請於答案紙作答。

1. 小明與小華合養孔雀魚，假設當第 t 期期末有 K 隻魚在魚缸時，到 t+1 期期初時，會有 $\sqrt{K}$ 隻新的小魚生出來。在第 t 期期間也會有10%原有的魚會自然壽終正寢，而有50%新的小魚被他們兄弟抓去賣。註：請允許魚的數目帶有小數。

a. 請問，題目中「當第 t 期期末有 K 隻魚在魚缸時，到 $t+1$ 期期初時，會有 $\sqrt{K}$ 新的小魚生出來」這樣的設定是否符合什麼經濟直覺。(8 分)

b. 請當魚缸中在期末恰存在幾隻魚時，每一期期末魚缸裡的魚將會一樣多。(8 分)

c. 請證明，當魚缸裡的魚的數目離小題 b 的答案愈遠時，魚缸裡的魚的數目變化速率愈快，且會向小題 b 的答案靠近。(8 分)

d. 如果他們兄弟想要每期多賣幾隻魚(當每期期初的小魚數量相同時)，你會建議他們每期將幾%新的小魚抓去賣才能達成這個目標呢？(8 分)

e. 如果每一期期間會有較多的魚自然壽終正寢，請繪圖說明，小題 d 的答案會有何變化？(8 分)

