Group Analysis of fMRI Data Using L_1 and L_2 Regularization – Supplement

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Figure 1: Three randomly selected simulation runs with $m = 10$ and no random effects, using L1 (red) and L2 (blue) regularization and AIC. The true curves are in black.

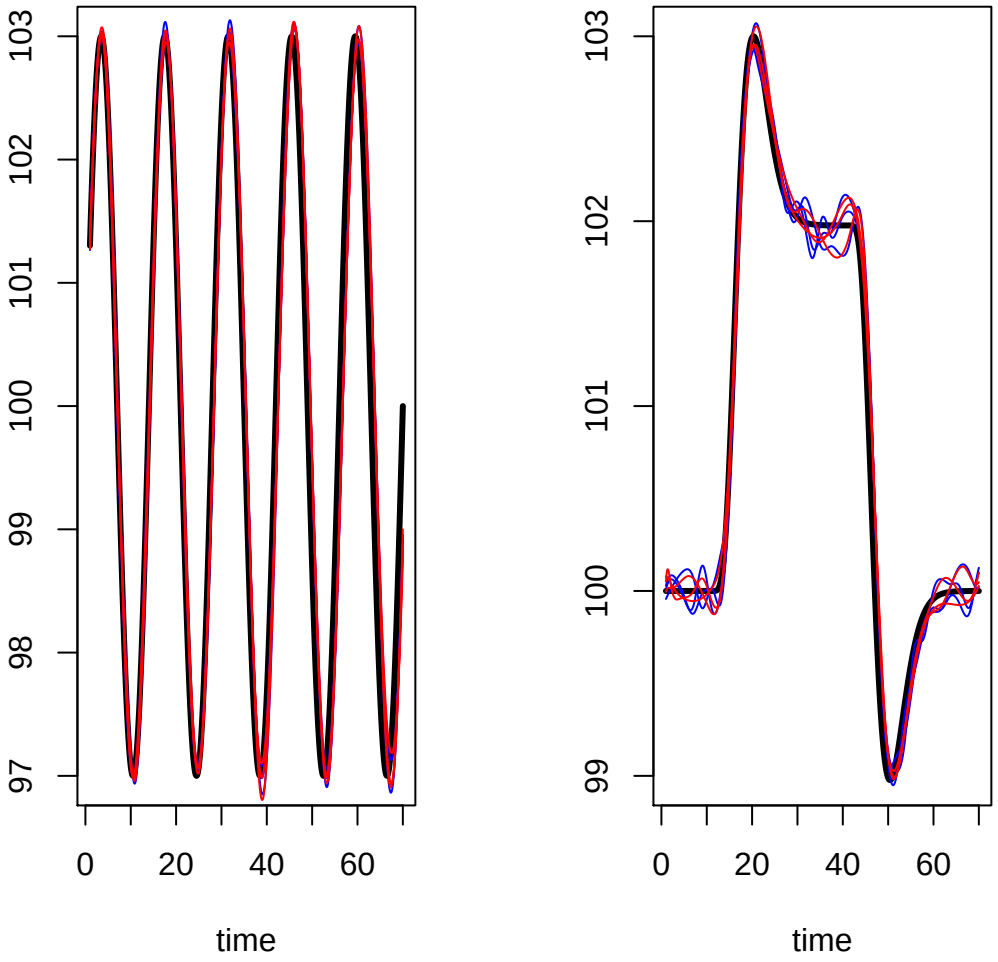


Table 1: Mean (standard deviation) of estimated correlation $\rho = 0.4$

	$m = 5$		$m = 10$	
	L1	L2	L1	L2
Sine				
AIC	0.335 (0.050)	0.339 (0.054)	0.369 (0.035)	0.277 (0.163)
BIC(m)	0.332 (0.050)	0.335 (0.052)	0.369 (0.035)	0.278 (0.164)
BIC(nm)	0.354 (0.050)	0.389 (0.054)	0.375 (0.035)	0.292 (0.172)
No Penalty	0.333 (0.051)		0.369 (0.034)	
fMRI				
AIC	0.373 (0.035)	0.356 (0.052)	0.372 (0.035)	0.374 (0.034)
BIC(m)	0.374 (0.035)	0.348 (0.051)	0.374 (0.035)	0.377 (0.035)
BIC(nm)	0.394 (0.038)	0.413 (0.053)	0.391 (0.036)	0.404 (0.033)
No Penalty	0.333 (0.051)		0.333 (0.051)	

