PROBLEMS FROM WOOLDRIDGE TEXT

10.1, 10.2, 10.3 (in part (b) show that the standard errors of \( \hat{\beta}_{FE} \) and \( \hat{\beta}_{FD} \) are same), 10.4, 10.8 (ignore the questions about testing for serial correlation), 10.14.

**Additional Problem 1**

Let \( Y_{it} = X'_{it}\theta_0 + C_i + \varepsilon_{it} \), where \( \theta_0 \) is \( p \times 1 \) and \( C \) is an unobserved random variable such that the strict exogeneity condition \( \mathbb{E}(\varepsilon_{it}|X_{i1}, \ldots, X_{iT}, C_i) = 0 \) holds for \( i = 1, \ldots, n \) and \( t = 1, \ldots, T \). Let \( \bar{Y}, \bar{X}, \) and \( \bar{\varepsilon} \) denote variables obtained after subtracting the group means (the within transformation).

(i) Derive the best estimator of \( \theta_0 \) under the assumption that \( \bar{X} \) is contemporaneously uncorrelated with \( \bar{\varepsilon} \).

(ii) What is its asymptotic distribution?

**Additional Problem 2**

In addition to the assumptions maintained in the previous problem, assume that the random effects hypothesis holds; i.e., \( \mathbb{E}(X_{it}C_i) = 0 \) for every \( i \) and \( t \).

(i) Derive the best estimator of \( \theta_0 \) without making any further assumptions about the distribution of \( C_i \) and \( \varepsilon_{it} \).

(ii) Find its asymptotic distribution.