037	.038	.037	.972	.951	.948
100	24	1	.5	.99	−.012	−.129	−.040	.021	.023	.013	.880	.000	.054
				.01	.001	.007	.002	.037	.038	.037	.972	.946	.949
100	24	2	.5	.99	−.003	−.103	−.024	.020	.021	.012	.919	.000	.349
				.01	.001	.011	.003	.037	.038	.037	.970	.939	.949

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval (ci$_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\text{al}}$), Arellano-Bond ($\widehat{\theta}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			ci$_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$
100	2	0	.99	.5	.006	—	.392	.088	—	.091	.948	.946	.747
				.5	.000	—	.094	.288	—	.371	.940	.939	.841
100	2	1	.99	.5	−.082	—	−.648	.268	—	.152	.848	.884	.001
				.5	−.002	—	.003	.277	—	.217	.973	.964	.830
100	2	2	.99	.5	.003	—	.444	.078	—	.086	.942	.942	.521
				.5	−.003	—	−.117	.287	—	.396	.938	.938	.798
100	4	0	.99	.5	.000	−.010	.201	.042	.040	.044	.941	.935	.005
				.5	−.004	−.005	.007	.127	.127	.141	.941	.942	.913
100	4	1	.99	.5	.015	−.084	−.222	.139	.112	.068	.932	.857	.059
				.5	−.007	.016	.047	.132	.128	.124	.958	.944	.876
100	4	2	.99	.5	−.001	−.009	.227	.038	.037	.041	.941	.937	.000
				.5	−.004	.000	−.124	.128	.128	.147	.944	.944	.809
100	6	0	.99	.5	−.001	−.013	.126	.031	.031	.033	.943	.925	.026
				.5	.000	.001	−.013	.084	.084	.086	.941	.941	.934
100	6	1	.99	.5	.001	−.059	−.095	.072	.065	.049	.956	.846	.419
				.5	.000	.023	.036	.088	.087	.085	.945	.936	.895
100	6	2	.99	.5	−.001	−.011	.145	.028	.028	.030	.945	.928	.002
				.5	.000	.007	−.095	.086	.086	.090	.943	.942	.777
100	8	0	.99	.5	−.001	−.015	.088	.027	.027	.027	.942	.910	.085
				.5	.000	.003	−.021	.063	.064	.062	.940	.940	.929
100	8	1	.99	.5	−.001	−.048	−.046	.048	.048	.040	.944	.829	.722
				.5	.000	.023	.022	.067	.067	.065	.942	.931	.918
100	8	2	.99	.5	.000	−.012	.103	.024	.025	.026	.942	.917	.016
				.5	.000	.008	−.075	.065	.066	.065	.943	.942	.763
100	16	0	.99	.5	−.001	−.019	.035	.019	.019	.019	.944	.834	.485
				.5	.000	.010	−.019	.033	.033	.031	.945	.936	.913
100	16	1	.99	.5	−.002	−.034	−.003	.025	.026	.024	.944	.743	.924
				.5	.001	.023	.002	.035	.036	.034	.943	.900	.943
100	16	2	.99	.5	−.001	−.016	.042	.017	.018	.018	.945	.849	.299
				.5	.000	.013	−.035	.034	.035	.033	.948	.927	.815
100	24	0	.99	.5	−.001	−.020	.020	.015	.015	.015	.950	.760	.700
				.5	.000	.013	−.013	.023	.024	.023	.944	.913	.908
100	24	1	.99	.5	−.001	−.029	.003	.018	.019	.018	.948	.671	.935
				.5	.001	.023	−.002	.025	.026	.025	.945	.855	.946
100	24	2	.99	.5	.000	−.018	.024	.015	.015	.015	.946	.777	.574
				.5	.000	.016	−.021	.025	.025	.024	.942	.898	.854

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0,1)$, $\varepsilon_{it} \sim \mathcal{N}(0,1)$, $u_{it} \sim \mathcal{N}(0,.25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval (ci$_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\rm al}$), Arellano-Bond ($\widehat{\theta}_{\rm ab}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\rm hk}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			$\text{ci}_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
100	2	0	.99	.9	−.045	—	−.382	.266	—	.151	.870	.915	.145
				.1	−.005	—	−.022	.284	—	.240	.970	.955	.828
100	2	1	.99	.9	−.138	—	−.541	.268	—	.153	.819	.814	.020
				.1	−.002	—	.001	.270	—	.222	.974	.978	.829
100	2	2	.99	.9	−.004	—	−.278	.270	—	.147	.888	.925	.346
				.1	−.002	—	.015	.289	—	.250	.970	.950	.831
100	4	0	.99	.9	−.008	−.119	−.155	.126	.122	.070	.910	.808	.268
				.1	−.005	−.009	−.011	.127	.123	.121	.965	.943	.903
100	4	1	.99	.9	−.077	−.539	−.285	.126	.238	.072	.852	.352	.009
				.1	.000	.028	.013	.124	.122	.117	.972	.942	.897
100	4	2	.99	.9	.012	−.074	−.078	.125	.097	.066	.928	.857	.685
				.1	−.006	.008	.008	.130	.125	.124	.963	.944	.907
100	6	0	.99	.9	.002	−.101	−.086	.086	.072	.047	.928	.700	.421
				.1	.000	−.003	−.003	.085	.083	.083	.959	.940	.919
100	6	1	.99	.9	−.046	−.354	−.193	.085	.131	.050	.865	.201	.010
				.1	.005	.039	.021	.084	.086	.082	.968	.920	.900
100	6	2	.99	.9	.010	−.063	−.024	.081	.056	.043	.942	.786	.868
				.1	−.002	.016	.006	.088	.084	.084	.953	.936	.925
100	8	0	.99	.9	.004	−.087	−.055	.066	.050	.036	.933	.581	.544
				.1	.000	−.001	−.001	.064	.064	.063	.956	.940	.925
100	8	1	.99	.9	−.027	−.251	−.143	.066	.087	.039	.888	.142	.018
				.1	.004	.038	.022	.064	.067	.063	.967	.908	.897
100	8	2	.99	.9	.007	−.054	−.003	.057	.040	.032	.951	.718	.908
				.1	−.002	.017	.000	.066	.064	.063	.949	.934	.933
100	16	0	.99	.9	.001	−.060	−.016	.030	.023	.019	.953	.256	.799
				.1	.000	.004	.001	.031	.033	.031	.947	.942	.941
100	16	1	.99	.9	−.001	−.115	−.060	.038	.033	.021	.933	.041	.110
				.1	.000	.033	.017	.033	.035	.033	.962	.842	.890
100	16	2	.99	.9	.000	−.040	.013	.022	.018	.017	.950	.420	.806
				.1	.000	.020	−.007	.033	.034	.032	.944	.899	.941
100	24	0	.99	.9	.000	−.049	−.007	.017	.015	.014	.951	.101	.870
				.1	.000	.008	.001	.021	.023	.021	.940	.931	.942
100	24	1	.99	.9	.001	−.075	−.031	.025	.019	.015	.951	.017	.364
				.1	.000	.030	.012	.023	.025	.022	.951	.764	.900
100	24	2	.99	.9	−.001	−.034	.012	.014	.013	.012	.948	.217	.740
				.1	.000	.022	−.008	.023	.023	.022	.941	.841	.935

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval ($\text{ci}_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\text{al}}$), Arellano-Bond ($\widehat{\theta}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			$\text{ci}_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
100	2	0	.99	.99	−.142	—	−.503	.267	—	.153	.815	.812	.042
				.01	−.003	—	−.005	.269	—	.226	.973	.980	.831
100	2	1	.99	.99	−.142	—	−.502	.267	—	.153	.814	.816	.042
				.01	−.002	—	.000	.269	—	.226	.973	.981	.832
100	2	2	.99	.99	−.131	—	−.485	.268	—	.153	.821	.829	.052
				.01	.000	—	.005	.271	—	.227	.974	.976	.830
100	4	0	.99	.99	−.086	−.660	−.257	.122	.260	.072	.838	.252	.023
				.01	−.005	−.007	−.006	.123	.125	.116	.972	.946	.905
100	4	1	.99	.99	−.086	−.662	−.257	.122	.260	.072	.838	.249	.024
				.01	−.003	.006	−.001	.123	.125	.116	.972	.946	.904
100	4	2	.99	.99	−.075	−.481	−.240	.122	.244	.072	.850	.405	.040
				.01	−.002	.012	.004	.124	.121	.117	.971	.945	.905
100	6	0	.99	.99	−.061	−.482	−.174	.081	.154	.049	.838	.071	.019
				.01	.000	−.001	−.001	.083	.091	.080	.969	.945	.918
100	6	1	.99	.99	−.061	−.481	−.174	.081	.152	.049	.842	.066	.021
				.01	.002	.013	.005	.083	.090	.080	.970	.942	.917
100	6	2	.99	.99	−.050	−.351	−.157	.080	.137	.049	.858	.177	.043
				.01	.003	.020	.009	.083	.085	.080	.970	.939	.917
100	8	0	.99	.99	−.047	−.371	−.132	.061	.105	.037	.844	.017	.021
				.01	−.001	−.002	−.001	.062	.070	.061	.972	.945	.924
100	8	1	.99	.99	−.046	−.371	−.131	.061	.106	.037	.845	.018	.022
				.01	.001	.013	.004	.062	.070	.061	.970	.942	.923
100	8	2	.99	.99	−.035	−.271	−.115	.061	.094	.037	.868	.084	.057
				.01	.002	.020	.008	.063	.066	.061	.969	.933	.923
100	16	0	.99	.99	−.023	−.196	−.067	.031	.041	.020	.854	.000	.022
				.01	.000	−.001	.000	.031	.038	.032	.972	.946	.934
100	16	1	.99	.99	−.022	−.196	−.066	.031	.041	.020	.855	.000	.025
				.01	.001	.014	.004	.031	.038	.032	.971	.932	.930
100	16	2	.99	.99	−.014	−.145	−.051	.031	.036	.019	.888	.002	.113
				.01	.002	.021	.007	.032	.035	.031	.969	.906	.929
100	24	0	.99	.99	−.015	−.134	−.045	.021	.023	.013	.861	.000	.021
				.01	.000	.000	.000	.021	.026	.022	.970	.943	.933
100	24	1	.99	.99	−.014	−.133	−.045	.021	.023	.013	.864	.000	.027
				.01	.002	.014	.005	.021	.026	.022	.969	.911	.929
100	24	2	.99	.99	−.007	−.099	−.031	.021	.020	.013	.903	.000	.179
				.01	.001	.021	.007	.022	.025	.021	.969	.857	.928

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval ($\text{ci}_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\text{al}}$), Arellano-Bond ($\widehat{\theta}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			ci$_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
250	2	0	.5	.5	−.068	—	−.662	.200	—	.095	.860	.920	.000
				.5	−.018	—	−.167	.159	—	.120	.965	.949	.484
250	2	1	.5	.5	.025	—	−.417	.204	—	.091	.918	.937	.000
				.5	−.002	—	.006	.160	—	.130	.968	.951	.834
250	2	2	.5	.5	.009	—	.076	.104	—	.073	.955	.944	.803
				.5	−.004	—	−.022	.160	—	.164	.946	.945	.837
250	4	0	.5	.5	.014	−.038	−.246	.104	.080	.043	.945	.912	.000
				.5	.001	−.005	−.030	.081	.079	.077	.956	.947	.869
250	4	1	.5	.5	.004	−.028	−.125	.072	.067	.042	.957	.926	.093
				.5	−.002	.003	.015	.080	.079	.077	.950	.948	.899
250	4	2	.5	.5	.000	−.010	.077	.039	.039	.035	.951	.942	.330
				.5	−.001	.003	−.030	.081	.080	.081	.947	.948	.891
250	6	0	.5	.5	.000	−.028	−.115	.048	.046	.032	.958	.906	.028
				.5	.001	.000	−.001	.058	.058	.058	.944	.944	.913
250	6	1	.5	.5	−.001	−.024	−.052	.039	.042	.031	.950	.911	.489
				.5	.001	.005	.010	.058	.058	.057	.946	.945	.920
250	6	2	.5	.5	−.001	−.011	.055	.027	.028	.026	.948	.930	.334
				.5	.001	.005	−.021	.058	.059	.058	.947	.945	.913
250	8	0	.5	.5	.000	−.023	−.062	.032	.033	.026	.947	.894	.261
				.5	.001	.002	.004	.047	.047	.047	.947	.947	.926
250	8	1	.5	.5	.000	−.020	−.025	.028	.031	.025	.946	.901	.756
				.5	.001	.005	.006	.047	.047	.047	.946	.945	.931
250	8	2	.5	.5	.000	−.011	.041	.022	.023	.021	.947	.921	.401
				.5	.001	.005	−.015	.047	.048	.047	.948	.945	.925
250	16	0	.5	.5	−.001	−.016	−.011	.017	.018	.016	.944	.854	.865
				.5	.000	.002	.001	.030	.030	.030	.947	.947	.940
250	16	1	.5	.5	.000	−.015	−.002	.016	.018	.016	.942	.859	.921
				.5	.000	.004	.000	.030	.031	.030	.947	.945	.942
250	16	2	.5	.5	.000	−.011	.017	.014	.015	.014	.945	.884	.696
				.5	.000	.003	−.007	.031	.031	.030	.947	.946	.939
250	24	0	.5	.5	.000	−.014	−.002	.012	.013	.012	.947	.821	.929
				.5	.000	.003	.001	.024	.024	.024	.950	.948	.948
250	24	1	.5	.5	.000	−.013	.001	.012	.013	.012	.948	.824	.930
				.5	.000	.004	.000	.024	.024	.024	.951	.948	.949
250	24	2	.5	.5	.000	−.011	.010	.011	.012	.011	.946	.849	.814
				.5	.000	.004	−.003	.024	.024	.024	.952	.948	.947

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval (ci$_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\text{al}}$), Arellano-Bond ($\widehat{\theta}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			ci$_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$
250	2	0	.5	.9	−.119	—	−.546	.199	—	.095	.829	.829	.000
				.1	−.007	—	−.029	.148	—	.121	.976	.973	.822
250	2	1	.5	.9	−.084	—	−.489	.200	—	.095	.853	.836	.000
				.1	.002	—	.023	.151	—	.124	.977	.975	.824
250	2	2	.5	.9	−.003	—	−.319	.203	—	.092	.901	.918	.032
				.1	−.001	—	.047	.161	—	.135	.972	.956	.803
250	4	0	.5	.9	−.064	−.406	−.290	.096	.210	.046	.846	.487	.000
				.1	−.004	−.018	−.014	.077	.074	.072	.972	.941	.894
250	4	1	.5	.9	−.031	−.319	−.234	.096	.196	.046	.886	.588	.000
				.1	.001	.027	.020	.079	.074	.073	.971	.935	.891
250	4	2	.5	.9	.013	−.071	−.097	.097	.094	.042	.935	.868	.261
				.1	−.004	.015	.021	.083	.080	.077	.962	.942	.896
250	6	0	.5	.9	−.037	−.253	−.199	.065	.109	.032	.865	.354	.000
				.1	−.001	−.008	−.007	.057	.056	.055	.971	.943	.914
250	6	1	.5	.9	−.010	−.195	−.147	.067	.100	.031	.908	.491	.001
				.1	.002	.021	.016	.058	.056	.055	.971	.930	.905
250	6	2	.5	.9	.007	−.051	−.035	.059	.051	.028	.948	.817	.653
				.1	−.001	.013	.009	.060	.058	.057	.956	.942	.920
250	8	0	.5	.9	−.021	−.176	−.151	.050	.070	.025	.890	.284	.000
				.1	.000	−.005	−.004	.047	.046	.046	.974	.946	.924
250	8	1	.5	.9	.000	−.136	−.103	.051	.065	.024	.928	.421	.003
				.1	.000	.016	.012	.047	.046	.046	.968	.934	.919
250	8	2	.5	.9	.004	−.039	−.010	.038	.034	.021	.958	.779	.866
				.1	−.001	.011	.003	.048	.047	.047	.951	.941	.933
250	16	0	.5	.9	.001	−.074	−.070	.029	.025	.014	.941	.161	.000
				.1	.000	−.001	−.001	.030	.030	.030	.964	.946	.934
250	16	1	.5	.9	.003	−.064	−.041	.026	.024	.013	.952	.229	.054
				.1	−.001	.007	.004	.030	.030	.030	.952	.941	.934
250	16	2	.5	.9	.000	−.025	.008	.014	.014	.011	.950	.598	.810
				.1	−.001	.005	−.003	.030	.030	.030	.946	.944	.942
250	24	0	.5	.9	.002	−.047	−.040	.019	.015	.010	.957	.099	.007
				.1	.000	.001	.001	.024	.024	.024	.954	.950	.942
250	24	1	.5	.9	.001	−.043	−.023	.014	.014	.009	.961	.130	.213
				.1	.000	.005	.003	.024	.024	.024	.951	.946	.944
250	24	2	.5	.9	.000	−.021	.008	.009	.010	.008	.946	.420	.741
				.1	.000	.005	−.002	.024	.024	.024	.950	.948	.948

