Advanced Econometrics

Exam 25/01
Open Questions
There were 21 sub-questions in total, each on 1 point.
Q1: (4p) You want to estimate the returns on schooling:
log w_i= beta_0 + S_i*beta+ epsilon_i
Schooling is a function of Z, a schooling shifter (e.g. living close to a college)
S_i= delta_0 + Z_i* delta+ eta_i
Epsilon and Eta have covariance sigma_(eta, sigma) which is strictly positive.
Z has a covariance of zero with both eta and epsilon. The variance of eta is sigma²_eta
1.1) Show that S_i is not predetermined
1.2) Show that Cov(log W_i, S_i)= beta*Var(S_i)+ sigma_(eta, sigma)
1.3) Show that Cov(log W_i, S_i)/Var(S_i) (OLS estimator) converges in probability to:
beta+ sigma_(eta, sigma)/(delta_i^2 var(Z_i) + sgima²_eta (or something)
1.4) Give a consistent estimator of the same form as 1.3

Q2: (7p) You receive 6 data points (observations) of time between arrivals:
194, 15, 41, 29, 33 and 181
The time between arrivals is given by:
f(lambda,y)=lambda exp(lambda y) (exponential distribution)
1.1 show that the log likelihood is given by 6 log(lambda)-493 lambda
1.2 Show that the maximum likelihood estimator is lamda_hat =0.01217
1.3 Use the likelihood ratio to test if lambda= 0.02
1.4 Show that the fisher information matrix per observation is equal to 1/lambda^2
1.5 Show that the standard error is given by 1/lamda_hat
1.6 What is the asymptotic distribution of lambda_hat?
1.7 Is the asymptotic distribution realistic for this sample?
Low n so not very representative.

Q3: (10p) 10 True or false questions+ motivate your answers briefly. It is false once you can give a situation where it does not holds.

1) Bootstrap estimation always involves simulations.
2) The mean of a population is always consistently estimated by the sample mean, but the bootstrap estimator for the mean has a bias that is non-zero.
   False
3) You have data about the consumption of 10 families, the error terms per household have different variances. In this case GLM estimator will lead to a smaller bias because it attaches a lower value to households which have a greater variance.
4) If you have a valid set of instruments the Hausmans test can always show that the regressors are exogenous
5) In the fixed effects case, the extra regressors you add to the system are constant through time but can vary over the individuals.

False

6) The R^2 value of a regression is 0.04, because this is small you cannot conclude that the regression is a good fit.

False

7) For a parameter theta defined on the parameter space (0, infinity) is 1/theta a bad prior and 1/theta² a good prior. (you can use that the derivative of log(theta) is 1/theta and the derivative of -1/theta is 1/theta²)

8) The gibbs sampler with Theta_1^0= N(0,1) and Theta_2^0=N(theta_1^0/2, ¾) and Theta_1^k=N(Theta_2^k-1/2, ¾) and Theta_2^k=(Theta_1^k-½, ¾) will converges to the bivariate distribution N([0;0],[1 0;0 1])

9) For GMM impose a function to describe the data that is known up to a finite sets of parameters

Maximum likelihood needs a distribution/density function.

10) For GMM, it is usually easy to find many valid instruments but it is difficult to select from those instrument a small set of instruments to use

False, it’s better to have overidentified identification instead of underidentified.