考試科目	經濟學	系所別	商學院共同科	考試時間	2月 7日(五) 第二節

Multiple Choice (1 point each)

Identify the letter of the choice that best completes the statement or answers the question.

1. Suppose Ethan increases his working hours when obtaining higher hourly pay. Which of the following statement(s) is (are) correct?

(i) Leisure could be an inferior good to Ethan.

(ii) Leisure could be a normal good to Ethan.

(iii) Leisure could be a Giffen good to Ethan.

A. (i) and (iii)

B. (ii)

C. (i) and (ii)

D. (i), (ii), and (iii)

2. Which of the following statement(s) is (are) correct when a government imposes tax on a good?

(i) When supply is perfectly inelastic, imposing tax on consumers creates zero deadweight loss.

(ii) When demand is perfectly elastic, imposing tax makes the market price of the good unchanged.

(iii) When supply is perfectly elastic, and demand is perfect inelastic, imposing tax makes the market equilibrium quantity unchanged.

A. (i) and (iii)

B. (ii)

C. (i) and (ii)

D. (i), (ii), and (iii)

3. Which of the following statement(s) is(are) correct?

(i) A monopoly firm can increase its revenue by raising the price when demand is perfectly inelastic.

(ii) When marginal cost is zero and demand is linear, a monopolistic competitive firm will produce at the midpoint of the demand curve.

(iii) A perfect competitive firm produces at the point that price elasticity of demand equals one.

A. (i) and (iii)

B. (ii)

C. (i) and (ii)

D. (i), (ii), and (iii)

備註	一、作答於試題上者，不予計分。 二、試題請隨卷繳交。

考試科目	經濟學	系所別	商學院共同科	考試時間	2 月 7 日(五) 第二節

4. Assume Ethan's preference on two goods, X and Y, follows typical assumptions in Economics. His budget constraint is $2X + 4Y = 20$, and his optimal consumption bundle is $(2, 4)$. Which of the following consumption bundles is possible to give the same utility level to Ethan as $(2, 4)$?

A. (3, 7)

B. (5, 2.5)

C. (0.5, 4)

D. (1, 7)

5. Town A has only three residents. They are deciding whether to spend $ 450 to provide a public good. The public good will only be provided when all of three residents agree to do it. The value of the public good to each resident is:

Resident A	Resident B	Resident C
i	ii	iii

What is a possible bundle of (i, ii, iii) that this public good will be provided?

A. (0, 0, 460)

B. (100, 150, 130)

C. (120, 150, 160)

D. (140, 140, 140)

6. When marginal cost exceeds average total cost,

A. average fixed cost must be falling.

B. average fixed cost must be rising.

C. average total cost must be rising.

D. average total cost is falling.

7. If a firm in a competitive market increases production and its marginal revenue remains positive, raising production will

A. be profitable.

B. cause the firm to incur loses.

C. leave profit unchanged.

D. It is impossible to tell from the information provided.

備註	一、作答於試題上者，不予計分。 二、試題請隨卷繳交。

考試科目	經濟學	系所別	商學院共同科	考試時間	2 月 7 日（五）第二節

8. When a natural monopoly exists, it is

A. always more cost effective for two or more private firms to produce the product.

B. never more cost effective for two or more private firms to produce the product.

C. always more cost effective for government owned firms to produce the product.

D. never more cost effective for one firm to produce the product.

9. If identical products are sold by firms participating in a market, the market is

(i) perfectly competitive.

(ii) an oligopoly.

(iii) monopolitically competitive.

A. (i) or (ii)

B. (ii) or (iii)

C. (i) or (iii)

D. (i) only

10. A profit-maximizing firm in a monopolistically competitive market is characterized by which of the following?

A. Revenue is always maximized along with profit.

B. Average revenue exceeds marginal revenue.

C. Marginal revenue exceeds average revenue.

D. Average revenue is equal to marginal revenue.

11. Every year more and more purchases are made with credit cards on the Internet. Given this trend, all else equal, we would expect:

A. the money demand curve to shift outward.

B. the money demand curve to shift inward.

C. a downward movement along a fixed money demand curve.

D. an upward movement along a fixed money demand curve.

12. As a result of a decrease in the value of the dollar in relation to other currencies, American imports decrease and exports increase. Consequently, there is a(n):

