

國立中正大學
108 學年度碩士班招生考試
試題

[第 2 節]

系所組別	財務金融學系
科目名稱	統計學

—作答注意事項—

※作答前請先核對「試題」、「試卷」與「准考證」之系所組別、科目名稱是否相符。

1. 預備鈴響時即可入場，但至考試開始鈴響前，不得翻閱試題，並不得書寫、畫記、作答。
2. 考試開始鈴響時，即可開始作答；考試結束鈴響畢，應即停止作答。
3. 入場後於考試開始 40 分鐘內不得離場。
4. 全部答題均須在試卷（答案卷）作答區內完成。
5. 試卷作答限用藍色或黑色筆（含鉛筆）書寫。
6. 試題須隨試卷繳還。

6. A one-tailed test is performed at 5% significance level. The p -value is determined to be 0.07. The null hypothesis
 - A) should be rejected
 - B) could be rejected, depending on the specification of the alternative hypothesis
 - C) fails to be rejected
 - D) has been designed incorrectly.
7. If a null hypothesis is *not* rejected at the 5% level of significance, it
 - A) will also not be rejected at the 1% level
 - B) will always be rejected at the 1% level
 - C) will sometimes be rejected at the 1% level
 - D) None of these alternatives is correct.
8. If a hypothesis is rejected at the 5% level of significance, it
 - A) will always be rejected at the 1% level
 - B) will always be accepted at the 1% level
 - C) will never be tested at the 1% level
 - D) may be rejected or not rejected at the 1% level.
9. If a hypothesis test leads to the rejection of the null hypothesis,
 - A) A Type I error must have be committed
 - B) A Type I error may have be committed
 - C) A Type II error must have be committed
 - D) A Type II error may have be committed.
10. The p -value is a probability that measures the support for the
 - A) null hypothesis
 - B) alternative hypothesis
 - C) either the null or the alternative hypothesis
 - D) sample statistic.
11. Which of the following is correct?
 - A) Hypothesis testing allows us to hypothesize about the characteristics of a sample based on what we know about the population from which the sample is draw.
 - B) Inferential statistics enables us to study a sample from a population in order to characterize a population.
 - C) Sampling survey of voting decisions is a descriptive statistic.
 - D) Self-selection bias is a sampling error.
12. Which of the following is correct?
 - A) A correlation coefficient of zero indicates a lack of relationship between the two variables of interest.

- B) The sample covariance must take a value between -1 and $+1$ inclusive.
 C) In regression analysis, it is necessary that any two independent variables are not correlated.
 D) In estimating a population mean, a confidence interval of 90% has smaller width than a confidence interval of 95%.
13. Which one is not a valid use of a regression line?
 A) to estimate the average value of y at a specified value of x .
 B) to predict the value of y for an individual, given that individual's x -value.
 C) to estimate the change in y for a one-unit change in x .
 D) to determine if a change in x causes a change in y .
14. Given the following multiple regression, which of the following null hypotheses could we test using an F -test?
- $$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \varepsilon$$
- i. $\beta_1 = 0$
 ii. $\beta_1 = 1$ and $\beta_2 + \beta_3 = 1$
 iii. $\beta_2 \times \beta_3 = 1$
 iv. $\beta_1 - \beta_2 - \beta_3 = 0$
- A) i and ii only
 B) ii and iv only
 C) i, ii, and iv only
 D) i, ii, iii, and iv
15. Which of the following are often considered disadvantages of the use of adjusted R^2 as a variable addition / variable deletion rule? Adjusted R^2
- i. always rises as more variables are added
 ii. often inevitably leads to large models with marginally significant variables
 iii. cannot be compared for models with different explanatory variables
 iv. cannot be compared for models with different explained variables.
- A) ii and iv only
 B) i and iii only
 C) i, ii, and iii only
 D) i, ii, iii, and iv
16. Which one of the following statements must hold for every case concerning the residual sums of squares for the restricted and unrestricted regressions, denoted as SSR_r and SSR_u , respective?
- A) $SSR_u > SSR_r$
 B) $SSR_u \geq SSR_r$
 C) $SSR_r > SSR_u$
 D) $SSR_r \geq SSR_u$
17. Suppose that the value of R^2 for an estimated regression model is exactly one. Which of the following are true?
- i. All of the data points must lie exactly on the line.
 ii. All of the residuals must be zero.

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- iii. All of the variability of y about mean has been explained by the model.
- iv. The fitted line will be horizontal with respect to all of the explanatory variables.

- A) ii and iv only
- B) i and iii only
- C) i, ii, and iii only
- D) i, ii, iii, and iv

18. Approximately what percentage of normally distributed data values will fall within 2 standard deviation above or below the mean?

