1. Hayashi, page 274, #1; page 283 #2; page 285 #5, # 9; page 286 # 10;

2. Consider the multiple equation GMM model we went over in class where each of the
\( m \) equations is linear:

\[
y_{im} = z_{im}' \delta_m + \epsilon_{im}
\]

\( m = 1, 2, ... M \quad n = 1, 2, ... n \). As in class, let \( x_{im} \) denote the vector of instruments for
the \( m \)th equation.

Let \( \hat{\delta}(\hat{W}) \) denote the GMM estimator of the ”stacked” vector of coefficients- i.e. the
coefficients in each equation stacked on top of each other.

Consider the weighting matrix \( \hat{W}_1 = I \sum_{m=1}^{M} K_m \) where \( I \sum_{m=1}^{M} K_m \) is the \( \sum_{m=1}^{M} K_m \times \sum_{m=1}^{M} K_m \) identity matrix.

(a) What is the asymptotic distribution of the multiple equation GMM estimator
using this weighting matrix?

(b) Suppose we now use the weighting matrix \( \hat{S}_{xx} \), which is the \( \sum_{m=1}^{M} K_m \times \sum_{m=1}^{M} K_m \)
matrix whose \( j, k \) block is of the form

\[
\frac{1}{n} \sum_{i=1}^{n} x_{ij}x_{ik}'
\]

If the system of equations is exactly identified (i.e. \( L_m = K_m \)) for all \( m \), under
what conditions is the GMM estimator using \( \hat{S}_{xx} \) as the weighting matrix asymptotically equivalent to the GMM estimator using the optimal weighting matrix?

(c) Suppose now the system is overidentified, and we use the weighting matrix \( \hat{S}_{xx}^{-1} \).
Under what conditions is this GMM estimator asymptotically equivalent to the
GMM estimator using the optimal weighting matrix?