

Figure 1: 30 Monte Carlo simulations for \mathcal{B}_c with $B = 200$, $k = 5$, $p = 13$, $\mu_\alpha = 2$, $X_{i,t} \stackrel{iid}{\sim} \Gamma(1, 2)$, $\delta_i \sim \mathcal{N}(\mathbf{1}_p, \sigma_\delta^2 \mathbf{I}_p)$, $\gamma_i \sim \mathcal{N}(\mathbf{1}_p, \sigma_\gamma^2 \mathbf{I}_p)$ with $\sigma_\delta = \sigma_\gamma = 0.5$

n	σ_α	$\hat{\alpha}_{\text{adj}}$	$\hat{\alpha}_{\text{wadj}}$	$\hat{\alpha}_{\text{IVW}}$	$\bar{\mathcal{C}}^{(k)}(\delta_{\hat{\alpha}_{\text{adj}}})$	$\bar{\mathcal{C}}^{(k)}(\delta_{\hat{\alpha}_{\text{wadj}}})$	$\bar{\mathcal{C}}^{(k)}(\delta_{\hat{\alpha}_{\text{IVW}}})$	$\bar{\mathcal{C}}^{(k)}(\mathcal{A})$
5	5	1 (0)	1 (0)	1 (0)	0.893 (0.025)	0.9 (0.023)	0.893 (0.025)	0.353 (0.038)
	10	1 (0)	1 (0)	1 (0)	0.887 (0.025)	0.887 (0.025)	0.887 (0.025)	0.373 (0.05)
	25	1 (0)	1 (0)	1 (0)	0.78 (0.028)	0.827 (0.025)	0.787 (0.027)	0.44 (0.049)
	50	0.9 (0.056)	0.967 (0.033)	0.933 (0.046)	0.66 (0.037)	0.647 (0.04)	0.653 (0.038)	0.447 (0.056)
	100	0.767 (0.079)	0.967 (0.033)	0.8 (0.074)	0.567 (0.043)	0.527 (0.044)	0.573 (0.043)	0.493 (0.051)
10	5	1 (0)	1 (0)	1 (0)	0.913 (0.021)	0.92 (0.023)	0.913 (0.021)	0.247 (0.033)
	10	1 (0)	1 (0)	1 (0)	0.893 (0.023)	0.893 (0.025)	0.893 (0.023)	0.293 (0.03)
	25	1 (0)	1 (0)	1 (0)	0.747 (0.034)	0.78 (0.031)	0.767 (0.035)	0.3 (0.043)
	50	0.833 (0.069)	1 (0)	0.8 (0.074)	0.587 (0.041)	0.633 (0.042)	0.593 (0.04)	0.373 (0.049)
	100	0.8 (0.074)	0.933 (0.046)	0.8 (0.074)	0.473 (0.038)	0.507 (0.042)	0.46 (0.042)	0.413 (0.047)
15	5	1 (0)	1 (0)	1 (0)	0.913 (0.021)	0.927 (0.022)	0.913 (0.021)	0.313 (0.049)
	10	1 (0)	1 (0)	1 (0)	0.873 (0.024)	0.887 (0.025)	0.873 (0.024)	0.313 (0.04)
	25	1 (0)	1 (0)	1 (0)	0.753 (0.031)	0.78 (0.028)	0.76 (0.029)	0.367 (0.035)
	50	0.933 (0.046)	1 (0)	0.9 (0.056)	0.607 (0.043)	0.693 (0.034)	0.64 (0.041)	0.407 (0.036)
	100	0.667 (0.088)	1 (0)	0.633 (0.089)	0.553 (0.043)	0.507 (0.04)	0.553 (0.04)	0.473 (0.041)
25	5	1 (0)	1 (0)	1 (0)	0.953 (0.016)	0.94 (0.02)	0.953 (0.016)	0.293 (0.038)
	10	1 (0)	1 (0)	1 (0)	0.927 (0.02)	0.913 (0.023)	0.927 (0.02)	0.3 (0.036)
	25	1 (0)	1 (0)	1 (0)	0.78 (0.035)	0.787 (0.036)	0.773 (0.036)	0.313 (0.038)
	50	0.9 (0.056)	1 (0)	0.9 (0.056)	0.573 (0.039)	0.6 (0.043)	0.58 (0.04)	0.34 (0.036)