- A) 95%
- B) 68%
- C) 99.7%
- D) 99%

19. The probability that a visit to a primary care physician's (PCP) office results in neither lab work nor referral to a specialist is 35%. Of those coming to a PCP's, 30% are referred to specialists and 40% require lab work. Determine the probability that a visit to a PCP's office results in both lab work and referral to a specialist.

- A) 0.18
- B) 0.05
- C) 0.25
- D) 0.35

20. What is the main distinction between a confidence interval and a prediction interval?

- A) A confidence interval estimates the mean value of y at a particular value of x , while a prediction interval estimates the range of y values at a particular value of x .
- B) A prediction interval estimates the mean value of y at a particular value of x , while a confidence interval estimates the range of y values at a particular value of x .
- C) A confidence interval and a prediction interval are the same thing; they both estimate the mean value of y at a particular value of x .
- D) A confidence interval and a prediction interval are the same thing; they both estimate the range of y values at a particular value of x .

二部份：問答題（每題 10 分，共 40 分。各子題配分以%列於題後）

- (1) 請將所有過程、步驟交代清楚；沒有說明過程者，不給分。
- (2) 無法整除的數字，請保留至少 2 位小數點。

PART II. Essay Questions: Show detailed steps to get credits (10 points each)

1. Let X and Y be discrete random variables with a joint probability distribution shows below. Calculate the correlation coefficient between X and Y .

		<u>X</u>		
		0	1	2
<u>Y</u>	0	1/9	2/9	1/9
	1	2/9	2/9	0
	2	1/9	0	0

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2. If the sample proportion is 0.8 and the sample size is 100,
 (1) what is the sample standard deviation? (5%)
 (2) what is the z statistic for testing whether the population proportion is 0.7? (5%)
3. An interesting feature of many economic time series, such as consumer price index (CPI), is that they exhibit seasonal patterns. The process of removing the seasonal component is called deseasonalization or seasonal adjustment. Illustrate how deseasonalization is proceeded by the method of dummy variables by taking CPI as an example.

4. One would like to see whether fast-food restaurants charge higher prices in areas with a larger concentration of blacks (African Americans). Consider a model to explain the price of soda (*psoda*) in terms of the proportion of the population that is black (*prpbck*) and median income (*income*), the estimated equation is given:

$$\widehat{psoda} = \underset{(0.019)}{0.956} + \underset{(0.026)}{0.115} prpbck + \underset{(3.618 \times 10^{-7})}{1.603 \times 10^{-6}} income$$

$$n = 401, R^2 = 0.064$$

where standard errors appear in parentheses below the estimated coefficients (n = sample size).

- (1) Discuss the significance and interpret the coefficient on *prpbck*. (5%)
 (2) Compare the estimate from part (1) with the simple regression estimate from *psoda* on *prpbck*, as given below. Is the discrimination effect larger or smaller? Explain why. (5%)

$$\widehat{psoda} = \underset{(0.005)}{1.037} + \underset{(0.024)}{0.065} prpbck$$

$$n = 401, R^2 = 0.018$$

Descriptive Statistics

	<i>psoda</i>	<i>prpbck</i>	<i>income</i>
Mean	1.0449	0.1150	46,999
Median	1.0600	0.0422	46,255
Maximum	1.4900	0.9817	136,529
Minimum	0.7300	0.0000	15,919
Std. Dev.	0.0888	0.1839	13,215

Correlation Coefficient

	<i>psoda</i>	<i>prpbck</i>	<i>income</i>
<i>psoda</i>	1.000		
<i>prpbck</i>	0.134	1.000	
<i>income</i>	0.135	-0.435	1.000