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval (ci$_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\rm al}$), Arellano-Bond ($\widehat{\theta}_{\rm ab}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\rm hk}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			$\text{ci}_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
250	2	0	.5	.99	−.122	—	−.505	.199	—	.095	.828	.819	.000
				.01	−.002	—	−.004	.148	—	.123	.977	.985	.834
250	2	1	.5	.99	−.118	—	−.498	.199	—	.095	.832	.822	.000
				.01	.001	—	.012	.148	—	.123	.977	.982	.833
250	2	2	.5	.99	−.105	—	−.478	.199	—	.095	.841	.826	.001
				.01	.004	—	.026	.150	—	.125	.977	.974	.823
250	4	0	.5	.99	−.070	−.673	−.257	.093	.261	.046	.834	.248	.000
				.01	−.002	−.004	−.003	.077	.074	.072	.973	.951	.903
250	4	1	.5	.99	−.066	−.642	−.250	.094	.261	.046	.841	.270	.000
				.01	.001	.023	.009	.077	.073	.072	.974	.941	.902
250	4	2	.5	.99	−.053	−.568	−.230	.093	.252	.046	.858	.333	.000
				.01	.003	.044	.018	.078	.073	.072	.974	.914	.894
250	6	0	.5	.99	−.048	−.487	−.172	.062	.149	.031	.836	.057	.000
				.01	.000	−.002	−.001	.057	.056	.054	.973	.950	.919
250	6	1	.5	.99	−.043	−.459	−.166	.062	.147	.031	.846	.075	.000
				.01	.003	.020	.008	.057	.056	.054	.973	.936	.915
250	6	2	.5	.99	−.031	−.385	−.146	.062	.140	.031	.871	.137	.000
				.01	.004	.036	.015	.057	.055	.055	.974	.903	.908
250	8	0	.5	.99	−.035	−.379	−.131	.046	.105	.024	.852	.016	.000
				.01	.000	−.002	.000	.046	.047	.045	.976	.949	.930
250	8	1	.5	.99	−.031	−.354	−.124	.046	.104	.024	.863	.023	.000
				.01	.002	.017	.006	.046	.046	.045	.975	.936	.928
250	8	2	.5	.99	−.019	−.282	−.104	.046	.096	.024	.890	.067	.001
				.01	.002	.029	.011	.047	.046	.045	.974	.908	.922
250	16	0	.5	.99	−.018	−.199	−.068	.023	.041	.012	.852	.000	.000
				.01	−.001	−.001	−.001	.030	.031	.030	.975	.947	.938
250	16	1	.5	.99	−.014	−.182	−.061	.023	.040	.012	.874	.000	.000
				.01	.000	.009	.003	.030	.031	.030	.974	.937	.937
250	16	2	.5	.99	−.004	−.129	−.043	.023	.033	.012	.915	.003	.014
				.01	.000	.013	.004	.030	.030	.030	.971	.925	.937
250	24	0	.5	.99	−.012	−.134	−.046	.016	.023	.009	.860	.000	.000
				.01	.000	.000	.000	.023	.024	.023	.975	.949	.944
250	24	1	.5	.99	−.008	−.121	−.039	.016	.023	.008	.887	.000	.000
				.01	.001	.006	.002	.024	.024	.023	.974	.940	.944
250	24	2	.5	.99	.000	−.081	−.023	.016	.018	.008	.929	.000	.067
				.01	.000	.009	.003	.024	.024	.023	.967	.934	.945

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval ($\text{ci}_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\text{al}}$), Arellano-Bond ($\widehat{\theta}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			$\text{ci}_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
250	2	0	.99	.5	.002	—	.388	.055	—	.057	.950	.947	.457
				.5	−.001	—	.095	.179	—	.232	.945	.945	.824
250	2	1	.99	.5	−.062	—	−.649	.200	—	.095	.868	.923	.000
				.5	−.001	—	.004	.175	—	.136	.976	.961	.836
250	2	2	.99	.5	.001	—	.442	.049	—	.053	.950	.948	.252
				.5	−.002	—	−.119	.180	—	.248	.945	.945	.764
250	4	0	.99	.5	.000	−.004	.201	.026	.025	.028	.950	.949	.000
				.5	−.001	−.001	.012	.081	.081	.090	.945	.945	.908
250	4	1	.99	.5	.013	−.034	−.220	.100	.075	.043	.948	.915	.000
				.5	−.004	.007	.050	.085	.083	.079	.953	.942	.827
250	4	2	.99	.5	−.001	−.004	.228	.023	.023	.025	.952	.952	.000
				.5	−.001	.001	−.121	.082	.082	.094	.944	.945	.656
250	6	0	.99	.5	.000	−.005	.127	.020	.020	.021	.949	.943	.000
				.5	.000	.001	−.013	.052	.052	.054	.948	.948	.931
250	6	1	.99	.5	−.001	−.025	−.094	.044	.043	.032	.953	.905	.101
				.5	.001	.010	.036	.055	.055	.053	.950	.947	.859
250	6	2	.99	.5	−.001	−.004	.145	.018	.018	.019	.949	.939	.000
				.5	.001	.003	−.095	.053	.053	.056	.950	.950	.563
250	8	0	.99	.5	.000	−.006	.089	.017	.017	.017	.946	.936	.001
				.5	.001	.002	−.020	.040	.040	.039	.943	.941	.909
250	8	1	.99	.5	−.001	−.021	−.045	.030	.031	.025	.947	.899	.483
				.5	.001	.011	.022	.042	.043	.041	.945	.938	.891
250	8	2	.99	.5	.000	−.005	.103	.015	.015	.016	.946	.936	.000
				.5	.001	.004	−.074	.041	.041	.041	.942	.942	.533
250	16	0	.99	.5	.000	−.008	.035	.012	.012	.012	.949	.904	.129
				.5	.000	.004	−.019	.021	.021	.020	.948	.944	.844
250	16	1	.99	.5	.000	−.014	−.002	.016	.017	.015	.945	.862	.924
				.5	.000	.009	.001	.023	.023	.022	.947	.928	.943
250	16	2	.99	.5	.000	−.006	.042	.011	.011	.011	.950	.913	.027
				.5	.000	.005	−.036	.022	.022	.021	.949	.942	.606
250	24	0	.99	.5	.000	−.008	.021	.010	.010	.010	.946	.871	.402
				.5	.000	.006	−.013	.015	.015	.014	.950	.932	.843
250	24	1	.99	.5	.000	−.012	.003	.012	.012	.012	.949	.826	.922
				.5	.000	.010	−.003	.016	.016	.016	.949	.909	.945
250	24	2	.99	.5	.000	−.007	.025	.009	.009	.009	.947	.882	.213
				.5	.000	.007	−.022	.015	.016	.015	.950	.930	.701

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confiydence interval ($\text{ci}_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\text{al}}$), Arellano-Bond ($\widehat{\theta}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			$\text{ci}_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
250	2	0	.99	.9	−.028	—	−.384	.202	—	.094	.885	.935	.005
				.1	−.003	—	−.021	.178	—	.150	.973	.955	.826
250	2	1	.99	.9	−.116	—	−.541	.199	—	.095	.833	.825	.000
				.1	−.001	—	.002	.170	—	.139	.977	.983	.833
250	2	2	.99	.9	.010	—	−.279	.204	—	.091	.909	.944	.070
				.1	−.003	—	.016	.182	—	.157	.972	.949	.834
250	4	0	.99	.9	.003	−.051	−.153	.098	.082	.044	.926	.892	.029
				.1	−.001	−.003	−.008	.082	.080	.077	.965	.946	.898
250	4	1	.99	.9	−.059	−.395	−.283	.096	.208	.046	.852	.496	.000
				.1	.002	.023	.016	.080	.077	.075	.973	.938	.887
250	4	2	.99	.9	.014	−.031	−.076	.095	.063	.042	.940	.912	.443
				.1	−.003	.004	.011	.083	.081	.079	.958	.945	.899
250	6	0	.99	.9	.007	−.045	−.083	.066	.048	.030	.939	.835	.117
				.1	.001	−.001	−.002	.053	.052	.051	.960	.948	.921
250	6	1	.99	.9	−.032	−.235	−.190	.066	.105	.032	.872	.388	.000
				.1	.004	.026	.021	.052	.052	.051	.973	.925	.888
250	6	2	.99	.9	.006	−.027	−.022	.056	.037	.027	.949	.879	.808
				.1	−.001	.007	.006	.054	.052	.052	.954	.947	.926
250	8	0	.99	.9	.007	−.039	−.052	.049	.033	.023	.950	.783	.240
				.1	.001	.000	.000	.040	.040	.040	.951	.942	.921
250	8	1	.99	.9	−.016	−.159	−.141	.051	.067	.025	.898	.330	.000
				.1	.003	.025	.022	.041	.041	.040	.970	.902	.866
250	8	2	.99	.9	.003	−.023	−.001	.035	.026	.020	.961	.846	.909
				.1	.000	.008	.001	.042	.041	.040	.946	.936	.928
250	16	0	.99	.9	.000	−.028	−.015	.018	.015	.012	.959	.565	.671
				.1	.000	.002	.001	.020	.020	.020	.946	.946	.937
250	16	1	.99	.9	.003	−.064	−.059	.028	.024	.013	.944	.217	.003
				.1	−.001	.019	.017	.021	.022	.021	.964	.861	.834
250	16	2	.99	.9	.000	−.017	.014	.013	.012	.010	.951	.698	.648
				.1	.000	.009	−.007	.021	.021	.020	.948	.929	.931
250	24	0	.99	.9	.000	−.023	−.006	.011	.010	.009	.951	.378	.831
				.1	.000	.004	.001	.013	.014	.013	.950	.943	.947
250	24	1	.99	.9	.001	−.041	−.030	.016	.014	.009	.960	.148	.062
				.1	.000	.016	.012	.014	.015	.014	.956	.814	.847
250	24	2	.99	.9	.000	−.015	.013	.008	.008	.007	.946	.539	.500
				.1	.000	.010	−.008	.014	.014	.014	.953	.900	.914

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval ($\text{ci}_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\text{al}}$), Arellano-Bond ($\widehat{\theta}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			$\text{ci}_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
250	2	0	.99	.99	−.120	—	−.503	.199	—	.095	.830	.830	.000
				.01	−.002	—	−.004	.170	—	.141	.977	.982	.831
250	2	1	.99	.99	−.120	—	−.503	.199	—	.095	.830	.824	.000
				.01	−.001	—	.001	.170	—	.141	.977	.982	.834
250	2	2	.99	.99	−.109	—	−.485	.199	—	.095	.837	.859	.001
				.01	.000	—	.006	.171	—	.143	.977	.977	.834
250	4	0	.99	.99	−.069	−.622	−.255	.093	.263	.046	.836	.286	.000
				.01	−.002	−.004	−.003	.079	.079	.074	.972	.952	.899
250	4	1	.99	.99	−.069	−.628	−.255	.094	.263	.046	.837	.281	.000
				.01	.000	.008	.003	.079	.079	.074	.973	.949	.897
250	4	2	.99	.99	−.058	−.320	−.238	.093	.196	.046	.853	.566	.000
				.01	.001	.010	.007	.079	.076	.074	.973	.946	.896
250	6	0	.99	.99	−.047	−.449	−.171	.062	.152	.031	.839	.088	.000
				.01	.000	−.002	−.001	.051	.055	.050	.975	.952	.919
250	6	1	.99	.99	−.047	−.454	−.170	.062	.150	.031	.840	.082	.000
				.01	.001	.012	.005	.051	.056	.050	.975	.946	.917
250	6	2	.99	.99	−.036	−.239	−.154	.062	.111	.031	.862	.347	.000
				.01	.002	.014	.009	.052	.051	.050	.975	.944	.917
250	8	0	.99	.99	−.034	−.350	−.129	.046	.104	.024	.853	.023	.000
				.01	.000	−.001	.000	.039	.044	.039	.973	.948	.919
250	8	1	.99	.99	−.034	−.351	−.128	.046	.105	.024	.853	.025	.000
				.01	.002	.013	.005	.040	.044	.039	.973	.940	.918
250	8	2	.99	.99	−.024	−.185	−.112	.046	.073	.024	.878	.199	.000
				.01	.002	.014	.009	.040	.040	.039	.972	.931	.914
250	16	0	.99	.99	−.017	−.183	−.066	.023	.040	.012	.856	.000	.000
				.01	.000	−.001	−.001	.020	.023	.020	.973	.949	.932
250	16	1	.99	.99	−.017	−.182	−.065	.023	.040	.012	.859	.000	.000
				.01	.001	.013	.004	.020	.023	.020	.972	.916	.928
250	16	2	.99	.99	−.008	−.099	−.050	.023	.027	.012	.901	.013	.003
				.01	.001	.014	.007	.020	.021	.020	.971	.897	.918
250	24	0	.99	.99	−.011	−.124	−.045	.016	.023	.009	.868	.000	.000
				.01	.000	.000	.000	.013	.016	.013	.976	.950	.937
250	24	1	.99	.99	−.010	−.122	−.044	.016	.022	.009	.870	.000	.000
				.01	.001	.013	.005	.013	.016	.013	.975	.873	.920
250	24	2	.99	.99	−.003	−.069	−.030	.016	.015	.008	.915	.000	.011
				.01	.001	.015	.007	.014	.014	.013	.974	.831	.911

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval ($\text{ci}_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\text{al}}$), Arellano-Bond ($\widehat{\theta}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			ci$_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
500	2	0	.5	.5	−.052	—	−.662	.166	—	.067	.867	.934	.000
				.5	−.012	—	−.165	.115	—	.085	.965	.954	.284
500	2	1	.5	.5	.031	—	−.417	.170	—	.064	.929	.947	.000
				.5	.000	—	.008	.112	—	.091	.967	.954	.831
500	2	2	.5	.5	.005	—	.075	.070	—	.052	.955	.947	.648
				.5	−.001	—	−.020	.112	—	.114	.952	.951	.837
500	4	0	.5	.5	.011	−.019	−.245	.080	.058	.030	.950	.928	.000
				.5	.002	−.002	−.029	.057	.056	.054	.955	.949	.847
500	4	1	.5	.5	.003	−.014	−.124	.050	.049	.030	.958	.936	.006
				.5	.000	.002	.016	.056	.056	.054	.950	.949	.896
500	4	2	.5	.5	.000	−.005	.078	.028	.028	.025	.945	.945	.085
				.5	.000	.002	−.030	.057	.057	.057	.949	.949	.872
500	6	0	.5	.5	.001	−.014	−.114	.033	.033	.022	.953	.927	.000
				.5	.000	.000	−.002	.040	.040	.041	.947	.946	.919
500	6	1	.5	.5	.000	−.012	−.051	.027	.030	.021	.953	.935	.240
				.5	.000	.002	.010	.041	.041	.040	.947	.945	.918
500	6	2	.5	.5	.000	−.005	.056	.019	.020	.018	.951	.940	.081
				.5	.000	.002	−.022	.041	.041	.041	.946	.946	.895
500	8	0	.5	.5	.000	−.011	−.061	.022	.024	.018	.951	.926	.054
				.5	.000	.001	.003	.033	.033	.033	.947	.947	.929
500	8	1	.5	.5	.000	−.010	−.025	.020	.022	.017	.950	.927	.619
				.5	.000	.002	.005	.033	.033	.033	.948	.947	.932
500	8	2	.5	.5	.000	−.005	.042	.015	.016	.015	.949	.936	.138
				.5	.000	.002	−.016	.033	.033	.033	.947	.947	.908
500	16	0	.5	.5	.000	−.008	−.010	.012	.013	.011	.949	.905	.818
				.5	.000	.002	.002	.021	.021	.021	.950	.950	.943
500	16	1	.5	.5	.000	−.008	−.002	.011	.012	.011	.951	.909	.928
				.5	.000	.002	.001	.021	.022	.021	.950	.949	.944
500	16	2	.5	.5	.000	−.006	.017	.010	.011	.010	.950	.920	.503
				.5	.000	.002	−.006	.022	.022	.021	.950	.949	.935
500	24	0	.5	.5	.000	−.007	−.002	.009	.009	.009	.946	.883	.922
				.5	.000	.002	.000	.017	.017	.017	.948	.947	.945
500	24	1	.5	.5	.000	−.007	.001	.009	.009	.008	.948	.883	.930
				.5	.000	.002	.000	.017	.017	.017	.949	.947	.945
500	24	2	.5	.5	.000	−.006	.010	.008	.008	.008	.948	.897	.704
				.5	.000	.002	−.004	.017	.017	.017	.949	.948	.941

