Name Jerry

Student Number

STA 431 S2017 Quiz 10

1. (7 points) Independently for $i = 1, \ldots, n$, let

$$\begin{aligned} D_{i,1} &= F_{i,1} + e_{i,1} \\ D_{i,2} &= \lambda_2 F_{i,1} + e_{i,2} \\ D_{i,3} &= F_{i,2} + e_{i,3} \\ D_{i,4} &= \lambda_4 F_{i,2} + e_{i,4} \end{aligned}$$

The $D_{i,j}$ variables are observable, while the $F_{i,j}$ are latent variables (factors). We have $Var(e_{i,j}) = \omega_j$ for $j = 1, \ldots, 4$, $cov\begin{pmatrix} F_{i,1} \\ F_{i,2} \end{pmatrix} = \begin{pmatrix} \phi_{11} & \phi_{12} \\ \phi_{12} & \phi_{22} \end{pmatrix}$ with $\phi_{12} \neq 0$, the factors are independent of the error terms, and all the error terms are independent of each other. Are the factor loadings λ_2, and λ_4 identifiable? Answer Yes or No and prove your answer. Do *not* assume they are non-zero.

$\Sigma =$

	D_1	D_2	D_3	D_4
D_1	$\sigma_{11} = \phi_{11} + \omega_1$	$\sigma_{12} = \lambda_2 \phi_{11}$	$\sigma_{13} = \phi_{12}$	$\sigma_{14} = \lambda_4 \phi_{12}$
D_2		$\sigma_{22} = \lambda_2^2 \phi_{11} + \omega_2$	$\sigma_{23} = \lambda_2 \phi_{12}$	$\sigma_{24} = \lambda_2 \lambda_4 \phi_{12}$
D_3			$\sigma_{33} = \phi_{22} + \omega_3$	$\sigma_{34} = \lambda_4 \phi_{22}$
D_4				$\sigma_{44} = \lambda_4^2 \phi_{22} + \omega_4$

Yes

$$\lambda_2 = \frac{\sigma_{23}}{\sigma_{13}} \qquad \lambda_4 = \frac{\sigma_{14}}{\sigma_{13}}$$

2. (3 points) For the poverty data, you fiished by fitting a single-factor model. In the space below, write the likelihood ratio test statistic for goodness of fit, the degrees of freedom, and the p-value. Does the model fit adequately? Answer Yes or No. On the printout, circle the numbers and write "Question 2" beside them.

$G^2 = 2.8232, df = 2, p = 0.2437$

Yes

Please attach *both* your log file and your results file to your quiz paper. Make sure your name appears on both documents. Attach the *log file*, not just a listing of the SAS program.