Department of Economics University of Maryland

Economics 325
Intermediate Macroeconomic Analysis
Midterm Exam – Part 2
Professor Sanjay Chugh
Fall 2008
October 16, 2008

NAME: ______________________________

Part 2 of the Exam has a total of three (3) problems and pages numbered one (1) through six (6). Each problem's total number of points is shown below. Your solutions should consist of some appropriate combination of mathematical analysis, graphical analysis, logical analysis, and economic intuition, but in no case do solutions need to be exceptionally long. Your solutions should get straight to the point – **solutions with irrelevant discussions and derivations will be penalized.** You are to answer all questions in the spaces provided

You may use one page (double-sided) of notes. You may **not** use a calculator.

Problem 3	**/ 11**
Problem 4	**/ 15**
Problem 5	**/ 24**
TOTAL PART 2	**/ 50**

Problem 3: Government Budgets and Government Asset Positions (11 points). Just as we can analyze the economic behavior of consumers over many time periods, we can analyze the economic behavior of the government over many time periods. **Suppose that at the beginning of period *t*, the government has zero net assets**. Also assume that the real interest rate is **always *r* = 0.** The following table describes the **real** quantities of government spending and **real** tax revenue the government collects starting in period *t* and for several periods thereafter.

Period	**Real government expenditure (*g*) during the period**	**Real tax collections during the period**	**Quantity of net government assets at the END of the period**
t	10	12	
***t*+1**	8	14	
***t*+2**	15	10	
***t*+3**	10	10	
***t*+4**	8	12	

a. **(7 points)** Complete the last column of the table based on the information given. **Briefly** explain the logic behind how you calculate these values.

b. **(4 points)** Suppose instead the government ran a balanced budget every period (i.e., every period it collected in taxes exactly the amount of its expenditures that period). In this balanced-budget scenario, what would be the government's net assets at the end of period *t*+4? **Briefly** explain/justify.

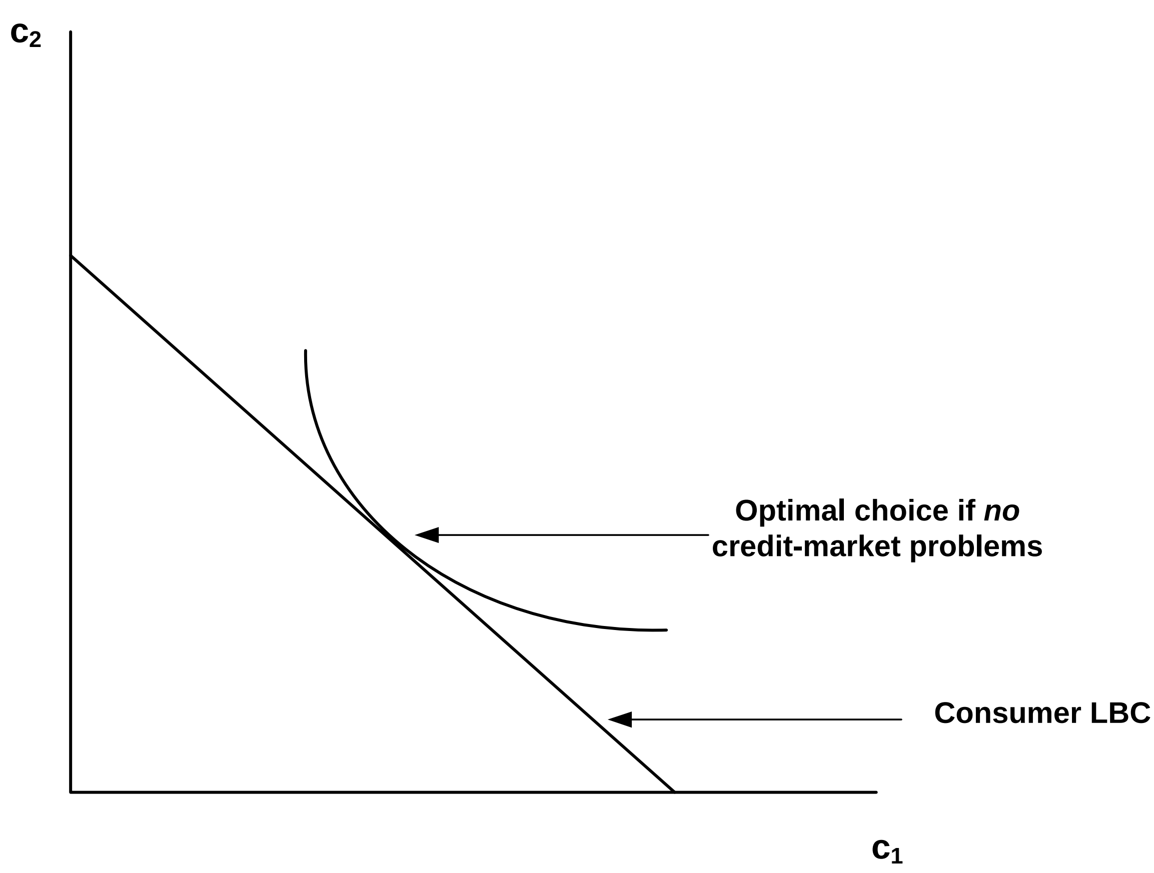
Problem 4: A Contraction in Credit Availability (15 points). The graph below shows our usual two-period indifference-curve/budget constraint diagram, with period-1 consumption plotted on the horizontal axis, period-2 consumption plotted on the vertical axis, and the downward-sloping line representing, as always, the consumer's LBC. Throughout all of the analysis here, assume that ***r* = 0 always.** Furthermore, there is no government, hence never any taxes.