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval (ci$_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\text{al}}$), Arellano-Bond ($\widehat{\theta}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			ci$_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$
500	2	0	.5	.9	−.103	—	−.546	.164	—	.067	.829	.834	.000
				.1	−.005	—	−.027	.105	—	.085	.977	.966	.813
500	2	1	.5	.9	−.066	—	−.489	.165	—	.067	.859	.842	.000
				.1	.004	—	.025	.107	—	.087	.978	.968	.817
500	2	2	.5	.9	.009	—	−.319	.169	—	.065	.912	.936	.000
				.1	−.001	—	.049	.113	—	.095	.973	.959	.780
500	4	0	.5	.9	−.051	−.283	−.289	.079	.175	.032	.850	.611	.000
				.1	−.002	−.012	−.013	.055	.053	.051	.974	.942	.890
500	4	1	.5	.9	−.019	−.205	−.232	.080	.158	.032	.891	.711	.000
				.1	.002	.018	.021	.056	.054	.051	.975	.940	.884
500	4	2	.5	.9	.013	−.036	−.096	.078	.069	.030	.942	.908	.060
				.1	−.003	.008	.021	.059	.057	.054	.964	.947	.887
500	6	0	.5	.9	−.028	−.164	−.198	.053	.086	.023	.875	.547	.000
				.1	−.001	−.005	−.007	.040	.039	.039	.975	.944	.914
500	6	1	.5	.9	−.003	−.118	−.146	.054	.076	.022	.923	.669	.000
				.1	.000	.013	.016	.041	.040	.039	.969	.938	.899
500	6	2	.5	.9	.005	−.026	−.034	.042	.037	.020	.958	.888	.475
				.1	−.001	.007	.009	.042	.041	.040	.952	.943	.921
500	8	0	.5	.9	−.015	−.109	−.150	.041	.055	.017	.897	.499	.000
				.1	−.001	−.003	−.005	.033	.032	.032	.972	.947	.923
500	8	1	.5	.9	.004	−.082	−.103	.042	.049	.017	.934	.609	.000
				.1	−.001	.009	.012	.033	.033	.032	.966	.942	.913
500	8	2	.5	.9	.002	−.021	−.010	.026	.024	.015	.962	.860	.833
				.1	−.001	.005	.002	.034	.033	.033	.948	.946	.932
500	16	0	.5	.9	.002	−.043	−.070	.024	.019	.010	.946	.391	.000
				.1	.000	.000	.000	.021	.021	.021	.962	.949	.937
500	16	1	.5	.9	.001	−.037	−.041	.018	.018	.009	.959	.448	.002
				.1	.000	.004	.005	.021	.021	.021	.950	.947	.933
500	16	2	.5	.9	.000	−.013	.008	.010	.011	.008	.948	.760	.720
				.1	.000	.003	−.002	.021	.021	.021	.950	.948	.941
500	24	0	.5	.9	.001	−.027	−.040	.013	.011	.007	.962	.300	.000
				.1	.000	.000	.000	.017	.017	.017	.949	.948	.940
500	24	1	.5	.9	.000	−.025	−.022	.009	.011	.007	.956	.337	.031
				.1	.000	.003	.002	.017	.017	.017	.949	.945	.941
500	24	2	.5	.9	.000	−.011	.008	.006	.007	.005	.949	.643	.584
				.1	.000	.002	−.002	.017	.017	.017	.949	.947	.943

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval (ci$_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\rm al}$), Arellano-Bond ($\widehat{\theta}_{\rm ab}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\rm hk}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			$\text{ci}_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
500	2	0	.5	.99	−.105	—	−.505	.164	—	.067	.828	.814	.000
				.01	.000	—	−.002	.105	—	.087	.978	.984	.837
500	2	1	.5	.99	−.100	—	−.498	.164	—	.067	.833	.815	.000
				.01	.003	—	.013	.105	—	.087	.977	.979	.829
500	2	2	.5	.99	−.087	—	−.478	.164	—	.067	.842	.823	.000
				.01	.006	—	.028	.106	—	.088	.977	.963	.813
500	4	0	0.5	.99	−.058	−.670	−.255	.077	.259	.032	.837	.251	.000
				.01	−.001	−.004	−.002	.054	.052	.050	.976	.955	.907
500	4	1	.5	.99	−.053	−.617	−.248	.077	.259	.032	.841	.290	.000
				.01	.002	.022	.009	.055	.051	.050	.977	.937	.904
500	4	2	.5	.99	−.041	−.500	−.228	.077	.243	.032	.861	.389	.000
				.01	.003	.039	.019	.055	.051	.051	.975	.896	.888
500	6	0	0.5	.99	−.039	−.481	−.172	.050	.150	.022	.844	.065	.000
				.01	.000	−.002	−.001	.040	.040	.038	.974	.949	.923
500	6	1	.5	.99	−.035	−.433	−.165	.050	.149	.022	.854	.101	.000
				.01	.002	.020	.008	.040	.039	.038	.973	.924	.917
500	6	2	.5	.99	−.022	−.320	−.145	.050	.131	.022	.882	.217	.000
				.01	.002	.031	.014	.040	.039	.038	.973	.886	.902
500	8	0	0.5	.99	−.030	−.372	−.130	.038	.104	.017	.850	.017	.000
				.01	.000	−.002	−.001	.032	.033	.032	.974	.952	.930
500	8	1	.5	.99	−.025	−.330	−.123	.037	.101	.017	.863	.032	.000
				.01	.001	.016	.006	.033	.032	.032	.975	.930	.926
500	8	2	.5	.99	−.013	−.228	−.104	.038	.083	.016	.893	.121	.000
				.01	.001	.023	.011	.033	.032	.032	.974	.898	.919
500	16	0	0.5	.99	−.015	−.193	−.067	.019	.040	.009	.847	.000	.000
				.01	.000	−.001	.000	.021	.022	.021	.976	.951	.940
500	16	1	.5	.99	−.011	−.166	−.060	.019	.038	.009	.871	.000	.000
				.01	.001	.009	.003	.021	.021	.021	.975	.933	.938
500	16	2	.5	.99	−.002	−.098	−.043	.020	.028	.008	.917	.014	.000
				.01	.000	.011	.005	.021	.021	.021	.971	.922	.937
500	24	0	0.5	.99	−.010	−.128	−.046	.013	.023	.006	.862	.000	.000
				.01	.000	−.001	.000	.017	.017	.017	.976	.950	.942
500	24	1	.5	.99	−.005	−.110	−.039	.013	.022	.006	.897	.000	.000
				.01	.000	.006	.002	.017	.017	.017	.975	.939	.942
500	24	2	.5	.99	.001	−.060	−.023	.013	.014	.006	.938	.002	.003
				.01	.000	.006	.002	.017	.017	.017	.965	.934	.942

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval ($\text{ci}_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\text{al}}$), Arellano-Bond ($\widehat{\theta}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			ci.95		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$
500	2	0	.99	.5	.001	—	.387	.039	—	.041	.947	.949	.266
				.5	.001	—	.098	.128	—	.165	.949	.948	.794
500	2	1	.99	.5	−.044	—	−.649	.166	—	.067	.873	.938	.000
				.5	.002	—	.007	.125	—	.097	.977	.958	.831
500	2	2	.99	.5	.001	—	.442	.034	—	.038	.949	.946	.102
				.5	.001	—	−.117	.127	—	.175	.948	.948	.714
500	4	0	0.99	.5	.000	−.002	.201	.019	.018	.020	.950	.948	.000
				.5	.000	.000	.013	.057	.057	.063	.951	.951	.905
500	4	1	.99	.5	.009	−.017	−.219	.073	.054	.031	.952	.931	.000
				.5	−.002	.004	.051	.060	.058	.055	.953	.949	.763
500	4	2	.99	.5	.000	−.002	.228	.017	.016	.018	.947	.949	.000
				.5	.000	.001	−.120	.058	.057	.067	.947	.949	.454
500	6	0	0.99	.5	.000	−.002	.127	.014	.014	.015	.946	.946	.000
				.5	.000	.001	−.013	.037	.037	.038	.948	.947	.920
500	6	1	.99	.5	.000	−.012	−.093	.031	.031	.022	.951	.933	.007
				.5	.000	.005	.036	.039	.039	.038	.948	.945	.792
500	6	2	.99	.5	.000	−.002	.146	.013	.013	.013	.948	.944	.000
				.5	.001	.002	−.095	.038	.038	.040	.948	.948	.292
500	8	0	0.99	.5	.000	−.003	.089	.012	.012	.012	.948	.940	.000
				.5	.000	.001	−.021	.028	.028	.027	.949	.949	.872
500	8	1	.99	.5	.000	−.010	−.044	.021	.022	.018	.949	.928	.233
				.5	.000	.005	.021	.030	.030	.029	.950	.947	.861
500	8	2	.99	.5	.000	−.002	.103	.011	.011	.011	.949	.942	.000
				.5	.000	.002	−.075	.029	.029	.029	.947	.947	.241
500	16	0	0.99	.5	.000	−.004	.036	.008	.009	.009	.945	.927	.009
				.5	.000	.002	−.019	.015	.015	.014	.948	.945	.738
500	16	1	.99	.5	.000	−.007	−.001	.011	.012	.011	.947	.909	.924
				.5	.000	.005	.001	.016	.016	.015	.946	.938	.941
500	16	2	.99	.5	.000	−.003	.042	.008	.008	.008	.951	.929	.001
				.5	.000	.003	−.035	.016	.016	.015	.946	.942	.338
500	24	0	0.99	.5	.000	−.004	.021	.007	.007	.007	.947	.908	.131
				.5	.000	.003	−.014	.010	.011	.010	.947	.940	.729
500	24	1	.99	.5	.000	−.006	.004	.008	.009	.008	.949	.888	.907
				.5	.000	.005	−.003	.011	.012	.011	.949	.930	.939
500	24	2	.99	.5	.000	−.004	.025	.007	.007	.007	.948	.909	.034
				.5	.000	.003	−.022	.011	.011	.011	.949	.940	.475

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval (ci.95) of adjusted likelihood ($\widehat{\theta}_{\rm al}$), Arellano-Bond ($\widehat{\theta}_{\rm ab}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\rm hk}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			ci.95		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
500	2	0	.99	.9	−.016	—	−.383	.168	—	.066	.891	.944	.000
				.1	.000	—	−.018	.127	—	.106	.975	.954	.826
500	2	1	.99	.9	−.099	—	−.541	.164	—	.067	.833	.828	.000
				.1	.002	—	.005	.122	—	.099	.978	.981	.835
500	2	2	.99	.9	.020	—	−.279	.170	—	.064	.920	.945	.004
				.1	.000	—	.019	.130	—	.111	.969	.952	.830
500	4	0	0.99	.9	.008	−.027	−.152	.081	.060	.031	.932	.917	.001
				.1	.000	−.001	−.006	.057	.056	.054	.968	.951	.906
500	4	1	.99	.9	−.046	−.271	−.281	.079	.172	.032	.854	.625	.000
				.1	.003	.017	.017	.056	.054	.052	.974	.943	.882
500	4	2	.99	.9	.012	−.015	−.074	.075	.045	.030	.947	.932	.200
				.1	−.002	.002	.012	.059	.057	.055	.957	.949	.901
500	6	0	0.99	.9	.009	−.023	−.083	.054	.034	.021	.947	.895	.011
				.1	.001	.000	−.002	.037	.037	.036	.958	.947	.922
500	6	1	.99	.9	−.023	−.149	−.189	.053	.083	.023	.885	.581	.000
				.1	.003	.017	.021	.037	.037	.036	.971	.926	.861
500	6	2	.99	.9	.003	−.014	−.021	.038	.026	.019	.960	.913	.736
				.1	.000	.004	.006	.038	.038	.037	.948	.946	.921
500	8	0	0.99	.9	.005	−.020	−.052	.037	.024	.016	.954	.862	.051
				.1	.000	.000	−.001	.028	.028	.028	.952	.949	.927
500	8	1	.99	.9	−.010	−.096	−.140	.041	.051	.017	.907	.547	.000
				.1	.001	.015	.021	.029	.029	.028	.973	.920	.829
500	8	2	.99	.9	.001	−.012	−.001	.024	.018	.014	.960	.900	.912
				.1	−.001	.004	.000	.029	.028	.028	.948	.944	.932
500	16	0	0.99	.9	.000	−.014	−.014	.013	.011	.009	.956	.748	.485
				.1	.000	.001	.001	.014	.014	.014	.947	.946	.936
500	16	1	.99	.9	.002	−.037	−.059	.022	.017	.009	.951	.455	.000
				.1	−.001	.011	.017	.015	.015	.015	.960	.892	.738
500	16	2	.99	.9	.000	−.009	.014	.009	.009	.007	.947	.816	.431
				.1	.000	.005	−.007	.015	.015	.014	.946	.932	.909
500	24	0	0.99	.9	.000	−.012	−.006	.008	.007	.006	.949	.606	.752
				.1	.000	.002	.001	.010	.010	.010	.946	.940	.940
500	24	1	.99	.9	.000	−.023	−.030	.011	.010	.007	.961	.374	.002
				.1	.000	.009	.012	.010	.010	.010	.946	.861	.749
500	24	2	.99	.9	.000	−.008	.013	.006	.006	.005	.949	.724	.246
				.1	.000	.005	−.008	.010	.010	.010	.948	.917	.860

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confiydence interval (ci.95) of adjusted likelihood ($\widehat{\theta}_{\text{al}}$), Arellano-Bond ($\widehat{\theta}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			$\text{ci}_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
500	2	0	.99	.99	−.104	—	−.503	.164	—	.067	.829	.827	.000
				.01	.001	—	−.002	.121	—	.100	.978	.983	.833
500	2	1	.99	.99	−.103	—	−.503	.164	—	.067	.830	.827	.000
				.01	.002	—	.004	.121	—	.100	.978	.981	.835
500	2	2	.99	.99	−.091	—	−.485	.164	—	.067	.840	.888	.000
				.01	.003	—	.009	.122	—	.101	.979	.971	.833
500	4	0	0.99	.99	−.057	−.566	−.254	.077	.259	.032	.840	.331	.000
				.01	.000	−.003	−.002	.055	.055	.052	.976	.957	.906
500	4	1	.99	.99	−.056	−.575	−.253	.077	.259	.032	.837	.325	.000
				.01	.001	.008	.004	.055	.055	.052	.975	.957	.905
500	4	2	.99	.99	−.045	−.199	−.236	.077	.152	.032	.853	.706	.000
				.01	.001	.007	.008	.056	.054	.052	.974	.951	.904
500	6	0	0.99	.99	−.038	−.407	−.170	.050	.148	.022	.845	.126	.000
				.01	.000	−.001	.000	.037	.038	.035	.974	.953	.918
500	6	1	.99	.99	−.038	−.411	−.170	.050	.150	.022	.847	.116	.000
				.01	.001	.011	.005	.037	.039	.035	.973	.944	.915
500	6	2	.99	.99	−.027	−.152	−.153	.050	.084	.022	.870	.535	.000
				.01	.002	.009	.009	.037	.036	.035	.971	.942	.910
500	8	0	0.99	.99	−.029	−.315	−.129	.038	.101	.017	.852	.042	.000
				.01	.000	−.001	−.001	.028	.030	.027	.975	.952	.924
500	8	1	.99	.99	−.028	−.317	−.128	.038	.101	.017	.854	.040	.000
				.01	.001	.011	.004	.028	.030	.027	.975	.937	.922
500	8	2	.99	.99	−.018	−.119	−.112	.038	.056	.017	.883	.394	.000
				.01	.001	.009	.008	.028	.028	.027	.975	.938	.913
500	16	0	0.99	.99	−.014	−.163	−.066	.019	.038	.009	.854	.000	.000
				.01	.000	.000	.000	.014	.016	.014	.972	.950	.931
500	16	1	.99	.99	−.014	−.162	−.065	.019	.038	.009	.857	.000	.000
				.01	.001	.012	.005	.014	.016	.014	.971	.893	.914
500	16	2	.99	.99	−.005	−.065	−.050	.019	.021	.008	.900	.082	.000
				.01	.001	.010	.008	.014	.015	.014	.970	.897	.898
500	24	0	0.99	.99	−.009	−.110	−.044	.013	.021	.006	.867	.000	.000
				.01	.000	.000	.000	.010	.011	.010	.975	.947	.931
500	24	1	.99	.99	−.008	−.107	−.043	.013	.021	.006	.873	.000	.000
				.01	.001	.011	.005	.010	.011	.010	.975	.820	.896
500	24	2	.99	.99	−.001	−.045	−.030	.013	.012	.006	.925	.013	.000
				.01	.000	.010	.006	.010	.010	.010	.973	.832	.875

