1. You're working for the finance department at TSMC (台積電), and one day the finance officer asked you if you are able to price an option on the TSMC's stock. Your answer is positive because you've been taken the derivative subject in class at your university. Based upon your understanding, to price an option on a stock one needs several parameters. What are these parameters? State the Black-Scholes option pricing formula, and be sure to fully identify each component. Also, you must give the sub-equations for d1 and d2. *(10%)*

2. The majority of derivative pricing models used today are based upon the concept of risk-neutrality. *(15%)*
   (a). Please explain the principle of risk-neutral valuation in the context of option pricing.
   (b). Why is it (risk-neutrality) so important to derivatives pricing?
   (c). With respect to derivatives pricing, does the risk preference of investor matter? Explain why they do or they do not.

3. Consider a one period world where a stock with a current price of $50 can either rise or fall in value 20%. The risk-free rate of interest is 8%. A put option written on the stock has an exercise price of $49. *(15%)*
   (a). Determine the two possible put prices at expiration.
   (b). Solve for the put option's current price?
   (c). In a risk neutral world, what is the expected stock price in period 1?
   (d). What is the put option's hedge ratio (delta)?
   (e). Using the delta in (d.), show how the hedge portfolio of the stock and put earns the riskless rate over the single period.

4. Prove that the breakeven point for a bullish call spread is obtained by adding the net cost of the spread to the lower strike price. (Note: Bull spread can be created by taking a long position in a call with strike price K_1 combined with taking a short position in a call with a strike price K_2, where $K_2 > K_1$. Both options have the same expiration date.) (Hint: You can simply assume that the premium paid for taking a long position call is C_1 and the premium received for taking a short position call is C_2. *(10%)*

5. (20%) You are a financial analyst for Tsing Hua Company. The director of capital budgeting has asked you to analyze two proposed capital investments, Projects A and B. Each project has a cost of $10,000, and the required rate of return for each project is 6 percent. The projects expected net cash flows are as follows:

	Expected Net Cash Flows	
Year	Project A	Project B
0	$(10,000)	$(10,000)
1	6,000	3,020
2	2,000	3,020
3	2,000	3,020
4	2,000	3,020

a. Calculate each project's payback period, net present value (NPV), and internal rate of return (IRR) (rounding to nearest whole percent).

b. Which project (or projects) should be accepted if they are independent?

c. Which project should be accepted if they are mutually exclusive?

d. How might a change in the required rate of return (k) produce a conflict between the NPV and IRR rankings of these two projects? Would this conflict exist if k were 1%? (Hint: Plot the NPV profiles.)

e. Why does the conflict exist?

表一　年金現值利率因子

$$PVIFA\ (k\%,\ n) = \sum_{t=1}^{n} \frac{1}{(1 + k\%)^n} = \frac{1 - \frac{1}{(1 + k\%)^n}}{k} = \frac{1}{k} - \frac{1}{k(1 + k\%)^n}$$

期數	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.9901	0.9804	0.9709	0.9615	0.9524	0.9434	0.9346	0.9259	0.9174	0.9091
2	1.9704	1.9416	1.9135	1.8861	1.8594	1.8334	1.8080	1.7833	1.7591	1.7355
3	2.9410	2.8839	2.8286	2.7751	2.7232	2.6730	2.6243	2.5771	2.5313	2.4869
4	3.9020	3.8077	3.7171	3.6299	3.5460	3.4651	3.3872	3.3121	3.2397	3.1699
5	4.8534	4.7135	4.5797	4.4518	4.3295	4.2124	4.1002	3.9927	3.8897	3.7908
6	5.7955	5.6014	5.4172	5.2421	5.0757	4.9173	4.7665	4.6229	4.4859	4.3553
7	6.7282	6.4720	6.2303	6.0021	5.7864	5.5824	5.3893	5.2064	5.0330	4.8684
8	7.6517	7.3255	7.0197	6.7327	6.4632	6.2098	5.9713	5.7466	5.5348	5.3349
9	8.5660	8.1622	7.7861	7.4353	7.1078	6.8017	6.5152	6.2469	5.9952	5.7590
10	9.4713	8.9826	8.5302	8.1109	7.7217	7.3601	7.0236	6.7101	6.4177	6.1446

6. (20%) The QF Company has earnings available for common stockholders of $ 2 million and 500,000 shares of common stock outstanding at $48 per share. The firm is currently contemplating the payment of $2 per share in cash dividends.

   a. Calculate the firm's current earnings per share (EPS) and price/earnings (P/E) ratio.
   b. If the firm can repurchase stock at $50 per share, how many share can be purchased in lieu of making the proposed cash dividend payment?
   c. How much will the EPS be after the proposed repurchase?
   d. If the stock sells at the old P/E ratio, what will the market price be after repurchase?
   e. Compare and contrast the EPS before and after the proposed repurchase.
   f. Compare and contrast the stockholders' position under the dividend and repurchase alternatives.

7. (10%) Comment on the following report that appeared in the BBC news (May 18, 2000):

From Boo.com to Boo.gone

Boo was beaten by technology and the fickle fingers of those who shop for clothes on the web. From the day it launched technology was a problem for the online clothes retailer. Originally it was supposed to launch in May 1999 but technical hitches delayed the unveiling. When Boo.com finally went live last November its ambitious technology was there for all to see - if they could be bothered to wait for it to download. The graphics-heavy site took a notoriously long time to load.

The first version of the Boo.com website made three big mistakes. First, the site could not be seen by people who use Macintosh computers which are heavily used by graphics, design and media companies - surely one of the key markets for a hip online retailer like Boo. Second, it used lots of graphics, pop-up windows and 3-D images that only those with a 56k modem could see it without waiting minutes for it to load. Third, the site was very difficult to navigate around. Shoppers could get lost and find no way back to their starting point.

Although Boo.com looked great, anyone visiting it in November 1999 was confronted with a formidable array of windows. Unfortunately at the time Boo launched, few people had installed the software program, called a plug-in, that let them see the funky graphics.