	100	0.833 (0.069)	1 (0)	0.8 (0.074)	0.493 (0.042)	0.48 (0.039)	0.5 (0.039)	0.393 (0.034)

Figure 2: 30 Monte Carlo simulation with $B = 200$, $p = 13$, $\mu_\alpha = 2$, $X_{i,t} \stackrel{iid}{\sim} \Gamma(1, 2)$, $\delta_i \sim \mathcal{N}(\mathbf{1}_p, \sigma_\delta^2 \mathbf{I}_p)$, $\gamma_i \sim \mathcal{N}(\mathbf{1}_p, \sigma_\gamma^2 \mathbf{I}_p)$ with $\sigma_\delta = \sigma_\gamma = 0.5$ and $\sigma = 10$

n	σ_α	Distance to α_1			Distance to y_{1, T_1^*+1}			
		$\hat{\alpha}_{\text{adj}}$	$\hat{\alpha}_{\text{wadj}}$	$\hat{\alpha}_{\text{IVW}}$	Original	$\hat{\alpha}_{\text{adj}}$	$\hat{\alpha}_{\text{wadj}}$	$\hat{\alpha}_{\text{IVW}}$
5	5	12.765 (1.637)	13.231 (1.881)	12.601 (1.636)	51.916 (4.035)	19.229 (2.552)	20.637 (2.762)	19.363 (2.517)
	10	15.403 (1.741)	16.235 (2.043)	15.247 (1.687)	52.582 (4.351)	21.565 (2.58)	23.38 (2.861)	21.716 (2.5)
	25	26.509 (2.702)	28.16 (3.168)	26.294 (2.569)	55.015 (5.841)	30.297 (3.594)	31.985 (4.356)	30.203 (3.498)
	50	48.402 (4.82)	50.384 (5.792)	47.957 (4.684)	64.423 (8.114)	49.999 (5.784)	52.556 (6.919)	49.553 (5.702)
	100	92.917 (9.805)	95.821 (11.622)	91.916 (9.74)	91.506 (13.198)	94.265 (10.406)	97.256 (12.565)	93.606 (10.267)
10	5	11.588 (1.668)	12.577 (1.701)	11.292 (1.693)	52.339 (4.004)	17.228 (2.956)	18.545 (2.835)	17.392 (2.951)
	10	13.572 (2.002)	15.634 (2)	13.308 (2.038)	52.587 (4.045)	19.02 (3.238)	20.952 (3.135)	19.232 (3.243)
	25	24.4 (3.298)	28.426 (3.39)	24.522 (3.287)	54.073 (4.967)	27.655 (4.554)	31.789 (4.472)	27.845 (4.605)
	50	45.878 (5.881)	51.615 (6.431)	45.944 (5.936)	60.317 (7.527)	47.699 (7.043)	52.972 (7.542)	47.776 (7.167)
	100	89.047 (11.745)	100.732 (12.454)	88.822 (11.959)	85.601 (12.994)	89.855 (12.815)	100.736 (13.614)	90.4 (12.907)
15	5	11.299 (2.119)	11.316 (1.655)	11.313 (2.118)	49.855 (4.014)	18.071 (2.883)	18.375 (2.711)	18.038 (2.882)
	10	12.971 (2.13)	12.613 (1.735)	12.927 (2.15)	48.728 (4.298)	19.451 (2.965)	19.352 (2.856)	19.323 (2.995)
	25	20.943 (2.342)	20.059 (2.43)	21.097 (2.347)	47.06 (5.131)	26.161 (3.312)	26.81 (3.126)	26.234 (3.33)
	50	35.106 (3.875)	35.521 (4.39)	35.505 (3.859)	48.75 (6.862)	40.268 (4.434)	42.092 (4.488)	40.77 (4.38)