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval ($\text{ci}_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\text{al}}$), Arellano-Bond ($\widehat{\theta}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			$\text{ci}_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
1000	2	0	.5	.5	−.040	—	−.662	.137	—	.048	.873	.943	.000
				.5	−.010	—	−.165	.083	—	.060	.961	.953	.085
1000	2	1	.5	.5	.026	—	−.417	.138	—	.046	.938	.949	.000
				.5	−.001	—	.007	.079	—	.064	.965	.953	.834
1000	2	2	.5	.5	.002	—	.074	.048	—	.037	.954	.952	.404
				.5	−.001	—	−.021	.078	—	.080	.951	.952	.827
1000	4	0	.5	.5	.006	−.010	−.245	.056	.042	.021	.957	.937	.000
				.5	.001	−.001	−.028	.040	.039	.038	.953	.952	.801
1000	4	1	.5	.5	.001	−.007	−.124	.034	.035	.021	.958	.944	.000
				.5	.000	.001	.016	.040	.039	.038	.951	.951	.880
1000	4	2	.5	.5	.000	−.002	.078	.019	.020	.017	.956	.950	.003
				.5	.000	.001	−.030	.040	.040	.040	.952	.951	.831
1000	6	0	.5	.5	.000	−.007	−.114	.023	.023	.016	.953	.941	.000
				.5	.000	.000	−.002	.028	.028	.028	.955	.956	.922
1000	6	1	.5	.5	.000	−.006	−.051	.019	.021	.015	.954	.943	.045
				.5	.000	.001	.009	.029	.029	.028	.954	.955	.910
1000	6	2	.5	.5	.000	−.003	.056	.013	.014	.013	.954	.947	.004
				.5	.000	.001	−.022	.029	.029	.029	.953	.953	.859
1000	8	0	.5	.5	.000	−.006	−.061	.016	.017	.013	.952	.937	.002
				.5	.000	.000	.003	.023	.024	.024	.952	.952	.928
1000	8	1	.5	.5	.000	−.005	−.025	.014	.016	.012	.953	.935	.391
				.5	.000	.001	.005	.024	.024	.023	.951	.951	.926
1000	8	2	.5	.5	.000	−.003	.042	.011	.012	.010	.953	.946	.013
				.5	.000	.001	−.016	.024	.024	.024	.952	.952	.875
1000	16	0	.5	.5	.000	−.004	−.010	.008	.009	.008	.949	.925	.699
				.5	.000	.001	.002	.015	.015	.015	.945	.944	.936
1000	16	1	.5	.5	.000	−.004	−.002	.008	.009	.008	.950	.930	.921
				.5	.000	.001	.001	.015	.015	.015	.946	.944	.939
1000	16	2	.5	.5	.000	−.003	.017	.007	.008	.007	.950	.935	.229
				.5	.000	.001	−.006	.015	.015	.015	.947	.944	.926
1000	24	0	.5	.5	.000	−.004	−.002	.006	.007	.006	.953	.917	.917
				.5	.000	.001	.001	.012	.012	.012	.952	.951	.948
1000	24	1	.5	.5	.000	−.004	.001	.006	.007	.006	.954	.921	.932
				.5	.000	.001	.000	.012	.012	.012	.953	.951	.950
1000	24	2	.5	.5	.000	−.003	.010	.005	.006	.005	.954	.922	.491
				.5	.000	.001	−.004	.012	.012	.012	.953	.951	.940

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval ($\text{ci}_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\text{al}}$), Arellano-Bond ($\widehat{\theta}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			$\text{ci}_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
1000	2	0	.5	.9	−.090	—	−.546	.135	—	.048	.828	.855	.000
				.1	−.005	—	−.027	.074	—	.060	.976	.959	.793
1000	2	1	.5	.9	−.055	—	−.489	.135	—	.048	.865	.870	.000
				.1	.003	—	.024	.076	—	.062	.978	.965	.803
1000	2	2	.5	.9	.013	—	−.319	.140	—	.047	.921	.944	.000
				.1	−.002	—	.048	.081	—	.067	.971	.957	.734
1000	4	0	.5	.9	−.041	−.174	−.289	.064	.142	.023	.856	.736	.000
				.1	−.002	−.007	−.013	.039	.038	.036	.975	.945	.881
1000	4	1	.5	.9	−.011	−.118	−.232	.065	.121	.023	.907	.813	.000
				.1	.001	.011	.021	.040	.039	.036	.975	.945	.853
1000	4	2	.5	.9	.010	−.018	−.096	.060	.050	.021	.954	.928	.002
				.1	−.003	.004	.021	.042	.041	.038	.962	.951	.859
1000	6	0	.5	.9	−.022	−.096	−.198	.044	.068	.016	.872	.703	.000
				.1	−.001	−.003	−.007	.028	.028	.027	.979	.955	.913
1000	6	1	.5	.9	.001	−.067	−.146	.046	.058	.015	.928	.781	.000
				.1	.000	.007	.016	.029	.028	.027	.972	.946	.873
1000	6	2	.5	.9	.002	−.014	−.034	.029	.027	.014	.962	.916	.212
				.1	.000	.003	.009	.029	.029	.028	.955	.952	.916
1000	8	0	.5	.9	−.010	−.063	−.150	.034	.041	.012	.895	.687	.000
				.1	.000	−.002	−.004	.023	.023	.023	.973	.950	.918
1000	8	1	.5	.9	.005	−.045	−.103	.035	.036	.012	.942	.763	.000
				.1	−.001	.005	.012	.024	.024	.023	.966	.945	.890
1000	8	2	.5	.9	.001	−.010	−.010	.017	.017	.010	.956	.909	.764
				.1	.000	.003	.003	.024	.024	.023	.953	.949	.933
1000	16	0	.5	.9	.003	−.024	−.070	.019	.014	.007	.951	.609	.000
				.1	.000	.000	.000	.015	.015	.015	.954	.947	.933
1000	16	1	.5	.9	.001	−.020	−.041	.012	.013	.006	.965	.658	.000
				.1	.000	.003	.005	.015	.015	.015	.947	.941	.921
1000	16	2	.5	.9	.000	−.007	.009	.007	.007	.005	.953	.855	.529
				.1	.000	.002	−.002	.015	.015	.015	.947	.943	.939
1000	24	0	.5	.9	.000	−.015	−.040	.009	.008	.005	.965	.553	.000
				.1	.000	.000	.000	.012	.012	.012	.950	.950	.942
1000	24	1	.5	.9	.000	−.014	−.023	.007	.008	.005	.956	.576	.000
				.1	.000	.002	.003	.012	.012	.012	.950	.950	.939
1000	24	2	.5	.9	.000	−.006	.008	.004	.005	.004	.954	.786	.355
				.1	.000	.001	−.002	.012	.012	.012	.951	.950	.945

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0,1)$, $\varepsilon_{it} \sim \mathcal{N}(0,1)$, $u_{it} \sim \mathcal{N}(0,.25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval ($\text{ci}_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\text{al}}$), Arellano-Bond ($\widehat{\theta}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			$\text{ci}_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
1000	2	0	.5	.99	−.092	—	−.505	.135	—	.048	.825	.824	.000
				.01	−.001	—	−.002	.074	—	.061	.980	.984	.833
1000	2	1	.5	.99	−.088	—	−.498	.135	—	.048	.832	.832	.000
				.01	.002	—	.013	.074	—	.061	.980	.975	.822
1000	2	2	.5	.99	−.075	—	−.478	.135	—	.048	.843	.838	.000
				.01	.004	—	.027	.075	—	.062	.977	.953	.798
1000	4	0	.5	.99	−.048	−.667	−.255	.063	.260	.023	.839	.253	.000
				.01	−.001	−.003	−.002	.039	.037	.036	.976	.951	.908
1000	4	1	.5	.99	−.044	−.566	−.249	.062	.251	.023	.849	.328	.000
				.01	.001	.021	.010	.039	.036	.036	.976	.921	.898
1000	4	2	.5	.99	−.031	−.395	−.228	.062	.214	.023	.874	.488	.000
				.01	.002	.032	.019	.039	.037	.036	.976	.873	.864
1000	6	0	.5	.99	−.033	−.472	−.172	.042	.150	.016	.835	.071	.000
				.01	.000	−.002	−.001	.028	.028	.027	.979	.955	.928
1000	6	1	.5	.99	−.029	−.390	−.165	.042	.144	.016	.850	.144	.000
				.01	.001	.017	.008	.028	.027	.027	.978	.913	.915
1000	6	2	.5	.99	−.017	−.240	−.145	.042	.110	.015	.881	.348	.000
				.01	.002	.023	.014	.029	.028	.027	.977	.874	.884
1000	8	0	.5	.99	−.025	−.361	−.130	.031	.102	.012	.840	.017	.000
				.01	.000	−.002	−.001	.023	.024	.023	.976	.950	.930
1000	8	1	.5	.99	−.020	−.291	−.123	.031	.095	.012	.859	.053	.000
				.01	.001	.014	.006	.023	.023	.023	.976	.911	.918
1000	8	2	.5	.99	−.009	−.163	−.104	.031	.066	.012	.897	.252	.000
				.01	.001	.017	.011	.024	.023	.023	.975	.889	.899
1000	16	0	.5	.99	−.012	−.182	−.067	.016	.039	.006	.852	.000	.000
				.01	.000	.000	.000	.015	.015	.015	.973	.948	.937
1000	16	1	.5	.99	−.008	−.142	−.060	.016	.035	.006	.883	.001	.000
				.01	.001	.008	.003	.015	.015	.015	.972	.918	.928
1000	16	2	.5	.99	.000	−.066	−.042	.016	.021	.006	.928	.080	.000
				.01	.000	.007	.005	.015	.015	.015	.967	.916	.923
1000	24	0	.5	.99	−.008	−.118	−.046	.011	.021	.004	.853	.000	.000
				.01	.000	.000	.000	.012	.012	.012	.976	.952	.945
1000	24	1	.5	.99	−.004	−.093	−.039	.011	.019	.004	.893	.000	.000
				.01	.000	.005	.002	.012	.012	.012	.974	.934	.942
1000	24	2	.5	.99	.001	−.039	−.023	.011	.011	.004	.941	.027	.000
				.01	.000	.004	.003	.012	.012	.012	.964	.936	.941

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval ($\text{ci}_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\text{al}}$), Arellano-Bond ($\widehat{\theta}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			ci.95		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$
1000	2	0	.99	.5	.000	—	.387	.028	—	.029	.945	.946	.126
				.5	.000	—	.096	.089	—	.116	.949	.949	.734
1000	2	1	.99	.5	−.033	—	−.649	.137	—	.048	.881	.945	.000
				.5	.000	—	.006	.088	—	.068	.975	.953	.832
1000	2	2	.99	.5	.000	—	.441	.024	—	.027	.953	.951	.021
				.5	.000	—	−.118	.089	—	.123	.949	.949	.635
1000	4	0	.99	.5	.000	−.001	.201	.013	.013	.014	.951	.951	.000
				.5	.000	.000	.013	.040	.040	.044	.950	.950	.899
1000	4	1	.99	.5	.004	−.009	−.219	.049	.039	.021	.964	.940	.000
				.5	−.001	.002	.051	.042	.041	.039	.954	.953	.631
1000	4	2	.99	.5	.000	−.001	.228	.012	.011	.013	.956	.954	.000
				.5	.000	.000	−.121	.040	.040	.046	.951	.951	.183
1000	6	0	.99	.5	.000	−.001	.127	.010	.010	.010	.949	.947	.000
				.5	.000	.000	−.013	.026	.026	.027	.949	.949	.907
1000	6	1	.99	.5	.000	−.006	−.092	.022	.022	.016	.953	.938	.000
				.5	.000	.002	.035	.027	.027	.026	.950	.951	.671
1000	6	2	.99	.5	.000	−.001	.146	.009	.009	.009	.952	.950	.000
				.5	.000	.001	−.096	.027	.027	.028	.949	.950	.059
1000	8	0	.99	.5	.000	−.002	.089	.008	.008	.009	.949	.946	.000
				.5	.000	.000	−.021	.020	.020	.019	.952	.951	.801
1000	8	1	.99	.5	.000	−.005	−.044	.015	.016	.013	.952	.937	.037
				.5	.000	.003	.021	.021	.021	.020	.951	.948	.781
1000	8	2	.99	.5	.000	−.001	.104	.008	.008	.008	.951	.950	.000
				.5	.000	.001	−.075	.020	.020	.020	.953	.951	.035
1000	16	0	.99	.5	.000	−.002	.036	.006	.006	.006	.949	.939	.000
				.5	.000	.001	−.019	.010	.010	.010	.950	.949	.524
1000	16	1	.99	.5	.000	−.004	−.001	.008	.009	.008	.948	.925	.920
				.5	.000	.002	.001	.011	.012	.011	.946	.940	.943
1000	16	2	.99	.5	.000	−.002	.042	.005	.006	.006	.954	.944	.000
				.5	.000	.001	−.036	.011	.011	.011	.949	.946	.082
1000	24	0	.99	.5	.000	−.002	.021	.005	.005	.005	.948	.932	.009
				.5	.000	.001	−.014	.007	.007	.007	.950	.947	.519
1000	24	1	.99	.5	.000	−.003	.004	.006	.006	.006	.952	.920	.887
				.5	.000	.003	−.003	.008	.008	.008	.951	.940	.933
1000	24	2	.99	.5	.000	−.002	.025	.005	.005	.005	.950	.931	.000
				.5	.000	.002	−.022	.008	.008	.008	.952	.946	.178

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval (ci.95) of adjusted likelihood ($\widehat{\theta}_{\rm al}$), Arellano-Bond ($\widehat{\theta}_{\rm ab}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\rm hk}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			ci.95		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
1000	2	0	.99	.9	−.006	—	−.383	.140	—	.047	.899	.946	.000
				.1	.000	—	−.019	.089	—	.074	.971	.951	.821
1000	2	1	.99	.9	−.086	—	−.541	.135	—	.048	.833	.844	.000
				.1	.001	—	.004	.085	—	.069	.975	.981	.835
1000	2	2	.99	.9	.021	—	−.280	.140	—	.046	.929	.947	.000
				.1	−.001	—	.018	.091	—	.078	.967	.950	.827
1000	4	0	.99	.9	.011	−.014	−.152	.068	.043	.022	.941	.937	.000
				.1	.000	−.001	−.007	.040	.040	.038	.964	.951	.903
1000	4	1	.99	.9	−.036	−.165	−.281	.064	.139	.023	.866	.749	.000
				.1	.002	.010	.017	.040	.039	.037	.976	.947	.868
1000	4	2	.99	.9	.008	−.008	−.074	.054	.032	.021	.957	.945	.029
				.1	−.002	.001	.012	.041	.040	.039	.956	.951	.895
1000	6	0	.99	.9	.006	−.012	−.083	.041	.025	.015	.950	.925	.000
				.1	.000	.000	−.003	.026	.026	.026	.954	.949	.921
1000	6	1	.99	.9	−.017	−.085	−.190	.044	.065	.016	.886	.730	.000
				.1	.002	.009	.021	.026	.026	.025	.975	.938	.816
1000	6	2	.99	.9	.001	−.007	−.021	.026	.019	.014	.961	.931	.571
				.1	.000	.002	.005	.027	.026	.026	.952	.949	.922
1000	8	0	.99	.9	.002	−.011	−.052	.026	.017	.011	.956	.903	.002
				.1	.000	.000	−.001	.020	.020	.020	.952	.951	.932
1000	8	1	.99	.9	−.005	−.054	−.140	.034	.039	.012	.911	.721	.000
				.1	.001	.009	.022	.020	.020	.020	.974	.932	.732
1000	8	2	.99	.9	.001	−.006	−.001	.016	.013	.010	.954	.927	.912
				.1	.000	.002	.000	.020	.020	.020	.951	.951	.937
1000	16	0	.99	.9	.000	−.008	−.014	.009	.008	.006	.950	.839	.231
				.1	.000	.000	.001	.010	.010	.010	.950	.950	.938
1000	16	1	.99	.9	.002	−.020	−.058	.017	.013	.007	.956	.664	.000
				.1	−.001	.006	.017	.011	.011	.010	.959	.911	.559
1000	16	2	.99	.9	.000	−.005	.014	.006	.006	.005	.953	.887	.163
				.1	.000	.002	−.007	.010	.010	.010	.947	.941	.881
1000	24	0	.99	.9	.000	−.006	−.006	.005	.005	.004	.949	.774	.619
				.1	.000	.001	.001	.007	.007	.007	.951	.949	.944
1000	24	1	.99	.9	.000	−.012	−.030	.007	.007	.005	.955	.613	.000
				.1	.000	.005	.012	.007	.007	.007	.951	.900	.567
1000	24	2	.99	.9	.000	−.004	.013	.004	.004	.004	.951	.835	.043
				.1	.000	.003	−.008	.007	.007	.007	.951	.937	.784

