

# Final Examination

Econ 381, Prof. Evans

JSFB B060: December 19, 2008, 7-10 a.m.

---

## INSTRUCTIONS:

- Please print your name in the upper left-hand corner.
  - Please read each question below carefully, and respond to the questions on a separate sheet of scratch paper. You must show your work.
  - When finished with the test, staple your scratch paper with your answers and your work to this test when you turn it in.
  - You may use a calculator provided by the instructor.
  - This final consists of the following two sections that total 100 points possible:
    - Part 1: Short answer, 40 points possible
    - Part 2: Analytical problems, 60 points possible
  - Good luck, and thanks for a great semester.
- 

## Part 1: Short answer

(40 points possible, 2 points each)

1. What are the three requirements for a good macro model?
2. If nominal GDP is \$13 trillion and the GDP deflator is 1.3, what is real GDP?
3. List the three main characteristics of money?
4. Describe the main difference between the short run and long run in the New Keynesian models discussed throughout most of the course.
5. Define the concept of “the impossible trinity”.
6. What were the three properties that Keynes proposed a consumption function should have?
7. Which one of Keynes’ three consumption function properties became the most questionable when looking at long-term aggregate data?
8. Define Milton Friedman’s permanent income hypothesis and give an example of a consumption function that fits the permanent income hypothesis.
9. Which would Fisher, Friedman, and Modigliani say is bigger, the variance in consumption over an individual’s lifetime  $var(c)$  or the variance in income over an individual’s lifetime  $var(y)$ ? Why?
10. What are the three main components of investment  $I$ ?

11. Define Tobin's  $q$  and say whether investment should increase or decrease when  $q > 1$ .
12. Define the efficient markets hypothesis. What does it imply about you if you can make above average profits on a regular basis investing in the market?
13. Define fractional reserve banking.
14. True or False. The Federal Reserve can control the amount of currency in circulation.
15. Explain why the reserve requirement does not perfectly control the amount of reserves that banks hold.
16. Define the portfolio theory of money.
17. The Federal Reserve conducts open market operations (buying and selling of bonds to change the money supply) to target what economic indicator?
18. What drives short-run changes in output  $Y$  according to Real Business Cycle (RBC) theory?
19. Name two New Keynesian modeling characteristics that Real Business Cycle theorists have added to their models in order to match the data better?
20. What is likely the biggest question that macroeconomist will be wrestling with over the next 15 years?

## Part 2: Analytical problems

(60 points possible)

21. **Microfoundations of consumption problem (20 points):** An individual (who is representative of all the other individuals in the economy) lives for two periods. Period 1 is young and period 2 is old. Assume that the real interest rate on savings and borrowing is  $r = 0.05$ .
- (a) If income in the first period of life is  $Y_1 = 15$  and income in the second period of life is  $Y_2 = 10$ , write down the intertemporal budget constraint.
  - (b) Assume that Modigliani's life cycle hypothesis is true and utility can only be maximized if consumption is constant over the life cycle  $C_1 = C_2$ . What is the optimal consumption  $C_1$  and  $C_2$  such that utility is maximized given the intertemporal budget constraint in part (a)?
  - (c) Assume a different utility function from part (b). If the lifetime utility function of the representative agent is  $U = (C_1)^{0.5}(C_2)^{0.5}$ , calculate the utility maximizing levels of consumption  $C_1$  and  $C_2$  given the intertemporal budget constraint from part (a). Is the agent a saver or a borrower?
  - (d) Given the utility function from part (c) for the rest of the questions in this problem, what are the optimal levels of consumption  $C_1$  and  $C_2$  if the agent is borrowing constrained  $S \geq 0$ ?
  - (e) What would be the effect on consumption  $C_1$  and  $C_2$  of a government policy that increased income in the second period of life to  $Y_2 = 20$ ? Would the agent be a saver or a borrower at the new consumption levels?
  - (f) Assume that  $Y_2 = 10$  again. What would be the effect on consumption  $C_1$  and  $C_2$  if the monetary authority reduced the real interest rate to  $r = 0.02$ ? That is, give the new levels of  $C_1$  and  $C_2$  that maximize utility.