	100	63.736 (8.09)	68.358 (8.848)	64.566 (8.034)	64.294 (11.108)	68.846 (8.266)	74.075 (8.719)	69.907 (8.138)
25	5	12.342 (1.558)	9.979 (1.423)	12.441 (1.56)	57.603 (6.938)	21.583 (5.896)	20.004 (5.861)	21.577 (5.901)
	10	14.011 (1.847)	11.716 (1.735)	14.087 (1.851)	56.795 (7.008)	22.198 (5.968)	20.469 (5.887)	22.217 (5.97)
	25	23.552 (3.405)	22.058 (3.074)	23.763 (3.37)	56.583 (7.489)	28.96 (6.488)	27.064 (6.194)	29.028 (6.484)
	50	42.906 (6.704)	41.323 (6.073)	43.289 (6.639)	64.333 (8.753)	47.157 (8.276)	46.299 (7.257)	47.351 (8.255)
	100	86.175 (13.071)	82.99 (11.945)	86.658 (12.997)	95.612 (13.023)	90.1 (13.293)	86.813 (11.747)	90.553 (13.229)

Figure 3: 30 Monte Carlo simulations for \mathcal{B}_c with $B = 200$, $k = 5$, $p = 13$, $\mu_\alpha = 2$, $X_{i,t} \stackrel{iid}{\sim} \Gamma(1, 2)$, $\delta_i \sim \mathcal{N}(\mathbf{1}_p, \sigma_\delta^2 \mathbf{I}_p)$, $\gamma_i \sim \mathcal{N}(\mathbf{1}_p, \sigma_\gamma^2 \mathbf{I}_p)$ with $\sigma_\delta = \sigma_\gamma = 0.5$

σ	σ_α	$\hat{\alpha}_{\text{adj}}$	$\hat{\alpha}_{\text{wadj}}$	$\hat{\alpha}_{\text{IVW}}$	$\bar{\mathcal{C}}^{(k)}(\delta_{\hat{\alpha}_{\text{adj}}})$	$\bar{\mathcal{C}}^{(k)}(\delta_{\hat{\alpha}_{\text{wadj}}})$	$\bar{\mathcal{C}}^{(k)}(\delta_{\hat{\alpha}_{\text{IVW}}})$	$\bar{\mathcal{C}}^{(k)}(\mathcal{A})$
5	5	1 (0)	1 (0)	1 (0)	0.987 (0.009)	0.987 (0.009)	0.987 (0.009)	0.4 (0.038)
	10	1 (0)	1 (0)	1 (0)	0.913 (0.025)	0.953 (0.018)	0.92 (0.025)	0.46 (0.041)
	25	0.967 (0.033)	1 (0)	0.967 (0.033)	0.833 (0.03)	0.893 (0.025)	0.833 (0.03)	0.427 (0.044)
	50	0.867 (0.063)	1 (0)	0.867 (0.063)	0.673 (0.038)	0.693 (0.03)	0.673 (0.038)	0.38 (0.04)
	100	0.7 (0.085)	0.933 (0.046)	0.767 (0.079)	0.52 (0.044)	0.507 (0.039)	0.513 (0.046)	0.513 (0.047)
10	5	1 (0)	1 (0)	1 (0)	0.927 (0.018)	0.933 (0.02)	0.933 (0.018)	0.267 (0.032)
	10	1 (0)	1 (0)	1 (0)	0.86 (0.029)	0.893 (0.027)	0.873 (0.026)	0.367 (0.042)
	25	0.967 (0.033)	1 (0)	0.967 (0.033)	0.78 (0.034)	0.82 (0.032)	0.787 (0.033)	0.293 (0.038)
	50	0.933 (0.046)	1 (0)	0.9 (0.056)	0.66 (0.039)	0.667 (0.038)	0.66 (0.039)	0.32 (0.04)
	100	0.767 (0.079)	0.967 (0.033)	0.7 (0.085)	0.54 (0.05)	0.54 (0.042)	0.553 (0.045)	0.427 (0.053)
