Econ. 240B, Second Half Daniel McFadden, 1999

EXERCISE 2. GROWTH AND EXIT OF FIRMS (continued)
(To be handed in on Nov. 9)

This exercise uses the data on exit of firms from Exercise 1. As before, 8031 observations can be found in the file ex1-1.dat in format ‘f12.0,3f10.0,3g11.0,f9.0,11g11.0', with the variables:

id	firm id
year	4 digit year, between 1986 and 1995
sic	4 digit sic code
ind	2 digit industry code
sales	annual sales (mill. dol.)
emply	employment (1000s)
invest	investment (mill. dol.)
rnd	R&D spending (mill. dol.)
cashfl	cash flow (= retained earnings + depreciation allowances) (mill. dol.)
kstock	knowledge stock (= accumulated R&D investment) (mill. dol.)
netcap	net capital stock (mill. dol.)
debt	long term debt (mill. dol.)
q	Tobin's q
loge	log (employment in 1000s)
rs	ratio of R&D invest to sales
cc	ratio of cashflow to net capital stock
drnd	dummy: zero R&D investment
exit	dummy: firm exits between year and year+1
grsales	growth rate in sales (percent) between year and year+1

For this exercise, ignore the panel structure and treat the observations across years *as if* they were independent. A Cobb-Douglas production function,

$$\text{sales} = A(\text{emply})^{\alpha}(\text{netcap})^{\beta}e^{\varepsilon}$$

is proposed in which ε is assumed to have mean zero and a homoskedastic variance, and A is a linear function of the ratio of the knowledge stock to the net capital stock, reflecting the impact of innovation on productivity, $A = \gamma + \delta$*(kstock)/(netcap).

a. Estimate the model by non-linear least squares, a GMM procedure.
b. Test the hypothesis that $\delta = 0$.
c. Do a Wald test of the hypothesis of constant returns to scale ($\alpha + \beta = 1$).
d. Do a Distance Metric test of the hypothesis of constant returns to scale.
e. Do a Lagrange Multiplier test of the hypothesis of constant returns to scale.
d. (extra credit) What is the power of the test of constant returns to scale against the alternative that $\alpha + \beta = 1.2$?