A. increase in short-run aggregate supply.

B. decrease in the quantity of aggregate output supplied in the short run.

C. increase in aggregate demand.

D. decrease in the quantity of aggregate output demanded.

備註	一、作答於試題上者，不予計分。 二、試題請隨卷繳交。

考試科目	經濟學	系所別	商學院共同科	考試時間	2 月 7 日(3) 第二節

13. The money demand curve is:

A. downward-sloping because the opportunity cost of holding money is inversely related to the interest rate.

B. downward-sloping because the opportunity cost of holding money rises as the interest rate rises.

C. downward-sloping because the opportunity cost of holding money rises as the interest rate falls.

D. upward-sloping because the opportunity cost of holding money rises with the interest rate.

14. An example of the frictionally unemployed is a(n):

A. autoworker who is temporarily laid off because of a decline in sales.

B. geologist who is permanently laid off from an oil company due to a new technological advance.

C. worker at a fast-food restaurant who quits work and attends college.

D. real estate agent who leaves a job in Texas and searches for a similar, higher paying job in California.

15. Suppose that in year 1 an economy produces 100 baseballs that sell for $3 each and 75 pizzas that sell for $8 each. The next year the economy produces 110 baseballs that sell for $3.25 each and 80 pizzas that sell for $9 each. Using year 1 as the base year, the growth rate of real GDP from year 1 to Year 2 is:

A. 10%.

B. 7.8%.

C. 19.7%.

D. 8.8%.

16. Suppose the economy is in long-run equilibrium. Concerns about pollution cause the government to significantly restrict the production of electricity. At the same time, taxes fall. In the short-run

A. real GDP will rise, and the price level might rise, fall, or stay the same.

B. real GDP will fall, and the price level might rise, fall, or stay the same.

C. the price level will rise, and real GDP might rise, fall, or stay the same.

D. the price level will fall, and real GDP might rise, fall, or stay the same.

備註	一、作答於試題上者，不予計分。 二、試題請隨卷繳交。

考試科目	經濟學	系所別	商學院共同科	考試時間	2 月 7 日（五）第二節

17. Critics of stabilization policy argue that
A. "animal spirits" must be offset by active monetary policy.
B. active monetary policy is necessary for steady economic growth.
C. the lag problem ends up being a cause of economic fluctuations.
D. active fiscal policy is required for steady economic growth.

18. Which of the following contains a list only of things that decrease when the budget deficit of the U.S. increases?
A. U.S. net exports, U.S. domestic investment, U.S. net capital outflow
B. U.S. supply of loanable funds, U.S. interest rates, U.S. domestic investment
C. U.S. imports, U.S. interest rates, the real exchange rate of the dollar
D. U.S. interest rates, the real exchange rate of the dollar, U.S. domestic investment

19. If purchasing power parity holds, then if the price of a basket of goods in the U.S. rose from $1,000 to $1,200 and the price of the same basket in Poland rose from 6,400 Polish zloty to 8,000 zloty, then
A. the nominal exchange rate would be unchanged and the real exchange rate would appreciate.
B. the U.S. dollar would appreciate and the real exchange rate would stay the same.
C. the nominal exchange rate would be unchanged and the real exchange rate would depreciate.
D. the U.S. dollar would depreciate and the real exchange rate would be unchanged.

20. Imagine the U.S. economy is in long-run equilibrium. Then suppose the value of the U.S. dollar decreases. At the same time, people in the U.S. revise their expectations so that the expected price level rises. We would expect that in the short-run
A. real GDP will rise and the price level might rise, fall, or stay the same.
B. real GDP will fall and the price level might rise, fall, or stay the same.
C. the price level will rise, and real GDP might rise, fall, or stay the same.
D. the price level will fall, and real GDP might rise, fall, or stay the same.

考試科目	經濟學	系所別	商學院共同科	考試時間	2 月 7 日(五) 第二節

Problems and Short-essay Questions

Please answer the following questions IN SEQUENCE. All questions may be answered in either Chinese or English.

1. Assume a government imposes a tax on the market of good A. The total tax revenue is \$500, and the quantity demanded is 100. Further, the demand is linear and has a slope of $-\frac{1}{5}$. The supply equation is $Q^S = 2P$.

