Cheynna Crowley
BIOS 6667 HW#4

(1)

$n_i = 2$ per subject

P = # of fixed effects

b_i = random intercept $q = 1$

$R_i = \sigma^2 I_{2\times 2}$

$Y_i = X_i\beta + Z_i b_i + \varepsilon_i$

Y_i is 2×1
$\varepsilon_i = 2\times 1$
$X_i = 2\times p$
$Z_i = 2\times p$

Q Develop expressions for $E[b_i|Y_i]$ and $var(b_i|Y_i)$

$$\begin{pmatrix} Y_i \\ b_i \end{pmatrix} \sim MVN\left[\begin{pmatrix} \mu_i \\ 0 \end{pmatrix}, \begin{bmatrix} \Sigma_i & Z_i G \\ G Z_i^T & G \end{bmatrix}\right]$$

$$E[b_i^T|Y_i^T] = \mu_2 + \Sigma_{21}\Sigma_{11}^{-1}(X_1 - \mu_1)$$

$$E[b_i^T|Y_i^T] = 0 + GZ_i^T\Sigma_i^{-1}(Y_i - \mu_i)$$

$$var(b_i|Y_i) = \Sigma_{22} - \Sigma_{21}\Sigma_{11}^{-1}\Sigma_{12}$$

$$= G - GZ_i^T\Sigma_i^{-1}Z_iG$$

Need explicit expressions −6

(2) ✓

# of parameters = 10 = 3 fixed effects + 1 from R + 6 from G

Effect	Estimate	sd error
Intercept	21.397	0.5676
time_0	2.478	0.1205
time_on	0.407	0.1579 ✓

significant digits should be the same in the table.

w/ time_0 = after menarche
time_on = before menarche

$$G_{3\times3} = \begin{bmatrix} 45.9102\ (5.7657) & 0.9012\ (0.2721) & \\ -3.6610\ (1.00) & -0.1171\ (0.2629) & 1.6508\ (0.437 \\ 2.5686\ (1.2245) & & \end{bmatrix}$$

note estimate (sderror)

$R = 9.4304\ (0.5444)$

- covariance and correlation matrix see attached page 2.
- Graph see attached
  Need to comment on graph -4

Q: Describe the correlation matrix

→ diagonal is 1

→ symmetric

→ 8 × 8

→ if looking at the upper triangle, each row decreases in corr as col # increases ("correlations decrease as time increases") ✓