2. 請你利用總體經濟學理論並參考所附圖形與你對台灣經濟數據的了解回答以下關於近年台灣總體經濟情勢的問題。以下問題未必有標準答案，請盡力作答，也可加上任何你需要的假設(但請敘明)，你的分數以答題邏輯與所運用的總體經濟理論是否合宜為準。
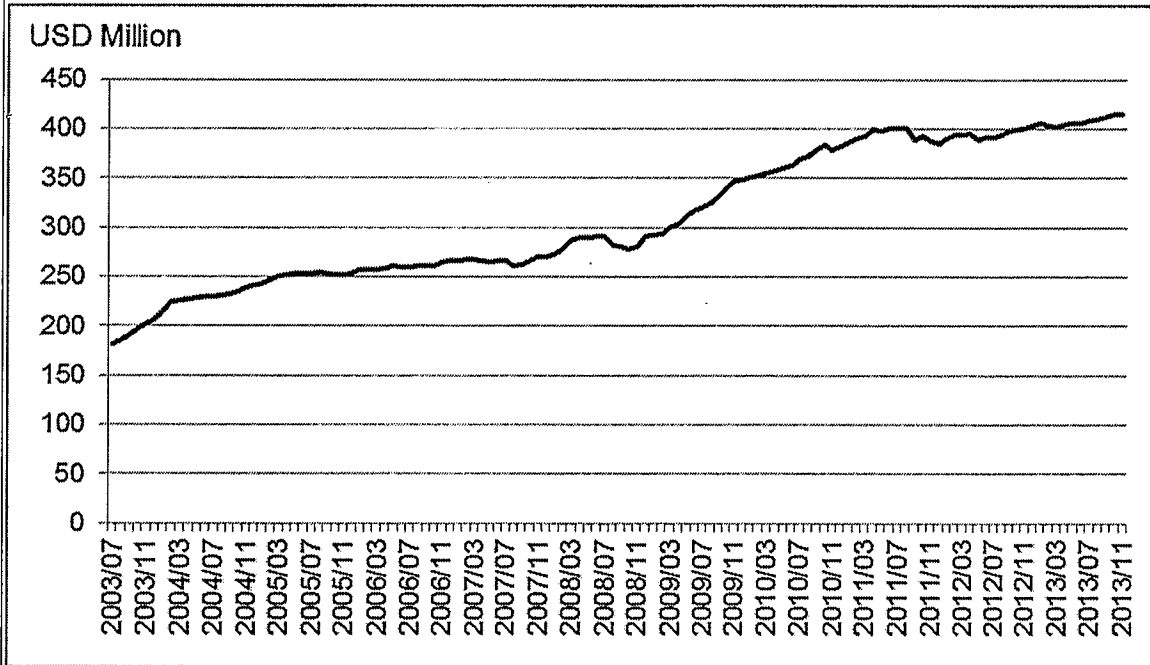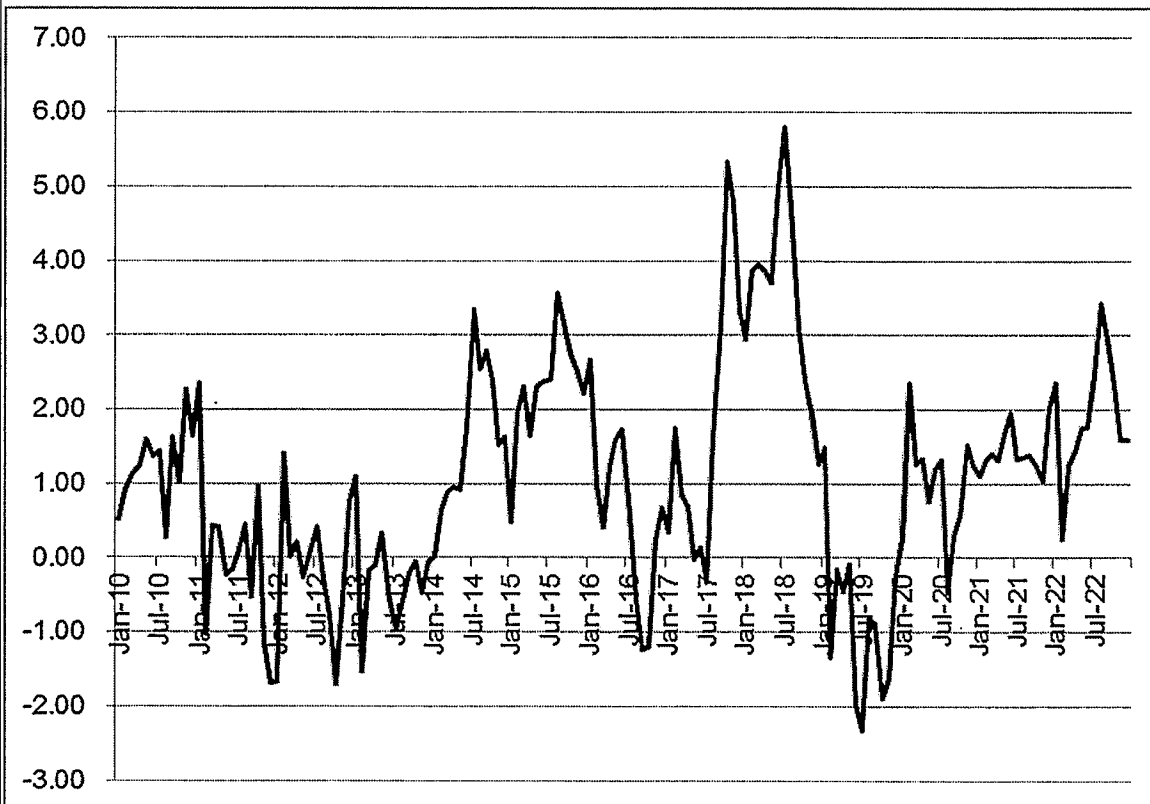
圖 1：台灣近年 M2 的變化
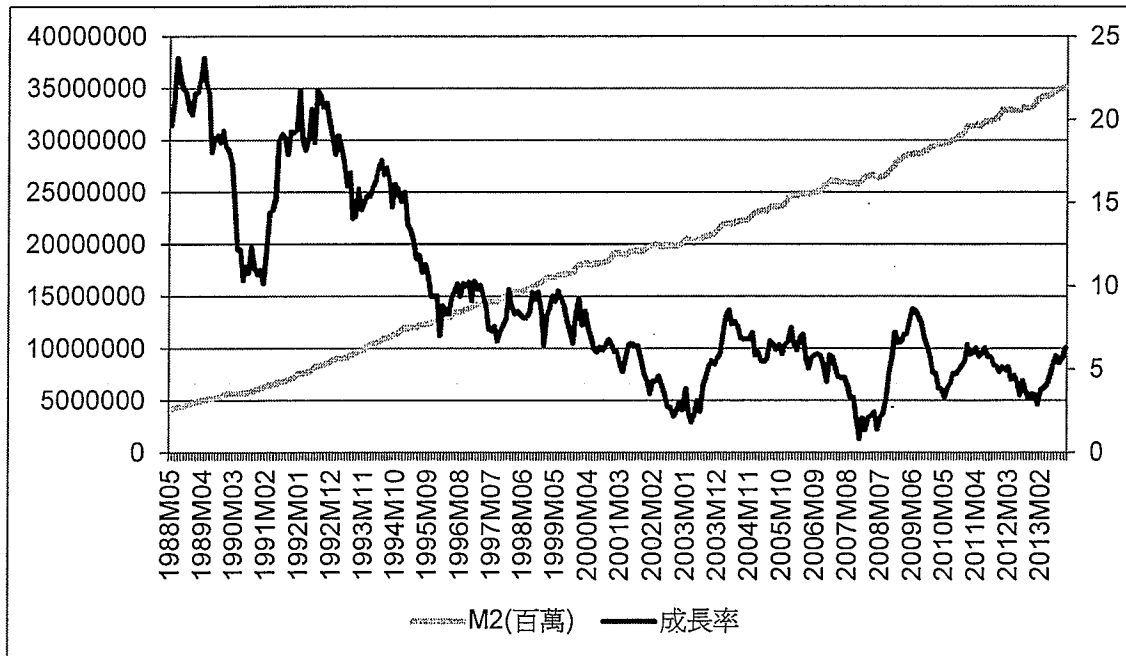
　M2(百萬)　——成長率

