

系所組別： 國際企業研究所乙組

考試科目： 統計學

考試日期：0308，節次：3

※ 考生請注意：本試題 可 不可 使用計算機 (請勿在本試題紙上作答，否則不予計分)

I. True or False (15 points, 1 pt each)

1. The interquartile range is a suitable measure for the central tendency in samples.
2. The sample mean in a sample is prone to be affected by the extreme values.
3. The categorical explanatory variables in an experimental are often called factors.
4. If a sample has a mean of 78, a median of 65, and a mode of 50, then we can say this sample is skewed to the left.
5. The probability that a bull market occurs is 0.5 if equally likely events of bull and bear markets are mutually exclusive and collectively exhaustive
6. The correlation coefficient can be used to measure linear and nonlinear relationship between two random variables.
7. If the mean, median and mode are the same in a data sample, then we can say this sample is normally distributed.
8. Random variables, X and Y, are independent. Then, variance of (X+Y) is equal to the variance of (X-Y).
9. If random variable X has a variance larger than zero, then we can be sure that $E(X^2) > E(X)^2$.
10. A randomized block (two-way) design with 5 treatments and 4 blocks produced the following sum of squares values: Total sum of squares $SS(\text{Total}) = 1800$, SST (sum of squares for treatments) = 500, SSE (sum of squares for error) = 400. Therefore, the value of MSB (mean square for blocks) must be 300.
11. A doorbell ring is distributed as a Bernoulli process with 0.5 while a clock strike is distributed as a Bernoulli process with 0.25, then the distribution of a doorbell ring and a clock strike at the same time is a Bernoulli process with 0.125 if the doorbell ring and the clock strike are independent.
12. When doing multiple comparisons in ANOVA, it is necessary to adjust the overall critical value in order to avoid over-rejecting the null hypothesis (Type I error).
13. Examining the same population, David and Mary reached different sample means and variances. They both think these differences are expected in advance and attribute these differences to possible reasons, such as sampling methods.

(背面仍有題目,請繼續作答)

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14. When conducting mean equality test within two groups, one can choose either ANOVA or t test. However, the t test is preferred if the test is performed in a one-sided alternative.
15. $E(X) = u_x$ and $E(Y) = u_y$. If random variables X and Y are independent, then $E(X + Y) = u_x + u_y$. Otherwise, this equality is not correct.

II. Choose the BEST answer (45 points, 3 pts each)

1. 150 firms were audited by the National Tax Bureau among 300 firms with annual operating revenue under NT\$50,000,000. Fundamentally, there are 200 more firms with annual operating revenue over NT\$50,000,000. Therefore, what is the probability of a company with annual operating incoming under NT\$50,000,000 will be audited by the National Tax Bureau?

- (A) 50%
 (B) 40%
 (C) 30%
 (D) 20%

2. A financial analyst wants to know portfolio A's beta by regressing returns of portfolio A on TAIEX returns. Currently, he has the following covariance table?

	TAIEX	Portfolio A
TAIEX	0.008123	
Portfolio A	0.004214	0.005734

Therefore, portfolio A's beta is?

- (A) 0.7349
 (B) 1.9275
 (C) 0.5188
 (D) 1.3607

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Use the following information to answer Questions 3 to 5.

16 students coming from 8 countries (i.e., 2 students from each country) joined a language learning project in which two different methods were employed to understand learning performance of each method. Assuming students coming from the same country have the same language learning capabilities. The following performance table is constructed by a TESOL researcher.

Country	Method A	Method B
1	78	82
2	154	100
3	143	150
4	120	121
5	85	80
6	76	79
7	136	130
8	112	114

The TESOL researcher employed Wilcoxon Signed Rank test to find out whether these two methods produced significantly different learning performances.

3. What is the sum of signed ranks?
 - (A) 36
 - (B) 2
 - (C) 0
 - (D) 18
4. What is the standard deviation of signed ranks?
 - (A) 4.25
 - (B) 6.12
 - (C) 7.84
 - (D) 5.39
5. Is there any statistically significant difference in learning performances between method A and method B? (*Hint: $t(6,0.975)=2.447$, $t(7,0.975)=2.365$, $t(8,0.975)=2.306$ and $t(9,0.975)=2.262$)

 - (A) Method A > Method B
 - (B) Method A = Method B
 - (C) Method A < Method B
 - (D) indecisive*

(背面仍有題目,請繼續作答)

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The duration a certain electronic appliance lasts can be modeled as an exponential distribution with a mean of 100 hours.

6. What is the probability of duration larger than 120 hours :
- (A) 0.0040
(B) 0.0030
(C) 0.3012
(D) 0.4161
7. Find the probability that 2 or more of 10 similar electronic appliances will have a duration larger than 120 hours:
- (A) 0.0386
(B) 0.0292
(C) 0.0328
(D) 0.1197

Use the following information to answer Questions 8 to 10.

The following table is prepared by a stock analyst regarding stocks and associated returns.

