Ph.D. Entrance Exam 2005 National Sun Yat-Sen University

第一部份（50分，每題25分）：

1.

Please explain the following terms and indicate their application in the field of "Corporate Finance".

A. Complete Market;

B. Financial Slack;

C. Real Options;

D. ESOPS;

E. LBO.

2.

In your own opinion, what topic or topics in the Field of "Corporate Finance" is the most worth of study in current Taiwan business environment? Please explain, FULLY, the reasons of its or their importance and describe, CONCRETELY, the research approaches you would utilize.

第二部份（50分）：

1. (25分) 假設公司 A 在外流通之股數爲 1 億股、舉債買回庫藏股前每股市值爲 100 元，A 計畫以舉債方式買回 5%之在外流通之股權、舉債之年利率爲 2%，A 舉債買回庫藏股前並無負債，整個經濟體系運轉期限爲一年（one-year economy）。假設資訊對稱(information symmetry)、無稅、放空不需保證金。A 舉債買回庫藏股前之價值如下：

	公司 A 無負債時	
	1 年後之 payoff(價值)	目前市值
負債	0	V_d
股東權益	$\tilde{X}$	V_e
合計	$\tilde{X}$	V_a

假設公司 A 舉債買回 5%之庫藏股的確使得 A 之股價上漲了 2 元，請以上述之數字建構一個無風險之套利交易。Hint: MM Theory 之證明。

2. (25分) Please evaluate the following 2 sentences separately (Do you agree or disagree ? Why ?): "When a company with a very high price-to-earnings ratio purchases another company with a very low PE ratio in an exchange of stock (股票交換), the acquirer's earnings per share will increase. Because such a takeover results in an increase in earnings per share, the acquirer's stock price will increase."

Answer:

請按題號順序作答，並請列出推導過程。

1. Suppose that the terms $\{a_n\}$ satisfy $|a_{n+1}-a_n|\le 2^{-n}$ for all n. Prove that $\{a_n\}$ is a Cauchy sequence. 10%
2. Prove that $f(x)=1/x$ is NOT uniformly continuous on $(0,\infty)$ but is uniformly continuous in (μ,∞) for $\mu>0$ .10%
3. Suppose that g is a continuous function on $[0,1]$ and $g(1)=0$. Define $f_n(x)=g(x)x^n$. Prove that $f_n(x)\to 0$ uniformly. 10%
4. Compute $\lim_{x\to 0}\frac{1}{\sin x}\int_0^{\sin 2x}\cos 5t\,dt$. 10%
5. Prove that $\rho(x,y)=\left|\frac{1}{x}-\frac{1}{y}\right|$ is a metric on $(0,\infty)$. 10%
6. $T:R^3\to R^2$ given by $T(x,y,z)=(3x+y-z,x+2y+z)$ and $v_1=(3,-4,5),v_2=(1,4,7)$. Determine whether or not these two vectors are in the kernel of T. 10%
7. Extend the set $\{(1,1,0),(1,-1,1)\}$ to form a basis for R^3.10%
8. Let A be an orthogonal matrix. Show that det(A)=±1 . 10%
9. Prove that λ is an eigenvalue of a nonsingular matrix A if and only if $1/\lambda$ is an eigenvalue of A^{-1}. What relationship holds between the eigenvectors of A and A^{-1}? 10%
10. Determine whether or not $\{1,x,x^2\}$ is orthogonal or orthonormal in P_2 where the inner product is defined as $(p,q)=\int_0^1 p(x)q(x)dx$. 10%

國立中山大學九十四學年度博士班招生考試試題

科目：經濟學【財管系選考】

個體部分

一、Consider an economy with two firms and two consumers. Firm 1 is owned by consumer 1; it produces guns from oil via production function :

$$g = 2x$$

Firms 2 is owned by consumer 2. It produces butter from oil via a production function :

$$b = 3x$$

Each consumer initially owns 10 units of oil. Consumer 1's preferences are given by :

$$u_1(g,b) = g^{0.4}b^{0.6}$$

Consumer 2's preferences are given by :

$$u_2(g,b) = 10 + 0.5\ln g + 0.5\ln b$$

(10 分)1.Find the market clearing prices for oil, guns, and butter.

(10 分)2.How many guns and how much butter does each consumer consume?

(5 分) 3.How much oil does each firm use?

二、(25 分)We have two agents with indirect utility functions

$$V_1(P_1,P_2,y) = \ln y - a\ln P_1 - (1-a)\ln P_2$$

$$V_2(P_1,P_2,y) = \ln y - b\ln P_1 - (1-b)\ln P_2$$

and initial endowments

$$W_1 = (1,1) \qquad W_2 = (1,1)$$

Calculate the market clearing prices and the equilibrium allocation.