25	5	0.967 (0.033)	1 (0)	1 (0)	0.78 (0.029)	0.773 (0.027)	0.787 (0.029)	0.22 (0.031)
	10	1 (0)	1 (0)	1 (0)	0.807 (0.031)	0.793 (0.032)	0.807 (0.028)	0.213 (0.034)
	25	1 (0)	1 (0)	1 (0)	0.72 (0.03)	0.767 (0.027)	0.713 (0.03)	0.247 (0.04)
	50	0.867 (0.063)	0.967 (0.033)	0.867 (0.063)	0.547 (0.039)	0.567 (0.044)	0.52 (0.044)	0.353 (0.037)
	100	0.9 (0.056)	1 (0)	0.867 (0.063)	0.54 (0.036)	0.54 (0.04)	0.56 (0.041)	0.393 (0.048)
50	5	0.833 (0.069)	0.733 (0.082)	0.8 (0.074)	0.54 (0.039)	0.573 (0.04)	0.553 (0.037)	0.193 (0.032)
	10	0.767 (0.079)	0.8 (0.074)	0.767 (0.079)	0.533 (0.041)	0.553 (0.048)	0.527 (0.043)	0.233 (0.03)
	25	0.733 (0.082)	0.8 (0.074)	0.733 (0.082)	0.58 (0.042)	0.58 (0.044)	0.573 (0.045)	0.213 (0.033)
	50	0.8 (0.074)	0.833 (0.069)	0.8 (0.074)	0.587 (0.044)	0.533 (0.041)	0.6 (0.041)	0.293 (0.049)
	100	0.5 (0.093)	0.733 (0.082)	0.533 (0.093)	0.507 (0.054)	0.48 (0.054)	0.513 (0.054)	0.307 (0.045)
100	5	0.433 (0.092)	0.367 (0.089)	0.433 (0.092)	0.473 (0.044)	0.467 (0.039)	0.467 (0.042)	0.193 (0.034)
	10	0.633 (0.089)	0.6 (0.091)	0.667 (0.088)	0.513 (0.037)	0.487 (0.041)	0.507 (0.039)	0.227 (0.034)
	25	0.567 (0.092)	0.6 (0.091)	0.567 (0.092)	0.507 (0.045)	0.533 (0.036)	0.487 (0.04)	0.213 (0.041)
	50	0.533 (0.093)	0.433 (0.092)	0.5 (0.093)	0.473 (0.042)	0.487 (0.048)	0.493 (0.046)	0.187 (0.033)
	100	0.633 (0.089)	0.633 (0.089)	0.633 (0.089)	0.427 (0.04)	0.413 (0.039)	0.453 (0.039)	0.173 (0.03)

Figure 5: 30 Monte Carlo simulations for \mathcal{B}_u with $B = 200$, $k = 5$, $p = 13$, $\mu_\alpha = 2$, $X_{i,t} \stackrel{iid}{\sim} \Gamma(1, 2)$, $\delta_i \sim \mathcal{N}(2\mathbf{1}_p, \sigma_\delta^2 \mathbf{I}_p)$, $\gamma_i \sim \mathcal{N}(\mathbf{1}_p, \sigma_\gamma^2 \mathbf{I}_p)$ with $\sigma_\delta = \sigma_\gamma = 0.5$ and $\sigma = 10$

n	σ_α	Guess			LOOCV with k random draws		
		$\hat{\alpha}_{\text{adj}}$	$\hat{\alpha}_{\text{wadj}}$	$\hat{\alpha}_{\text{IVW}}$	$\bar{\mathcal{C}}^{(k)}(\hat{\delta}_{\hat{\alpha}_{\text{adj}}})$	$\bar{\mathcal{C}}^{(k)}(\hat{\delta}_{\hat{\alpha}_{\text{wadj}}})$	$\bar{\mathcal{C}}^{(k)}(\hat{\delta}_{\hat{\alpha}_{\text{IVW}}})$
5	5	1 (0)	1 (0)	1 (0)	0.92 (0.021)	0.96 (0.015)	0.92 (0.021)
	10	1 (0)	1 (0)	1 (0)	0.9 (0.021)	0.92 (0.018)	0.9 (0.021)
