

Cornell University

#### ECON 3040 Intermediate Macroeconomic Theory

#### Prelim 1: Review session

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## About the exam :

- The first prelim is on Wednesday in class
   Arrive 5 minutes ahead of time
- Bring :
  - <u>One</u> cheat-sheet 8.5" x 11" (both sides)
    - Cannot be reproduction of large sections of material (lectures slides, textbook, problem set solution, etc)
  - A calculator (no phone/tablet/computer allowed)

# **Preparation for Midterm**

- Make sure you solve as many questions as you can from the textbook.
- Review the problem sets
- Make sure you understand the slides well

# Plan for today

- Go over two problems
  - ABC Chapter 3 Problem 5
  - Practice consumption savings problem
- Answer questions

#### ABC Ch. 3 Numerical Problem 5

- **5.** Consider an economy in which the marginal product of labor *MPN* is MPN = 309 2N, where *N* is the amount of labor used. The amount of labor supplied, *NS*, is given by NS = 22 + 12w + 2T, where *w* is the real wage and *T* is a lump-sum tax levied on individuals.
  - a. Use the concepts of income effect and substitution effect to explain why an increase in lump-sum taxes will increase the amount of labor supplied.
  - b. Suppose that T = 35. What are the equilibrium values of employment and the real wage?
  - c. With T remaining equal to 35, the government passes minimum-wage legislation that requires firms to pay a real wage greater than or equal to 7. What are the resulting values of employment and the real wage?

# ABC Ch. 3 Numerical Problem 5

- Economy with MPN = 309 2N
- Labor supply: NS = 22 + 12w + 2T
- T: Lump-sum tax
- Why is it that an increase in taxes increases labor supply?

- Income effect dominates; no substitution effect

## ABC Ch. 3 Problem 5

- Economy with MPN = 309 2N
- Labor supply: NS = 22 + 12w + 2T

• Labor demand:

 $MPN = w \rightarrow ND = (309 - w) / 2$ 

## ABC Ch. 3 Problem 5

• Equilibrium (T = 35)  

$$ND = NS \rightarrow (309 - w) / 2 = 22 + 12w + 2T$$
  
 $(309 - w) / 2 = 22 + 12w + 70$   
 $309 / 2 - 92 = 12w + w / 2$   
 $w = 5$ 

• We can solve for w. Use either demand or supply function to find N.

N = (309 - 5) / 2 = 152

## ABC Ch. 3 Problem 5

- What happens if we introduce a minimum wage?
  - It depends on the value of minimum wage, if it is below equilibrium wage, no effect.
- In our case, wm = 7. The equilibrium wage was
   w = 5 so the minimum wage is binding.
- The wage is therefore w = 7 and the level of employment N = (309 - w) / 2 = 151



## **Consumption and Savings**

- Problem:
  - A consumer lives for two periods. Initial assets are 497 apples. Labor income is 3410 apples in the first period and 5115 apples in the second period. There is a 20% tax on labor income in each period. The slope of the consumer's indifference curves is  $-(1.2)(c^f/c)^{0.5}$ , where *c* is consumption in the first period and  $c^f$  is consumption in the second period.
  - The nominal interest rate is 40%. Interest earnings in the second period are taxed at a 20% tax rate, and interest payments in the second period are taxdeductible. The rate of inflation is zero.

#### Questions

• What is the value of the real after-tax interest rate?

 $-r_{after-tax} = (1-t)i - \pi = (1-0.2)(0.4) - 0 = 0.32$ , so  $r_{after-tax} = 0.32$  per period.

What is the after-tax present value of lifetime resources?

$$- PVLR = a + y + y^{f}/(1+r),$$

- a = 497 apples,

$$- y = (1 - 0.2)(3410) = 2728$$
 apples,

$$-y^{f} = (1 - 0.2)(5115) = 4092$$
 apples

$$-r = r_{after-tax} = 0.32.$$

Therefore,
 PVLR = 497 + 2728 + 4092/(1.32) = 3225 + 3100, so PVLR = 6325 apples.

## Questions

- What is the slope of the indifference curve at the optimal combination of consumption in the first period and consumption in the second period?
  - At the optimal consumption combination, the budget line is tangent to an indifference curve, so the slope of the indifference curve equals the slope of the budget line = -(1+r) = -1.32. Therefore, the slope of the indifference curve = -1.32 at that point.

#### Question

- What is the optimal value of the ratio  $c^f/c$ ?
  - -1.32 = slope of indifference curve  $= -(1.2)(c^{f}/c)^{0.5}$ , where the first equality is from previous question and the second equality is from the given expression for the slope of indifference curves.
  - $-1.32 = -(1.2)(c^{f}/c)^{0.5}$  which implies  $c^{f}/c = 1.21$ .

## Question

- What are the optimal values of consumption in the first period, saving in the first period, and consumption in the second period?
  - $c^{f} = (1.21)c$ . Substitute in  $c + c^{f}/(1+r) = PVLR$  to obtain c + (1.21)c/(1.32) = PVLR. After some math c = 3300 apples. Saving in the first period is s = y - c = 2728 - 3300 = -572 apples. From the budget constraint,  $c^{f} = (a+y-c)(1+r)+y^{f} = (497 + 2728 - 3300)(1.32) + 4092 = -99 + 4092 = 3993 = c^{f}$ .