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confiydence interval (ci.95) of adjusted likelihood ($\widehat{\theta}_{\text{al}}$), Arellano-Bond ($\widehat{\theta}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			ci$_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$
1000	2	0	.99	.99	−.091	—	−.503	.135	—	.048	.827	.846	.000
				.01	.000	—	−.002	.085	—	.070	.975	.982	.836
1000	2	1	.99	.99	−.091	—	−.502	.135	—	.048	.828	.842	.000
				.01	.001	—	.003	.085	—	.070	.975	.981	.835
1000	2	2	.99	.99	−.080	—	−.485	.135	—	.048	.841	.917	.000
				.01	.001	—	.008	.086	—	.071	.975	.967	.833
1000	4	0	0.99	.99	−.047	−.477	−.254	.063	.245	.023	.839	.417	.000
				.01	−.001	−.002	−.002	.039	.038	.036	.977	.955	.905
1000	4	1	.99	.99	−.046	−.485	−.253	.063	.245	.023	.843	.406	.000
				.01	.000	.007	.004	.039	.038	.036	.977	.953	.905
1000	4	2	.99	.99	−.036	−.111	−.236	.062	.114	.023	.866	.817	.000
				.01	.001	.004	.008	.039	.038	.037	.976	.952	.898
1000	6	0	0.99	.99	−.032	−.340	−.170	.042	.137	.016	.839	.196	.000
				.01	.000	−.002	−.001	.026	.026	.025	.976	.953	.920
1000	6	1	.99	.99	−.032	−.348	−.170	.042	.139	.016	.840	.187	.000
				.01	.001	.008	.004	.026	.026	.025	.975	.948	.917
1000	6	2	.99	.99	−.022	−.087	−.153	.042	.063	.015	.869	.704	.000
				.01	.001	.005	.008	.026	.026	.025	.976	.949	.906
1000	8	0	0.99	.99	−.024	−.263	−.128	.031	.092	.012	.846	.085	.000
				.01	.000	−.001	−.001	.019	.020	.019	.977	.954	.927
1000	8	1	.99	.99	−.023	−.265	−.128	.031	.092	.012	.848	.077	.000
				.01	.001	.009	.005	.020	.020	.019	.977	.933	.919
1000	8	2	.99	.99	−.013	−.068	−.112	.031	.040	.012	.883	.614	.000
				.01	.001	.005	.009	.020	.020	.019	.976	.943	.900
1000	16	0	0.99	.99	−.011	−.135	−.065	.016	.034	.006	.861	.002	.000
				.01	.000	.000	.000	.010	.011	.010	.975	.952	.934
1000	16	1	.99	.99	−.011	−.133	−.065	.016	.033	.006	.864	.003	.000
				.01	.001	.010	.005	.010	.011	.010	.974	.866	.901
1000	16	2	.99	.99	−.003	−.038	−.050	.016	.015	.006	.914	.277	.000
				.01	.000	.006	.007	.010	.010	.010	.973	.914	.862
1000	24	0	0.99	.99	−.007	−.090	−.044	.011	.018	.004	.862	.000	.000
				.01	.000	.000	.000	.007	.007	.007	.976	.954	.937
1000	24	1	.99	.99	−.007	−.087	−.043	.011	.018	.004	.871	.000	.000
				.01	.001	.009	.005	.007	.007	.007	.976	.773	.874
1000	24	2	.99	.99	.000	−.027	−.030	.011	.008	.004	.928	.098	.000
				.01	.000	.006	.006	.007	.007	.007	.975	.871	.822

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0,1)$, $\varepsilon_{it} \sim \mathcal{N}(0,1)$, $u_{it} \sim \mathcal{N}(0,.25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval (ci$_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\rm al}$), Arellano-Bond ($\widehat{\theta}_{\rm ab}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\rm hk}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			ci$_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
2500	2	0	.5	.5	−.024	—	−.662	.105	—	.030	.889	.950	.000
				.5	−.006	—	−.166	.056	—	.038	.961	.953	.002
2500	2	1	.5	.5	.019	—	−.417	.100	—	.028	.947	.951	.000
				.5	.000	—	.007	.050	—	.041	.956	.950	.824
2500	2	2	.5	.5	.001	—	.074	.030	—	.023	.952	.950	.067
				.5	.000	—	−.021	.050	—	.051	.949	.950	.806
2500	4	0	.5	.5	.002	−.004	−.245	.033	.026	.014	.961	.948	.000
				.5	.000	.000	−.028	.025	.025	.024	.954	.954	.675
2500	4	1	.5	.5	.001	−.003	−.124	.022	.022	.014	.950	.949	.000
				.5	.000	.000	.016	.025	.025	.024	.955	.955	.837
2500	4	2	.5	.5	.000	−.001	.078	.012	.013	.011	.949	.951	.000
				.5	.000	.000	−.030	.025	.025	.025	.954	.953	.715
2500	6	0	.5	.5	.000	−.003	−.114	.015	.015	.010	.949	.948	.000
				.5	.000	.000	−.002	.018	.018	.018	.951	.951	.918
2500	6	1	.5	.5	.000	−.002	−.051	.012	.014	.010	.950	.945	.000
				.5	.000	.001	.010	.018	.018	.018	.950	.952	.883
2500	6	2	.5	.5	.000	−.001	.056	.009	.009	.008	.950	.947	.000
				.5	.000	.001	−.022	.018	.018	.018	.951	.952	.741
2500	8	0	.5	.5	.000	−.002	−.061	.010	.011	.008	.948	.945	.000
				.5	.000	.000	.003	.015	.015	.015	.952	.951	.926
2500	8	1	.5	.5	.000	−.002	−.025	.009	.010	.008	.950	.942	.075
				.5	.000	.000	.005	.015	.015	.015	.952	.951	.921
2500	8	2	.5	.5	.000	−.001	.041	.007	.007	.007	.953	.948	.000
				.5	.000	.000	−.016	.015	.015	.015	.951	.951	.790
2500	16	0	.5	.5	.000	−.002	−.010	.005	.006	.005	.949	.939	.425
				.5	.000	.000	.002	.009	.009	.009	.954	.954	.942
2500	16	1	.5	.5	.000	−.002	−.001	.005	.006	.005	.951	.942	.915
				.5	.000	.001	.000	.009	.010	.009	.954	.955	.948
2500	16	2	.5	.5	.000	−.001	.017	.004	.005	.004	.949	.946	.014
				.5	.000	.000	−.006	.010	.010	.009	.955	.954	.899
2500	24	0	.5	.5	.000	−.001	−.002	.004	.004	.004	.948	.933	.889
				.5	.000	.000	.001	.008	.008	.008	.948	.948	.944
2500	24	1	.5	.5	.000	−.001	.001	.004	.004	.004	.948	.934	.910
				.5	.000	.000	.000	.008	.008	.008	.950	.948	.945
2500	24	2	.5	.5	.000	−.001	.010	.003	.004	.003	.948	.936	.139
				.5	.000	.000	−.004	.008	.008	.008	.950	.949	.916

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval (ci$_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\text{al}}$), Arellano-Bond ($\widehat{\theta}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			ci$_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$
2500	2	0	.5	.9	−.072	—	−.546	.104	—	.030	.839	.895	.000
				.1	−.003	—	−.027	.048	—	.038	.976	.951	.731
2500	2	1	.5	.9	−.038	—	−.489	.105	—	.030	.878	.899	.000
				.1	.002	—	.024	.048	—	.039	.974	.952	.756
2500	2	2	.5	.9	.018	—	−.319	.110	—	.029	.930	.950	.000
				.1	−.003	—	.048	.052	—	.042	.968	.951	.596
2500	4	0	.5	.9	−.031	−.080	−.288	.050	.100	.015	.861	.855	.000
				.1	−.001	−.003	−.013	.024	.024	.022	.976	.951	.852
2500	4	1	.5	.9	−.003	−.051	−.232	.052	.082	.015	.913	.888	.000
				.1	.000	.005	.021	.025	.025	.023	.977	.949	.772
2500	4	2	.5	.9	.004	−.007	−.096	.038	.032	.014	.960	.942	.000
				.1	−.001	.002	.022	.026	.026	.024	.959	.953	.786
2500	6	0	.5	.9	−.015	−.043	−.198	.034	.046	.010	.886	.838	.000
				.1	.000	−.001	−.007	.018	.018	.017	.975	.950	.895
2500	6	1	.5	.9	.004	−.029	−.146	.036	.038	.010	.937	.882	.000
				.1	.000	.003	.016	.018	.018	.017	.969	.950	.799
2500	6	2	.5	.9	.001	−.005	−.034	.017	.017	.009	.958	.937	.013
				.1	.000	.002	.009	.019	.018	.018	.951	.952	.894
2500	8	0	.5	.9	−.005	−.028	−.150	.026	.028	.008	.908	.830	.000
				.1	.000	−.001	−.005	.015	.015	.014	.974	.952	.913
2500	8	1	.5	.9	.005	−.020	−.103	.027	.024	.008	.946	.861	.000
				.1	−.001	.002	.012	.015	.015	.014	.962	.950	.840
2500	8	2	.5	.9	.000	−.005	−.010	.011	.011	.007	.950	.929	.561
				.1	.000	.001	.002	.015	.015	.015	.951	.949	.933
2500	16	0	.5	.9	.002	−.010	−.069	.013	.009	.004	.957	.808	.000
				.1	.000	.000	.000	.009	.009	.009	.955	.953	.940
2500	16	1	.5	.9	.000	−.009	−.041	.008	.008	.004	.957	.834	.000
				.1	.000	.001	.005	.009	.009	.009	.953	.952	.909
2500	16	2	.5	.9	.000	−.003	.009	.004	.005	.003	.952	.911	.188
				.1	.000	.001	−.002	.009	.009	.009	.953	.953	.942
2500	24	0	.5	.9	.000	−.006	−.040	.005	.005	.003	.952	.777	.000
				.1	.000	.000	.001	.008	.008	.008	.946	.946	.936
2500	24	1	.5	.9	.000	−.006	−.022	.004	.005	.003	.953	.786	.000
				.1	.000	.001	.003	.008	.008	.008	.948	.947	.929
2500	24	2	.5	.9	.000	−.002	.008	.003	.003	.002	.950	.884	.058
				.1	.000	.001	−.002	.008	.008	.008	.948	.946	.938

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval (ci$_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\rm al}$), Arellano-Bond ($\widehat{\theta}_{\rm ab}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\rm hk}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			$\text{ci}_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
2500	2	0	.5	.99	−.074	—	−.505	.104	—	.030	.836	.831	.000
				.01	.000	—	−.003	.047	—	.039	.977	.984	.829
2500	2	1	.5	.99	−.070	—	−.498	.104	—	.030	.841	.841	.000
				.01	.002	—	.013	.047	—	.039	.976	.963	.811
2500	2	2	.5	.99	−.057	—	−.478	.104	—	.030	.857	.855	.000
				.01	.003	—	.027	.048	—	.039	.974	.928	.741
2500	4	0	.5	.99	−.038	−.634	−.255	.049	.254	.015	.842	.273	.000
				.01	.000	−.003	−.001	.024	.023	.022	.978	.954	.909
2500	4	1	.5	.99	−.034	−.445	−.248	.049	.227	.015	.851	.439	.000
				.01	.001	.017	.010	.024	.023	.022	.977	.896	.880
2500	4	2	.5	.99	−.022	−.235	−.228	.049	.162	.015	.879	.659	.000
				.01	.002	.020	.019	.025	.026	.023	.977	.875	.793
2500	6	0	.5	.99	−.026	−.441	−.172	.032	.147	.010	.844	.088	.000
				.01	.000	−.002	−.001	.018	.017	.017	.974	.954	.925
2500	6	1	.5	.99	−.021	−.292	−.165	.032	.122	.010	.862	.258	.000
				.01	.001	.014	.008	.018	.017	.017	.976	.887	.892
2500	6	2	.5	.99	−.010	−.132	−.145	.032	.077	.010	.898	.582	.000
				.01	.001	.013	.015	.018	.018	.017	.975	.891	.818
2500	8	0	.5	.99	−.019	−.334	−.130	.024	.098	.008	.847	.028	.000
				.01	.000	−.002	−.001	.015	.015	.014	.976	.952	.933
2500	8	1	.5	.99	−.015	−.214	−.123	.024	.079	.008	.865	.146	.000
				.01	.001	.010	.006	.015	.014	.014	.978	.898	.907
2500	8	2	.5	.99	−.004	−.087	−.103	.025	.047	.007	.909	.518	.000
				.01	.000	.009	.011	.015	.015	.014	.975	.909	.853
2500	16	0	.5	.99	−.010	−.155	−.067	.012	.035	.004	.853	.001	.000
				.01	.000	−.001	.000	.009	.009	.009	.975	.954	.942
2500	16	1	.5	.99	−.005	−.099	−.060	.012	.027	.004	.889	.014	.000
				.01	.000	.005	.003	.009	.009	.009	.976	.916	.926
2500	16	2	.5	.99	.001	−.033	−.042	.013	.014	.004	.939	.341	.000
				.01	.000	.004	.005	.010	.009	.009	.967	.935	.912
2500	24	0	.5	.99	−.006	−.095	−.046	.008	.018	.003	.857	.000	.000
				.01	.000	.000	.000	.008	.008	.008	.973	.947	.940
2500	24	1	.5	.99	−.002	−.063	−.039	.008	.014	.003	.899	.001	.000
				.01	.000	.003	.002	.008	.008	.008	.971	.927	.931
2500	24	2	.5	.99	.001	−.019	−.023	.009	.007	.002	.948	.219	.000
				.01	.000	.002	.003	.008	.008	.008	.957	.940	.930

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval ($\text{ci}_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\text{al}}$), Arellano-Bond ($\widehat{\theta}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			$\text{ci}_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
2500	2	0	.99	.5	.000	—	.387	.017	—	.018	.949	.948	.022
				.5	.000	—	.097	.057	—	.073	.954	.954	.565
2500	2	1	.99	.5	−.018	—	−.649	.106	—	.030	.897	.952	.000
				.5	.000	—	.006	.056	—	.043	.976	.956	.833
2500	2	2	.99	.5	.000	—	.441	.015	—	.017	.951	.950	.000
				.5	.000	—	−.118	.057	—	.078	.954	.954	.430
2500	4	0	.99	.5	.000	.000	.201	.008	.008	.009	.950	.950	.000
				.5	.000	.000	.013	.025	.025	.028	.952	.952	.878
2500	4	1	.99	.5	.002	−.003	−.219	.029	.024	.014	.955	.948	.000
				.5	.000	.001	.051	.026	.026	.025	.951	.950	.338
2500	4	2	.99	.5	.000	.000	.228	.007	.007	.008	.949	.948	.000
				.5	.000	.000	−.121	.026	.026	.030	.951	.951	.008
2500	6	0	.99	.5	.000	−.001	.127	.006	.006	.007	.950	.950	.000
				.5	.000	.000	−.013	.017	.017	.017	.949	.949	.860
2500	6	1	.99	.5	.000	−.003	−.092	.014	.014	.010	.950	.947	.000
				.5	.000	.001	.035	.017	.017	.017	.953	.951	.374
2500	6	2	.99	.5	.000	.000	.146	.006	.006	.006	.949	.947	.000
				.5	.000	.000	−.096	.017	.017	.018	.951	.951	.000
2500	8	0	.99	.5	.000	−.001	.089	.005	.005	.006	.948	.948	.000
				.5	.000	.000	−.021	.012	.012	.012	.950	.949	.582
2500	8	1	.99	.5	.000	−.002	−.044	.010	.010	.008	.948	.945	.000
				.5	.000	.001	.021	.013	.013	.013	.948	.946	.586
2500	8	2	.99	.5	.000	−.001	.103	.005	.005	.005	.952	.952	.000
				.5	.000	.000	−.075	.013	.013	.013	.948	.947	.000
2500	16	0	.99	.5	.000	−.001	.036	.004	.004	.004	.948	.943	.000
				.5	.000	.000	−.019	.007	.007	.006	.948	.947	.155
2500	16	1	.99	.5	.000	−.001	−.001	.005	.005	.005	.948	.941	.915
				.5	.000	.001	.001	.007	.007	.007	.950	.948	.943
2500	16	2	.99	.5	.000	−.001	.043	.003	.004	.004	.953	.949	.000
				.5	.000	.001	−.036	.007	.007	.007	.948	.949	.000
2500	24	0	.99	.5	.000	−.001	.021	.003	.003	.003	.950	.944	.000
				.5	.000	.001	−.014	.005	.005	.005	.946	.944	.142
2500	24	1	.99	.5	.000	−.001	.004	.004	.004	.004	.949	.939	.795
				.5	.000	.001	−.003	.005	.005	.005	.947	.943	.901
2500	24	2	.99	.5	.000	−.001	.025	.003	.003	.003	.952	.943	.000
				.5	.000	.001	−.022	.005	.005	.005	.950	.948	.005