Table 2: Mean (standard deviation) of estimated error variance $\sigma^2 = 1$

	$m = 5$		$m = 10$	
	L1	L2	L1	L2
Sine				
AIC	0.900 (0.078)	0.864 (0.088)	0.944 (0.064)	0.707 (0.415)
BIC(m)	0.891 (0.079)	0.852 (0.080)	0.946 (0.064)	0.709 (0.416)
BIC(nm)	0.951 (0.089)	0.970 (0.097)	0.964 (0.067)	0.739 (0.433)
No Penalty	0.844 (0.075)		0.929 (0.064)	
fMRI				
AIC	0.954 (0.065)	0.909 (0.090)	0.954 (0.065)	0.955 (0.067)
BIC(m)	0.958 (0.065)	0.889 (0.090)	0.957 (0.065)	0.963 (0.070)
BIC(nm)	1.002 (0.078)	1.022 (0.103)	0.997 (0.072)	1.017 (0.073)
No Penalty	0.844 (0.075)		0.844 (0.074)	

Table 3: Mean (standard deviation) of estimated random intercept variance $\tau^2 = 100$

	$m = 5$		$m = 10$	
	L1	L2	L1	L2
Sine				
AIC	80.073 (51.595)	78.669 (51.625)	94.472 (37.883)	71.564 (51.549)
BIC(m)	80.074 (51.596)	78.670 (51.626)	94.472 (37.883)	71.563 (51.548)
BIC(nm)	80.071 (51.596)	78.662 (51.624)	94.471 (37.884)	71.562 (51.548)
No Penalty	78.671 (51.626)		94.652 (37.882)	
fMRI				
AIC	94.472 (37.884)	78.667 (51.624)	94.472 (37.884)	95.246 (35.224)
BIC(m)	94.471 (37.884)	78.668 (51.624)	94.471 (37.884)	95.246 (35.224)
BIC(nm)	94.469 (37.883)	78.661 (51.624)	94.469 (37.883)	95.243 (35.224)
No Penalty	78.670 (51.626)		78.673 (51.618)	

Table 4: Mean (standard deviation) of integrated square error

	$m = 5$		$m = 10$	
	L1	L2	L1	L2
Sine				
AIC	26.544 (5.029)	28.022 (5.500)	21.657 (3.719)	16.991 (10.299)
BIC(m)	26.593 (5.055)	27.745 (5.468)	21.675 (3.720)	17.069 (10.344)
BIC(nm)	27.948 (5.508)	32.797 (7.144)	22.567 (3.555)	18.957 (11.469)
No Penalty	27.791 (5.233)		22.566 (3.678)	
fMRI				
AIC	6.066 (1.588)	11.171 (2.871)	6.076 (1.606)	6.457 (2.697)
BIC(m)	6.008 (1.500)	11.239 (3.102)	6.050 (1.578)	6.599 (2.738)
BIC(nm)	7.458 (2.455)	14.791 (3.927)	7.199 (2.190)	8.672 (3.460)
No Penalty	12.479 (2.930)		12.449 (2.990)	

Figure 2: Boxplots of estimated correlation $\rho = 0.4$. Left panel: without random effects; right panel: with random effects. (a) $m = 5$, (b) $m = 10$, (c) $m = 40$.

