MACROECONOMICS (I)

Midterm Exam

April 20, 2023

1. 假設某代表性個人追求效用現值和 $E_0 \sum_{t=0}^{\infty} \beta^t u(c_t)$ 極大，其第 t 期的預算限制式為：$py_t + d_t s_t + Rb_t = p(c_t + i_t) + p_{st}(s_{t+1} - s_t) + (b_{t+1} - b_t)$，其中 c_t 為其消費，$i_t = k_{t+1} - (1-\delta)k_t$ 為投資，所得 $y_t = f(k_t)$，f 為生產函數，k_t 為第 t 期期初的資本數量，s_t 為第 t 期期初的股票數量，b_t 為第 t 期期初的債券金額，d_t 為每股現金股利，p_{st} 為每股股價。p 為商品價格，R 為債券利率，假設都不隨時間改變，$0 < \beta < 1$ 為效用的折現因子，$0 < \delta < 1$ 為資本折舊率，$t = 0, 1, 2, \ldots, \infty$。

   (1) 請寫下此問題的 Bellman 方程式。(5 分)

   (2) 請導出此問題的隨機 Euler 方程式，並解釋其經濟意義。(15 分)

   (3) 本題的均衡股價是否滿足弱型式 (weak-form) 效率市場假說 (*efficient market hypothesis*)？(10 分)

2. Markowitz 在他 1990 年的諾貝爾演講中，提到發現資產組合理論 (*portfolio theory*) 的心路歷程，他是這樣說的：

   The basic principles of portfolio theory came to me one day while I was reading John Burr Williams, *The Theory of Investment Value*. Williams proposed that the value of a stock should equal the present value of its future dividend stream. But clearly dividends are uncertain, so I took William's recommendation to be to value a stock as the expected value of its discounted future dividend stream…Thus action based on expected return only (like action based on certainty of the future) must be rejected as descriptive of actual or rational investment behavior. It seemed obvious that investors are concerned with risk and return, and that these should be measured for the portfolio as a whole. Variance (or, equivalently, standard deviation), came to mind as a measure of risk of the portfolio.[1]

   (1) Markowitz 提到未來的股利是不確定的，而他決定用變異數 (或標準差) 來度量風險，請問他用什麼來度量不確定性呢？(10 分)

   (2) 你認為 Williams 和 Markowitz 的想法哪一個比較合理？為什麼？(10 分)

---

[1] Harry M. Markowitz, "Foundations of Portfolio Theory," *Journal of Finance*, 1991, p. 470.

3. Kelly 根據 Claude Shannon 資訊理論推出的投資方式，[2] 後來被 Edward Thorp 稱為凱利準則 (*Kelly criterion*)，而這個準則通常被認為是 Warren Buffett 價值投資 (*value investment*) 理論的基礎，但可惜經濟學教科書卻幾乎一字未提。

   (1) Shannon/Kelly/Thorp 是用什麼來度量不確定性？他們和 Markowitz 對不確定的看法主要的差別是什麼？(15 分)

   (2) 現代財務理論之父 Louis Bachelier 在他巴黎大學博士論文中假設股價是一個隨機漫步 (*random walk*)，但這個假設後來被 Paul Samuelson 認為是錯的。你認為股價是隨機漫步最主要的錯誤是什麼？為什麼？(10 分)。

4. Adam Smith 的<u>國富論</u>是經濟學最重要的經典，至今我們仍然可以從中吸取許多知識和智慧，而 Ronald Coase 也對其推崇備至。

   (1) 請說明<u>國富論</u>一書主要的邏輯是什麼？試說明之。(15 分)

   (2) Keynes 的投資理論強調資本邊際效率 (*marginal efficiency of capital*)，[3] 而他又加上使用者成本 (*user cost*) 這個和 Smith/Coase 都有關的概念。請問你在第一大題推出的 Euler 方程式中關於投資的部份，和 Keynes 的投資理論是否一致？試說明之。(10 分)

5. (<u>bonus points</u>) 本題可以不答，答對可得 5 分，答錯不扣分。

   "The process of substitution…is one form of competition…we do not assume that competition is perfect. Perfect competition requires a perfect knowledge of the state of the market…The older economists…partly for brevity and simplicity, partly because the term "free competition" had become almost a catchword, partly because they had not sufficiently classified and conditioned their doctrines, they often seemed to imply that they did assume this perfect knowledge."

   以上這段話是誰說的？(A) Adam Smith, (B) Ronald Coase, (C) Alfred Marshall, (D) Friedrich Hayek, (E) John Maynard Keynes, (F) Milton Friedman.

---

[2] John L. Kelly, Jr., "A New Interpretation of Information Rate," *Bell System Technical Journal*, 1956, 917-926.

[3] John Maynard Keynes, *The General Theory of employment, Interest, and Money*, Macmillan, 1936, Ch. 11.