國立中央大學100學年度碩士班考試入學試題卷

所別：經濟學系碩士班 不分組(一般生)　科目：統計學　共 2 頁　第 1 頁

本科考試禁用計算器　　＊請在試卷答案卷（卡）內作答

參考用

1. The following are the final exam scores of 13 students in a Statistics course

   142, 132, 116, 163, 118, 123, 124, 156, 124, 121, 179, 124, 133

(1) (5%) Present the distribution of the scores using a stem-and-leaf plot.

(2) (10%) Are there any suspected outliers according to the 1.5 IQR criteria?

(3) (5%) Base on the shape of the distribution, would you report the mean or the median as a measure of the center? Explain your choice.

2. A friend tells you he has a coin that lands heads 30%, 50%, or 70% of the time, but he does not tell you which. Before seeing any data you assume that each possibility is equally likely. He then lets you toss the coin 8 times, and it lands heads 7 times.

(1) (10%) What is your posterior probability that p=0.5?

(2) (5%) What is your prediction for the probability that the coin will land heads the next time it is tossed?

(3) (5%) Suppose you wanted to test H_0: p=0.5 against H_1: p>0.5. What is the observed p-value?

3 (10%) A binomial experiment is based on 100 trials and an unknown success probability p. Let X is the number of successes. The null hypothesis is H_0: p = 0.5 and the alternative hypothesis is H_1: p= 0.6. H_1 is accepted if X > 58. Find the probabilities of type 1 and type 2 errors. Use the *normal approximation* and the *continuity correction*. [Note: 標準差取到小數點一位即可]

4. Mr. Bob considers a single-equation model which explains Y_t as a function of X_{1t}, X_{2t}, and X_{3t}:

$$Y_t = \alpha_0 + \alpha_1 X_{1t} + \alpha_2 X_{2t} + \alpha_3 X_{3t} + \varepsilon_t$$

The monthly data from January 1990 through October 2009 is employed for empirical study by Bob. He then presents the estimated equation with t statistics in parentheses as the following:

$$\hat{Y}_t = \underset{(2.22)}{1.21} + \underset{(8.79)}{0.48} X_{1t} + \underset{(3.89)}{140.3} X_{2t} + \underset{(6.00)}{104.6} X_{3t}$$

R^2=0.22　　*s(the standard error of regression)*=2.48　　*DW*=0.18.

(1) (10%) Mr. Bob concludes that according to the coefficient estimates, X_{2t} is the most important explanatory variables among others. Is his conclusion correct? Why or why not?

(2) (10%) Bob also conducts a t test and calculates the corresponding conference interval to do the hypothesis test on the effect of X_{1t} as shown below. He then confirms the impact of X_{1t} on Y_t (with significance level $\alpha = 0.05$). The notation "^" denotes the estimator of the corresponding population parameter.

注意:背面有試題

"$H_0 : \hat{\alpha}_1 = 0$ v.s. $H_1 : \hat{\alpha}_1 \neq 0$; t=8.79>$t_{0.05}(N-1)=t_{0.05}(118-1)$, where N represents the number of observations."

"The 95% confidence interval for the coefficient of X_{1t} is $0.48 \pm t_{0.05}(118-1) \times (\frac{8.79}{0.48})$"

Identify all the mistakes that Bob had got involved, if there is any.

(3) (10%) Suppose all the assumptions for obtaining the best linear unbiased estimators are satisfied in this case. Moreover, suppose that the true coefficient of X_{1t} is 0.20, which is, of course, unknown to Mr. Bob. Based on the above estimation results, what is the power of hypothesis test that there is no effect of X_{1t} on Y? (Approximate the probability by the normal distribution).

5. (10%) State all the assumptions needed for Mr. Bob in question (1) to get the best linear unbiased estimators by the ordinary least squares method.

Indicate the likely violation of the assumptions in question (1).

6. (10%) How would you evaluate if a given data series follows the normal distribution?

注意:背面有試題

TABLE ***Binomial probability***

Tabulated values are $P(x \le a) = \sum_{x=0}^{a} p(x)$. (Computations are rounded at the third decimal place.)

$n = 8$

	p												
a	0.01	0.05	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.99	a
0	.923	.663	.430	.168	.058	.017	.004	.001	.000	.000	.000	.000	.000	0
1	.997	.943	.813	.503	.255	.106	.035	.009	.001	.000	.000	.000	.000	1
2	1.000	.994	.962	.797	.552	.315	.145	.050	.011	.001	.000	.000	.000	2
3	1.000	1.000	.995	.944	.806	.594	.363	.174	.058	.010	.000	.000	.000	3
4	1.000	1.000	1.000	.990	.942	.826	.637	.406	.194	.056	.005	.000	.000	4
5	1.000	1.000	1.000	.999	.989	.950	.855	.685	.448	.203	.038	.006	.000	5
6	1.000	1.000	1.000	1.000	.999	.991	.965	.894	.745	.497	.187	.057	.003	6
7	1.000	1.000	1.000	1.000	1.000	.999	.996	.983	.942	.832	.570	.337	.077	7
8	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	8

$n = 9$

	p												
a	0.01	0.05	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.99	a
0	.914	.630	.387	.134	.040	.010	.002	.000	.000	.000	.000	.000	.000	0
1	.997	.929	.775	.436	.196	.071	.020	.004	.000	.000	.000	.000	.000	1
2	1.000	.992	.947	.738	.463	.232	.090	.025	.004	.000	.000	.000	.000	2
3	1.000	.999	.992	.914	.730	.483	.254	.099	.025	.003	.000	.000	.000	3
4	1.000	1.000	.999	.980	.901	.733	.500	.267	.099	.020	.001	.000	.000	4
5	1.000	1.000	1.000	.997	.975	.901	.746	.517	.270	.086	.008	.001	.000	5
6	1.000	1.000	1.000	1.000	.996	.975	.910	.768	.537	.262	.053	.008	.000	6
7	1.000	1.000	1.000	1.000	1.000	.996	.980	.929	.804	.564	.225	.071	.003	7
8	1.000	1.000	1.000	1.000	1.000	1.000	.998	.990	.960	.866	.613	.370	.086	8
9	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	9

參考用

TABLE
STANDARDIZED NORMAL DISTRIBUTION

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641
.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4686	.4247
.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
.3	.3821	.3873	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2217	.2148
.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681
1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
1.8	.0359	.0351	.0344	.0366	.0329	.0322	.0314	.0307	.0301	.0294
1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
2.3	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
2.4	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0020	.0020	.0019
2.9	.0019	.0018	.0018	.0017	.0016	.0016	.0015	.0015	.0014	.0014
3.0	.0013	.0013	.0013	.0012	.0012	.0011	.0011	.0010	.0011	.0010

The table plots the cumulative probability $Z \ge z$.

Source: Produced from Edward J. Kane, *Economic Statistics and Econometrics: An Introduction to Quantitative Economics* (New York: Harper & Row, 1968).