Stocks	Year 1	Year 2
1	3.45%	2.12%
2	4.65%	1.13%
3	2.34%	3.23%
4	5.23%	2.31%
5	6.21%	7.45%
6	1.21%	0.65%
7	9.12%	5.89%
8	4.23%	3.12%

8. Which of the following statistical methods is not suitable to be used to check whether stock return performances are significantly different in years 1 and 2?
- (A) Kruskal-Wallis test
(B) Mann-Whitney-Wilcoxon test
(C) t test with independent samples
(D) all of above

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9. If this analyst decided to use the sign test to test whether these two groups have different mean returns, what is the probability of test statistics under the small sample size condition?
- (A) 0.2341
(B) 0.1325
(C) 0.1445
(D) 0.2124
10. Based on information in question 9, what is value of the sign test statistic under the large sample size condition?
- (A) -0.3145
(B) -1.0607
(C) -2.1231
(D) -3.1965

Use the following information to answer Questions 11 to 13.

The following table list two stock market performances across 10 years.

Year	Market A	Market B
1	1.23%	2.02%
2	3.12%	1.12%
3	5.17%	3.29%
4	4.76%	1.24%
5	6.35%	2.35%
6	7.15%	1.14%
7	8.17%	5.45%
8	4.78%	3.05%
9	3.89%	4.68%
10	1.29%	4.96%

11. What is the sample correlation coefficient between markets A and B?
- (A) 0.0341
(B) 0.0354
(C) 0.0362
(D) 0.0371
12. Is the correlation between markets A and B statistically significant using t statistic?
- | | t statistic | significance |
|-----|---------------|---------------|
| (A) | 1.9457 | Significant |
| (B) | 2.1235 | Significant |
| (C) | 0.1095 | Insignificant |
| (D) | 0.0965 | Insignificant |

(背面仍有題目,請繼續作答)

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13. A stock analyst finds out that there is a 27 % chance that the Taiwan stock market increases when the American stock market increases. If this stock analyst predicts that there is a 75% chance that the American stock market increases next month, what is the probability that the Taiwan stock market will increase as well?

(A) 0.1825
(B) 0.0675
(C) 0.5475
(D) 0.2025

Use the following information to answer Questions 14 and 15.

A stock analyst has constructed a 95% confidence interval for the mean of weekly S&P 500 index returns, μ , as follows:

$$-0.0014 \leq \mu \leq 0.0254$$

The sample size of weekly S&P500 index returns is 120. The weekly S&P 500 index returns are assumed normally distributed.

14. What is the sample mean of weekly S&P 500 index returns? (The critical values of normal distribution at significance levels of 2.5% and 5% equal 1.96 and 1.645, respectively, for the right tail)

(A) 0.012
(B) 0.014
(C) 0.016
(D) 0.018

15. If the standard deviation of weekly S&P 500 index returns is 5.4%, then what is the new 95% confidence interval? (The critical values of normal distribution at significance levels of 2.5% and 5% equal 1.96 and 1.645, respectively, for the right tail)

(A) $0.0021 \leq \mu \leq 0.0215$
(B) $0.0023 \leq \mu \leq 0.0217$
(C) $0.0025 \leq \mu \leq 0.0219$
(D) $0.0027 \leq \mu \leq 0.0221$

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Notes:

- (1) Label blanks in alphabetical order.
- (2) Write down your answers and calculations along with associated blanks.

1. The table below lists 10- period returns of TAIEX and stock A:

Periods	TAIEX	Stock A
1	0.012297	0.025526
2	0.041633	0.063708
3	-0.000710	0.013768
4	-0.037440	-0.052640
5	0.029556	0.047157
6	0.000687	0.004996
7	0.006743	0.011127
8	0.010067	0.002064
9	-0.033870	-0.000510
10	-0.028590	-0.034060

A stock analyst regressed stock A returns on TAIEX returns using the following model:

$$\text{Stock } A_t = \alpha + \beta \times \text{TAIEX}_t + \varepsilon_t$$

Where ε are residuals and α and β are parameters.

- (a) What is the residual sum of squares in this regression?
- (b) What is adjusted R-squared value?
- (c) What is F test statistic value for testing β ?
- (d) What is Durbin-Watson statistic value?
- (e) If the estimation model is estimated using demeaned returns of stock A and TAIEX, what is the estimated coefficient of α ?

(背面仍有題目,請繼續作答)

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2. The following table list performances of 3 mutual fund managers:

Months	Manager 1	Manager 2	Manager 3
August	0.342	0.112	0.015
September	0.115	-0.010	0.011
October	0.053	-0.012	0.010
November	0.117	0.232	0.013
December	0.024	0.135	0.012

The critical value of chi-square distribution with the degree of freedom equal to 4 at significance level of 5% is 9.49

- (f) If the analyst used the Kruskal-Wallis test for comparing managers' performances, what is the combined sample mean rank?
- (g) What is the value of the Kruskal-Wallis statistic?
- (h) Is there evidence showing that three managers have significantly different performances using the Kruskal-Wallis test? (please answer "yes" or "no")?