ECONOMICS 6002 CLASS 17
SERIAL CORRELATION

1. Effects of serial correlation in residuals
   a. Covariance matrix of residuals $\Sigma=\sigma^2\ \Omega$ is not diagonal
   b. OLS is not BLUE
   c. GLS *is* BLUE, but requires knowledge of Ω
   d. If Ω is *not* known, but a consistent estimate is available, FGLS is consistent and asymptotically efficient, but is not BLUE.
   e. OLS standard errors are invalid, buy a consistent estimate of the asymptotic covariance matrix has been derived by Newey-West.
   f. Two common processes analysed
      i. Autoregressive processes (long-memory)
      ii. Moving-average processes (short-memory)

2. Properties of OLS estimator with serial correlation
   a. Normally unbiased, but inefficient
   b. Covariance matrix incorrectly computed
      i. A consistent estimator (by Newey-West) is available
   c. OLS is biased and inconsistent when a lagged dependent variable is present in the equation

3. Testing for serial correlation
   a. Durbin-Watson exact test
   b. Durbin *h*-test (when lagged dependent variable present)
   c. LM test (Breusch-Godfrey)

4. OLS estimation in the presence of autocorrelation
   a. Loss of efficiency can be significant
   b. The Newey-West covariance matrix is a consistent estimate of the OLS covariance matrix, but a truncation parameter must be specified.

5. Correcting for serial correlation
   a. GLS is BLUE because it transforms the disturbance so that it is no longer autocorrelated. This requires knowledge of the covariance matrix of the disturbances Ω.
   b. FGLS is based on a consistent estimate of Ω.
      i. The Cochrane-Orcutt method is a back-and-forth two-step method that estimates the first-order autocorrelation coefficient from the equation residuals.
      ii. The Hildreth-Lu method is a grid-search method.
      iii. Higher-order autocorrelation models are typically estimated by non-linear methods.

6. Autoregressive Conditional Heteroskedasticity (ARCH) models