A. (4 points) What is the price that consumers pay after the tax?

B. (4 points) What is the demand equation?

C. (4 points) What is the size of the deadweight loss of the taxation?

D. (4 points) What is the tax burden of consumers?

E. (4 points) Additionally, assume the government imposes this tax to deal with externality efficiently. What is the size of the externality per output unit? Is this externality positive or negative?

2. Consider an endowment economy (an economy without production). The utility function of each consumer is $U = D_x^{1/2} D_y^{1/2}$, where D_x and D_y represent demand of x and y respectively. The endowment of x is 20 units and that of y is 30 units. Answer the following questions.

A. (5 points) Show that the utility function is homothetic.

B. (5 points) Derive the demand of x relative to y as a function of p_x/p_y where p represents price.

C. (5 points) Derive the equilibrium level of p_x/p_y.

D. (5 points) Suppose there is another economy, where consumers have the same utility function but both the endowment of x and y is 30 units. Derive the equilibrium level of p_x/p_y under free trade.

備註	一、作答於試題上者，不予計分。 二、試題請隨卷繳交。

考試科目	經濟學	系所別	商學院共同科	考試時間	2月 7日(五) 第二節

3. Given the following information: bank deposits 350, currency-to-deposits ratio 0.20, required reserve ratio 0.15,

A. (15 points) solve for the monetary base level, the level of bank reserves, and the money supply level in this economy.

B. (5 points) Suppose there is a sudden rise in the currency-to-deposits ratio, from the original level of 0.2 to a new level of 0.4. If everything else remains unchanged, find the level of monetary base needed to keep money supply fixed at the same level.

4. One example of how inflation discourages saving is the tax treatment of capital gains. Suppose that someone bought a parcel of land for $2,000 in 1980 when the price index equaled 100. In 2018, the person sold the land for $13,000, and the price index equaled 500. The tax rate on nominal gains was 20 percent.

A. (5 points) Find the before-tax real rate of capital gains.

B. (5 points) Compute the taxes on the nominal gains in terms of 2018 prices.

C. (5 points) Compute the after-tax real value of the land in terms of 1980 prices.

D. (5 points) Find the after-tax real rate of caiptal gains.

備註	一、作答於試題上者，不予計分。 二、試題請隨卷繳交。

國立政治大學 109 學年度 碩士暨碩士在職專班 招生考試試題

考試科目	財務管理	系所別	金融學系/金融管理組	考試時間	2 月 7 日(五) 第 三 節

1. Given the following information:

Expected return on Stock A	0.12(12%)
Standard deviation of return on Stock A	0.10
Expected return on Stock B	0.20(20%)
Standard deviation of return on Stock B	0.60
Correlation coefficient of the returns on Stock A and Stock B	0.2

   a. What are the expected returns and standard deviations of the following portfolios:
      (1) (2 points) 100 percent of funds invested in Stock A?
      (2) (2 points) 100 percent of funds invested in Stock B?
      (3) (4 points) 50 percent of funds invested in each stock?
   b. (7 points) What would be the impact if the correlation coefficient were 0.6 instead of 0.2?

2. Answer following questions.
   a. (5 points) The inventory turnover for an industry is 6 (every two months) but Slow Corp. turns over its inventory 4 times a year (every three months). If annual sales are $1,000,000 and the interest cost to carry inventory is 12 percent, what is the potential savings in interest expense if the firm achieves the industry for the turnover of its inventory?
   b. (5 points) If the industry average days sales outstanding is 65 days and a firm with sales of $1,034,550 has receivables of $268,700, how much in interest expense could the firm save if the receivables turn over as quickly as the industry average and the cost of carrying the receivables is 9%?

3. Two stocks each pay a $1 dividend that is growing annually at 8 percent. Stock A has a beta of 1.3; stock B's beta is 0.8.
   a. (5 points) Which stock is more volatile?
   b. (5 points) If treasury bills yield 6 percent and you expect the market to rise by 12 percent, what is risk adjusted required rate of return for each stock?
   c. (5 points) Using the dividend growth model, what is the maximum amount you would be willing to pay for each stock?
   d. (5 points) Why are your valuations different?