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confiydence interval ($\text{ci}_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\text{al}}$), Arellano-Bond ($\widehat{\theta}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			ci.95		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
2500	2	0	.99	.9	.006	—	−.383	.110	—	.029	.920	.948	.000
				.1	.000	—	−.019	.057	—	.047	.973	.954	.804
2500	2	1	.99	.9	−.069	—	−.541	.104	—	.030	.843	.875	.000
				.1	.001	—	.004	.055	—	.044	.978	.976	.837
2500	2	2	.99	.9	.021	—	−.280	.109	—	.029	.938	.949	.000
				.1	−.001	—	.018	.058	—	.050	.965	.954	.808
2500	4	0	.99	.9	.009	−.005	−.152	.051	.027	.014	.952	.946	.000
				.1	.001	.000	−.006	.025	.025	.024	.959	.952	.900
2500	4	1	.99	.9	−.027	−.075	−.281	.050	.097	.015	.869	.859	.000
				.1	.002	.005	.018	.025	.025	.023	.976	.946	.807
2500	4	2	.99	.9	.003	−.003	−.074	.032	.020	.013	.961	.945	.000
				.1	.000	.001	.012	.026	.025	.025	.953	.952	.870
2500	6	0	.99	.9	.003	−.005	−.082	.026	.016	.009	.959	.938	.000
				.1	.000	.000	−.002	.017	.016	.016	.950	.950	.919
2500	6	1	.99	.9	−.010	−.038	−.189	.034	.043	.010	.898	.855	.000
				.1	.001	.004	.021	.017	.017	.016	.973	.943	.661
2500	6	2	.99	.9	.001	−.003	−.020	.016	.012	.009	.955	.941	.249
				.1	.000	.001	.005	.017	.017	.016	.952	.950	.912
2500	8	0	.99	.9	.001	−.004	−.051	.015	.011	.007	.963	.931	.000
				.1	.000	.000	−.001	.012	.012	.012	.948	.947	.926
2500	8	1	.99	.9	−.001	−.024	−.140	.027	.026	.008	.922	.845	.000
				.1	.000	.003	.021	.013	.013	.012	.972	.940	.522
2500	8	2	.99	.9	.000	−.002	−.001	.010	.008	.006	.949	.940	.906
				.1	.000	.001	.000	.013	.013	.013	.949	.948	.933
2500	16	0	.99	.9	.000	−.003	−.014	.006	.005	.004	.950	.903	.018
				.1	.000	.000	.001	.006	.006	.006	.947	.947	.933
2500	16	1	.99	.9	.001	−.008	−.058	.010	.008	.004	.962	.833	.000
				.1	.000	.003	.017	.007	.007	.007	.955	.936	.206
2500	16	2	.99	.9	.000	−.002	.014	.004	.004	.003	.954	.927	.006
				.1	.000	.001	−.007	.007	.007	.006	.950	.946	.778
2500	24	0	.99	.9	.000	−.003	−.006	.003	.003	.003	.950	.880	.334
				.1	.000	.000	.001	.004	.004	.004	.948	.948	.935
2500	24	1	.99	.9	.000	−.005	−.030	.005	.005	.003	.951	.805	.000
				.1	.000	.002	.012	.005	.005	.004	.948	.925	.224
2500	24	2	.99	.9	.000	−.002	.013	.003	.003	.002	.951	.907	.000
				.1	.000	.001	−.008	.005	.005	.004	.947	.943	.530

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval (ci.95) of adjusted likelihood ($\widehat{\theta}_{\text{al}}$), Arellano-Bond ($\widehat{\theta}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			$\text{ci}_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
2500	2	0	.99	.99	−.073	—	−.503	.104	—	.030	.838	.864	.000
				.01	.000	—	−.003	.055	—	.045	.977	.977	.836
2500	2	1	.99	.99	−.073	—	−.502	.104	—	.030	.839	.859	.000
				.01	.001	—	.003	.055	—	.045	.979	.978	.837
2500	2	2	.99	.99	−.062	—	−.485	.104	—	.030	.851	.938	.000
				.01	.001	—	.008	.055	—	.045	.978	.961	.830
2500	4	0	.99	.99	−.037	−.310	−.253	.049	.198	.015	.846	.590	.000
				.01	.000	−.001	−.001	.025	.024	.023	.976	.954	.907
2500	4	1	.99	.99	−.037	−.323	−.253	.049	.199	.015	.843	.567	.000
				.01	.001	.005	.004	.025	.024	.023	.977	.951	.900
2500	4	2	.99	.99	−.026	−.048	−.236	.049	.076	.015	.869	.894	.000
				.01	.001	.002	.009	.025	.025	.023	.977	.952	.884
2500	6	0	.99	.99	−.025	−.225	−.170	.032	.109	.010	.851	.375	.000
				.01	.000	−.001	−.001	.016	.016	.016	.974	.952	.920
2500	6	1	.99	.99	−.024	−.231	−.169	.032	.108	.010	.853	.366	.000
				.01	.001	.006	.004	.016	.016	.016	.974	.938	.907
2500	6	2	.99	.99	−.014	−.038	−.153	.032	.042	.010	.884	.841	.000
				.01	.001	.002	.009	.016	.016	.016	.975	.949	.874
2500	8	0	.99	.99	−.018	−.174	−.128	.024	.070	.008	.854	.228	.000
				.01	.000	−.001	−.001	.012	.012	.012	.973	.948	.921
2500	8	1	.99	.99	−.018	−.177	−.127	.024	.070	.008	.855	.218	.000
				.01	.000	.006	.004	.012	.012	.012	.975	.925	.904
2500	8	2	.99	.99	−.008	−.031	−.111	.024	.027	.007	.894	.787	.000
				.01	.000	.002	.008	.013	.012	.012	.974	.945	.860
2500	16	0	.99	.99	−.008	−.088	−.065	.012	.025	.004	.863	.025	.000
				.01	.000	.000	.000	.006	.006	.006	.972	.949	.931
2500	16	1	.99	.99	−.008	−.086	−.064	.012	.024	.004	.868	.027	.000
				.01	.001	.006	.005	.006	.007	.006	.973	.849	.854
2500	16	2	.99	.99	−.001	−.017	−.050	.013	.010	.004	.923	.599	.000
				.01	.000	.003	.007	.007	.006	.006	.972	.932	.745
2500	24	0	.99	.99	−.005	−.057	−.044	.008	.013	.003	.871	.003	.000
				.01	.000	.000	.000	.004	.004	.004	.973	.948	.929
2500	24	1	.99	.99	−.005	−.055	−.043	.008	.013	.003	.877	.004	.000
				.01	.000	.006	.005	.004	.005	.004	.972	.754	.771
2500	24	2	.99	.99	.001	−.012	−.030	.009	.006	.003	.934	.416	.000
				.01	.000	.003	.006	.005	.004	.004	.968	.907	.644

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval ($\text{ci}_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\text{al}}$), Arellano-Bond ($\widehat{\theta}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			$\text{ci}_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
5000	2	0	.5	.5	−.015	—	−.662	.089	—	.021	.891	.944	.000
				.5	−.004	—	−.165	.041	—	.027	.960	.952	.000
5000	2	1	.5	.5	.012	—	−.417	.074	—	.020	.953	.947	.000
				.5	.000	—	.007	.035	—	.029	.955	.953	.823
5000	2	2	.5	.5	.000	—	.074	.021	—	.016	.952	.951	.002
				.5	.000	—	−.021	.035	—	.036	.951	.950	.771
5000	4	0	.5	.5	.001	−.002	−.245	.023	.019	.010	.951	.945	.000
				.5	.000	.000	−.028	.018	.018	.017	.949	.950	.496
5000	4	1	.5	.5	.000	−.001	−.124	.015	.016	.010	.947	.946	.000
				.5	.000	.000	.016	.018	.018	.017	.951	.949	.760
5000	4	2	.5	.5	.000	.000	.078	.009	.009	.008	.948	.948	.000
				.5	.000	.000	−.030	.018	.018	.018	.951	.949	.539
5000	6	0	.5	.5	.000	−.001	−.114	.011	.011	.007	.951	.947	.000
				.5	.000	.000	−.002	.013	.013	.013	.951	.951	.917
5000	6	1	.5	.5	.000	−.001	−.051	.009	.010	.007	.951	.948	.000
				.5	.000	.000	.009	.013	.013	.013	.951	.950	.847
5000	6	2	.5	.5	.000	−.001	.056	.006	.006	.006	.950	.950	.000
				.5	.000	.000	−.022	.013	.013	.013	.950	.949	.561
5000	8	0	.5	.5	.000	−.001	−.061	.007	.007	.006	.954	.949	.000
				.5	.000	.000	.003	.010	.010	.010	.952	.951	.919
5000	8	1	.5	.5	.000	−.001	−.025	.006	.007	.005	.953	.951	.003
				.5	.000	.000	.005	.010	.010	.010	.952	.952	.903
5000	8	2	.5	.5	.000	−.001	.041	.005	.005	.005	.951	.952	.000
				.5	.000	.000	−.016	.011	.011	.010	.952	.951	.645
5000	16	0	.5	.5	.000	−.001	−.010	.004	.004	.004	.951	.947	.156
				.5	.000	.000	.002	.007	.007	.007	.951	.950	.934
5000	16	1	.5	.5	.000	−.001	−.001	.004	.004	.003	.953	.950	.902
				.5	.000	.000	.000	.007	.007	.007	.951	.951	.944
5000	16	2	.5	.5	.000	−.001	.017	.003	.003	.003	.953	.952	.000
				.5	.000	.000	−.006	.007	.007	.007	.951	.950	.841
5000	24	0	.5	.5	.000	−.001	−.002	.003	.003	.003	.951	.945	.850
				.5	.000	.000	.000	.005	.005	.005	.952	.951	.947
5000	24	1	.5	.5	.000	−.001	.001	.003	.003	.003	.951	.942	.889
				.5	.000	.000	.000	.005	.005	.005	.950	.949	.945
5000	24	2	.5	.5	.000	−.001	.010	.002	.003	.002	.948	.942	.011
				.5	.000	.000	−.004	.005	.005	.005	.952	.952	.892

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confiydence interval ($\text{ci}_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\text{al}}$), Arellano-Bond ($\widehat{\theta}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; $10,000$ Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			ci$_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$
5000	2	0	.5	.9	−.062	—	−.546	.087	—	.021	.836	.911	.000
				.1	−.003	—	−.027	.034	—	.027	.976	.951	.638
5000	2	1	.5	.9	−.028	—	−.489	.088	—	.021	.881	.919	.000
				.1	.002	—	.024	.034	—	.028	.976	.953	.681
5000	2	2	.5	.9	.017	—	−.319	.091	—	.021	.939	.949	.000
				.1	−.002	—	.048	.038	—	.030	.968	.950	.415
5000	4	0	.5	.9	−.026	−.041	−.289	.042	.075	.010	.854	.898	.000
				.1	−.001	−.002	−.013	.018	.018	.016	.976	.950	.802
5000	4	1	.5	.9	.000	−.026	−.232	.044	.060	.010	.917	.916	.000
				.1	.000	.002	.021	.018	.018	.016	.972	.946	.646
5000	4	2	.5	.9	.002	−.004	−.096	.025	.023	.010	.959	.947	.000
				.1	.000	.001	.022	.018	.018	.017	.952	.949	.662
5000	6	0	.5	.9	−.010	−.023	−.198	.028	.034	.007	.890	.894	.000
				.1	.000	−.001	−.007	.013	.013	.012	.972	.949	.866
5000	6	1	.5	.9	.005	−.015	−.146	.030	.028	.007	.947	.913	.000
				.1	−.001	.002	.016	.013	.013	.012	.965	.948	.686
5000	6	2	.5	.9	.000	−.003	−.034	.012	.012	.006	.952	.943	.000
				.1	.000	.001	.009	.013	.013	.013	.952	.950	.861
5000	8	0	.5	.9	−.002	−.014	−.150	.022	.020	.006	.914	.892	.000
				.1	.000	.000	−.005	.010	.010	.010	.972	.951	.902
5000	8	1	.5	.9	.003	−.010	−.103	.020	.017	.005	.953	.909	.000
				.1	.000	.001	.012	.011	.011	.010	.957	.951	.749
5000	8	2	.5	.9	.000	−.002	−.010	.008	.008	.005	.949	.942	.313
				.1	.000	.001	.003	.011	.011	.010	.951	.951	.929
5000	16	0	.5	.9	.001	−.005	−.069	.009	.006	.003	.958	.874	.000
				.1	.000	.000	.000	.007	.007	.007	.953	.953	.937
5000	16	1	.5	.9	.000	−.004	−.041	.005	.006	.003	.952	.888	.000
				.1	.000	.001	.005	.007	.007	.007	.952	.951	.874
5000	16	2	.5	.9	.000	−.001	.009	.003	.003	.002	.950	.928	.028
				.1	.000	.000	−.002	.007	.007	.007	.952	.951	.934
5000	24	0	.5	.9	.000	−.003	−.040	.004	.004	.002	.953	.861	.000
				.1	.000	.000	.000	.005	.005	.005	.951	.951	.943
5000	24	1	.5	.9	.000	−.003	−.022	.003	.004	.002	.951	.865	.000
				.1	.000	.000	.002	.005	.005	.005	.951	.952	.919
5000	24	2	.5	.9	.000	−.001	.008	.002	.002	.002	.949	.918	.002
				.1	.000	.000	−.002	.005	.005	.005	.951	.952	.932

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0,1)$, $\varepsilon_{it} \sim \mathcal{N}(0,1)$, $u_{it} \sim \mathcal{N}(0,.25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval (ci$_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\rm al}$), Arellano-Bond ($\widehat{\theta}_{\rm ab}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\rm hk}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			$\text{ci}_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
5000	2	0	.5	.99	−.064	—	−.505	.087	—	.021	.832	.821	.000
				.01	.000	—	−.002	.034	—	.027	.978	.984	.833
5000	2	1	.5	.99	−.060	—	−.498	.087	—	.021	.839	.841	.000
				.01	.002	—	.013	.034	—	.027	.978	.949	.789
5000	2	2	.5	.99	−.047	—	−.478	.087	—	.021	.854	.873	.000
				.01	.003	—	.027	.034	—	.028	.976	.917	.649
5000	4	0	.5	.99	−.033	−.596	−.255	.041	.242	.010	.826	.296	.000
				.01	.000	−.003	−.001	.017	.016	.016	.976	.954	.906
5000	4	1	.5	.99	−.029	−.326	−.248	.041	.193	.010	.842	.563	.000
				.01	.001	.013	.010	.017	.017	.016	.977	.883	.841
5000	4	2	.5	.99	−.017	−.139	−.228	.041	.127	.010	.878	.778	.000
				.01	.001	.012	.019	.018	.020	.016	.975	.894	.685
5000	6	0	.5	.99	−.021	−.405	−.172	.027	.137	.007	.844	.113	.000
				.01	.000	−.002	−.001	.013	.012	.012	.974	.950	.924
5000	6	1	.5	.99	−.017	−.208	−.165	.027	.099	.007	.862	.397	.000
				.01	.001	.010	.008	.013	.012	.012	.975	.888	.864
5000	6	2	.5	.99	−.006	−.076	−.145	.027	.058	.007	.903	.736	.000
				.01	.001	.007	.014	.013	.013	.012	.973	.913	.720
5000	8	0	.5	.99	−.016	−.295	−.130	.020	.090	.005	.848	.044	.000
				.01	.000	−.001	−.001	.010	.010	.010	.974	.953	.931
5000	8	1	.5	.99	−.012	−.148	−.123	.020	.062	.005	.871	.297	.000
				.01	.001	.007	.006	.010	.010	.010	.975	.899	.883
5000	8	2	.5	.99	−.002	−.049	−.103	.021	.034	.005	.914	.697	.000
				.01	.000	.005	.011	.011	.011	.010	.973	.925	.775
5000	16	0	.5	.99	−.008	−.125	−.067	.010	.030	.003	.851	.003	.000
				.01	.000	.000	.000	.007	.007	.007	.976	.952	.942
5000	16	1	.5	.99	−.004	−.065	−.060	.010	.020	.003	.890	.081	.000
				.01	.000	.004	.003	.007	.007	.007	.975	.919	.908
5000	16	2	.5	.99	.002	−.018	−.042	.011	.010	.003	.942	.578	.000
				.01	.000	.002	.005	.007	.007	.007	.965	.940	.876
5000	24	0	.5	.99	−.005	−.071	−.046	.007	.015	.002	.857	.000	.000
				.01	.000	.000	.000	.005	.005	.005	.976	.953	.946
5000	24	1	.5	.99	−.001	−.040	−.039	.007	.011	.002	.907	.021	.000
				.01	.000	.002	.002	.005	.005	.005	.974	.935	.927
5000	24	2	.5	.99	.001	−.010	−.023	.006	.005	.002	.951	.473	.000
				.01	.000	.001	.002	.005	.005	.005	.957	.950	.919