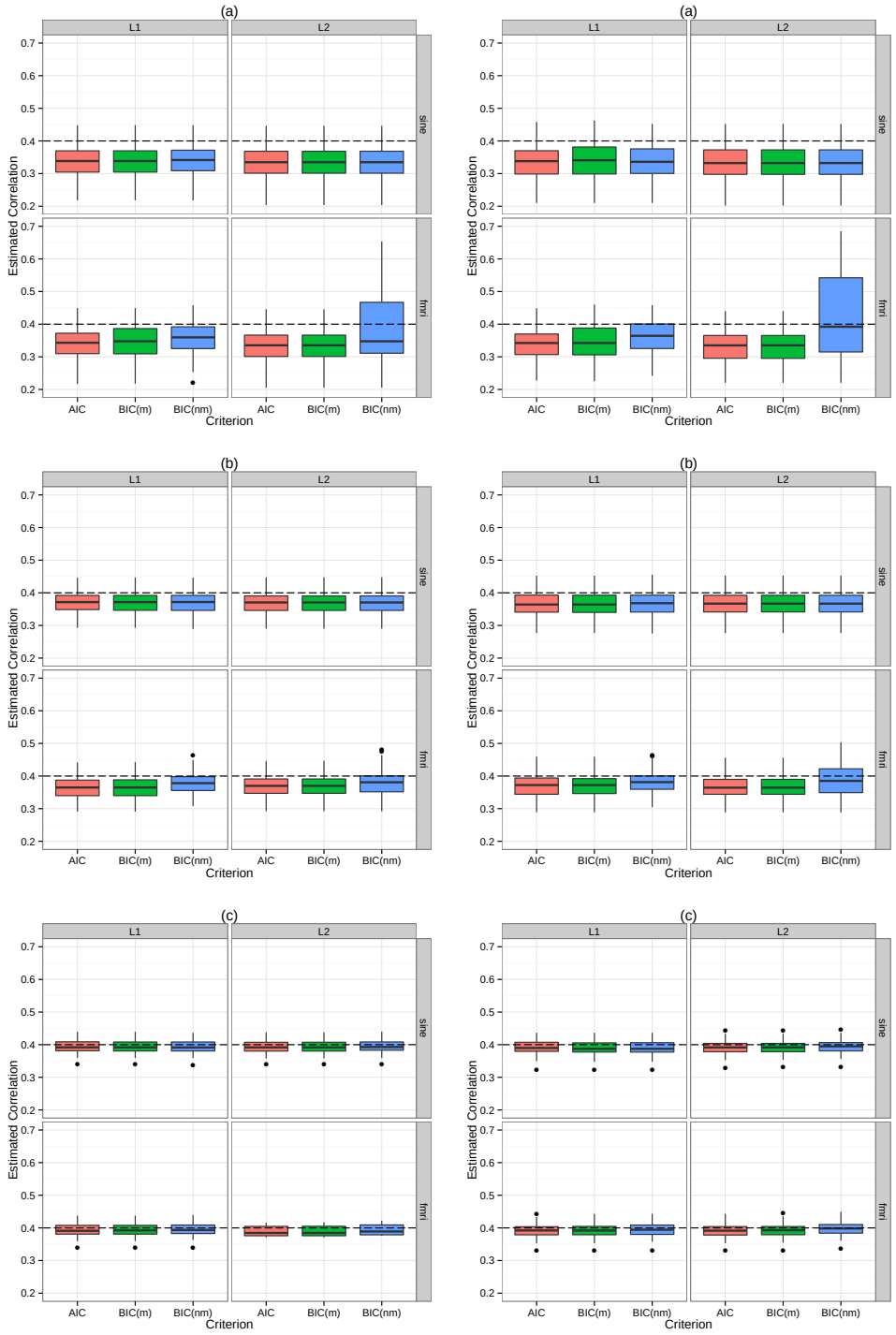


Figure 3: Boxplots of estimated error variance $\sigma^2 = 0.09$. Left panel: without random effects; right panel: with random effects. (a) $m = 5$, (b) $m = 10$, (c) $m = 40$.

