SYSTEM ESTIMATION
ECONOMICS 6002 CLASS 9

1. **System** estimation can be more efficient than equation-by-equation estimation
   a. System Estimation can take account of
      i. Cross-equation correlation in the disturbances
      ii. Cross-equation restrictions on the parameters
   b. Examples:
      i. Panels where units have different parameters
      ii. Demand systems
      iii. Simultaneous systems

2. The Seemingly Unrelated Regression (SUR) Model
   a. Equations in the SUR model are linked together through cross-equation correlation in the equation disturbances.
   b. The SUR model can be estimated efficiently through a two-step FGLS process.
      i. Estimate each equation consistently by OLS.
      ii. Compute consistent estimates of the equation variances and covariances using the OLS residuals.
      iii. Compute the FGLS estimate of the equation parameters using the consistent estimate of the covariance matrix of the equation disturbances.
   c. With a consistent estimate of the cross-equation covariances, FGLS is asymptotically efficient.
   d. There is no efficiency gain from SUR estimation if
      i. There is no cross-equation correlation in the disturbances, OR
      ii. All equation contain the same set on independent variables.

3. Pooled regression models ("long, narrow panels")
   a. Pooled regression models enable us to estimate parameters more precisely, by pooling observations from several units.
   b. Unlike the case with longitudinal ("short, wide") panels, the T dimension is large enough that reasonable inferences can sometimes be made about the covariance structure of the disturbances.
   c. As with SUR estimation, for greater efficiency OLS estimates can be corrected through GLS for
      i. Cross-sectional (or groupwise) heteroskedasticity
      ii. Cross-sectional correlation
         (1) A large T (relative to N) is needed for usable estimates.
   d. As with panel estimation, unobserved individual effects can be accommodated through a fixed effect model (using dummy variables) or a random effects model (using an estimate of the covariance matrix Ω).

4. Random coefficients model
   a. This model treats the slope parameters as random variables, differing across units.
   b. GLS is more efficient than OLS, but estimation of the covariance matrix can be problematic.