

American University  
*Department of Economics*

Comprehensive Exam  
Monetary Economics

January 2005  
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DIRECTIONS: There are two parts to this exam. Be sure you follow the directions for each part.

**PART 1. Answer ONE question from Section A and ONE question from Section B. You must show all relevant formulas and calculations along with relevant explanations to receive credit.**

**Section A.**

1. Suppose McPhee Inc. is a publicly traded firm with current (year 0) earnings per share equal to \$2 and a current dividend equal to \$1 per 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) Find the expected return on this stock when the risk-free rate equals 3%, the market risk premium equals 4% and the  $\beta$  for the firm equals .90.
  - (b) Explain the main elements of the capital asset pricing model that you used in your answer to (a).
  - (c) What are the possible limitations of the capital asset pricing model when it is applied in this manner?
  - (d) Find the intrinsic value in year 0 for a share of stock in McPhee Inc. Show and explain your approach.
  - (e) According to the principles of traditional finance, if the price of the stock was \$100 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) Is this firm a potential takeover target if its market price is equal to its intrinsic value? Explain and show why or why not explicitly.
  
2. A World Bank bond denominated in dollars has annual coupon payments of 5%, a face value of \$1000 and a term to maturity of four years. Four-year bonds of similar quality are currently yielding 7%.
  - (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 three-year bonds equals 10%. Find the investor's realized rate of return.
  - (e) Suppose the World Bank would like to issue a peso-denominated bond with a term to maturity of four years. Explain how it should determine the coupon payments in pesos given the information on the dollar denominated bond. You may explain this as a general strategy rather than as a specific numerical case.

**Section B.**

1. (a) Explain the principle of value additivity. (b) Use it to replicate a forward contract for pesos. Assume that an investor owns a forward contract to buy pesos in one year and that the spot price of the peso is .09 and a one-year zero coupon bond yields 5%. (c) Assume the actual forward price for the peso was .12 and show the steps that an arbitrageur would undertake.
2. Replicate a put option on a share of stock by finding how many shares to sell short (“a”) today and how much to invest (“b”) at the risk free rate. Assume the spot price of a share of stock is \$50 and in the future there are only two possible prices: \$60 or \$40. The risk free interest rate equals 10% and the strike price of the put option equals \$50. Show the replication strategy carefully and be sure you find the price of the put option.
3. (a) Derive the put-call parity condition and explain how it relies on the value additivity condition. (b) Use the parity condition to carefully show how to replicate a call option.

**PART 2. Answer ONE question from Section A and ONE question from Section B. Answers are judged on clarity of exposition and intuition, command of the relevant literature, and accuracy and depth of technical detail.**

**Section A.**

1. Three key theoretical models have investigated the question of how money affects output and prices in the long-run: the Tobin model, the Sidrauski model, and the cash-in-advance model.
  - a. In each case, describe how money is incorporated into a model of economic growth in the long-run, and discuss whether its approach is sensible.
  - b. Define neutrality and superneutrality.
  - c. Describe how each model is set up and solved, and discuss its findings on neutrality and superneutrality.
  - d. What does the empirical evidence say: Does faster money growth promote faster growth of output in the long-run? Point to findings of specific studies.
  - e. Compare and contrast the models: Are one model’s findings more compelling than those of the others, in terms of theoretical plausibility and/or consistency with empirical evidence?
2. Seigniorage and the Cagan model
  - a. Define seigniorage, and write and explain an expression for its two sources. Will both sources be at work in the steady state?

- b. Suppose the money demand function has the form:

$$m_t = \alpha \exp \{ -\omega t / \beta c_t \} \text{ where } m_t = \text{money demanded at time } t$$

$c_t$  = consumption at time  $t$

$$\omega = i / (1 + i)$$

$i$  = nominal interest rate =  $r + \pi$

$r$  = real interest rate

$\pi$  = inflation

- and  $\alpha$  and  $\beta$  are parameters. Use this function to show how the government's revenue from seigniorage will vary with the rate of inflation.
- c. In the Cagan model, what is the relationship between money growth and the government deficit in the steady-state? Write down an expression for this relationship and explain.
- d. Using a graph to illustrate your answer, explain how money growth and expected inflation will be related *in equilibrium* in the Cagan model. Make sure to discuss stability and any conditions required for it.
- e. Define hyperinflation. Discuss how the empirical evidence on hyperinflation relates to the Cagan model.

### Section B.

1. At present there are proposals to form regional monetary unions in several parts of the world (e.g. the former Soviet Union, East Asia, and the Arab Gulf).
- Explain the gains that countries may experience from forming a monetary union, making reference to the models of Robert Mundell and Alesina Barro. What factors do the models predict would make for a successful union? How do benefits differ by country size and by countries' ability to commit to time-consistent monetary policy?
  - Explain whether the following monetary associations would seem to be advisable, based on the model of Alesina and Barro. What are the advantages? What are the risks? What are the factors that should be considered?
    - Nigeria, a large developing economy, decides to replace its currency with the U.K. pound.
    - Belarus, a small transition economy that has not had credible monetary policy, enters a monetary union with Russia, its major trade partner.
    - The Arab Gulf states, all of which presently peg their currencies to the U.S. dollar, decide to replace their national currencies with a single Gulf money.
  - Paul Krugman has called hard pegs and dollarization "an intellectual fad" and argues that instead we should let "a hundred currencies bloom." Would Alesina and Barro agree? Why or why not?

2. In Barro and Gordon's model of the time consistency problem, the central bank's objective is to maximize the expected value of

$$U = \lambda (y - y_n) - (1/2) \pi^2 \quad \text{where } y = y_n + a (\pi - \pi^e) + \varepsilon$$

- a. Define the time consistency problem, and show how and why it appears in this model. What factors will underlie the magnitude of the 'inflation bias'?
- b. Milton Friedman argued that monetary policy *rules* are preferable to discretion, and that the central bank should set money supply growth equal to the long-run rate of growth of real output. Is such a rule optimal in the Barro-Gordon model? Is it feasible? Explain.
- c. Describe Rogoff's idea of solving the time consistency problem through conservative central bankers. What, if anything, would be suboptimal about this approach?
- d. How do the ideas of central bank independence and inflation targeting relate to the theory of the time consistency problem?
- e. Explain what empirical studies have found with regard to the relationship between central bank independence and inflation, elaborating on methodological problems that complicate a causal interpretation of their findings.