Our model with non-diagnol elements in structural variance covariance matrix is given by (Elements of S have been changed to x)

$$\begin{bmatrix} \epsilon^{i^*} \\ \epsilon^{y} \\ \epsilon^{CP} \\ \epsilon^{MP} \\ \epsilon^{ER} \end{bmatrix} = \begin{bmatrix} x_1 & 0 & 0 & 0 & 0 \\ x_2 & x_3 & 0 & 0 & 0 \\ x_4 & x_5 & x_6 & 0 & 0 \\ x_7 & x_8 & x_9 & x_{10} & x_{11} \\ x_{12} & x_{13} & x_{14} & x_{15} & x_{16} \end{bmatrix} \begin{bmatrix} \mu^{i^*} \\ \mu^{y} \\ \mu^{CP} \\ \mu^{MP} \\ \mu^{ER} \end{bmatrix} \tag{1}$$

$$\sum \quad _{\mu} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & x_{17} \\ 0 & 0 & 0 & x_{17} & 1 \end{bmatrix} \tag{2}$$

$\sum_{\epsilon} = S \sum_{\mu} S'$

$$\sum_{\epsilon} = \begin{bmatrix} x_1 & 0 & 0 & 0 & 0 \\ x_2 & x_3 & 0 & 0 & 0 \\ x_4 & x_5 & x_6 & 0 & 0 \\ x_7 & x_8 & x_9 & x_{10} & x_{11} \\ x_{12} & x_{13} & x_{14} & x_{15} & x_{16} \end{bmatrix} \times \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & x_{17} \\ 0 & 0 & 0 & x_{17} & 1 \end{bmatrix} \times \begin{bmatrix} x_1 & x_2 & x_4 & x_7 & x_{12} \\ 0 & x_3 & x_5 & x_8 & x_{13} \\ 0 & 0 & x_6 & x_9 & x_{14} \\ 0 & 0 & 0 & x_{!0} & x_{15} \\ 0 & 0 & 0 & x_{11} & x_{16} \end{bmatrix}$$

$$\sum_\epsilon = \begin{bmatrix} x_1 & 0 & 0 & 0 & 0 \\ x_2 & x_3 & 0 & 0 & 0 \\ x_4 & x_5 & x_6 & 0 & 0 \\ x_7 & x_8 & x_9 & x_{10}+x_{11}x_{17} & x_{10}x_{17}+x_{11} \\ x_{12} & x_{13} & x_{14} & x_{15}+x_{16}x_{17} & x_{15}x_{17}+x_{16} \end{bmatrix} \times \begin{bmatrix} x_1 & x_2 & x_4 & x_7 & x_{12} \\ 0 & x_3 & x_5 & x_8 & x_{13} \\ 0 & 0 & x_6 & x_9 & x_{14} \\ 0 & 0 & 0 & x_{10} & x_{15} \\ 0 & 0 & 0 & x_{11} & x_{16} \end{bmatrix}$$

$$\sum_\epsilon = \begin{matrix} x_1^2 & x_1x_2 & x_1x_4 \\ x_1x_2 & x_2^2+x_3^2 & x_2x_4+x_3x_5 \\ x_1x_4 & x_2x_4+x_3x_5 & x_4^2+x_5^2+x_6^2 \\ x_1x_7 & x_2x_7+x_3x_8 & x_4x_7+x_5x_8+x_6x_9 \\ x_1x_{12} & x_2x_{12}+x_3x_{13} & x_4x_{12}+x_5x_{13}+x_6x_{14} \end{matrix}$$

$$\begin{matrix} x_1x_7 & x_1x_{12} \\ x_2x_7+x_3x_8 & x_2x_{12}+x_3x_{13} \\ x_4x_7+x_5x_8+x_6x_9 & x_4x_{12}+x_5x_{13}+x_6x_{14} \\ x_7^2+x_8^2+x_9^2+x_{10}^2+(x_{10}+x_{11}x_{17})x_{10}+(x_{10}x_{17}+x_{11})x_{11} & x_7x_{12}+x_8x_{13}+x_9x_{14}+(x_{10}+x_{11}x_{17})x_{15}+(x_{10}x_{17}+x_{11})x_{16} \\ x_7x_{12}+x_8x_{13}+x_9x_{14}+(x_{15}+x_{16}x_{17})x_{10}+(x_{15}x_{17}+x_{16})x_{11} & x_{12}^2+x_{13}^2+x_{14}^2+(x_{15}+x_{16}x_{17})x_{15}+(x_{15}x_{17}+x_{16})x_{16} \end{matrix}$$

$$C_{54}(1) = E_{51}(1)S_{14} + E_{52}(1)S_{24} + E_{53}(1)S_{34} + E_{54}(1)S_{44} + E_{55}(1)S_{54} = 0 \tag{3}$$

which can be written as

$$C_{54}(1) = E_{51}(1)\times 0 + E_{52}(1)\times 0 + E_{53}(1)\times 0 + E_{54}(1)\times x_{10} + E_{55}(1)\times x_{15} = 0 \tag{4}$$

these two gives us

$$x_{10} = \frac{-E_{55}}{E_{54}} \times x_{15} \tag{5}$$

Our objective is to solve $\sum_\epsilon = S\sum_\mu S'$. $\sum_\epsilon$ has 15 free parameters. Our $S\sum_\mu S'$ is symmetric and can be mapped to $\sum_\epsilon$ but it has 17 variables which can't be estimated uniquely. One long run restriction helps in reducing the variable by 1 and using one more long run restrcitions, we can identify the model. We can solve it using nonlinear estimation. isn't it?

Why can't we do this?