

MACROECONOMICS 73-240

REVIEW FOR MIDTERM 1

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Midterm 1

- 1) When: October 7 Monday, during class time
- 2) Covers Lectures 1 to 9 (includes Pareto Optimality)
- 3) Which is the same as Chapters 1,2,4,5 in textbook
- 4) Bring a pen! don't bring a calculator

Format

- ① 10 Short Questions (60% of midterm score)
 - Each Question is worth 6 points

- ② 3 Long Problems (40% of midterm score)
 - One 10 points problem

 - Two 15 points problem

Some advice: Plan your time accordingly. You should give yourself at least 40 minutes for the long problems.

What did we cover?

1 Measurement:

- How to calculate GDP
- Real vs. Nominal values
- How to calculate a price index and inflation

2 Modeling an aggregate economy:

- Household
- Firm
- Government
- Putting them together in a competitive equilibrium (CE)

3 Thinking about Private vs. Social Optimality:

- Social Planner

Measurement: GDP

3 ways to measure GDP

- Product Approach: Sum of value-added (value added = final value less value of intermediate goods)
- Expenditure Approach: Sum of all spending on newly produced final goods and services
- Income Approach: Sum of all income earned from newly produced final goods and services

Goal: Know how to measure this in data

Measurement: Real vs. Nominal

- 1) Nominal GDP is the market value of all final goods and services measured at **current prices**.

$$\text{Nominal GDP} = \sum_x P_{x,t} Q_{x,t}$$

- 2) Real GDP is the market value of all final goods and services measured at **constant prices**

$$\text{Real GDP} = \sum_x P_{x,b} Q_{x,t}$$

where b denotes the base year

Note: Not testing on chain weights since no calculators allowed.

Goal: Be able to talk about the productive capacity of an economy by focusing on Real values.

Measurement: Prices and inflation

1) Price Indices:

- GDP Deflator (Paasche Index)

$$\text{GDP Deflator}_t = \frac{\text{Nominal GDP}_t}{\text{Real GDP}_t} \times 100$$

- CPI (Laspeyres Index)

$$\text{CPI}_t = \frac{E_t}{E_b} \times 100 = \frac{\sum_x P_{x,t} Q_{x,b}}{\sum_x P_{x,b} Q_{x,b}}$$

where E denotes expenditure and b denotes the base year.

2) Inflation:

$$\text{Inflation}_t = \left(\frac{P_t}{P_t - 1} - 1 \right) \times 100$$

Goal: Should be able to construct price indices and know the differences between them and what they measure.

Modeling the Economy: the Household

1) Constraints:

- Time: $l + N^s = h$
- Budget:
 $c = \text{income}$ (types of income received depends on the question!)

2) Preferences:

- Utility function used to describe preferences
- Must know assumptions we make!

Goal: Know how to write down the household's problem

Modeling the Economy: the Household

A standard Household problem:

$$\max_{c, \ell} U(c, \ell)$$

s.t.

$$c = wN^s + \pi - T$$

and

$$N^s = h - \ell$$

Solving, you get two optimality conditions:

- Choice must be **desirable**

$$MRS_{\ell, c} = \frac{\partial U(c, \ell) / \partial \ell}{\partial U(c, \ell) / \partial c} = w = \text{opportunity cost of leisure}$$

- Choice must be **affordable**

$$c = wN^s + \pi - T$$

Modeling the Economy: the Household

Given any household problem, you should know:

- How to set-up the household's problem
 - Graphically (budget constraint and indifference curve)
 - Analytically
- How to characterize optimality conditions
- Comparative statics: e.g. what happens when π changes?
 - income vs substitution effects (IE vs. SE)
- Going from 1 to many: assumptions for aggregation

Modeling the Economy: the Firm

1) Production Function: $Y = zF(K, N)$

- Production function simply converts inputs into output
- Assumptions about $zF(K, N)$.

2) Firm's objective: maximize profits, takes (z, K, w) as given

$$\max_{N^d} \pi = zF(K, N^d) - wN^d$$

3) Characterize firm's optimality condition:

MB of 1 more unit of $N = MP_N = w = \text{MC of 1 more unit of } N$

Goal: Be able to set-up and solve the firm's problem!

Modeling the Economy: the Govt

1) has exogenous spending G (forced to spend G)

2) must collect enough tax revenue to finance G

- With lump-sum taxes

$$G = T$$

- With distortionary taxes (depends on what the tax instrument is)

$$\underbrace{\text{tax rate} \times \text{tax base}}_{\text{tax revenue}} = G$$

Goal: Understand how the government's choice of tax instrument affects the household and firm's problem.

Modeling the Economy: Putting all agents together

- 1) Know the definition of a competitive equilibrium (CE).
 - The definition tells you what variables are exogenous (z, K, G)
 - the definition tells you what agents are doing
 - Household privately optimizes
 - Firm privately optimizes
 - Govt balances its budget
 - the definition tells you how they come together:
 - Markets clear (Labor and Goods markets)

Modeling the Economy: Putting all agents together

2) Know how to graph a competitive equilibrium (CE).

- From the Firm: use production function $Y = zF(K, N)$ to draw Y in terms of l .
- From the Govt: know G . Together with the $Y = zF(K, N)$ from firm, can draw PPF

$$\text{PPF} : C = zF(K, h - \ell) - G$$

- From the HH: get budget constraint (BC) & indifference curve (IC)
- Putting together: a CE must be:
 - Feasible (on PPF)
 - Affordable (on BC)
 - Desirable

$$\underbrace{MRS_{\ell,c}}_{\text{slope of IC}} = \underbrace{w}_{\text{slope of BC}} = \underbrace{MPN = MRT_{\ell,c}}_{\text{slope of PPF}}$$

Modeling the Economy: Putting all agents together

3) Know how to analytically characterize a competitive equilibrium (CE).

- Characterize optimality from the Household problem
- Characterize optimality from the Firm's problem
- Govt balances its budget
- Bring agents together using markets:
 - When labor market clears, Household and firms face same wage rate:

$$MRS_{\ell,c} = w^* = MPN$$

- When goods market clears, how much output firms produce is equal to total output demanded by households and govt:

$$Y = C + G$$

Modeling the Economy: Putting all agents together

A standard example: characterize the competitive equilibrium:

- 1 Household utility: $U(c, l) = \ln c + \ln \ell$
- 2 Firm production function $Y = zK^\alpha N^{1-\alpha}$
- 3 Lump-sum tax T to finance spending G
- 4 Firm is born with capital.

Modeling the Economy: Putting all agents together

- 4) Know how outcomes change in our aggregate economy if exogenous variable changes
- How does economy react if z or K or G changes?

Privately vs. Socially Optimal

1) Social Planner's problem is the benchmark for deciding what is socially optimal.

- Know how to set up social planner problem

$$\max_{C, \ell} U(C, \ell)$$

s.t.

$$C = zF(K, h - \ell) - G$$

Observe that social planner wants to make households happy by maximizing their utility **while** respecting the feasibility constraints (PPF).

Privately vs. Socially Optimal

2) Social Planner's solution is always socially optimal.

- Know how to characterize the social planner's optimality conditions

$$\underbrace{MRS_{l,c}}_{\text{slope of IC}} = \underbrace{MRT_{l,c}}_{\text{slope of PPF}}$$

and PPF

3) With lump-sum taxes and under certain conditions:

- First welfare theorem: a CE is Pareto Optimal
- Second welfare theorem: any Pareto Optimum can be achieved by a CE with suitable transfers.

4) if exist distortionary taxes or externalities or missing markets or non-competitive firms

- A CE fails to be pareto optimal

Good luck on midterm 1!