圖 2：台灣歷年外匯存底變化

圖 3：台灣近年消費者物價指數變化率

a. 請問你認為台灣的外匯市場屬於結清狀態(market clear)嗎？(10 分)

b. 請問你認為台灣貨幣供給的成長速度是否與貨幣需求相符?(10 分)

c. 請問你認為央行近年來在公開市場操作可能是以那些動作為主?(10 分)

背面有題

3. 請利用 FE-IS-LM 模型分析以下政策或事件在長期與短期對產出、就業、實質利率、物價、民間消費、民間投資等經濟變數的影響。你可加上任何需要的假設(但請敘明)，你的分數以答題邏輯是否合宜為準。

a. 天氣嚴寒使燃油需求上升，提升油價。(15 分)

b. 政府增加新的社會福利支出。(15 分)

1. (10pts) Consider a quadratic VMN (von Neumann-Morgenstern) utility function as follows:
$$U(w) = a + bw + cw^2.$$
   (a) (5pts) What restrictions if any must be placed on parameters a, b, and c for this function to display risk aversion?
   (b) (5pts) Over what domain of wealth can a quadratic VMN utility function be defined?

2. (10pts) Consider the following hidden action model with three possible actions $E = \{e_1, e_2, e_3\}$. There are two possible profit outcomes: $\pi_H = 20$ and $\pi_L = 0$. The probabilities of π_H conditional on three effort levels are $f(\pi_H | e_1) = 0.7$, $f(\pi_H | e_2) = 0.5$, and $f(\pi_H | e_3) = 0.3$. The agent's effort cost function is $g(e_1) = 2$, $g(e_2) = 1.6$, $g(e_3) = 1.3$. Finally, $v(w) = \sqrt{w}$, in which w is the agent's payoff received from the principal. The agent's reservation utility, $\bar{u}$, is set at 0.
   (a) (5pts) What is the optimal contract when effort is observable?
   (b) (5pts) Is e_2 implementable if effort is not observable?

3. (10pts) Consider the game below with $X > Z$. Find the set of $\{(X, Y, Z)\}$, if there exists no pure strategy equilibrium.

Table 1

Player 1\2	L	R
U	$X, -6$	$12, Y$
D	$Z, X+Z$	$Y+15, Z+7$

4. (10pts) What is the Coase theorem?(5pts) In addition, give an example about negative production externalities to illustrate the essence of Coase's argument.(5pts)

5. (10pts) Nash equilibrium implies Pareto allocation of resources. True or false and why?

6. (15pts) Please use graphs and the case of rent control to explain the short-run and long-run supply elasticity. Furthermore, what happens if the economy grows in the long-run?

7. (5pts) Please use the Engel curve to explain the difference between a normal good and an inferior good.

8. (10pts) Does cost-minimization imply profit-maximization? Why or why not?

9. (15pts) Assume there are 2 firms competing in the market and consider Stackelberg's leader-follower oligopolistic competition. The market demand function is as follows:
$$Q = 100 - p$$
Where Q is the total demand and p is the market price. Assume both firms have the same total cost function: $TC = 10 + 10q$, where q is the individual output and both firms behave as the leader in the market. Please answer the following questions:
   (a) (5pts) What is the market price?
   (b) (5pts) What is the amount of quantities produced by each firm?
   (c) (5pts) What is the profit for each firm?

10. (5pts) Please explain "two-part tariff."

Answer the following five questions, equally weighted

請依題序在答案卷上作答

1. (20%)

   If the pdf for Y is

   $$f_Y(y) = \begin{cases} 0, & |y| > 1, \\ 1 - |y|, & |y| \leq 1. \end{cases}$$

   Find cdf for Y, ie., $F_Y(y)$.

2. (20%)

   A tool and die company makes castings for steel stress-monitoring gauges. Their annual profit, Q, in hundreds of thousands of dollars, can be expressed as a function of product demand, x,

   $$Q = Q(x) = 2(1 - e^{-2x}).$$

   Suppose that the demand (in thousands) for their castings follows an exponential pdf, $f_X(x) = 6e^{-6x}$, $x > 0$. Find the company's expected profit.

3. (20%)

   Let $X_1, X_2, ..., X_n$ be a random sample from the following distribution with density function

   $$f(x; \theta) = (1/\theta^2)xe^{-x/\theta}, \quad 0 < x < \infty, \ 0 < \theta < \infty.$$

   Find the maximum likelihood estimator for θ.

4. (20%)

   Let X_1, X_2 have the joint pdf

   $$f(x_1, x_2) = 2, \quad 0 < x_1 < x_2 < 1.$$

   Consider the transformation

   $$Y_1 = \frac{X_1}{X_2}, \quad Y_2 = X_2.$$

   Find the joint pdf of Y_1, Y_2, i.e., $f(y_1, y_2)$.

5. (20%)

   If it is known that X has a mean of 25 and a variance of 16. Find

   (a). A lower bound for $P(17 < X < 33)$, and

   (b). An upper bound for $P(|X - 25|) \geq 12$.

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