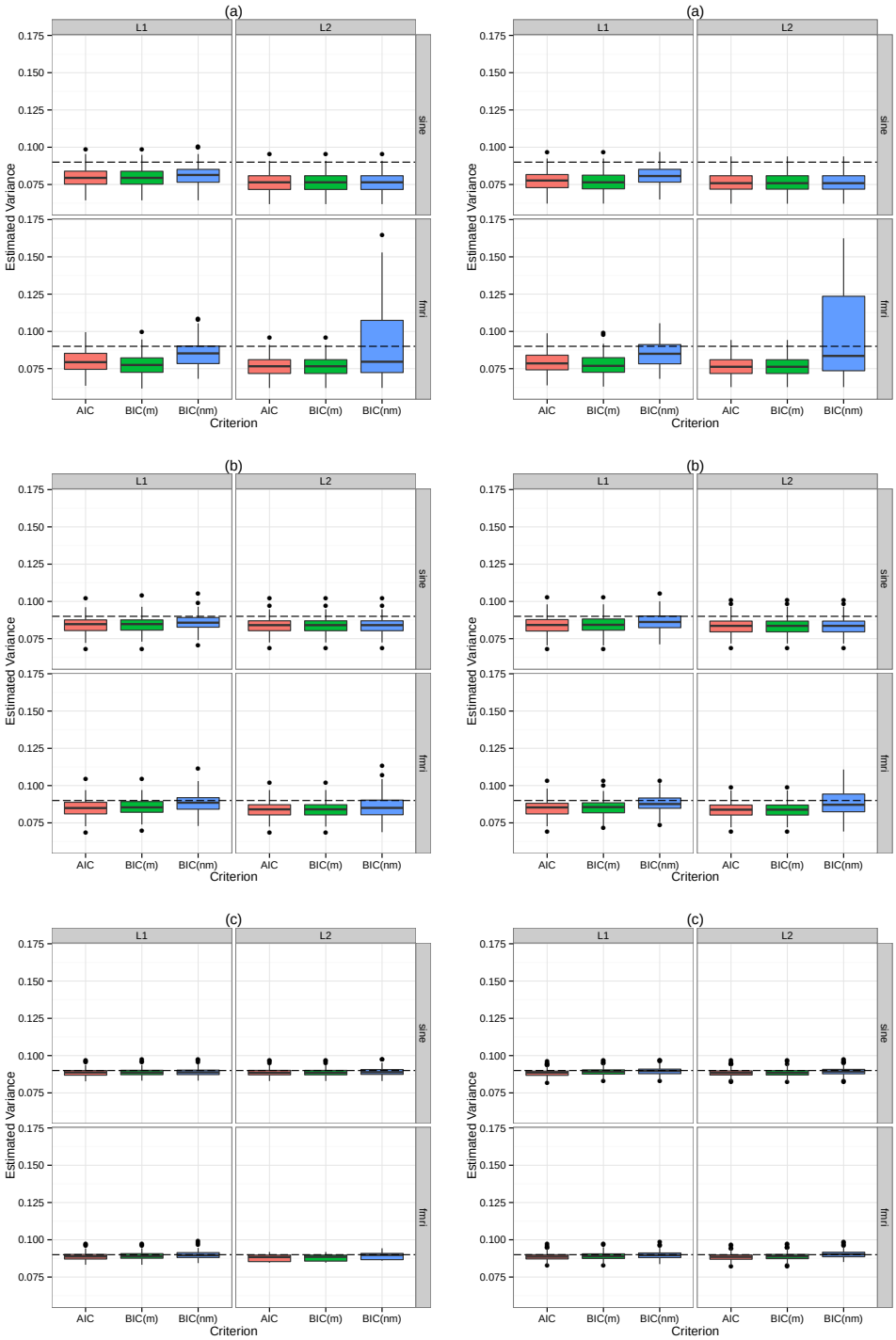


Figure 4: Boxplots of Estimated Random Intercept Variance $\tau^2 = 100$: (a) $m = 5$, (b) $m = 10$, (c) $m = 40$.