	25	0.967 (0.033)	1 (0)	0.967 (0.033)	0.8 (0.023)	0.813 (0.023)	0.8 (0.025)
	50	0.833 (0.069)	0.867 (0.063)	0.867 (0.063)	0.553 (0.05)	0.573 (0.045)	0.547 (0.052)
	100	0.467 (0.093)	0.733 (0.082)	0.467 (0.093)	0.48 (0.045)	0.48 (0.042)	0.46 (0.044)
10	5	1 (0)	1 (0)	1 (0)	0.953 (0.016)	0.953 (0.018)	0.953 (0.016)
	10	1 (0)	1 (0)	1 (0)	0.92 (0.025)	0.913 (0.027)	0.92 (0.025)
	25	0.9 (0.056)	0.967 (0.033)	0.933 (0.046)	0.767 (0.041)	0.787 (0.039)	0.753 (0.045)
	50	0.767 (0.079)	0.8 (0.074)	0.767 (0.079)	0.553 (0.044)	0.64 (0.043)	0.547 (0.045)
	100	0.633 (0.089)	0.7 (0.085)	0.633 (0.089)	0.527 (0.041)	0.533 (0.046)	0.507 (0.043)
15	5	1 (0)	1 (0)	1 (0)	0.92 (0.021)	0.927 (0.02)	0.92 (0.021)
	10	1 (0)	1 (0)	1 (0)	0.92 (0.021)	0.907 (0.023)	0.92 (0.021)
	25	1 (0)	1 (0)	1 (0)	0.827 (0.03)	0.833 (0.029)	0.833 (0.03)
	50	0.9 (0.056)	0.933 (0.046)	0.9 (0.056)	0.707 (0.033)	0.667 (0.038)	0.687 (0.035)
	100	0.7 (0.085)	0.733 (0.082)	0.7 (0.085)	0.54 (0.046)	0.607 (0.039)	0.54 (0.046)
25	5	1 (0)	1 (0)	1 (0)	0.9 (0.027)	0.907 (0.025)	0.9 (0.027)
	10	1 (0)	1 (0)	1 (0)	0.873 (0.028)	0.893 (0.025)	0.873 (0.028)
	25	1 (0)	1 (0)	1 (0)	0.733 (0.034)	0.74 (0.042)	0.733 (0.034)
	50	0.833 (0.069)	0.867 (0.063)	0.833 (0.069)	0.553 (0.047)	0.56 (0.047)	0.553 (0.047)
	100	0.767 (0.079)	0.733 (0.082)	0.767 (0.079)	0.48 (0.048)	0.493 (0.039)	0.487 (0.049)

Figure 6: 30 Monte Carlo simulations for \mathcal{B}_u with $B = 200$, $k = 5$, $p = 13$, $\mu_\alpha = 2$, $X_{i,t} \stackrel{iid}{\sim} \Gamma(1, 2)$, $\delta_i \sim \mathcal{N}(2\mathbf{1}_p, \sigma_\delta^2 \mathbf{I}_p)$, $\gamma_i \sim \mathcal{N}(\mathbf{1}_p, \sigma_\gamma^2 \mathbf{I}_p)$ with $\sigma_\delta = \sigma_\gamma = 0.5$ and $\sigma = 10$

σ		Guess		LOOCV with k random draws				
σ_α		$\hat{\alpha}_{\text{adj}}$	$\hat{\alpha}_{\text{wadj}}$	$\hat{\alpha}_{\text{IVW}}$	$\bar{\mathcal{C}}^{(k)}(\delta_{\hat{\alpha}_{\text{adj}}})$	$\bar{\mathcal{C}}^{(k)}(\delta_{\hat{\alpha}_{\text{wadj}}})$	$\bar{\mathcal{C}}^{(k)}(\delta_{\hat{\alpha}_{\text{IVW}}})$	$\bar{\mathcal{C}}^{(k)}(\mathcal{A})$
5	5	1 (0)	1 (0)	1 (0)	0.987 (0.009)	0.987 (0.009)	0.987 (0.009)	0.393 (0.047)
	10	1 (0)	1 (0)	1 (0)	0.967 (0.014)	0.973 (0.013)	0.967 (0.014)	0.34 (0.041)