4. Answer following questions.
   a. (10 points) Define and discuss the Sharpe, Treynor, and Jensen measures of portfolio performance evaluation, and the situations in which each measure is the most appropriate measure.
   b. (5 points) What is the problem with using the Sharpe measure for evaluation of an active portfolio management strategy?

備註	一、作答於試題上者，不予計分。 二、試題請隨卷繳交。

考試科目	財務管理	系所別	金融學系/金融管理組	考試時間	2 月 7 日(五) 第 三 節

5. (10 points) Discuss why common stocks must earn a risk premium.

6. (10 points) Discuss the differences between the capital market line and the security market line.

7. (10 points) Although the expectations of increases in future interest rates can result in an upward sloping yield curve; an upward sloping yield curve does not in and of itself imply the expectations of higher future interest rates. Explain.

8. (10 points) With regard to market efficiency, what is meant by the term "anomaly"? Give three examples of market anomalies and explain why each is considered to be an anomaly.

考試科目	統計學 A	系所別	金融學系/金融管理組	考試時間	2 月 7 日(五) 第四節

1. (3pt) If a test of hypothesis has a Type I error probability of 0.05, this means that:
A. if the null hypothesis is true, we don't reject if 5% of the time
B. if the null hypothesis is true, we reject it 5% of the time
C. if the null hypothesis is false, we don't reject it 5% of the time
D. if the null hypothesis is false, we reject it 5% of the time

2. (3pt) Suppose we wish to test H_0: $\mu = 23$ vs. H_1: $\mu < 23$. Which of the following possible sample results gives the most evidence to support H_1?
A. sample mean is 19 and standard error is 5
B. sample mean is 20 and standard error is 8
C. sample mean is 21 and standard error is 6
D. sample mean is 19 and standard error is 11

3. (3pt) If a random sample of size n=100 fine-dining restaurants is selected and it is found that 45 restrict the use of the cell phones, give a 99% confidence interval for the true proportion of fine-dining restaurants that restrict the use of cell phone.
A. (0.3219, 0.5781)
B. (0.3525, 0.5475)
C. (0.2378, 0.4222)
D. (0.2526, 0.4073)

4. (3pt) Which of the following does the Central Limit Theorem allow us to disregard when working with the sampling distribution of the sample mean?
A. the standard deviation of the population distribution
B. the shape of the population distribution
C. the mean of the population distribution
D. all of the above can be disregarded when the Central Limit Theorem is used

5. (3pt) A man with 10 keys wants to open his door and tries the keys at random. Suppose there is exactly one key will open the door. If unsuccessful keys are eliminated from further selections. Let X be the number of trials to find the right key. What is the distribution of X?
A. Uniform distribution
B. Geometric distribution
C. Binomial distribution
D. Negative binomial distribution

備註	一、作答於試題上者，不予計分。 二、試題請隨卷繳交。

考試科目	統計學 A	系所別	金融學系/金融管理組	考試時間	2 月 7 日(五) 第四節

6. (3pt) The seasonal output of a new experimental strain of pepper plants was carefully weighed. The mean weight per plant is 15.0 pounds, and the standard deviation of the normally distributed weights is 1.75 pounds. Of the 200 plants in the experiment, how many produced peppers weighing between 13 and 16 pounds?

A. 100
B. 118
C. 197
D. 53

7. (3pt) Which of the following tests is appropriate for data if the problem objective is to compare two populations and there are exactly 2 categories?

A. The z-test for the difference of two proportions
B. The chi-squared test of a contingency table
C. Both A and B
D. None of these choices

8. (3pt) In testing the hypothesis H_0: $\mu = 100$ vs. H_1: $\mu > 100$, the p-value is found to be 0.074, and the sample mean is 105. Which of the following statements is true?

A. The probability of observing a sample mean at least as large as 105 from a population whose mean is 100 is 0.074
B. The probability of observing a sample mean smaller than 105 from a population whose mean is 100 is 0.074
C. The probability that the population mean is larger than 100 is 0.074
D. None of these choices

9. (3pt) The sample size needed to within 10 units of the population mean was found to be 68. If the population standard deviation was 50, then the confidence level used was

A. 99%
B. 95%
C. 90%
D. 98%

10. (3pt) The SAT scores of entering freshmen at a certain university have mean 1215 and standard deviation 110. A random sample of 100 freshmen is taken and $\bar{X}$ is computed. The probability that $\bar{X}$ less than 1190 is

A. 0.2272
B. 0.1335
C. 0.4090
D. 0.0116

考 試 科 目	統計學 A	系 所 別	金融學系/金融管理組	考 試 時 間	2 月 7 日(五) 第四節

11. (15%) The weekly oil demand X (in tons) follows the pdf

$f(x) = \frac{1}{\theta} e^{-x/\theta}$, $0 < x < \infty$.