總體部分

1. (i)建立一跨期消費模型，敘述每一變數的定義，是內生或是外生變數，名目或實質 (6 分)
   (ii)以圖形及數學推導出跨期消費理論的主要結論 (12 分)

2. (i)建立包括貨幣市場，勞動市場的 AS-AD 模型 (8 分)
   (ii)若物價預期為理性，但是契約工資使得名目工資有僵固性，以圖形分析事先預知的貨幣供給擴張所致各個市場的變化，是否會改變產出？(10 分)

3. (i)說明為何貨幣市場是債券市場的 mirror image (8 分)
   (ii)說明超額貨幣供給會導致利率下跌的經濟直覺(economic intuition) (6 分)

Part One: {50%}

1. The following estimates were to explain a short-term interest rate: (Figures in parentheses are standard errors).

$$Y_t = 5.5 + \underset{(1.3)}{} \underset{(0.04)}{0.9X_t} \underset{(0.09)}{- 0.38X_{t-1}} \underset{(1.3)}{- 5.2\,(P_t/P_{t-4})} \underset{(0.07)}{+ 0.5Y_{t-1}} \underset{(0.04)}{- 0.05\,(D_1 - D_4)} \underset{(0.04)}{+ 0.08\,(D_2 - D_4)}$$

$$\underset{(0.04)}{+0.06\,(D_3 - D_4)}$$

$R^2 = 0.9$ $\quad \overline{R}^{\,2} = 0.89$ $\quad \hat{\sigma}$ =SSE = 0.19 $\quad$ DW=1.3 $\quad$ T=92

Where Y_t = interest rate (in %) on 6-month commercial paper

X_t = interest rate (in %) on 3-month Treasury bills

P_t = price index

D_i = seasonal dummy = $\begin{cases} 1 & for \quad ith \quad quarter \; i = 1,2,3,4 \\ 0 & otherwise \end{cases}$

(a) What is the economic reasoning for using the seasonal dummy variables? {10%}

(b) What is the estimated seasonal pattern in the interest rate of commercial paper? {10%}

(c) Suppose that we use the percentage rate of inflation $\Pi_t = 100\left(\frac{P_t - P_{t-4}}{P_{t-4}}\right)$ instead of P_t/P_{t-4}. What will be the new coefficients and their estimates? {10%}

2. For another example for the empirical test of the interest rates, the following figure plots 3-month and 6-month T-bill rates from January 1982 to June 2001, for a total of 234 observations. From financial theory, we would expect that there is an equilibrium relationship, how to explore any discrepancy between the short-run dynamics and the long-run relationship? {20%}

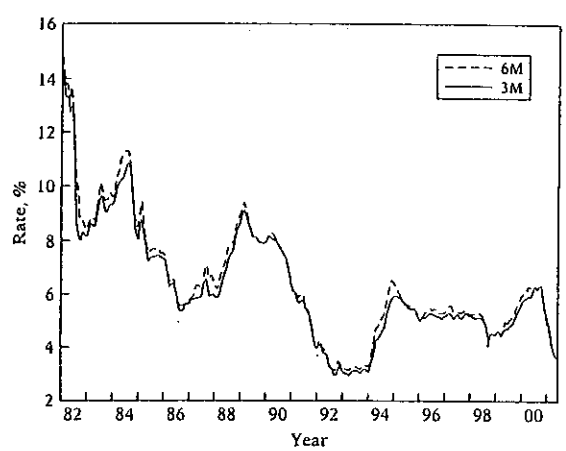

FIGURE 21.13
Three- and six-month Treasury bill rates (constant maturity).

第二部份

1. 一家電腦公司購買了一批爲數二千的電腦零組件。當該貨品送達時，該公司的檢驗員以單次抽樣的合格抽樣方案來決定是否要拒絕或接受該批貨品。該公司決定樣本數大小爲 20，若不合格數未超過 2 就可以接受。(本題只需寫出計算式，不用算出機率大小)

   (1). 假設該批貨品之中 3%是不合格的，而這個比例對買方是可以接受的範圍，請問生產者風險有多大？(5 分)

   (2). 假設該貨品之中有 10%是不合格的，而這個比例對買方來說是不可接受的，請問消費者風險有多大？(5 分)

2. 某家冰品店想要知道顧客對他們三種冰品的滿意程度，他們簡單設計了一個問卷，滿意程度的尺度訂爲滿意，普通，不滿意三種。該店家對來店點這三種冰品的顧客進行調查，每種冰品各調查了二十位。假若這家店想要知道顧客對這三種冰的滿意度是否有差異，請說明他們該如何進行假設檢定，假設顧客並是不從常態分配的母體抽樣而得。(10 分)