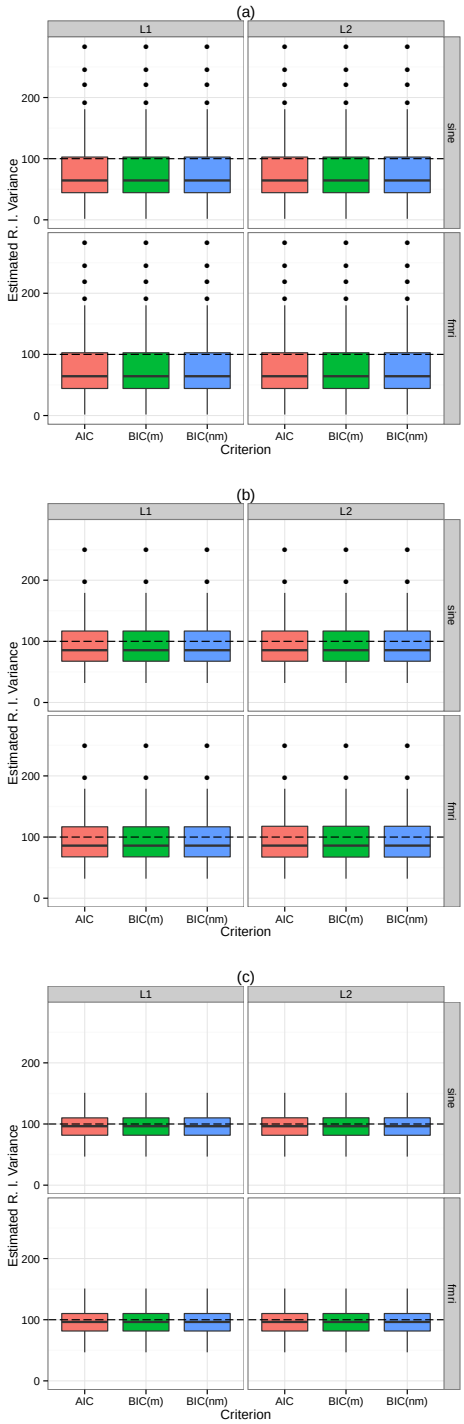


Figure 5: Boxplots of estimated correlation $\rho = 0.4$. (a) $m = 5$, (b) $m = 10$.

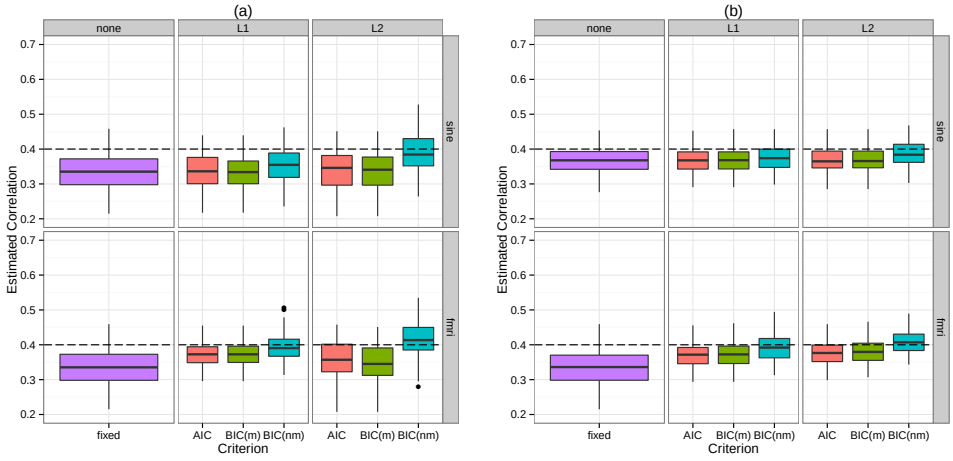


Figure 6: Boxplots of estimated error variance $\sigma^2 = 1$. (a) $m = 5$, (b) $m = 10$.