However, the company can produce at most only 4 tons of the oil per week. Let Y be the oil sold per week.

(a) (3%) Find the probability that the oil will be sold out per week

(b) (7%) Find the cumulative distribution function of Y

(c) (5%) Find $\mathrm{E}(Y)$

12. (20%) Suppose that a random sample of 60 observations was drawn from a normal population. Suppose that we would like to infer whether or not the observations come from a zero mean and variance one. After drawing observations randomly, the number of observations in each of the intervals below was counted. Can we infer at the 5% significance level that the data were drawn from a hypothesized population? Ps. your answer should include: (i) the null/alternative hypothesis; (ii) the test statistic; (iii) the decision rule; (iv) the conclusion of the test

intervals	Frequency
$(-\infty, -1]$	8
$(-1, 0]$	30
$(0, 1]$	17
$(1, \infty)$	5

13. (15%) Three different models of automobiles (A, B, and C) were compared for gasoline consumption. For each model of car, 15 cars were randomly selected and subjected to standard driving procedures. The average miles/gallon obtained for each model of car and sample standard deviations are shown below. Suppose that the population variances ($\sigma_A^2 = \sigma_B^2 = \sigma_C^2 = \sigma^2$) are equal.

	Car A	Car B	Car C
Average Mile/Gallon	42	49	44
Sample Standard Deviation	4	5	3

(a) (10%) Let α= 0.05, and see if the mean gasoline consumption for all three models of cars is the same

(b) (5%) Find a 95% confidence interval for $(\mu_C - \mu_A)$. Please use $Q_{\alpha,d.f.}$ to denote the critical value. (you must specify the distribution Q and value of d.f.)

14. (20%) An insurance company is considering opening a new branch in Lansing. The company will choose the final location from two locations within the city. One of the factors in the decision is the annual family income (in thousands of dollars) from the potential locations.

Suppose that they randomly selected n families from each location (so the sample size is $2n$). Let $\bar{X}_A$ and

考試科目	統計學 A	系所別	金融學系/金融管理組	考試時間	2 月 7 日(五) 第四節

S_A be the sample mean and the sample standard deviation of location A, respectively. Similarly, $\bar{X}_B$ and S_B are the corresponding statistics from location B.

Use $\alpha = 0.05$ to answer the following questions. Please state your answer step-by step, including: (i) the null/alternative hypothesis; (ii) the test statistic(use $\bar{X}_\cdot$ And $S_\cdot$ to define your test statistic); (iii) the decision rule(including the distribution and critical value)

(a) (5%) Suppose that we have no idea whether the variances are equal or not. So how to use a statistical method to determine the variances are equal or not?

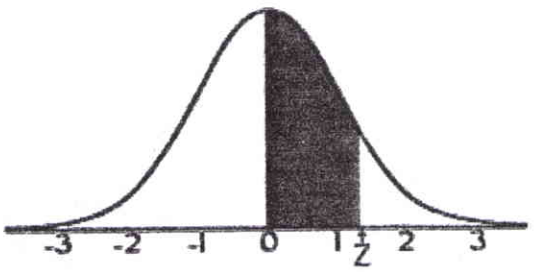
(b) (5%) Suppose that the variances are the same. Perform a hypothesis testing to determine whether the population means differ significantly.

(c) (10%) Let Z be 1 if it comes from location B and 0 otherwise. And Y be the income. We fit a simple linear regression model to this dataset $\{(Z_i, Y_i)\}_{i=1,\ldots,2n}$ and use the least squares method to get the estimated regression equation. Show that the least squares estimates of intercept and slope parameters are $\bar{X}_A$ and $\bar{X}_B - \bar{X}_A$, respectively.