3. Suppose a teller supervisor believe the distribution of random arrivals at a local bank is Poisson and sets out to test this hypothesis by gathering information. The following data represent a distribution of frequency of arrivals during one-minute intervals at the banks. Use α=0.05 to test these data in an effort to determine whether they are Poisson distributed. (10 分)

Number of Arrivals	Observed Frequencies
0	7
1	18
2	25
3	17
4	12
≧5	5

4. 請說明 t, χ^2, F 分配之定義、應用時機及三者之間的關係。(10分)

5. 在古典迴歸模型下，何謂 heteroscedasticity？要如何檢定是否具有 heteroscedasticity？其對迴歸參數的估計式有何影響？可如何補救？(10分)

The Chi-Square Table

Degrees of Freedom	Area in Upper Tail									
	.995	.99	.975	.95	.9	.1	.05	.025	.01	.005
1	0.0000393	0.0001571	0.0009821	0.0039322	0.0157907	2.7055	3.8415	5.0239	6.6349	7.8794
2	0.010025	0.020100	0.050636	0.102586	0.210721	4.6052	5.9915	7.3778	9.2104	10.5965
3	0.07172	0.11483	0.21579	0.35185	0.58438	6.2514	7.8147	9.3484	11.3449	12.8381
4	0.20698	0.29711	0.48442	0.71072	1.06362	7.7794	9.4877	11.1433	13.2767	14.8602
5	0.41175	0.55430	0.83121	1.14548	1.61031	9.2363	11.0705	12.8325	15.0863	16.7496
6	0.67573	0.87208	1.23734	1.63538	2.20413	10.6446	12.5916	14.4494	16.8119	18.5475
7	0.98925	1.23903	1.68986	2.16735	2.83311	12.0170	14.0671	16.0128	18.4753	20.2777
8	1.34440	1.64651	2.17972	2.73263	3.48954	13.3616	15.5073	17.5345	20.0902	21.9549
9	1.73491	2.08789	2.70039	3.32512	4.16816	14.6837	16.9190	19.0228	21.6660	23.5893
10	2.15585	2.55820	3.24696	3.94030	4.86518	15.9872	18.3070	20.4832	23.2093	25.1881
11	2.60320	3.05350	3.81574	4.57481	5.57779	17.2750	19.6752	21.9200	24.7250	26.7569
12	3.07379	3.57055	4.40378	5.22603	6.30380	18.5493	21.0261	23.3367	26.2170	28.2997
13	3.56504	4.10690	5.00874	5.89186	7.04150	19.8119	22.3620	24.7356	27.6882	29.8193
14	4.07466	4.66042	5.62872	6.57063	7.78954	21.0641	23.6848	26.1189	29.1412	31.3194
15	4.60087	5.22936	6.26212	7.26093	8.54675	22.3071	24.9958	27.4884	30.5780	32.8015
16	5.14216	5.81220	6.90766	7.96164	9.31224	23.5418	26.2962	28.8453	31.9999	34.2671
17	5.69727	6.40774	7.56418	8.67175	10.08518	24.7690	27.5871	30.1910	33.4087	35.7184
18	6.26477	7.01490	8.23074	9.39045	10.86494	25.9894	28.8693	31.5264	34.8052	37.1564
19	6.84392	7.63270	8.90651	10.11701	11.65091	27.2036	30.1435	32.8523	36.1908	38.5821
20	7.43381	8.26037	9.59077	10.85080	12.44260	28.4120	31.4104	34.1696	37.5663	39.9969
21	8.03360	8.89717	10.28291	11.59132	13.23960	29.6151	32.6706	35.4789	38.9322	41.4009
22	8.64268	9.54249	10.98233	12.33801	14.04149	30.8133	33.9245	36.7807	40.2894	42.7957
23	9.26038	10.19569	11.68853	13.09051	14.84795	32.0069	35.1725	38.0756	41.6383	44.1814
24	9.88620	10.85635	12.40115	13.84842	15.65868	33.1962	36.4150	39.3641	42.9798	45.5584
25	10.51965	11.52395	13.11971	14.61140	16.47341	34.3816	37.6525	40.6465	44.3140	46.9280
26	11.16022	12.19818	13.84388	15.37916	17.29188	35.5632	38.8851	41.9231	45.6416	48.2898
27	11.80765	12.87847	14.57337	16.15139	18.11389	36.7412	40.1133	43.1945	46.9628	49.6450
28	12.46128	13.56467	15.30785	16.92788	18.93924	37.9159	41.3372	44.4608	48.2782	50.9936
29	13.12107	14.25641	16.04705	17.70838	19.76774	39.0875	42.5569	45.7223	49.5878	52.3355
30	13.78668	14.95346	16.79076	18.49267	20.59924	40.2560	43.7730	46.9792	50.8922	53.6719
40	20.70658	22.16420	24.43306	26.50930	29.05052	51.8050	55.7585	59.3417	63.6908	66.7660
50	27.99082	29.70673	32.35738	34.76424	37.68864	63.1671	67.5048	71.4202	76.1538	79.4898
60	35.53440	37.48480	40.48171	43.18797	46.45888	74.3970	79.0820	83.2977	88.3794	91.9518
70	43.27531	45.44170	48.75754	51.73926	55.32894	85.5270	90.5313	95.0231	100.4251	104.2148
80	51.17193	53.53998	57.15315	60.39146	64.27784	96.5782	101.8795	106.6285	112.3288	116.3209
90	59.19633	61.75402	65.64659	69.12602	73.29108	107.5650	113.1452	118.1359	124.1162	128.2987
100	67.32753	70.06500	74.22188	77.92944	82.35813	118.4980	124.3421	129.5613	135.8069	140.1697

