## Cornell University

Department of Economics

Econ 620 - Spring 2004
Instructor: Prof. Kiefer
Problem set \# 8
1)

The following model is specified:

$$
\begin{aligned}
& y_{1}=\gamma_{1} y_{2}+\beta_{11} x_{1}+\epsilon_{1} \\
& y_{2}=\gamma_{2} y_{1}+\beta_{22} x_{2}+\beta_{32} x_{3}+\epsilon_{2}
\end{aligned}
$$

All variables are in measured in deviations from their means. The sample of 25 observations produces the following matrix of sum of squares and cross products:

|  | $y_{1}$ | $y_{2}$ | $x_{1}$ | $x_{2}$ | $x_{3}$ |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $y_{1}$ | 20 | 6 | 4 | 3 | 5 |
| $y_{2}$ | 6 | 10 | 3 | 6 | 7 |
| $x_{1}$ | 4 | 3 | 5 | 2 | 3 |
| $x_{2}$ | 3 | 6 | 2 | 10 | 8 |
| $x_{3}$ | 5 | 7 | 3 | 8 | 15 |

a) Estimate the two equations by OLS.
b) Estimate the parameters of the two equations by 2SLS.
c) Estimate the reduced form coefficient matrix by OLS and indirectly by using your structural estimates from part b.
2)

The following model is specified:

$$
\begin{aligned}
& y_{1}+\gamma_{1} y_{2}+\beta_{11} x_{1}+\beta_{12} x_{2}+\beta_{13} x_{3}=\epsilon_{1} \\
& y_{2}+\gamma_{2} y_{1}+\beta_{21} x_{1}+\beta_{22} x_{2}+\beta_{23} x_{3}=\epsilon_{2}
\end{aligned}
$$

The error terms have both expectation zero.
Verify whether the model is identified under the following restrictions:
a) $\gamma_{1}=\gamma_{2}$ and $\beta_{13}=0$.
b) $\sigma_{12}=0$ and $\gamma_{2}=0$.