Table I: Chi-square table

Upper tail		0.3	0.2	0.1	0.05	0.02	0.01	0.005	0.001
df	2	2.41	3.22	4.61	5.99	7.82	9.21	10.60	13.82
	3	3.66	4.64	6.25	7.81	9.84	11.34	12.84	16.27
	4	4.88	5.99	7.78	9.49	11.67	13.28	14.86	18.47
	5	6.06	7.29	9.24	11.07	13.39	15.09	16.75	20.52
	6	7.23	8.56	10.64	12.59	15.03	16.81	18.55	22.46
	7	8.38	9.80	12.02	14.07	16.62	18.48	20.28	24.32
	8	9.52	11.03	13.36	15.51	18.17	20.09	21.95	26.12
	9	10.66	12.24	14.68	16.92	19.68	21.67	23.59	27.88
	10	11.78	13.44	15.99	18.31	21.16	23.21	25.19	29.59
	11	12.90	14.63	17.28	19.68	22.62	24.72	26.76	31.26
	12	14.01	15.81	18.55	21.03	24.05	26.22	28.30	32.91
	13	15.12	16.98	19.81	22.36	25.47	27.69	29.82	34.53
	14	16.22	18.15	21.06	23.68	26.87	29.14	31.32	36.12
	15	17.32	19.31	22.31	25.00	28.26	30.58	32.80	37.70
	16	18.42	20.47	23.54	26.30	29.63	32.00	34.27	39.25
	17	19.51	21.61	24.77	27.59	31.00	33.41	35.72	40.79
	18	20.60	22.76	25.99	28.87	32.35	34.81	37.16	42.31
	19	21.69	23.90	27.20	30.14	33.69	36.19	38.58	43.82
	20	22.77	25.04	28.41	31.41	35.02	37.57	40.00	45.31
	25	28.17	30.68	34.38	37.65	41.57	44.31	46.93	52.62
	30	33.53	36.25	40.26	43.77	47.96	50.89	53.67	59.70
	40	44.16	47.27	51.81	55.76	60.44	63.69	66.77	73.40
	50	54.72	58.16	63.17	67.50	72.61	76.15	79.49	86.66

考試科目	統計學 A	系所別	金融學系/金融管理組	考試時間	2 月 7 日(五) 第四節



STANDARD NORMAL TABLE (Z)

Entries in the table give the area under the curve between the mean and *z* standard deviations above the mean. For example, for $z = 1.25$ the area under the curve between the mean (0) and z is 0.3944.

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0190	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2969	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3513	0.3554	0.3577	0.3529	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990
3.1	0.4990	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4992	0.4993	0.4993
3.2	0.4993	0.4993	0.4994	0.4994	0.4994	0.4994	0.4994	0.4995	0.4995	0.4995
3.3	0.4995	0.4995	0.4995	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4997
3.4	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4998

