

ECON 222
Macroeconomic Theory I
Fall Term 2010

Assignment 2

*Due: Drop Box 2nd Floor Dunning Hall by **noon October 15th 2010***

No late submissions will be accepted
No group submissions will be accepted
No “Photocopy” answers will be accepted

*Remarks: Write clearly and concisely. Present graphs, plots and tables in a format that is easy to understand. The way you present your answers will be reflected in the final grade. Even if a question is mainly analytical, **briefly** explain what you are doing, stressing the economic meaning of the various steps.*

Question 1: Productivity, Output and Employment (30 Marks)

Suppose we have an economy with only one aggregate production function, given by:

$$Y = AK\sqrt{N}$$

where A is TFP, K represents capital and N represents labour. Set $A = 1.2$ and $K = 121$. The price level is 1.

1. Use the production function to derive an algebraic expression for the demand curve for labour, explaining your reasons. Assuming that the wage rate for the economy was constant at 8.55, what would be the level of employment? Show your results graphically.
2. Now suppose that the supply curve is upward sloping and has the following form:

$$NS = \frac{47}{50}w^2$$

where w is the real wage rate. Show how this addition affects your results by calculating the new wage rate and new demand for labour. What has been the effect?

3. Suppose that a minimum wage of $w = 9.00$ is imposed. What is the quantity of labour that households are willing to supply? What is the demand for labour? Plot labour supply, labour demand, and the impact of the imposed wage rate on the labour market. What is the resulting level of employment? What is the rate of unemployment? Does the introduction of the minimum wage increase the total income of workers, taken as a group?
4. A production function is said to exhibit constant returns to scale (CRS) if $cF(K, L) = F(cK, cL)$ for any constant c . Does the above production function exhibit CRS? What does that imply in terms of aggregation?

Question 2: The Consumption/Saving Decision (30 Marks)

This question studies the present value budgeting problem introduced in Appendix 4A. Suppose Michelle's life can be divided into two aggregate blocks of time: period 1 and 2. Michelle is a professional hand model. In period 1, Michelle's hands are featured in many fashion magazine ads for nail polish, and she earns income $y_1 = 40$. In period 2, Michelle's hands are old and full of wrinkles, and very few companies are willing to hire her for nail polish photo shoots. As a result, she only receives income $y_2 = 21$. The nominal interest rate is 7 percent ($i = 0.07$), and the expected inflation rate is 2 percent ($\pi^e = 0.02$). The real interest rate is therefore 5 percent ($r = i - \pi^e = 0.05$).

1. Derive an expression for the budget constraint by setting the present value of Michelle's lifetime consumption (P VLC) equal to the present value of her lifetime income (PV LI). Then rearrange the budget constraint in terms of period 2 consumption. Interpret the expression. Use the notation

c_1 = consumption in period 1

c_2 = consumption in period 2

y_1 = income in period 1

y_2 = income in period 2

r = real interest rate

2. Based on the information above, what is the present value of her lifetime income? What is the highest feasible level of consumption Michelle could enjoy in period 1? What is the highest feasible level of consumption Michelle could enjoy in period 2? Use this information to graph the budget line. What is the slope of the budget constraint and what is its interpretation?
3. Michelle wishes to smooth her consumption over time, so that $c_1 = c_2 = c^*$. Find the optimal consumption in each period, c^* , and the amount of saving/borrowing. Is Michelle a borrower or a lender? Plot the optimal consumption point along with the budget line and the original no-borrowing, no-lending point on the graph. Also include in your graph an indifference curve representing Michelle's preferences that clearly identifies c^* as the optimal point.
4. Suppose that the government decides to institute a tax on interest earnings. Let $t = 1/7$ be the tax rate on interest earnings. The expected after-tax real interest rate is

$$r_{a-t} = (1 - t)i - \pi^e$$

Find the new optimal consumption and savings plan, and graphically show the effects of this policy change. Comparing with the result in part (b), explain which effect is stronger for Michelle, the substitution effect or the income effect?

Question 3: Consumption, Saving, and Investment (20 Marks)

Imagine a closed economy called Pabstania. The economywide expected future marginal product of capital is

$$MPK^f = 90 - 0.05K^f$$

where K^f is the future capital stock. The current capital stock in Pabstania is 1650 units, but capital depreciates at a rate of 20 percent per period ($d = 0.2$). The price of capital is 1 unit of output ($p_K = 1$). Firms in Pabstania pay taxes equal to 50 percent of their output ($\tau = 0.5$).

1. Suppose that the real interest rate is 5 percent per period. What are the values of the tax-adjusted user cost of capital, the desired future capital stock, and the desired level of investment?
2. Write the tax-adjusted user cost of capital as a function of the real interest rate r . Also write the desired future capital stock and desired investment as functions of r .

The consumption function in Pabstania is

$$C = 1050 + 0.63Y - 4500r$$

Moreover, government purchases equal 220 ($G = 220$), and full employment output is 4000 ($\bar{Y} = 4000$).

3. Use the investment function derived in part 2 along with the consumption function and government purchases, to calculate the real interest rate that clears the goods market. What are the goods market-clearing values of consumption, saving, and investment? What are the tax-adjusted user cost of capital and the desired capital stock in this equilibrium? Show your results graphically.

Question 4: Saving and Investment in an Open Economy (20 Marks)

Consider the following information for a small open economy:

$$\text{output, } Y = 1200$$

$$\text{desired consumption } C^d = 125 + 0.7Y - 600r^w$$

$$\text{desired investment } I^d = 250 - 200r^w$$

$$\text{government purchases } G = 190$$

$$\text{net factor payments } NFP = 0$$

1. Write national saving for the economy as a function of the world real interest rate r^w .
2. Suppose the world real interest rate is $r^w = 7\%$. Find the economy's national saving, investment, current account surplus, net exports, desired consumption, and absorption.
3. Owing to a large number of hard-working graduates from the Queen's Economics program, the economy's output rises by 300 to 1500. Repeat parts 1 and 2.