Calculating the Log-Likelihood for Assignment #2

For assignment #2, Limdep prints out the log likelihood function, $LL(\boldsymbol{\beta})$, and the restricted likelihood function which is not $LL(0)$ (the likelihood function when all parameters are equal to zero). But we need $LL(0)$ to compute ρ^2

To compute $LL(0)$, note that from Eq. 11.4 on page 284 of the text:

$$LL(\boldsymbol{\beta}) = \sum_{i=1}^{n}\left[-EXP(\boldsymbol{\beta}\mathbf{X}_i) + y_i\boldsymbol{\beta}\mathbf{X}_i - LN(y_i!)\right].$$

When $\boldsymbol{\beta}$ = 0, the term $y_i\boldsymbol{\beta}\mathbf{X}_i$ falls out since they will be zeros for all 96 observations. The term $-EXP(\boldsymbol{\beta}\mathbf{X}_i)$ will be equal to 1 for all observations so this term will contribute -96 to the log-likelihood when summed over the 96 observations. This leaves $-LN(y_i!)$. To calculate the effect of this term, the following is done:

y_i trip changes	Number of observations (N_{yi}) making y_i trip changes (from Limdep histogram command)	$-LN(y_i!)$	$N_{y_i} \times\left[-LN(y_i!)\right]$
0	18	0	0
1	23	0	0
2	27	-0.693	-18.715
3	20	-1.792	-35.835
4	1	-3.178	-3.178
5	7	-4.787	-33.509
TOTAL	96		-91.237

Thus the log-likelihood at zero is (see $LL(\boldsymbol{\beta})$ equation above),

$$LL(0) = -96 + 0 - 91.237 = \underline{\underline{-187.237}}$$

So, when applying Eq. 11.12 (page 287 of text) at the end of assignment #2 you will have:

$$\rho^2 = 1 - \frac{LL(\boldsymbol{\beta})}{LL(\mathbf{0})} = 1 - \frac{\text{your limdep reported log likelihood function}}{-187.237} = ?$$