Suppose that the representative consumer has lifetime utility function $u(c_1, c_2) = \ln c_1 + \ln c_2$, and that the **real** income of the consumer in period 1 and period 2 is y_1 = 12 and y_2 = 8. Finally, suppose that the initial amount of net assets the consumer has is a_0 = 0. **EVERY** consumer in the economy is described by this utility function and these values of y_1, y_2, and a_0.

a. **(6 points)** If there are no problems in credit markets whatsoever (so that consumers can borrow or save as much or as little as they want), compute the numerical value of the optimal quantity of period-1 consumption. (**Note:** if you can solve this problem without setting up a Lagrangian, you are free to do so as long as you explain your logic.)

b. **(9 points)** Now suppose that because of problems in the financial sector, no consumers are allowed to be in debt at the end of period 1. With this credit restriction in place, compute the numerical value of the optimal quantity of period-1 consumption. **ALSO,** on the diagram on the next page, qualitatively and **clearly** sketch the optimal choice with this credit restriction in place (qualitatively sketched already for you is the optimal choice if there are no problems in credit markets). Your sketch should indicate **both** the new optimal choice **and** an appropriately-drawn and labeled indifference curve that contains the new optimal choice. (**Note:** if you can solve this problem without setting up a Lagrangian, you are free to do so as long as you explain your logic.)

Problem 4b continued



Problem 5: Two Types of Stock (24 points). Consider a variation of our usual infinite-period "stock-pricing" model. The variation here is that there are **two distinct "types" of stock** (rather than just one) that the representative consumer can buy: "Dow" stock and "S&P" stock. Denote by a_{t-1}^{DOW} the representative consumer's holdings of Dow stock at the beginning of period t and by a_{t-1}^{SP} the representative consumer's holdings of S&P stock at the beginning of period t. Likewise, let S_t^{DOW} and S_t^{SP} denote, respectively, the nominal price of Dow and S&P stock in period t, and D_t^{DOW} and D_t^{SP} denote, respectively, the per-share nominal dividend that Dow and S&P stock pay in period t. The period-t budget constraint of the representative consumer is thus

$$P_t c_t + S_t^{SP} a_t^{SP} + S_t^{DOW} a_t^{DOW} = Y_t + (S_t^{SP} + D_t^{SP}) a_{t-1}^{SP} + (S_t^{DOW} + D_t^{DOW}) a_{t-1}^{DOW},$$

in which all of the other notation is standard: Y_t denotes nominal income (over which the consumer has no control) in period t, c_t is real units of consumption, and P_t is the nominal price of each unit of consumption. Also as usual, the lifetime utility of the consumer starting from period t onwards is $u(c_t) + \beta u(c_{t+1}) + \beta^2 u(c_{t+2}) + \beta^3 u(c_{t+3}) + \ldots$, where $\beta \in (0,1]$ is the usual measure of consumer impatience.

The sequential Lagrangian for this problem is

$$\begin{aligned}
&u(c_t) + \beta u(c_{t+1}) + \beta^2 u(c_{t+2}) + \ldots \\
&+ \lambda_t \left[Y_t + S_t^{SP} a_{t-1}^{SP} + D_t^{SP} a_{t-1}^{SP} + S_t^{DOW} a_{t-1}^{DOW} + D_t^{DOW} a_{t-1}^{DOW} - P_t c_t - S_t^{SP} a_t^{SP} - S_t^{DOW} a_t^{DOW} \right] \\
&+ \beta \lambda_{t+1} \left[Y_{t+1} + S_{t+1}^{SP} a_t^{SP} + D_{t+1}^{SP} a_t^{SP} + S_{t+1}^{DOW} a_t^{DOW} + D_{t+1}^{DOW} a_t^{DOW} - P_{t+1} c_{t+1} - S_{t+1}^{SP} a_{t+1}^{SP} - S_{t+1}^{DOW} a_{t+1}^{DOW} \right] \\
&+ \ldots.
\end{aligned}$$

a. **(8 points)** Based on the Lagrangian presented above, compute the first-order conditions with respect to both a_t^{SP} and a_t^{DOW} .

Problem 5a continued (if you need more space)

b. **(8 points)** Based on the expressions you obtained in part a above, determine whether it is the case that $S_t^{DOW} = S_t^{SP}$? If so, briefly explain why; if not, briefly explain why not; if it's not possible to tell, explain why not.

Problem 5 continued

c. **(8 points – Harder)** Assume here for simplicity that $\beta = 1$. Suppose the economy eventually reaches a steady-state. In this steady state, Dow stock continue to pay zero dividends but S&P stock pay a nominal dividend that is **always one-tenth the nominal price of a share of S&P stock.** That is, in the steady state, $D^{SP} = 0.1S^{SP}$. Further suppose that in the steady-state, the inflation rate of consumer goods prices between one period and the next is always 10 percent (i.e., $\pi = 0.10$). Compute numerically the **steady-state rate at which the nominal price of *each* type of stock grows every period** (i.e., what you're being asked to compute is the "inflation" or "appreciation" rates of each of the two types of stock). Justify your answer with any appropriate combination of mathematical, graphical, or qualitative arguments. **Also provide brief economic rationale/intuition for your findings.**

END OF PART 2 OF EXAM