	25	0.933 (0.046)	0.967 (0.033)	0.933 (0.046)	0.807 (0.042)	0.82 (0.038)	0.807 (0.042)	0.293 (0.04)
	50	0.767 (0.079)	0.8 (0.074)	0.767 (0.079)	0.567 (0.047)	0.667 (0.044)	0.573 (0.049)	0.34 (0.039)
	100	0.633 (0.089)	0.7 (0.085)	0.633 (0.089)	0.513 (0.044)	0.533 (0.049)	0.5 (0.04)	0.353 (0.046)
10	5	1 (0)	1 (0)	1 (0)	0.953 (0.016)	0.953 (0.018)	0.953 (0.016)	0.327 (0.041)
	10	1 (0)	1 (0)	1 (0)	0.92 (0.025)	0.913 (0.027)	0.92 (0.025)	0.333 (0.041)
	25	0.9 (0.056)	0.967 (0.033)	0.933 (0.046)	0.767 (0.041)	0.787 (0.039)	0.753 (0.045)	0.313 (0.04)
	50	0.767 (0.079)	0.8 (0.074)	0.767 (0.079)	0.553 (0.044)	0.64 (0.043)	0.547 (0.045)	0.307 (0.036)
	100	0.633 (0.089)	0.7 (0.085)	0.633 (0.089)	0.527 (0.041)	0.533 (0.046)	0.507 (0.043)	0.333 (0.04)
25	5	1 (0)	1 (0)	1 (0)	0.787 (0.044)	0.78 (0.039)	0.773 (0.042)	0.193 (0.036)
	10	0.967 (0.033)	0.967 (0.033)	0.967 (0.033)	0.747 (0.044)	0.753 (0.035)	0.733 (0.045)	0.2 (0.035)
	25	0.9 (0.056)	0.933 (0.046)	0.9 (0.056)	0.66 (0.047)	0.693 (0.047)	0.66 (0.047)	0.3 (0.045)
	50	0.767 (0.079)	0.8 (0.074)	0.8 (0.074)	0.547 (0.048)	0.64 (0.045)	0.553 (0.049)	0.34 (0.047)
	100	0.6 (0.091)	0.7 (0.085)	0.633 (0.089)	0.48 (0.037)	0.52 (0.042)	0.473 (0.039)	0.313 (0.037)
50	5	0.733 (0.082)	0.733 (0.082)	0.767 (0.079)	0.573 (0.049)	0.567 (0.049)	0.58 (0.047)	0.24 (0.039)
	10	0.733 (0.082)	0.733 (0.082)	0.733 (0.082)	0.553 (0.046)	0.547 (0.046)	0.553 (0.048)	0.233 (0.033)
	25	0.767 (0.079)	0.7 (0.085)	0.733 (0.082)	0.48 (0.05)	0.507 (0.049)	0.473 (0.052)	0.24 (0.035)
	50	0.767 (0.079)	0.733 (0.082)	0.733 (0.082)	0.46 (0.049)	0.527 (0.043)	0.467 (0.05)	0.253 (0.041)
	100	0.567 (0.092)	0.7 (0.085)	0.567 (0.092)	0.46 (0.046)	0.493 (0.034)	0.447 (0.05)	0.327 (0.049)
100	5	0.633 (0.089)	0.6 (0.091)	0.633 (0.089)	0.46 (0.051)	0.52 (0.044)	0.48 (0.046)	0.233 (0.038)
	10	0.6 (0.091)	0.6 (0.091)	0.633 (0.089)	0.46 (0.047)	0.527 (0.042)	0.46 (0.049)	0.24 (0.035)
	25	0.633 (0.089)	0.567 (0.092)	0.633 (0.089)	0.453 (0.048)	0.54 (0.042)	0.467 (0.05)	0.213 (0.037)
	50	0.567 (0.092)	0.533 (0.093)	0.567 (0.092)	0.487 (0.04)	0.54 (0.035)	0.467 (0.046)	0.227 (0.034)
	100	0.433 (0.092)	0.533 (0.093)	0.433 (0.092)	0.52 (0.049)	0.547 (0.034)	0.507 (0.05)	0.267 (0.04)