考試科目	統計學	所別	財政	考試時間	4月21日上午第二節 星期日 (下)

1. (20%)(a) Explain what we mean by saying OLS estimators are *unbiased*, *relatively efficient*, *fully efficient*, *consistent*, *asymptotically unbiased*, and *asymptotically efficient*.

   (b) Define Type I and Type II errors.

2. (10%) Comment on a major news report: "The effect of interest rate on the housing market is large in economic terms but statistically insignificant."

3. (10%)Do symmetric continuous random variables always have unique median(s)? If you think so, prove it heuristically（概略的證明即可）; if you do not think so, construct a counterexample.

4. (15%)Suppose two leading technology firms are investing in R&D in order to compete for a do-or-die patent. The research technology is characterized by the assumption that a firm's probability of making a discovery and obtaining a patent at a point of time depends only on this firm's current R&D expenditure and not on its past R&D experience. Given firms' research intensities are $x_1(t)$ and $x_2(t)$. Each firm's probability of making a discovery during the time interval dt is $h(x_i)dt$, then:
   (a) What is the probability that at time t none of the firms has made a discovery?
   (b) Why this competition is always named a "memoryless" patent race?

5. (15%)Suppose that the random pair (X,Y) has the joint p.d.f.
   $$f(x,y) = 6(x-y), 0 < y < x < 1.$$
   (a) Find the marginal p.d.f. of X and Y respectively.
   (b) Compute cov(X,Y).

6. (15%)The following table reports the result if a regression of the deficit and debt ratios on a specific structural index among 12 countries.

Dependent Variable	Constant (t-ratio)	Index (t-ratio)	R^2
Deficit/GDP	-12.22 (-5.64)	0.19 (3.39)	0.34
Gross Debt/GDP	98.97 (6.50)	-0.93 (-2.60)	0.24

備考	試題隨卷繳交

命題委員： （簽章）91 年 4 月 10 日

考試科目	統計學	所別	財政	考試時間	4月21日 星期日 (下)午第二節

(a) What assumptions have to be made in order to make the t values valid?

(b) What is the hypothesis regarding this regression model and should we accept or reject it?

7. (15%)The OLS estimator for β in the regression model

$$Y_i = \alpha + \beta x_i + \varepsilon_i$$

is $\hat{\beta} = \sum_{i=1}^{N} d_i Y_i$, and $d_i = \dfrac{(x_i - \bar{x})}{\sum_{k=1}^{N} (x_k - \bar{x})}$

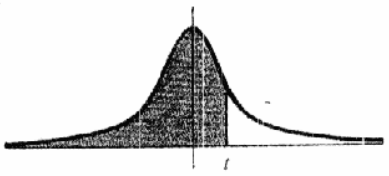
(a) Show that $\sum_{i=1}^{N} d_i = 0$

(b) Show that $\sum_{i=1}^{N} d_i x_i = 1$

(c) Show that $\sum_{i=1}^{N} (d_i)^2 = \dfrac{1}{\sum_{k=1}^{N} (x_k - \bar{x})^2}$

(d) Show that $\hat{\beta} = \beta + \sum_{i=1}^{N} d_i \varepsilon_i$

Percentiles of the t-Distribution



Degrees of Freedom	*p*								
	.60	.70	.80	.85	.90	.95	.975	.99	.995
1	.325	.727	1.38	1.96	3.08	6.31	12.7	31.8	63.7
2	.289	.617	1.06	1.39	1.89	2.92	4.30	6.96	9.92
3	.277	.584	.978	1.25	1.64	2.35	3.18	4.54	5.84
4	.271	.569	.941	1.19	1.53	2.13	2.78	3.75	4.60
5	.267	.559	.920	1.16	1.48	2.01	2.57	3.36	4.03
6	.265	.553	.906	1.13	1.44	1.94	2.45	3.14	3.71
7	.263	.549	.896	1.12	1.42	1.90	2.36	3.00	3.50
8	.262	.546	.889	1.11	1.40	1.86	2.31	2.90	3.36
9	.261	.543	.883	1.10	1.38	1.83	2.26	2.82	3.25
10	.260	.542	.879	1.09	1.37	1.81	2.23	2.76	3.17
11	.260	.540	.876	1.09	1.36	1.80	2.20	2.72	3.11
12	.259	.539	.873	1.08	1.36	1.78	2.18	2.68	3.06
13	.259	.538	.870	1.08	1.35	1.77	2.16	2.65	3.01
14	.258	.537	.868	1.08	1.34	1.76	2.14	2.62	2.98
15	.258	.536	.866	1.07	1.34	1.75	2.13	2.60	2.95

備考	試題隨卷繳交

命題委員： (簽章) 91 年 4 月 10 日