22. **Microfoundations of investment problem (20 points):** Assume an economy populated with two types of firms—production firms and rental firms. Production firms rent capital  $K$  from rental firms at nominal price  $R$ . Production firms also hire labor  $L$  at nominal wage  $W$  in order to produce their output  $Y$  that they sell at nominal price  $P$ . The production function of production firms takes the following Cobb-Douglas form:

$$Y = 3K^{\frac{1}{3}}L^{\frac{2}{3}}$$

The key decision for production firms is how much capital  $K$  to rent from rental firms. On the other hand, rental firms rent capital  $K$  to production firms for nominal price  $R$ . The nominal costs of rental firms can be broken down into three parts—the opportunity cost ( $iP_K K$ ), the appreciation value from the market ( $-\Delta P_K K$ ), and the depreciation from use ( $\delta P_K K$ ). The key decision of rental firms is how much capital  $K$  to buy at the market price  $P_K$ .

- (a) Derive the function for demand for capital  $K^D$  on the part of production firms that maximizes their profits. That is, write out the nominal profit function for the production firm, and derive the demand for capital  $K^D$  from it. This will be a function of the real rental rate of capital. Show that  $K^D$  is a negative function of the real rental rate.
- (b) Assuming that the rate of capital price increase equals the rate of aggregate price increase  $\frac{\Delta P_K}{P_K} = \frac{\Delta P}{P}$ , derive the real profit function for a rental firm in terms of  $K$ ,  $P_K$ ,  $P$ ,  $R$ ,  $r$ , and  $\delta$ , where  $r = i - \pi$  is the real interest rate.
- (c) Derive the function for supply of capital  $K^S$  (that rental firms supply to production firms) that maximizes the real profits of rental firms. [Note: This involves substituting the  $MPK$  relation from the production firm problem into the rental firm's profit maximization problem.]
- (d) Assume that the Consumer Price Index (CPI), a measure of *aggregate price levels*, is reported on January 16, 2009 to have fallen, but that the rental price of capital stays the same. What does this model say will happen to investment and why?
- (e) Assume the monetary authority can affect real interest rates  $r$ . What should the monetary authority do in response to the scenario in part (d) if it wants to keep investment stable?

23. **Microfoundations of money problem: supply and demand (20 points):**

Assume that banks in this economy act as financial intermediaries and take deposits, hold *exactly* the reserve requirement in reserves, and loan out the rest of the money. Assume all individuals deposit all their money in the bank and hold no currency so that the currency-deposit ratio  $C/D$  is zero and so there is no need for currency  $C = 0$ . Then the monetary base equals the amount of reserves  $B = R$  and the money supply equals deposits  $M^S = D$ .

- (a) If the reserve requirement is  $rr = 0.10$ , calculate the money multiplier  $m$ .
- (b) Give an expression of the nominal money supply  $M^S$  in terms of the money multiplier  $m$  and the monetary base  $B$ .
- (c) How much would the money supply  $M^S$  increase if the monetary authority injected \$1,000 of monetary base  $B$  into this economy?

Assume that the representative individual in this economy wants to spend all his income  $Y = \$10,000$  evenly over the course of a year. The nominal interest rate that banks pay on deposits is  $i = 0.02$ . Let  $N$  be the number of trips an individual makes to the bank to withdraw money and the withdrawal amount is the same each time  $Y/N$ . The cost of each trip to the bank to make a withdrawal is  $F = \$3$ .

- (d) If each withdrawal is  $Y/N$ , give an expression for the average money holdings of the representative individual.
- (e) Given the expression for average money holdings, write down an expression for the total cost of holding money.
- (f) Derive the optimal number of trips  $N^*$  that an individual would choose to make to the bank in order to minimize the total cost of holding money.
- (g) If nominal money demand  $M^D$  is defined as the average money holdings of individuals making an optimal number of trips to the bank  $N^*$ , then what is the money demand  $M^D$  in this economy?