

American University
Department of Economics

Comprehensive Exam
Eco 013 Monetary Economics

June 2007
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DIRECTIONS: There are two sections to this exam. Be sure you follow the directions for each section.

Section 1

PART A. Answer ONE question. Remember to answer all parts of the question. You must show all relevant formulas and calculations in addition to your explanation.

1. A corporate bond denominated in dollars has annual coupon payments of 5%, a face value of \$1000, and a term to maturity of three years. Three-year bonds of similar quality are currently yielding 3%.
 - (a) Find the market price of the bond.
 - (b) Find the bond's current yield and yield to maturity.
 - (c) Find the duration of the bond and explain its meaning.
 - (d) Suppose an investor buys the bond today and sells it after one year at a time when the yield to maturity on two-year bonds equals 8%. Find the investor's realized rate of return over the one-year holding period. Show all calculations.
 - (e) Are there any conditions under which the initial investor with a one-year holding period would prefer the three-year bond described above to a one-year bond with a yield to maturity of 4%? Make your comparison explicit.

2. A firm's assets consist only of 20-year zero coupon bonds and 1-year zero coupon bonds. Each individual bond has a face value of \$1000. Assume the annual interest rate is 10% with a flat term structure. The firm has liabilities worth \$100,000 payable in 5 years.
 - (a) How many units of each bond should the portfolio hold if the firm wants to create a duration immunizing portfolio? Show and explain.
 - (b) If the market interest rate increases to 11% tomorrow, is the net value of the firm's position positive or negative? Show this.
 - (c) Suppose instead that the firm decides to hold all assets in 20-year zero coupon bonds and the market interest rate increases to 11% tomorrow. Show and explain the impact on the firm's balance sheet.

3. Consider a model in which the price of the stock can go up 12% or down 8% per period. (You may assume the price today is \$1). The interest rate is 5% per period (simple interest). Compute the price of a derivative that pays \$1000 if the stock goes down for 5 consecutive periods and pays \$40 if the stock goes up for 5 consecutive periods. (There are only these two possible states.)

PART B. Answer ONE question. Remember to answer all parts of the question. You must show all relevant formulas and calculations in addition to your explanation.

4. Suppose a publicly traded firm has current (year 0) earnings per share equal to \$2 and a current dividend payout ratio equal to 25% for each share. The firm's rate of return on equity (ROE) is expected to equal 10% for the foreseeable future. The dividend payout rate is expected to remain constant.
- (a) Use the capital asset pricing model to find the expected return on this stock when the risk-free rate equals 2%, the market risk premium equals 5% and the β for the firm equals 1.5.
 - (b) How is risk incorporated into the expected return on the stock?
 - (c) What are the possible limitations of the capital asset pricing model when it is applied in this manner? List and explain. What adjustments could be made to account for the limitations?
 - (d) Find the intrinsic (fundamental) value in year 0 for a share of stock this firm. Show and explain your approach.
 - (e) According to the principles of traditional finance, if the price of the stock was \$10 per share how would the mispricing be corrected?
 - (f) According to the principles of behavioral finance, why might the mispricing persist? Explain in detail.
 - (g) Does the current dividend policy of this firm maximize the return to its shareholders? Explain. (No calculations are necessary here.)
5. Consider a 2-period CRR (Cox-Ross-Rubinstein) model with a continuously compounded interest rate $r = .06$, $S(0) = \$200$, $u = 1.1$ and $d = .90$. The payoff is the European at-the-money put option with strike price $K = \$200$. Let $\Delta t = 1$.
- (a) Find the projected value of the stock after two periods.
 - (b) Find the payoffs of the put option after two periods.
 - (c) Compute the relevant risk-neutral probabilities and explain their meaning.
 - (d) Find the price of the put option after the first period.
 - (e) Find the price of the put option today (time 0).

PART C. Answer ONE of the following questions.

6. Consider a one-year European call option that sells for \$6. Is the option priced correctly if the annual risk-free rate is 5% and the strike price equals \$50? In this problem, also assume the spot price of the stock is \$50 and there are only two possible prices a year from now: \$60 or \$40. Be sure you include in your answer a strategy to replicate the call option by finding how many shares to buy (“a”) today and how much to borrow (“b”) at the risk-free rate. Show the replication strategy carefully and be sure you evaluate the current price of the call option.
7. (a) Derive the put-call parity condition (you can use graphs for this) and explain in detail how it relies on the value additivity condition. (b) Use the parity condition to carefully show how to replicate a zero coupon bond. (c) Next, use the parity condition to carefully show how to replicate a European call option. You must demonstrate and explain each step completely.
8. Consider a one-period binomial model for a European put option with strike price $K = 100$. The underlying model is:

$$S^u = 120$$

$$S^d = 80$$

Let the interest rate $r = 0$.

$$S(0) = 100.$$

The put option was sold for $P(0)$.

