

Question 2

Use the data in PATENT.RAW for this exercise.

- (a) Estimate a pooled Poisson regression model relating patents to $\text{Isales} = \log(\text{sales})$ and current and four lags of $\text{Imd} = \log(l + \text{rnd})$, where we add one before taking the log to account for the fact that rnd is zero for some firms in some years. Use an exponential mean function and include a full set of year dummies. Which lags of Imd are significant using the usual Poisson MLE standard errors?
- (b) Give two reasons why the usual Poisson MLE standard errors from part a might be invalid.
- (c) Obtain a for the pooled Poisson estimation. Using the GLM standard errors (but without an adjustment for possible serial dependence), which lags of Imd are significant?
- (d) Obtain the QLR statistic for joint significance of lags one through four of lrnd . (Be careful here; you must use the same set of years in estimating the restricted version of the model.) How does it compare to the usual LR statistic?
- (e) Compute the standard errors that are robust to an arbitrary conditional variance and serial dependence. How do they compare with the standard errors from parts a and c?
- (f) What is the estimated long-run elasticity of expected patents with respect to R&D spending? (Ignore the fact that one has been added to the R&D numbers before taking the log.) Obtain a fully robust standard error for the long-run elasticity.
- (g) Now use the fixed effects Poisson estimator, and compare the estimated lag coefficients to those from the pooled Poisson analysis. Estimate the long-run elasticity, and obtain its standard error. (Assume that the full set of FEP assumptions hold.)