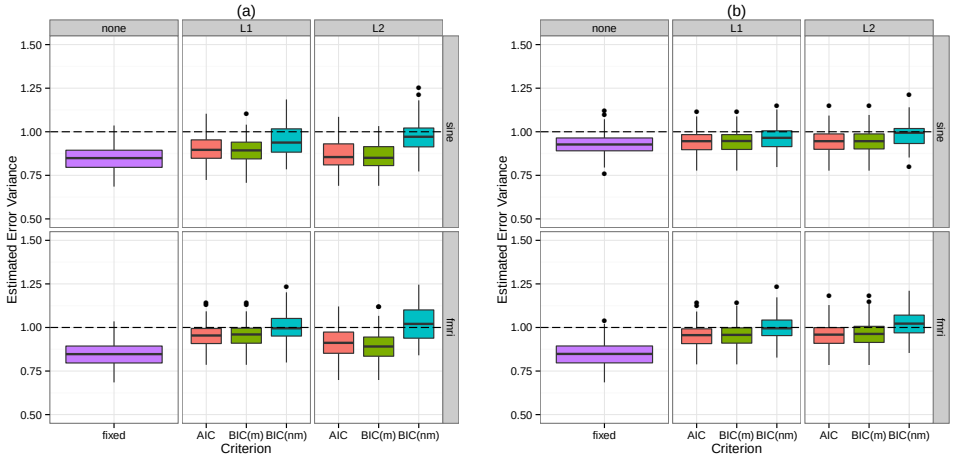
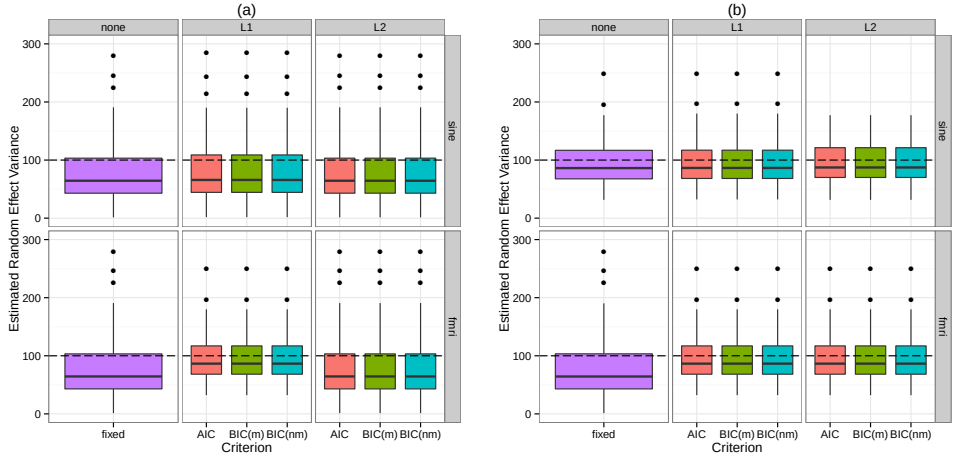


Figure 7: Boxplots of estimated random intercept variance $\tau^2 = 100$. (a) $m = 5$, (b) $m = 10$.



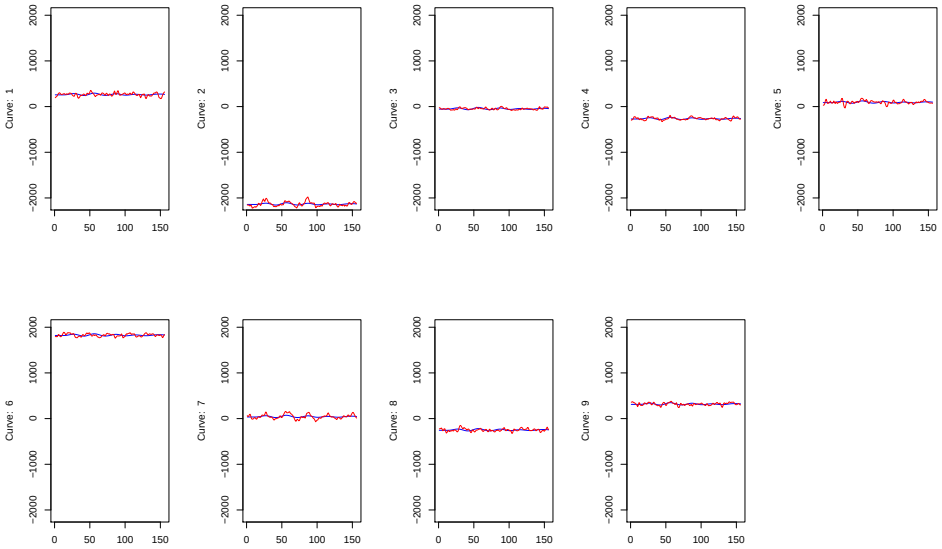


Figure 8: Voxel averaged pre - post difference for each subject: observed data (red) and L_1 fitted (blue).