The seller of the put option wants to hedge the risk.

- (a) Describe the risk faced by the seller of the put option.
- (b) Find the replicating portfolio and solve for δ_0 and δ_1 .
- (c) Explain the meaning of δ_1 .
- (d) Compare the profit or loss with hedging to the profit or loss without hedging. Suppose that at maturity, $S(T) = 70$.

PART D. Answer ONE question.

9. Explain two concepts from behavioral finance: “prospect theory” and “ambiguity aversion.” Give a specific example of how each concept can help us some of the deviations from traditional finance.
10. What is the “equity premium”? Discuss two of the main hypotheses that have been proposed as explanations.

Part 2

Instructions: Answer *one* question from Section A and *one* question from Section B. Make sure to read the questions carefully, and answer what is asked. Answers are judged on clarity of exposition and intuition, command of the relevant literature, and accuracy and depth of technical detail.

Section A. Answer one question.

1. The Sidrauski and CIA models

- a. Explain Sidrauski's approach to incorporating money into a model of economic growth, contrasting his approach with that of Tobin.
- b. How do households allocate their resources between money and consumption? (Refer to the equalization of marginal utilities).
- c. What is the steady-state capital-labor ratio in the Sidrauski model? Explain what it tells us about the neutrality of money.
- d. Is money super-neutral in the Sidrauski model? Explain why or why not.
- e. Explain how the cash-in-advance (CIA) model differs from Sidrauski's approach. In the CIA model, what are the two constraints that households face in their optimization problem?
- f. In the CIA model, what does the marginal utility of consumption have to equal at its optimal level?
- g. What relationships define the capital-labor ratio and the level of consumption in the steady state?
- h. Is money neutral in the CIA model? Is it superneutral?
- i. Compare the Sidrauski and CIA approaches: What are their advantages and disadvantages? How compelling are their methods of incorporating money into the model? How consistent are their predictions with empirical evidence?

2. Contemporary theories of the business cycle

- a. Is it possible for fluctuations in money supply to cause short-run fluctuations in output, even with freely-adjusting wages and prices and rational expectations? Explain the "island model" that Lucas developed to answer this question. Describe the stochastic properties of the money supply process, and explain what 'signal extraction problem' is at work.
- b. In this model, do anticipated and unanticipated changes in money supply have the same short-run effect on output? Why or why not? Explain the mechanisms involved.
- c. Describe how the set-up of the neo-Keynesian model (or, as Goodfriend calls it, the 'neoclassical synthesis') differs from that of the classical real-business-cycle model, making sure to refer to (a) whether businesses and consumers optimize, (b) whether markets are perfectly competitive, and (c) the flexibility of wages and prices.

- d. Which story is the empirical evidence more consistent with: a Lucas-style interpretation of the business cycle or a neo-Keynesian-type view? Discuss specific findings.

Section B. Answer one question.

3. Inflation targeting

- a. Define the problem of ‘time consistency’ and explain why, in the Barro-Gordon model, it causes ‘inflation bias.’
- b. What is inflation targeting, and why is it thought to represent a good solution to the time consistency problem?
- c. What has been the experience among industrial countries with inflation targeting to date: Does it seem to have led to consistent reductions in inflation rates? What difficulties are there in interpreting the empirical evidence?
- d. Does targeting inflation inevitably imply that monetary policy can no longer be used to offset aggregate fluctuations? Explain.
- e. There was initially considerable skepticism that inflation targeting would be suitable for emerging-market countries. Why? Explain in terms of complementary policies thought to be needed to go along with successful inflation targeting. Does the evidence suggest that this skepticism was fully warranted?
- f. If a country opts to target the domestic inflation rate, does this necessarily imply that it cannot control its exchange rate? Explain the trade-offs involved.

4. Dominant international currency

- a. What is a ‘dominant international currency’? Explain the functions it serves.
- b. Explain Krugman’s notion of a vehicle currency. In his model, how does a country’s currency wind up being the dominant vehicle currency? Is its role in this respect directly dependent on its current importance in international production and trade? Why or why not?
- c. Given the trend in the U.S. economy’s share of world output, should we necessarily expect a change in the role of the U.S. dollar in the international monetary system? Explain and discuss the various factors involved, including possible alternatives to the U.S. dollar and the role of the U.S. current-account deficit.