

Midterm 2 Practice Problems

ECON 30020, Intermediate Macroeconomics, Spring 2026
The University of Notre Dame
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These are practice questions and problems to assist you with studying for the first midterm (covering Part II: Micro of Macro).

I. True/False Questions:

1. Suppose that an optimizing household is initially a saver (i.e. $C_t < Y_t$). Then an increase in the real interest rate, r_t , always results in current consumption falling.
2. The overall effect of an increase in the real interest rate on consumption of a borrower could be positive or negative.
3. For a saver, the income effect of an increase in the real interest rate is to reduce current consumption.
4. For a saver, the overall effect of an increase in the real interest rate on current consumption is theoretically ambiguous.
5. The marginal propensity to consume (MPC) does not depend on income or the real interest rate.
6. Ricardian Equivalence means that government debt does not matter.
7. In either an endowment economy or a production economy with endogenous investment, the IS curve plots combinations of the real interest rate and output where aggregate saving is strictly positive.
8. In an endowment economy where households have identical preferences but potentially different endowment patterns, so long as agents can freely borrow and lend with one another the equilibrium real interest rate depends only on aggregate endowments across time, not how those endowments are distributed across agents.
9. If the government outlives households, then Ricardian Equivalence may not hold.
10. A higher nominal interest increases the opportunity cost of holding money.
11. In a two period consumption-saving problem, first period saving ought to react more to a persistent change in income (i.e. Y_t and Y_{t+1} both increase) compared to a transient change in income (i.e. Y_t increases and Y_{t+1} is unaffected).
12. If the utility function is the natural log (i.e. $u(C_t) = \ln C_t$), then the *third* derivative of the utility function is positive.

13. Precautionary saving refers to a situation in which a household increases its saving in period t in anticipation of lower income in period $t + 1$.
14. In an endowment economy, a deficit-financed increase in G_t should have a *bigger* effect on r_t when Ricardian Equivalence does *not* hold.
15. Under standard assumptions, the IS curve in a model with variable investment should be flatter than the IS curve in an endowment economy in which there is no investment.
16. In a standard endowment economy with heterogeneous agents, the equilibrium real interest rate does not depend on the distribution of endowments across agents, only on the aggregate endowments across time.
17. Under Ricardian Equivalence, the effect of an increase in G_t on r_t is independent of whether the increase in spending is financed via debt or taxes.

II. Multiple-Choice Questions:

1. Suppose that we have a two-period consumption-saving model with log utility. If consumption is expected to grow, then:
 - (a) $\beta(1 + r_t) = 1$
 - (b) $\beta(1 + r_t) < 1$
 - (c) $\beta(1 + r_t) > 1$
 - (d) not enough information
2. Suppose we observe consumption, C_t , declining when the interest rate, r_t , increases. This means:
 - (a) The household is definitely a borrower
 - (b) The household is definitely a saver
 - (c) Not enough information
3. In the two-period consumption-saving model, the maximum that a household can borrow in the first period is:
 - (a) Y_t (its income)
 - (b) Y_{t+1} (its future income)
 - (c) $\frac{Y_{t+1}}{1+r_t}$
 - (d) $(1 + r_t)Y_t$
4. In a two-period model, suppose that the value of the government's outstanding debt is $B_t = 1$. Suppose that the real interest rate is $r_t = 0.1$. What must be the value of period $t + 1$ primary surplus ($T_{t+1} - G_{t+1}$)?