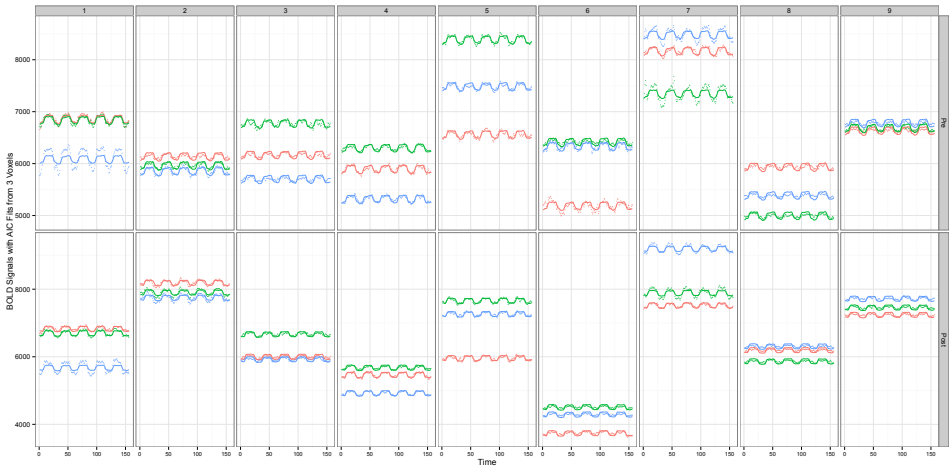


Figure 9: Three randomly selected voxels per subject and session: observed data (dots) and L_2 fitted (solid).

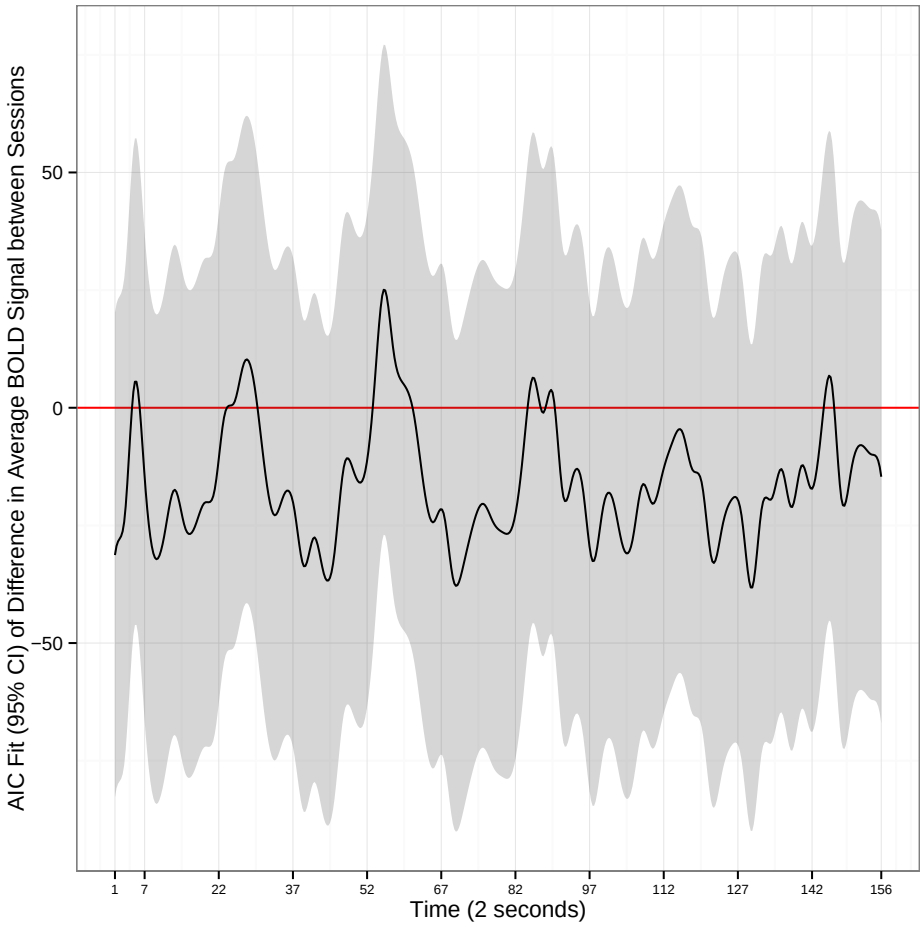


Figure 10: Estimated pre-post caffeine activation difference in BOLD signals with pointwise 95% confidence intervals (shaded).