考試科目	統計學 A	系所別	金融學系/金融管理組	考試時間	2 月 7 日(五) 第四節

Table III: F table with $\alpha = 0.05$

Denominator DF	Numerator DF 1	2	3	4	5	6	7	8	9	10
1	161.448	199.500	215.707	224.583	230.162	233.986	236.768	238.883	240.543	241.882
2	18.513	19.000	19.164	19.247	19.296	19.330	19.353	19.371	19.385	19.396
3	10.128	9.552	9.277	9.117	9.013	8.941	8.887	8.845	8.812	8.786
4	7.709	6.944	6.591	6.388	6.256	6.163	6.094	6.041	5.999	5.964
5	6.608	5.786	5.409	5.192	5.050	4.950	4.876	4.818	4.772	4.735
6	5.987	5.143	4.757	4.534	4.387	4.284	4.207	4.147	4.099	4.060
7	5.591	4.737	4.347	4.120	3.972	3.866	3.787	3.726	3.677	3.637
8	5.318	4.459	4.066	3.838	3.687	3.581	3.500	3.438	3.388	3.347
9	5.117	4.256	3.863	3.633	3.482	3.374	3.293	3.230	3.179	3.137
10	4.965	4.103	3.708	3.478	3.326	3.217	3.135	3.072	3.020	2.978
11	4.844	3.982	3.587	3.357	3.204	3.095	3.012	2.948	2.896	2.854
12	4.747	3.885	3.490	3.259	3.106	2.996	2.913	2.849	2.796	2.753
13	4.667	3.806	3.411	3.179	3.025	2.915	2.832	2.767	2.714	2.671
14	4.600	3.739	3.344	3.112	2.958	2.848	2.764	2.699	2.646	2.602
15	4.543	3.682	3.287	3.056	2.901	2.790	2.707	2.641	2.588	2.544
16	4.494	3.634	3.239	3.007	2.852	2.741	2.657	2.591	2.538	2.494
17	4.451	3.592	3.197	2.965	2.810	2.699	2.614	2.548	2.494	2.450
18	4.414	3.555	3.160	2.928	2.773	2.661	2.577	2.510	2.456	2.412
19	4.381	3.522	3.127	2.895	2.740	2.628	2.544	2.477	2.423	2.378
20	4.351	3.493	3.098	2.866	2.711	2.599	2.514	2.447	2.393	2.348
21	4.325	3.467	3.072	2.840	2.685	2.573	2.488	2.420	2.366	2.321
22	4.301	3.443	3.049	2.817	2.661	2.549	2.464	2.397	2.342	2.297
23	4.279	3.422	3.028	2.796	2.640	2.528	2.442	2.375	2.320	2.275
24	4.260	3.403	3.009	2.776	2.621	2.508	2.423	2.355	2.300	2.255
25	4.242	3.385	2.991	2.759	2.603	2.490	2.405	2.337	2.282	2.236
26	4.225	3.369	2.975	2.743	2.587	2.474	2.388	2.321	2.265	2.220
27	4.210	3.354	2.960	2.728	2.572	2.459	2.373	2.305	2.250	2.204
28	4.196	3.340	2.947	2.714	2.558	2.445	2.359	2.291	2.236	2.190
29	4.183	3.328	2.934	2.701	2.545	2.432	2.346	2.278	2.223	2.177
30	4.171	3.316	2.922	2.690	2.534	2.421	2.334	2.266	2.211	2.165
31	4.160	3.305	2.911	2.679	2.523	2.409	2.323	2.255	2.199	2.153
32	4.149	3.295	2.901	2.668	2.512	2.399	2.313	2.244	2.189	2.142
33	4.139	3.285	2.892	2.659	2.503	2.389	2.303	2.235	2.179	2.133
34	4.130	3.276	2.883	2.650	2.494	2.380	2.294	2.225	2.170	2.123
35	4.121	3.267	2.874	2.641	2.485	2.372	2.285	2.217	2.161	2.114
36	4.113	3.259	2.866	2.634	2.477	2.364	2.277	2.209	2.153	2.106
37	4.105	3.252	2.859	2.626	2.470	2.356	2.270	2.201	2.145	2.098
38	4.098	3.245	2.852	2.619	2.463	2.349	2.262	2.194	2.138	2.091
39	4.091	3.238	2.845	2.612	2.456	2.342	2.255	2.187	2.131	2.084
40	4.085	3.232	2.839	2.606	2.449	2.336	2.249	2.180	2.124	2.077
41	4.079	3.226	2.833	2.600	2.443	2.330	2.243	2.174	2.118	2.071
42	4.073	3.220	2.827	2.594	2.438	2.324	2.237	2.168	2.112	2.065
43	4.067	3.214	2.822	2.589	2.432	2.318	2.232	2.163	2.106	2.059
44	4.062	3.209	2.816	2.584	2.427	2.313	2.226	2.157	2.101	2.054
45	4.057	3.204	2.812	2.579	2.422	2.308	2.221	2.152	2.096	2.049
46	4.052	3.200	2.807	2.574	2.417	2.304	2.216	2.147	2.091	2.044
47	4.047	3.195	2.802	2.570	2.413	2.299	2.212	2.143	2.086	2.039
48	4.043	3.191	2.798	2.565	2.409	2.295	2.207	2.138	2.082	2.035
49	4.038	3.187	2.794	2.561	2.404	2.290	2.203	2.134	2.077	2.030
50	4.034	3.183	2.790	2.557	2.400	2.286	2.199	2.130	2.073	2.026

