ECONOMETRICS II

FINAL EXAMINATION

TIME ALLOCATION: 3 HOURS

INSTRUCTION TO STUDENTS: ATTEMPT **ALL** QUESTIONS

QUESTION 1 (20 Marks)

Explain the idea of partialing out for the linear IV model

$$Y = D\alpha + W'\beta + u,$$
$$D = Z'\delta + W'\gamma + v,$$

and how it can be used to simplify analysis.

QUESTION 2 (15 Marks)

Explain what logistic regression is and how it fits in the GMM framework. What are the large sample properties of the logistic regression estimator?

QUESTION 3 (20 Marks)

Explain how "FD" and "FE" columns were obtained in the table below and what each entry in these columns are. Explain what clustering in Note 2 refers to.

TABLE 1. Effect of Expenditure per Student on Math Scores

	Pooled	FD	GMM-FD1	GMM-FD2	FE	GMM-FE1	GMM-FE2
log(rexpp)	0.53	-1.41	-1.73	0.65	-0.41	-0.28	1.07
	(2.51)	(4.93)	(2.99)	(1.30)	(2.79)	(2.09)	(1.31)
	[2.49]	[4.65]	[3.43]	[3.39]	[2.74]	[2.51]	[2.61]
L1.log(rexpp)	9.05	11.04	7.94	9.87	7.00	9.44	7.63
	(2.79)	(5.12)	(2.77)	(1.12)	(4.24)	(2.47)	(1.03)
	[2.81]	[5.10]	[3.69]	[4.26]	[4.20]	[3.42]	[3.87]
log(enrol)	0.59	2.14	1.84	1.42	0.25	0.31	0.05
	(0.41)	(1.64)	(1.02)	(0.42)	(0.95)	(0.75)	(0.41)
	[0.40]	[1.59]	[1.34]	[1.32]	[0.95]	[0.96]	[0.93]
lunch	-0.41	0.07	0.02	0.02	0.06	0.01	0.01
	(0.03)	(0.17)	(0.12)	(0.04)	(0.13)	(0.10)	(0.04)
	[0.03]	[0.15]	[0.16]	[0.12]	[0.12]	[0.11]	[0.11]
J-test			25.37	157.94		19.13	157.43
p-val			0.06	0.00		0.51	0.02
d.o.f.			16	101		24	122

Note 1: All the specifications include time effects.
Note 2: Clustered standard errors at the school level in parentheses.
Note 3: Bootstrap standard errors in brackets based on 500 replication.

QUESTION 4 (25 Marks)

You have a panel data model:

$$y_{it} = X_{it}\beta + Z_i\gamma_i + \alpha_i + \eta_{it}$$

$$i = 1,\ldots,N; t = 1,\ldots,T$$

Where N is large and T is small.

(i) How should you test Ho: $E(\alpha_i | X_{it}, Z_i) = 0$?

(ii) You run fixed effects estimation and do an F test that Ho:

$$\alpha_1 = \alpha_2 = \ldots = \alpha_N = 0$$

Specify the test. What should you conclude about your estimates of β and γ if you reject Ho?

(iii) Suppose you think you may have errors in variables (EIV) in one of the X_{it}'s: $X_{1it} = X^*_{1it} + v_{it}$, where $Ev_{it} = 0$, $Ev_{it}v_{i\tau} = 0$ for $t \neq \tau$ and $E(X^*_{1it}v_{it}) = 0$. What effect could EIV have on your fixed effects estimates and your test of $E(\alpha_i|X_{it},Z_i) = 0$?

(iv) How could you test if you do have an EIV problem? Can you give a consistent estimator if you do have an EIV problem?

QUESTION 5 (20 Marks)

Let $y = \beta_1 x_1 + \epsilon$ where $x_1 = x^*_1 + v$
where $Ev = 0, E(x_{1i}v_i) = 0, E(E_iv_i) = 0, E(\epsilon_i x^*_{1i}) = 0.$

(i) Suppose you do least squares. Derive the plim of $\hat{\beta}$ and demonstrate "attenuation bias." ("iron law" of econometrics)

(ii) Suppose you have an instrument z. What properties must z have to be a valid instrument? Give a proof that the IV estimation is consistent.

(iii) Suppose the specification is $y_1 = \beta_1 x_1 + \beta_2 x_2 + \epsilon$, where $Cov\,(x_1,x_2) \neq 0$ and $E(x_{2i}v_i) = 0, E(x_{2i}\epsilon_i) = 0$. Determine the large sample bias in $\hat{\beta}_1$ and $\hat{\beta}_2$. (Hint: partial out x_2).

(iv) Does the "iron law" of econometrics hold for $\hat{\beta}_1$ (downward bias in magnitude). Does the presence of x_2 lead to less or more large sample bias in $\hat{\beta}_1$?

Good luck!