Poisson Probabilities

	λ									
x	.005	.01	.02	.03	.04	.05	.06	.07	.08	.09
0	.9950	.9900	.9802	.9704	.9608	.9512	.9418	.9324	.9231	.9139
0	.0050	.0099	.0196	.0291	.0384	.0476	.0565	.0653	.0738	.0823
0	.0000	.0000	.0002	.0004	.0008	.0012	.0017	.0023	.0030	.0037
0	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0001	.0001	.0001

x	.1	.2	.3	.4	.5	.6	.7	.8	.9	1.0
0	.9048	.8187	.7408	.6703	.6065	.5488	.4966	.4493	.4066	.3679
1	.0905	.1637	.2222	.2681	.3033	.3293	.3476	.3595	.3659	.3679
2	.0045	.0164	.0333	.0536	.0758	.0988	.1217	.1438	.1647	.1839
3	.0002	.0011	.0033	.0072	.0126	.0198	.0284	.0383	.0494	.0613
4	.0000	.0001	.0003	.0007	.0016	.0030	.0050	.0077	.0111	.0153
5	.0000	.0000	.0000	.0001	.0002	.0004	.0007	.0012	.0020	.0031
6	.0000	.0000	.0000	.0000	.0000	.0000	.0001	.0002	.0003	.0005
7	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0001

x	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
0	.3329	.3012	.2725	.2466	.2231	.2019	.1827	.1653	.1496	.1353
1	.3662	.3614	.3543	.3452	.3347	.3230	.3106	.2975	.2842	.2707
2	.2014	.2169	.2303	.2417	.2510	.2584	.2640	.2678	.2700	.2707
3	.0738	.0867	.0998	.1128	.1255	.1378	.1496	.1607	.1710	.1804
4	.0203	.0260	.0324	.0395	.0471	.0551	.0636	.0723	.0812	.0902
5	.0045	.0062	.0084	.0111	.0141	.0176	.0216	.0260	.0309	.0361
6	.0008	.0012	.0018	.0026	.0035	.0047	.0061	.0078	.0098	.0120
7	.0001	.0002	.0003	.0005	.0008	.0011	.0015	.0020	.0027	.0034
8	.0000	.0000	.0001	.0001	.0001	.0002	.0003	.0005	.0006.	.0009
9	.0000	.0000	.0000	.0000	.0000	.0000	.0001	.0001	.0001	.0002

x	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0
0	.1225	.1108	.1003	.0907	.0821	.0743	.0672	.0608	.0550	.0498
1	.2572	.2438	.2306	.2177	.2052	.1931	.1815	.1703	.1596	.1494
2	.2700	.2681	.2652	.2613	.2565	.2510	.2450	.2384	.2314	.2240
3	.1890	.1966	.2033	.2090	.2138	.2176	.2205	.2225	.2237	.2240
4	.0992	.1082	.1169	.1254	.1336	.1414	.1488	.1557	.1622	.1680
5	.0417	.0476	.0538	.0602	.0668	.0735	.0804	.0872	.0940	.1008
6	.0146	.0174	.0206	.0241	.0278	.0319	.0362	.0407	.0455	.0504
7	.0044	.0055	.0068	.0083	.0099	.0118	.0139	.0163	.0188	.0216
8	.0011	.0015	.0019	.0025	.0031	.0038	.0047	.0057	.0068	.0081
9	.0003	.0004	.0005	.0007	.0009	.0011	.0014	.0018	.0022	.0027
10	.0001	.0001	.0001	.0002	.0002	.0003	.0004	.0005	.0006	.0008
11	.0000	.0000	.0000	.0000	.0000	.0001	.0001	.0001	.0002	.0002
12	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0001