備註	一、作答於試題上者，不予計分。 二、試題請隨卷繳交。

國立政治大學　109 學年度　碩士班　招生考試試題

考試科目	統計學 B	所別	金融學系財務工程與金融科技組一般生	考試時間	2 月　7 日（五）第三節

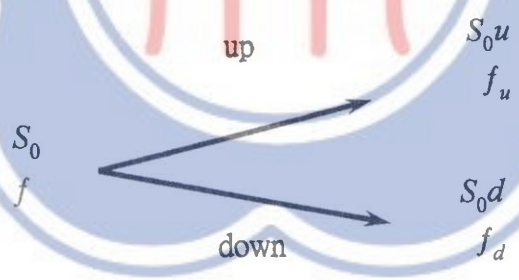
1. (15%) Statistics and Econometrics

Please describe one assignment or one project you have done for financial analysis, where the assignment or project needs the estimating methods or the testing methods. Please give the name and the procedure and property of the estimation or the testing methods in detail. (15%)

2. (25%) Binomial model and no-arbitrage argument

Based on a binomial model and no-arbitrage argument, we can generalize the no-arbitrage argument just presented by considering a stock whose price is S_0 and an option on the stock shoes current price is f. We assume that option fasts for time and that during the life of the option the stock price can tither move up from S_0 to a new level, S_0u, where $u>1$, or down from S_0 to a new level, S_0d, where $d<1$, and $u\,d=1$.

If the stock price moves up to S_0u , we suppose that the payoff from the option is f_u ; if the stock price moves down to S_0d , we suppose that the payoff from the option is f_d .



1. We imagine a portfolio consisting of a long position in △ shares and a short position in one option. Please Calculate the value of △ that makes the portfolio riskless. (5%)
2. What is the value of the option f at the one-step binomial tree under the no-arbitrage argument? (5%)
3. What is the value of the option f at the n-step binomial tree under the no-arbitrage argument? (5%)
4. What is the value of the option f at the continuous time under the no-arbitrage argument when the n-step binomial tree goes to infinity? (10%)

備註	一、作答於試題上者，不予計分。 二、試題請隨卷繳交。

考試科目	統計學B	所別	金融學系財務工程與金融科技組一般生	考試時間	2月 7日(五)第三節

3. (60%) Black-Scholes Option Pricing Formula

Consider a Brownian motion process $\{B(t), t \geq 0\}$. $B(0) = 0$ and $B(t)$ is normal with mean 0 and variance t, where its density function is given by

$$f_t(b) = \frac{1}{\sqrt{2\pi t}} e^{-b^2/2t},$$

and the process $B(t)$ has stationary and independent increments, where $B(t_1)$, $B(t_2) - B(t_1)$, ..., $B(t_n) - B(t_{n-1})$ for $t_1 < \ldots < t_n$ are independent and $B(t_k) - B(t_{k-1})$ is normal with mean 0 and variance $t_k - t_{k-1}$. Assume $B(t_1) = b_1$, $B(t_2) = b_2$, ..., $B(t_n) = b_n$.

(a). Please give the joint density of $B(t_1)$, $B(t_2)$, ..., $B(t_n)$. (5%)

(b). Please find the covariance of $B(t)$ and $B(s)$, $Cov(B(t), B(s))$ where $s < t$. (5%)

(c). Please find the conditional distribution of $B(s)$ given $B(t) = C$ where $s < t$. (5%)

Now, let the dynamics of the stock price be $S(T) = S(0)\exp\{(r - 0.5\sigma^2)T + \sigma B(T)\}$ under the risk neutral measure at time T, where $S(0)$ denotes the stock price at time 0, r is the riskless rate, σ is the volatility of the log stock price under risk-neutral probability measure.

(d). Please find the mean and variance of $S(T)$ under the risk-neutral probability measure. (10%)

(e). If the underlying asset of the option is the stock, what is the theoretical value of the stock option with strike price K and maturity T at time 0 under the risk-neutral probability measure? (Hint: To derive Black-Scholes Option Pricing Formula.) (10%)

(f). Please find the estimators of μ and σ by the maximum likelihood estimation (MLE) at the physical (real) probability measure based on the stock prices data S_i i=1,2,..., n for n days. (10%)

(g). What is the implied volatility? (5%)

(h). Please find the implied volatility based on the option price C. (10%)?

備註	一、作答於試題上者，不予計分。 二、試題請隨卷繳交。