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TABLE A.1 Areas Under the Normal Curve										
z	0.09	0.08	0.07	0.06	0.05	0.04	0.03	0.02	0.01	0.00
-4.00	0.00002	0.00002	0.00002	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003
-3.90	0.00003	0.00003	0.00004	0.00004	0.00004	0.00004	0.00004	0.00004	0.00005	0.00005
-3.80	0.00005	0.00005	0.00005	0.00006	0.00006	0.00006	0.00006	0.00007	0.00007	0.00007
-3.70	0.00008	0.00008	0.00008	0.00009	0.00009	0.00009	0.00010	0.00010	0.00010	0.00011
-3.60	0.00011	0.00012	0.00012	0.00013	0.00013	0.00014	0.00014	0.00015	0.00015	0.00016
-3.50	0.00017	0.00017	0.00018	0.00019	0.00019	0.00020	0.00021	0.00022	0.00022	0.00023
-3.40	0.00024	0.00025	0.00026	0.00027	0.00028	0.00029	0.00030	0.00031	0.00033	0.00034
-3.30	0.00035	0.00036	0.00038	0.00039	0.00040	0.00042	0.00043	0.00045	0.00047	0.00048
-3.20	0.00050	0.00052	0.00054	0.00056	0.00058	0.00060	0.00062	0.00064	0.00066	0.00069
-3.10	0.00071	0.00074	0.00076	0.00079	0.00082	0.00085	0.00087	0.00090	0.00094	0.00097
-3.00	0.00100	0.00104	0.00107	0.00111	0.00114	0.00118	0.00122	0.00126	0.00131	0.00135
-2.90	0.0014	0.0014	0.0015	0.0015	0.0016	0.0016	0.0017	0.0018	0.0018	0.0019
-2.80	0.0019	0.0020	0.0021	0.0021	0.0022	0.0023	0.0023	0.0024	0.0025	0.0026
-2.70	0.0026	0.0027	0.0028	0.0029	0.0030	0.0031	0.0032	0.0033	0.0034	0.0035
-2.60	0.0036	0.0037	0.0038	0.0039	0.0040	0.0041	0.0043	0.0044	0.0045	0.0047
-2.50	0.0048	0.0049	0.0051	0.0052	0.0054	0.0055	0.0057	0.0059	0.0060	0.0062
-2.40	0.0064	0.0066	0.0068	0.0069	0.0071	0.0073	0.0075	0.0078	0.0080	0.0082
-2.30	0.0084	0.0087	0.0089	0.0091	0.0094	0.0096	0.0099	0.0102	0.0104	0.0107
-2.20	0.0110	0.0113	0.0116	0.0119	0.0122	0.0125	0.0129	0.0132	0.0136	0.0139
-2.10	0.0143	0.0146	0.0150	0.0154	0.0158	0.0162	0.0166	0.0170	0.0174	0.0179
-2.00	0.0183	0.0188	0.0192	0.0197	0.0202	0.0207	0.0212	0.0217	0.0222	0.0228
-1.90	0.0233	0.0239	0.0244	0.0250	0.0256	0.0262	0.0268	0.0274	0.0281	0.0287
-1.80	0.0294	0.0301	0.0307	0.0314	0.0322	0.0329	0.0336	0.0344	0.0351	0.0359
-1.70	0.0367	0.0375	0.0384	0.0392	0.0401	0.0409	0.0418	0.0427	0.0436	0.0446
-1.60	0.0455	0.0465	0.0475	0.0485	0.0495	0.0505	0.0516	0.0526	0.0537	0.0548
-1.50	0.0559	0.0571	0.0582	0.0594	0.0606	0.0618	0.0630	0.0643	0.0655	0.0668
-1.40	0.0681	0.0694	0.0708	0.0721	0.0735	0.0749	0.0764	0.0778	0.0793	0.0808
-1.30	0.0823	0.0838	0.0853	0.0869	0.0885	0.0901	0.0918	0.0934	0.0951	0.0968
-1.20	0.0985	0.1003	0.1020	0.1038	0.1057	0.1075	0.1093	0.1112	0.1131	0.1151
-1.10	0.1170	0.1190	0.1210	0.1230	0.1251	0.1271	0.1292	0.1314	0.1335	0.1357
-1.00	0.1379	0.1401	0.1423	0.1446	0.1469	0.1492	0.1515	0.1539	0.1562	0.1587
-0.90	0.1611	0.1635	0.1660	0.1685	0.1711	0.1736	0.1762	0.1788	0.1814	0.1841
-0.80	0.1867	0.1894	0.1922	0.1949	0.1977	0.2005	0.2033	0.2061	0.2090	0.2119
-0.70	0.2148	0.2177	0.2207	0.2236	0.2266	0.2297	0.2327	0.2358	0.2389	0.2420
-0.60	0.2451	0.2483	0.2514	0.2546	0.2578	0.2611	0.2643	0.2676	0.2709	0.2743
-0.50	0.2776	0.2810	0.2843	0.2877	0.2912	0.2946	0.2981	0.3015	0.3050	0.3085
-0.40	0.3121	0.3156	0.3192	0.3228	0.3264	0.3300	0.3336	0.3372	0.3409	0.3446
-0.30	0.3483	0.3520	0.3557	0.3594	0.3632	0.3669	0.3707	0.3745	0.3783	0.3821
-0.20	0.3859	0.3897	0.3936	0.3974	0.4013	0.4052	0.4090	0.4129	0.4168	0.4207
-0.10	0.4247	0.4286	0.4325	0.4364	0.4404	0.4443	0.4483	0.4522	0.4562	0.4602
-0.00	0.4641	0.4681	0.4721	0.4761	0.4801	0.4840	0.4880	0.4920	0.4960	0.5000