

American University
Department of Economics

Comprehensive Exam
Eco 013 Monetary Economics

June 2009
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DIRECTIONS: There are two parts to this exam. Be sure you follow the directions for each part.

Part 1

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

1. (a) Construct a synthetic one-year zero coupon bond using the information in the table. All bonds are free of default risk and have face value equal to \$100. The annual coupon of 7% is paid in semi-annual installments.

<u>Term to maturity</u>	<u>Price</u>	<u>Coupon</u>
6 months	\$97	0
1 year	\$101	7%

- (b) Find the profitable arbitrage opportunity if the price of a one-year zero coupon bond in the market is \$92. Be specific in your answer (e.g. show all cash flows).
- (c) What conditions are necessary for arbitrage to enforce the price calculated in part (a)?
2. Consider a 2-period CRR (Cox-Ross-Rubinstein) model with a continuously compounded interest rate $r = .10$, $S(0) = \$200$, $u = 1.20$ and $d = .80$. The payoff is the European 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).
 - (f) Describe the arbitrage profit if the current price of the put option equals \$5.
 - (g) Why might the seller of the put option want to hedge the risk? What steps should be taken (in general) to create the hedge?

3. (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 European call option. (c) Next, use the parity condition to carefully show how to replicate a risk-free bond. You must demonstrate and explain each step completely.
4. Consider a one-period binomial model for a European call option with strike price $K = 100$. The underlying model is:
 $S^u = 150$
 $S^d = 50$
Let the interest rate $r = .20$.
 $S(0) = 100$.
The call option was sold for $C(0)$.
- (a) Describe the risk faced by the seller of the call option. Is the risk unlimited?
(b) Find the replicating portfolio and solve for δ_0 and δ_1 .
(c) Explain the meaning of δ_1 and find $C(0)$.
(d) The seller of the call option wants to hedge the risk. Compare the profit or loss with hedging to the profit or loss without hedging. Suppose that at maturity, $S(T) = 200$.
(e) Would you recommend that the risk be hedged in this specific case? How about in the general case?

SECTION B. Answer ONE question. Be sure your answers are responsive to the questions.

1. A prominent economist summarizes the theoretical basis for the efficient markets Hypothesis (EMH) by claiming it relies on rational investors and “market forces.” (a) Do you agree with this description? Explain why or why not. (b) Describe two anomalies that call the validity of the EMH into question. (c) How can the presence of “noise traders” and “investor sentiment” help us understand the anomalies?
2. (a) What are the main assumptions of the Capital Asset Pricing Model (CAPM)? Are these assumptions realistic in your view? Does this affect the usefulness of the model? (b) How does the CAPM price the market risk of asset j ? How much does the market pay for the specific risk of asset j ? (c) Explain why CAPM is an example of an equilibrium model. (d) Explain and then evaluate the extension of the CAPM to a multi-factor model by French and Fama.

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. In the Sidrauski (MIU) model, write out the expression showing how households allocate their resources between money and consumption.
- b. What is the steady-state capital-labor ratio in the Sidrauski model? Explain what it tells us about the neutrality of money.
- c. Is money super-neutral in the Sidrauski model? Explain why or why not.
- d. 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?
- e. In the CIA model, what does the marginal utility of consumption have to equal at its optimal level?
- f. What relationships define the capital-labor ratio and the level of consumption in the steady state?
- g. Is money neutral in the CIA model? Is it superneutral?
- h. 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. Seigniorage

- a. Define seigniorage, and write an expression for it. What are the two sources of seigniorage? Are both at work in the steady state?
- b. How does the government's revenue from seigniorage vary with the rate of inflation? Write an expression for this, derived from a plausible money demand function. Explain what the expression tells us.
- c. According to Phelps, should governments be using seigniorage as a means of mobilizing public resources? Explain.
- d. What determines the optimal balance between taxes and seigniorage as sources of government revenue? Explain.
- e. Is the empirical evidence consistent with the predictions of the model? Explain, citing specific studies and their approaches to support your answer.
- f. Define the 'Friedman rule.' Does the notion of optimal seigniorage invalidate it? Explain.

Section B. Answer one question.

1. Hyperinflation

- a. How is hyperinflation defined?
- b. 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.
- c. Using a graph to illustrate your answer, explain the two possible equilibria in the Cagan model. Are both points stable? What conditions are required for stability? Explain.
- d. Sargent, Williams and Zha on hyperinflation:
 - i. Explain the basics of the model that SWZ use to study hyperinflations. What does an 'escape' refer to? How does an escape start?
 - ii. What are the three policy options that governments use to end an escape?
 - iii. What does their simulation work suggest about how hyperinflations ended in Argentina, Bolivia and Brazil: what methods were used? how and why did the experiences differ across countries?

2. 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 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.