- (a) 1
 - (b) 1.1
 - (c) -1.1
 - (d) -1
 - (e) it is indeterminate due to Ricardian Equivalence
5. Suppose that the future (period $t+1$) is uncertain. In particular, a household's period- $t+1$ consumption could be 1.2 (with probability $1/2$) or 0.8 (also with probability $1/2$). If the household's utility function is the natural log, the expected marginal utility of future consumption (i.e., $\mathbb{E}(1/C_{t+1})$) will be:
- (a) 1
 - (b) Less than 1
 - (c) Greater than 1
6. If a household is behaving optimally, then the marginal utility of leisure ought to equal:
- (a) The marginal utility of consumption
 - (b) The real wage
 - (c) The marginal utility of consumption times the real wage
 - (d) One plus the real interest rate
7. In an endowment economy, in response to an anticipated increase in the future endowment, a household would like to ____ its current saving, but in equilibrium its saving ____.
- (a) increase; is unchanged
 - (b) decrease; is unchanged
 - (c) increase; is higher
 - (d) decrease; is lower
8. A precautionary saving motive requires:
- (a) the third derivative of the utility function to be positive
 - (b) the third derivative of the utility function to be negative
 - (c) the discount factor (β) to be 1
 - (d) taxes to be lump sum
9. If the real interest is 4 percent and expected inflation is 2 percent, the nominal interest rate ought to be approximately equal to:

- (a) 2 percent
 - (b) 4 percent
 - (c) 6 percent
 - (d) 8 percent
10. If households do not receive utility from holding real money balances, then a positive nominal interest rate means households will want to hold:
- (a) no money
 - (b) an infinite amount of money
 - (c) an indeterminate amount of money
11. All of the following are reasons why a household might increase its current saving in the two period consumption model *except*:
- (a) future income is more uncertain
 - (b) future income is expected to be lower
 - (c) future income is expected to be higher
 - (d) current income is higher than expected
12. All of the following are implications of the permanent income hypothesis (PIH) *except*:
- (a) consumption is a function of permanent income, not just current income
 - (b) consumption should react more to a persistent change in income than to a transitory change in income
 - (c) the MPC (marginal propensity to consume) should be less than 1
 - (d) the MPC will be bigger the younger is a household (i.e. the more remaining years of life it has)
13. The implication that households would like to smooth consumption relative to income follows from which assumption?
- (a) diminishing marginal utility
 - (b) positive marginal utility
 - (c) the discount factor is assumed to be between 0 and 1
 - (d) a positive third derivative of the flow utility function
14. Which of the following is the *most complete* statement concerning the *IS* curve?
- (a) It shows combinations of (r_t, Y_t) consistent with household and firm optimization
 - (b) It shows combinations of (r_t, Y_t) consistent with income equaling expenditure

- (c) It shows combinations of (r_t, Y_t) consistent with household and firm optimization and income equaling expenditure
- (d) It shows combination of (r_t, Y_t) consistent with household and firm optimization and income equaling production

III. Free-Response Questions:

1. Suppose that you have a standard two-period consumption-saving model. A household begins life with no wealth, and may save or borrow at interest rate r_t . A household faces the flow budget constraints (assume that these hold with equality):

$$C_t + S_t = Y_t$$

$$C_{t+1} + S_{t+1} - S_t = Y_{t+1} + r_t S_t$$

- (a) Briefly explain, with reference to the variables in these two budget constraints, the distinction between flow saving and stock savings.
 - (b) What must be true about S_{t+1} ? Why? Provide a brief explanation.
 - (c) Using your answer on (b), combine the two flow budget constraints into one, intertemporal budget constraint.
 - (d) Suppose that the household has an endowment pattern with $Y_t = 0$ and $Y_{t+1} > 0$. In a graph with C_{t+1} on the vertical axis and C_t on the horizontal axis, draw the budget line. Carefully label the vertical and horizontal axis intercepts, as well as the endowment point.
 - (e) Suppose that the household has “standard” preferences (standard meaning that our typical assumptions on the utility function hold). Take your budget line and draw in an indifference curve where the household has optimally chosen a consumption bundle (you may do this on the graph above). Will the household be borrowing or saving in the first period?
 - (f) Suppose that the real interest rate increases. Show how the increase in the interest rate affects the budget line. Decompose the effects of the higher interest rate on C_t and C_{t+1} in terms of substitution and income effects. Can you sign the overall effect of the higher interest rate on C_t and C_{t+1} ? If so, what are the signs of the overall effects? You may use your earlier graph, or draw a new one in the space provided.
2. Suppose that you have a standard two-period consumption saving model. The household faces the problem:

$$\max_{C_t, C_{t+1}} U = \ln C_t + \beta \ln C_{t+1}$$

s.t.