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval ($\text{ci}_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\text{al}}$), Arellano-Bond ($\widehat{\theta}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			ci.95		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$
5000	2	0	.99	.5	.000	—	.386	.012	—	.013	.949	.951	.002
				.5	.000	—	.097	.040	—	.052	.951	.952	.339
5000	2	1	.99	.5	−.010	—	−.649	.090	—	.021	.903	.947	.000
				.5	.000	—	.006	.040	—	.031	.976	.954	.823
5000	2	2	.99	.5	.000	—	.441	.011	—	.012	.951	.950	.000
				.5	.000	—	−.117	.040	—	.056	.953	.952	.225
5000	4	0	.99	.5	.000	.000	.201	.006	.006	.006	.949	.950	.000
				.5	.000	.000	.013	.018	.018	.020	.948	.949	.844
5000	4	1	.99	.5	.000	−.002	−.219	.021	.018	.010	.949	.942	.000
				.5	.000	.001	.051	.019	.018	.017	.947	.949	.102
5000	4	2	.99	.5	.000	.000	.228	.005	.005	.006	.949	.949	.000
				.5	.000	.000	−.121	.018	.018	.021	.948	.949	.000
5000	6	0	.99	.5	.000	.000	.127	.004	.004	.005	.950	.953	.000
				.5	.000	.000	−.013	.012	.012	.012	.950	.950	.780
5000	6	1	.99	.5	.000	−.001	−.092	.010	.010	.007	.952	.947	.000
				.5	.000	.001	.035	.012	.012	.012	.950	.950	.124
5000	6	2	.99	.5	.000	.000	.146	.004	.004	.004	.949	.947	.000
				.5	.000	.000	−.095	.012	.012	.013	.950	.951	.000
5000	8	0	.99	.5	.000	.000	.089	.004	.004	.004	.952	.953	.000
				.5	.000	.000	−.021	.009	.009	.009	.952	.952	.320
5000	8	1	.99	.5	.000	−.001	−.044	.007	.007	.006	.957	.948	.000
				.5	.000	.001	.021	.009	.009	.009	.954	.952	.308
5000	8	2	.99	.5	.000	.000	.103	.003	.003	.004	.951	.950	.000
				.5	.000	.000	−.075	.009	.009	.009	.953	.954	.000
5000	16	0	.99	.5	.000	.000	.036	.003	.003	.003	.949	.949	.000
				.5	.000	.000	−.019	.005	.005	.004	.949	.951	.011
5000	16	1	.99	.5	.000	−.001	−.001	.004	.004	.003	.948	.944	.907
				.5	.000	.001	.001	.005	.005	.005	.950	.950	.942
5000	16	2	.99	.5	.000	.000	.042	.002	.003	.003	.951	.950	.000
				.5	.000	.000	−.036	.005	.005	.005	.950	.950	.000
5000	24	0	.99	.5	.000	.000	.021	.002	.002	.002	.949	.946	.000
				.5	.000	.000	−.014	.003	.003	.003	.946	.945	.010
5000	24	1	.99	.5	.000	−.001	.004	.003	.003	.003	.948	.945	.652
				.5	.000	.001	−.003	.004	.004	.004	.948	.946	.861
5000	24	2	.99	.5	.000	.000	.025	.002	.002	.002	.949	.948	.000
				.5	.000	.000	−.022	.003	.004	.003	.949	.948	.000

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0,1)$, $\varepsilon_{it} \sim \mathcal{N}(0,1)$, $u_{it} \sim \mathcal{N}(0,.25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confiydence interval (ci.95) of adjusted likelihood ($\widehat{\theta}_{\rm al}$), Arellano-Bond ($\widehat{\theta}_{\rm ab}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\rm hk}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			ci.95		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
5000	2	0	.99	.9	.010	—	−.383	.093	—	.021	.923	.950	.000
				.1	.001	—	−.019	.041	—	.034	.971	.951	.766
5000	2	1	.99	.9	−.058	—	−.541	.087	—	.021	.841	.896	.000
				.1	.001	—	.004	.039	—	.031	.979	.974	.827
5000	2	2	.99	.9	.017	—	−.280	.087	—	.021	.946	.950	.000
				.1	−.001	—	.018	.041	—	.035	.962	.953	.779
5000	4	0	.99	.9	.006	−.003	−.152	.038	.019	.010	.950	.948	.000
				.1	.000	.000	−.006	.018	.018	.017	.953	.948	.882
5000	4	1	.99	.9	−.022	−.038	−.281	.042	.073	.010	.866	.898	.000
				.1	.001	.003	.017	.018	.018	.016	.974	.946	.719
5000	4	2	.99	.9	.001	−.002	−.074	.022	.015	.009	.957	.947	.000
				.1	.000	.000	.012	.018	.018	.017	.949	.949	.830
5000	6	0	.99	.9	.001	−.002	−.082	.017	.011	.007	.961	.946	.000
				.1	.000	.000	−.002	.012	.012	.012	.949	.949	.913
5000	6	1	.99	.9	−.006	−.020	−.189	.029	.032	.007	.904	.901	.000
				.1	.001	.002	.021	.012	.012	.011	.972	.947	.453
5000	6	2	.99	.9	.000	−.001	−.020	.011	.008	.006	.951	.945	.049
				.1	.000	.000	.005	.012	.012	.012	.950	.951	.896
5000	8	0	.99	.9	.001	−.002	−.051	.011	.008	.005	.956	.942	.000
				.1	.000	.000	−.001	.009	.009	.009	.953	.953	.927
5000	8	1	.99	.9	.001	−.012	−.140	.023	.018	.006	.927	.900	.000
				.1	.000	.002	.022	.009	.009	.009	.975	.947	.240
5000	8	2	.99	.9	.000	−.001	−.001	.007	.006	.005	.949	.944	.908
				.1	.000	.000	.000	.009	.009	.009	.951	.952	.936
5000	16	0	.99	.9	.000	−.002	−.014	.004	.003	.003	.952	.932	.000
				.1	.000	.000	.001	.004	.004	.004	.952	.953	.937
5000	16	1	.99	.9	.000	−.004	−.058	.007	.006	.003	.958	.885	.000
				.1	.000	.001	.017	.005	.005	.005	.952	.942	.030
5000	16	2	.99	.9	.000	−.001	.014	.003	.003	.002	.946	.937	.000
				.1	.000	.001	−.007	.005	.005	.004	.953	.950	.619
5000	24	0	.99	.9	.000	−.001	−.006	.002	.002	.002	.954	.914	.095
				.1	.000	.000	.001	.003	.003	.003	.950	.949	.931
5000	24	1	.99	.9	.000	−.003	−.030	.003	.003	.002	.948	.876	.000
				.1	.000	.001	.012	.003	.003	.003	.951	.941	.033
5000	24	2	.99	.9	.000	−.001	.013	.002	.002	.002	.952	.933	.000
				.1	.000	.001	−.008	.003	.003	.003	.948	.947	.239

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval (ci.95) of adjusted likelihood ($\widehat{\theta}_{\text{al}}$), Arellano-Bond ($\widehat{\theta}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			$\text{ci}_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
5000	2	0	.99	.99	−.063	—	−.503	.087	—	.021	.834	.890	.000
				.01	.000	—	−.002	.039	—	.032	.978	.973	.827
5000	2	1	.99	.99	−.063	—	−.503	.087	—	.021	.834	.891	.000
				.01	.001	—	.003	.039	—	.032	.978	.975	.828
5000	2	2	.99	.99	−.052	—	−.485	.087	—	.021	.848	.948	.000
				.01	.001	—	.008	.039	—	.032	.979	.956	.818
5000	4	0	.99	.99	−.032	−.189	−.253	.041	.148	.010	.830	.723	.000
				.01	.000	−.001	−.001	.018	.017	.016	.975	.954	.902
5000	4	1	.99	.99	−.032	−.202	−.253	.041	.155	.010	.832	.705	.000
				.01	.001	.003	.004	.018	.017	.016	.975	.951	.897
5000	4	2	.99	.99	−.021	−.024	−.236	.041	.056	.010	.867	.917	.000
				.01	.001	.001	.009	.018	.018	.016	.974	.949	.859
5000	6	0	.99	.99	−.020	−.142	−.170	.027	.081	.007	.849	.560	.000
				.01	.000	−.001	−.001	.012	.011	.011	.976	.952	.920
5000	6	1	.99	.99	−.020	−.148	−.169	.027	.082	.007	.851	.542	.000
				.01	.001	.004	.004	.012	.012	.011	.976	.940	.894
5000	6	2	.99	.99	−.010	−.019	−.153	.027	.030	.007	.889	.897	.000
				.01	.001	.001	.009	.012	.012	.011	.975	.948	.832
5000	8	0	.99	.99	−.015	−.109	−.128	.020	.052	.005	.854	.428	.000
				.01	.000	−.001	−.001	.009	.009	.008	.977	.954	.924
5000	8	1	.99	.99	−.015	−.113	−.127	.020	.053	.005	.856	.415	.000
				.01	.000	.004	.004	.009	.009	.008	.975	.931	.888
5000	8	2	.99	.99	−.006	−.016	−.111	.020	.020	.005	.898	.867	.000
				.01	.000	.001	.008	.009	.009	.008	.975	.952	.792
5000	16	0	.99	.99	−.007	−.055	−.065	.010	.018	.003	.863	.126	.000
				.01	.000	.000	.000	.004	.004	.004	.977	.952	.934
5000	16	1	.99	.99	−.006	−.054	−.064	.010	.018	.003	.868	.130	.000
				.01	.000	.004	.005	.004	.005	.004	.976	.869	.786
5000	16	2	.99	.99	.000	−.009	−.050	.011	.007	.003	.928	.756	.000
				.01	.000	.001	.007	.005	.004	.004	.974	.942	.574
5000	24	0	.99	.99	−.004	−.036	−.044	.007	.010	.002	.873	.039	.000
				.01	.000	.000	.000	.003	.003	.003	.971	.946	.930
5000	24	1	.99	.99	−.004	−.034	−.043	.007	.010	.002	.881	.047	.000
				.01	.000	.004	.005	.003	.003	.003	.970	.805	.633
5000	24	2	.99	.99	.001	−.006	−.030	.007	.004	.002	.940	.651	.000
				.01	.000	.001	.006	.003	.003	.003	.966	.925	.410

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval ($\text{ci}_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\text{al}}$), Arellano-Bond ($\widehat{\theta}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			ci.95		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
10000	2	0	.5	.5	−.007	—	−.662	.074	—	.015	.905	.950	.000
				.5	−.002	—	−.166	.030	—	.019	.960	.953	.000
10000	2	1	.5	.5	.006	—	−.417	.050	—	.014	.958	.949	.000
				.5	.000	—	.007	.024	—	.020	.954	.953	.817
10000	2	2	.5	.5	.001	—	.074	.015	—	.012	.946	.946	.000
				.5	.000	—	−.021	.025	—	.025	.953	.952	.705
10000	4	0	.5	.5	.000	−.001	−.245	.016	.013	.007	.951	.949	.000
				.5	.000	.000	−.028	.013	.013	.012	.949	.949	.243
10000	4	1	.5	.5	.000	−.001	−.124	.011	.011	.007	.951	.953	.000
				.5	.000	.000	.016	.013	.013	.012	.949	.949	.629
10000	4	2	.5	.5	.000	.000	.078	.006	.006	.006	.952	.953	.000
				.5	.000	.000	−.030	.013	.013	.013	.948	.949	.283
10000	6	0	.5	.5	.000	−.001	−.114	.007	.007	.005	.949	.945	.000
				.5	.000	.000	−.002	.009	.009	.009	.951	.951	.915
10000	6	1	.5	.5	.000	−.001	−.051	.006	.007	.005	.953	.947	.000
				.5	.000	.000	.010	.009	.009	.009	.951	.951	.760
10000	6	2	.5	.5	.000	.000	.056	.004	.005	.004	.951	.946	.000
				.5	.000	.000	−.022	.009	.009	.009	.952	.952	.299
10000	8	0	.5	.5	.000	−.001	−.061	.005	.005	.004	.947	.947	.000
				.5	.000	.000	.003	.007	.007	.008	.946	.945	.897
10000	8	1	.5	.5	.000	.000	−.025	.004	.005	.004	.950	.951	.000
				.5	.000	.000	.005	.008	.008	.007	.946	.946	.860
10000	8	2	.5	.5	.000	.000	.042	.003	.004	.003	.947	.950	.000
				.5	.000	.000	−.016	.008	.008	.007	.946	.946	.403
10000	16	0	.5	.5	.000	.000	−.010	.003	.003	.003	.951	.948	.013
				.5	.000	.000	.002	.005	.005	.005	.950	.949	.926
10000	16	1	.5	.5	.000	.000	−.001	.002	.003	.002	.949	.947	.872
				.5	.000	.000	.000	.005	.005	.005	.950	.949	.943
10000	16	2	.5	.5	.000	.000	.017	.002	.002	.002	.948	.945	.000
				.5	.000	.000	−.006	.005	.005	.005	.950	.949	.726
10000	24	0	.5	.5	.000	.000	−.002	.002	.002	.002	.948	.947	.765
				.5	.000	.000	.001	.004	.004	.004	.947	.947	.942
10000	24	1	.5	.5	.000	.000	.001	.002	.002	.002	.954	.946	.844
				.5	.000	.000	.000	.004	.004	.004	.954	.956	.942
10000	24	2	.5	.5	.000	.000	.010	.002	.002	.002	.951	.949	.000
				.5	.000	.000	−.004	.004	.004	.004	.951	.951	.836

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confiydence interval ($\text{ci}_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\text{al}}$), Arellano-Bond ($\widehat{\theta}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; $10,000$ Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			ci.95		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$
10000	2	0	.5	.9	−.051	—	−.546	.072	—	.015	.843	.933	.000
				.1	−.003	—	−.027	.024	—	.019	.976	.957	.473
10000	2	1	.5	.9	−.018	—	−.489	.073	—	.015	.892	.935	.000
				.1	.001	—	.024	.024	—	.019	.977	.957	.557
10000	2	2	.5	.9	.015	—	−.319	.073	—	.015	.947	.947	.000
				.1	−.002	—	.048	.027	—	.021	.966	.952	.191
10000	4	0	.5	.9	−.020	−.022	−.288	.035	.054	.007	.864	.924	.000
				.1	−.001	−.001	−.013	.012	.013	.011	.976	.948	.699
10000	4	1	.5	.9	.003	−.014	−.232	.037	.043	.007	.930	.934	.000
				.1	.000	.001	.021	.013	.013	.011	.970	.948	.426
10000	4	2	.5	.9	.001	−.002	−.096	.017	.016	.007	.955	.951	.000
				.1	.000	.000	.022	.013	.013	.012	.949	.950	.457
10000	6	0	.5	.9	−.007	−.012	−.198	.023	.025	.005	.901	.918	.000
				.1	.000	.000	−.007	.009	.009	.009	.973	.951	.816
10000	6	1	.5	.9	.004	−.008	−.145	.024	.020	.005	.952	.925	.000
				.1	.000	.001	.016	.009	.009	.009	.962	.949	.469
10000	6	2	.5	.9	.000	−.002	−.034	.008	.009	.004	.952	.945	.000
				.1	.000	.001	.009	.009	.009	.009	.953	.952	.789
10000	8	0	.5	.9	.000	−.007	−.150	.019	.014	.004	.919	.919	.000
				.1	.000	.000	−.004	.007	.007	.007	.968	.946	.867
10000	8	1	.5	.9	.002	−.005	−.103	.014	.012	.004	.958	.932	.000
				.1	.000	.001	.012	.008	.008	.007	.948	.945	.569
10000	8	2	.5	.9	.000	−.001	−.010	.005	.006	.003	.949	.947	.089
				.1	.000	.000	.003	.008	.008	.007	.946	.947	.912
10000	16	0	.5	.9	.000	−.003	−.069	.006	.005	.002	.963	.914	.000
				.1	.000	.000	.000	.005	.005	.005	.950	.949	.934
10000	16	1	.5	.9	.000	−.002	−.041	.004	.004	.002	.951	.920	.000
				.1	.000	.000	.005	.005	.005	.005	.951	.951	.817
10000	16	2	.5	.9	.000	−.001	.009	.002	.002	.002	.951	.939	.001
				.1	.000	.000	−.002	.005	.005	.005	.950	.951	.920
10000	24	0	.5	.9	.000	−.002	−.040	.003	.003	.002	.951	.902	.000
				.1	.000	.000	.000	.004	.004	.004	.949	.949	.936
10000	24	1	.5	.9	.000	−.001	−.022	.002	.002	.001	.953	.910	.000
				.1	.000	.000	.003	.004	.004	.004	.948	.948	.889
10000	24	2	.5	.9	.000	−.001	.008	.001	.002	.001	.950	.935	.000
				.1	.000	.000	−.002	.004	.004	.004	.949	.949	.918

