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Hayashi *Econometrics*: Answers to Selected Review Questions

Chapter 8

Section 8.1

1(a) Deriving the score should be easy. Differentiating the score with respect to θ and rearranging, you should obtain

$$-\frac{y_t - 2y_tF_t + F_t^2}{[F_t \cdot (1-F_t)]^2} f_t^2 \mathbf{x}_t\mathbf{x}_t' + \left[\frac{y_t - F_t}{F_t \cdot (1-F_t)}\right] f_t' \mathbf{x}_t\mathbf{x}_t'.$$

Since y_t is either 0 or 1, we have $y_t = y_t^2$. So $y_t - 2y_tF_t + F_t^2$, which is the numerator in the first term, equals $y_t^2 - 2y_tF_t + F_t^2 = (y_t - F_t)^2$.

Section 8.3

2. Since $\lambda(-v) + v \geq 0$ for all $-v$, the coefficients of the two matrices in (8.3.12) are nonpositive. So the claim is proved if the two matrices are both positive semi-definite. The hint makes clear that they are.

3. Yes, because even if the data are not i.i.d., the conditional ML estimator is still an M-estimator.

Section 8.5

2. Since $|\mathbf{\Gamma}_0| \neq 0$, the reduced form (8.5.9) exists. Since x_{tK} does not appear in any of the structural-form equations, the last column of $\mathbf{B}_0$ is a zero vector, and so for any m the m-th reduced form is that y_{tm} is a linear function of $x_{t1}, \ldots, x_{t,K-1}$ and v_{tm}. Since x_{tK} is predetermined, it is orthogonal to any element of the reduced-form disturvance vector $\mathbf{v}_t$. Therefore, in the least square projection of y_{tm} on $\mathbf{x}_t$, the coefficient of x_{tK} is zero.