$$C_t + \frac{C_{t+1}}{1 + r_t} = Y_t + \frac{Y_{t+1}}{1 + r_t}$$

- (a) Use calculus to derive the consumption Euler equation. Provide some brief, written intuition for why the Euler equation must hold if the household is optimizing.
 - (b) Use the Euler equation to derive a savings function, i.e. $S_t = S^d(Y_t, Y_{t+1}, r_t)$.
 - (c) Produce analytic expressions for the partial derivative of the savings function with respect to all three arguments. Can you definitively sign all three partial derivatives? If so, what are the signs?
 - (d) Define the marginal propensity to save (MPS) as $\frac{\partial S^d(Y_t, Y_{t+1}, r_t)}{\partial Y_t}$. How does the value of the parameter β impact the magnitude of the MPS? Provide some brief, written intuition for your answer.
3. Consider a static model (i.e., there is only one time period – period t – and no future). A representative household has the problem:

$$\max_{C_t, N_t} U = \ln [C_t + \theta_t \ln(1 - N_t)]$$

s.t.

$$C_t = w_t N_t + D_t$$

You may assume that the exogenous variable θ_t lies between 0 and 1 (i.e., $0 < \theta_t < 1$). D_t is a dividend payment from ownership in the production firm; the household takes this as given. A representative production firm produces output according to the production function $Y_t = N_t$. Its dividend is $D_t = Y_t - w_t N_t$.

- (a) Use calculus to derive a first-order optimality condition for the household problem.
 - (b) Use calculus to derive a first-order optimality condition for the firm problem.
 - (c) What is the aggregate resource constraint for this economy?
 - (d) Solve for exact analytic expressions for the equilibrium values of w_t , Y_t , C_t , and N_t .
 - (e) Suppose that θ_t increases. Sign the effects of this change on w_t , Y_t , C_t , and N_t . Please provide some written intuition for your answer regarding the effect of θ_t on w_t .
4. Consider two individuals – Big Tony and Little Tony. Both are 55 and plan to retire at 65. Big Tony gets fired and goes into early retirement and his income declines. You observe his consumption declining significantly relative to his consumption when he was 54. Little Tony retires at 65 as planned, and his income flow between 55 and 65 is as he expected at age 55. When he retires, you also observe his consumption dropping significantly relative to his consumption while he was working. Whose behavior – Big Tony or Little Tony – is consistent with the implications of the random walk hypothesis, and whose is not? Explain briefly.

5. Consider a static, one-period model of the macroeconomy. There is a representative household. The household can choose how much to consume and how much to work. There is no saving since the model is static. The household problem is:

$$\max_{C_t, N_t} U = \ln \left[C_t - \frac{N_t^{1+\chi}}{1+\chi} \right], \quad \chi \geq 0$$

s.t.

$$C_t = w_t N_t + D_t$$

Here N_t is labor, C_t consumption, D_t a dividend received from ownership of the firm, and w_t is the real wage. χ is a non-negative parameter. A firm produces output according to the production technology:

$$Y_t = A_t N_t$$

The firm's dividend is:

$$D_t = Y_t - w_t N_t$$

The firm's objective is to pick N_t to maximize D_t :

$$\max_{N_t} D_t = A_t N_t - w_t N_t$$

- (a) Use calculus to derive a first order condition characterizing optimal behavior by the household.
- (b) Use calculus to derive a first order condition characterizing optimal behavior by the firm.
- (c) Given your previous answers, what will be true about D_t in equilibrium?
- (d) Given previous answers, derive the aggregate resource constraint.
- (e) Use previous answers to derive an expression for equilibrium Y_t as a function of the exogenous variable, A_t .
- (f) How is the sensitivity of Y_t to A_t (i.e. the magnitude of the derivative you derived on the previous part) impacted by the value of χ ? Please provide some graphical intuition for why this is the case.