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0,1)$, $\varepsilon_{it} \sim \mathcal{N}(0,1)$, $u_{it} \sim \mathcal{N}(0,.25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval (ci.95) of adjusted likelihood ($\widehat{\theta}_{\rm al}$), Arellano-Bond ($\widehat{\theta}_{\rm ab}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\rm hk}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			$\text{ci}_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
10000	2	0	.5	.99	−.053	—	−.505	.072	—	.015	.839	.831	.000
				.01	.000	—	−.003	.024	—	.019	.978	.983	.833
10000	2	1	.5	.99	−.049	—	−.498	.072	—	.015	.847	.871	.000
				.01	.001	—	.013	.024	—	.019	.977	.940	.753
10000	2	2	.5	.99	−.036	—	−.478	.072	—	.015	.865	.902	.000
				.01	.002	—	.027	.024	—	.019	.977	.926	.501
10000	4	0	.5	.99	−.027	−.532	−.255	.034	.235	.007	.839	.349	.000
				.01	.000	−.003	−.001	.012	.011	.011	.975	.949	.908
10000	4	1	.5	.99	−.023	−.207	−.248	.034	.152	.007	.855	.699	.000
				.01	.001	.008	.010	.012	.013	.011	.974	.897	.785
10000	4	2	.5	.99	−.011	−.075	−.228	.034	.095	.007	.888	.861	.000
				.01	.001	.006	.019	.013	.014	.011	.973	.922	.487
10000	6	0	.5	.99	−.018	−.342	−.171	.022	.126	.005	.850	.176	.000
				.01	.000	−.001	−.001	.009	.009	.009	.974	.946	.922
10000	6	1	.5	.99	−.013	−.130	−.165	.022	.075	.005	.871	.585	.000
				.01	.001	.006	.008	.009	.009	.009	.975	.895	.797
10000	6	2	.5	.99	−.003	−.041	−.145	.023	.043	.005	.914	.832	.000
				.01	.001	.004	.015	.009	.010	.009	.974	.926	.534
10000	8	0	.5	.99	−.014	−.238	−.130	.017	.079	.004	.845	.098	.000
				.01	.000	−.001	−.001	.007	.007	.007	.973	.944	.928
10000	8	1	.5	.99	−.009	−.090	−.123	.017	.047	.004	.874	.506	.000
				.01	.001	.005	.006	.007	.007	.007	.974	.902	.821
10000	8	2	.5	.99	.000	−.026	−.103	.018	.025	.004	.921	.822	.000
				.01	.000	.003	.011	.008	.008	.007	.971	.929	.610
10000	16	0	.5	.99	−.007	−.089	−.067	.008	.024	.002	.851	.019	.000
				.01	.000	.000	.000	.005	.005	.005	.976	.949	.939
10000	16	1	.5	.99	−.003	−.039	−.060	.008	.015	.002	.900	.273	.000
				.01	.000	.002	.003	.005	.005	.005	.976	.932	.881
10000	16	2	.5	.99	.001	−.009	−.042	.009	.007	.002	.953	.756	.000
				.01	.000	.001	.005	.005	.005	.005	.959	.946	.816
10000	24	0	.5	.99	−.004	−.048	−.046	.006	.011	.001	.857	.008	.000
				.01	.000	.000	.000	.004	.004	.004	.976	.949	.940
10000	24	1	.5	.99	−.001	−.024	−.039	.006	.008	.001	.918	.141	.000
				.01	.000	.001	.002	.004	.004	.004	.970	.936	.906
10000	24	2	.5	.99	.000	−.005	−.023	.004	.004	.001	.960	.695	.000
				.01	.000	.001	.003	.004	.004	.004	.950	.946	.888

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval ($\text{ci}_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\text{al}}$), Arellano-Bond ($\widehat{\theta}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			ci$_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$
10000	2	0	.99	.5	.000	—	.386	.009	—	.009	.948	.949	.000
				.5	.000	—	.097	.028	—	.036	.952	.952	.113
10000	2	1	.99	.5	−.001	—	−.649	.075	—	.015	.914	.948	.000
				.5	.000	—	.006	.028	—	.021	.973	.953	.826
10000	2	2	.99	.5	.000	—	.441	.008	—	.009	.948	.946	.000
				.5	.000	—	−.118	.028	—	.038	.953	.953	.046
10000	4	0	.99	.5	.000	.000	.201	.004	.004	.004	.952	.952	.000
				.5	.000	.000	.013	.013	.013	.014	.950	.949	.783
10000	4	1	.99	.5	.000	−.001	−.219	.015	.012	.007	.949	.949	.000
				.5	.000	.000	.051	.013	.013	.012	.949	.948	.007
10000	4	2	.99	.5	.000	.000	.228	.004	.004	.004	.951	.950	.000
				.5	.000	.000	−.121	.013	.013	.015	.947	.948	.000
10000	6	0	.99	.5	.000	.000	.127	.003	.003	.003	.946	.950	.000
				.5	.000	.000	−.013	.008	.008	.009	.948	.948	.623
10000	6	1	.99	.5	.000	−.001	−.092	.007	.007	.005	.947	.946	.000
				.5	.000	.000	.035	.009	.009	.008	.949	.949	.008
10000	6	2	.99	.5	.000	.000	.146	.003	.003	.003	.950	.950	.000
				.5	.000	.000	−.095	.009	.009	.009	.949	.948	.000
10000	8	0	.99	.5	.000	.000	.089	.003	.003	.003	.953	.951	.000
				.5	.000	.000	−.021	.006	.006	.006	.951	.951	.066
10000	8	1	.99	.5	.000	.000	−.044	.005	.005	.004	.949	.950	.000
				.5	.000	.000	.021	.007	.007	.006	.948	.948	.075
10000	8	2	.99	.5	.000	.000	.103	.002	.002	.003	.949	.949	.000
				.5	.000	.000	−.075	.006	.006	.006	.949	.947	.000
10000	16	0	.99	.5	.000	.000	.036	.002	.002	.002	.953	.951	.000
				.5	.000	.000	−.019	.003	.003	.003	.950	.950	.000
10000	16	1	.99	.5	.000	.000	−.001	.002	.003	.002	.953	.950	.887
				.5	.000	.000	.001	.004	.004	.003	.951	.951	.939
10000	16	2	.99	.5	.000	.000	.042	.002	.002	.002	.950	.947	.000
				.5	.000	.000	−.036	.003	.003	.003	.951	.951	.000
10000	24	0	.99	.5	.000	.000	.021	.002	.002	.002	.948	.947	.000
				.5	.000	.000	−.014	.002	.002	.002	.951	.950	.000
10000	24	1	.99	.5	.000	.000	.004	.002	.002	.002	.947	.945	.416
				.5	.000	.000	−.003	.003	.003	.002	.951	.949	.773
10000	24	2	.99	.5	.000	.000	.025	.001	.002	.002	.951	.947	.000
				.5	.000	.000	−.022	.002	.002	.002	.946	.947	.000

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval (ci$_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\rm al}$), Arellano-Bond ($\widehat{\theta}_{\rm ab}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\rm hk}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			$\text{ci}_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$	$\widehat{\rho}_{\text{al}}$	$\widehat{\rho}_{\text{ab}}$	$\widehat{\rho}_{\text{hk}}$
10000	2	0	.99	.9	.013	—	−.383	.077	—	.015	.933	.949	.000
				.1	.001	—	−.019	.028	—	.023	.967	.953	.701
10000	2	1	.99	.9	−.048	—	−.541	.072	—	.015	.849	.919	.000
				.1	.000	—	.004	.027	—	.022	.977	.969	.838
10000	2	2	.99	.9	.012	—	−.280	.065	—	.014	.953	.947	.000
				.1	−.001	—	.018	.028	—	.024	.957	.953	.735
10000	4	0	.99	.9	.003	−.001	−.152	.027	.014	.007	.961	.949	.000
				.1	.000	.000	−.006	.013	.013	.012	.950	.949	.859
10000	4	1	.99	.9	−.016	−.020	−.281	.035	.052	.007	.877	.924	.000
				.1	.001	.001	.017	.013	.013	.012	.972	.947	.567
10000	4	2	.99	.9	.000	−.001	−.074	.015	.010	.007	.953	.951	.000
				.1	.000	.000	.012	.013	.013	.012	.949	.948	.759
10000	6	0	.99	.9	.001	−.001	−.082	.012	.008	.005	.959	.950	.000
				.1	.000	.000	−.002	.008	.008	.008	.947	.948	.908
10000	6	1	.99	.9	−.003	−.010	−.189	.024	.023	.005	.915	.924	.000
				.1	.000	.001	.021	.009	.009	.008	.974	.946	.196
10000	6	2	.99	.9	.000	−.001	−.020	.008	.006	.004	.952	.948	.001
				.1	.000	.000	.005	.009	.008	.008	.949	.948	.871
10000	8	0	.99	.9	.000	−.001	−.051	.007	.005	.004	.953	.946	.000
				.1	.000	.000	−.001	.006	.006	.006	.949	.950	.925
10000	8	1	.99	.9	.002	−.006	−.140	.019	.013	.004	.933	.927	.000
				.1	.000	.001	.022	.007	.007	.006	.971	.946	.046
10000	8	2	.99	.9	.000	−.001	.000	.005	.004	.003	.949	.947	.906
				.1	.000	.000	.000	.006	.006	.006	.949	.948	.935
10000	16	0	.99	.9	.000	−.001	−.014	.003	.002	.002	.949	.936	.000
				.1	.000	.000	.001	.003	.003	.003	.952	.952	.931
10000	16	1	.99	.9	.000	−.002	−.058	.005	.004	.002	.957	.922	.000
				.1	.000	.001	.017	.003	.003	.003	.952	.948	.001
10000	16	2	.99	.9	.000	.000	.014	.002	.002	.002	.951	.944	.000
				.1	.000	.000	−.007	.003	.003	.003	.951	.951	.347
10000	24	0	.99	.9	.000	−.001	−.006	.002	.002	.001	.953	.936	.005
				.1	.000	.000	.001	.002	.002	.002	.955	.955	.926
10000	24	1	.99	.9	.000	−.001	−.029	.002	.002	.001	.950	.912	.000
				.1	.000	.001	.012	.002	.002	.002	.952	.946	.001
10000	24	2	.99	.9	.000	.000	.013	.001	.001	.001	.949	.937	.000
				.1	.000	.000	−.008	.002	.002	.002	.953	.952	.038

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval ($\text{ci}_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\text{al}}$), Arellano-Bond ($\widehat{\theta}_{\text{ab}}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\text{hk}}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.

Table 3. Simulation results for the first-order autoregression with a covariate (cont'd)

					bias			std			ci$_{.95}$		
N	T	ψ	γ	θ_0	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$	$\widehat{\rho}_{\rm al}$	$\widehat{\rho}_{\rm ab}$	$\widehat{\rho}_{\rm hk}$
10000	2	0	.99	.99	−.052	—	−.503	.072	—	.015	.841	.911	.000
				.01	.000	—	−.003	.027	—	.022	.978	.970	.841
10000	2	1	.99	.99	−.052	—	−.503	.072	—	.015	.842	.912	.000
				.01	.000	—	.003	.027	—	.022	.977	.972	.840
10000	2	2	.99	.99	−.041	—	−.485	.072	—	.015	.858	.947	.000
				.01	.001	—	.008	.027	—	.022	.977	.955	.819
10000	4	0	.99	.99	−.026	−.106	−.253	.034	.112	.007	.843	.823	.000
				.01	.000	−.001	−.001	.012	.012	.012	.973	.951	.904
10000	4	1	.99	.99	−.026	−.114	−.253	.034	.115	.007	.845	.811	.000
				.01	.000	.002	.004	.012	.012	.012	.973	.947	.887
10000	4	2	.99	.99	−.016	−.013	−.236	.034	.040	.007	.875	.935	.000
				.01	.001	.000	.009	.013	.013	.012	.972	.947	.821
10000	6	0	.99	.99	−.017	−.080	−.170	.022	.060	.005	.853	.722	.000
				.01	.000	.000	−.001	.008	.008	.008	.973	.948	.916
10000	6	1	.99	.99	−.016	−.085	−.169	.022	.061	.005	.856	.715	.000
				.01	.000	.002	.004	.008	.008	.008	.973	.943	.875
10000	6	2	.99	.99	−.007	−.010	−.153	.023	.022	.005	.900	.922	.000
				.01	.000	.001	.009	.008	.008	.008	.973	.946	.745
10000	8	0	.99	.99	−.012	−.062	−.128	.017	.039	.004	.853	.636	.000
				.01	.000	.000	−.001	.006	.006	.006	.975	.949	.922
10000	8	1	.99	.99	−.012	−.065	−.127	.017	.039	.004	.854	.624	.000
				.01	.000	.002	.005	.006	.006	.006	.975	.938	.842
10000	8	2	.99	.99	−.003	−.008	−.111	.017	.014	.004	.909	.907	.000
				.01	.000	.001	.008	.006	.006	.006	.974	.948	.651
10000	16	0	.99	.99	−.006	−.032	−.065	.008	.013	.002	.863	.352	.000
				.01	.000	.000	.000	.003	.003	.003	.976	.954	.936
10000	16	1	.99	.99	−.005	−.031	−.064	.008	.013	.002	.874	.363	.000
				.01	.000	.002	.005	.003	.003	.003	.975	.898	.630
10000	16	2	.99	.99	.001	−.004	−.050	.009	.005	.002	.938	.861	.000
				.01	.000	.001	.007	.003	.003	.003	.972	.948	.303
10000	24	0	.99	.99	−.003	−.020	−.044	.006	.007	.001	.880	.200	.000
				.01	.000	.000	.000	.002	.002	.002	.979	.954	.939
10000	24	1	.99	.99	−.003	−.019	−.043	.006	.007	.001	.889	.222	.000
				.01	.000	.002	.005	.002	.002	.002	.973	.851	.384
10000	24	2	.99	.99	.001	−.003	−.030	.006	.003	.001	.952	.794	.000
				.01	.000	.001	.006	.002	.002	.002	.968	.941	.130

Notes: Data generated as $y_{it} = \theta_{01} y_{it-1} + \theta_{02} x_{it} + \alpha_i + \varepsilon_{it}$, $x_{it} = .5\alpha_i + \gamma x_{it-1} + u_{it}$ $(i = 1, ..., N; t = 1, ...T)$ with $\alpha_i \sim \mathcal{N}(0, 1)$, $\varepsilon_{it} \sim \mathcal{N}(0, 1)$, $u_{it} \sim \mathcal{N}(0, .25)$, ψ the degree of outlyingness of the initial observations y_{i0}, and x_{i0} drawn from the stationary distribution. Entries: bias, standard deviation (std), and coverage rate of 95% confidence interval (ci$_{.95}$) of adjusted likelihood ($\widehat{\theta}_{\rm al}$), Arellano-Bond ($\widehat{\theta}_{\rm ab}$), and Hahn-Kuersteiner ($\widehat{\theta}_{\rm hk}$) estimators; '—' indicates non-existence of the moment; 10,000 Monte Carlo replications.