Lecture 3

Money and Banking, Econ 345

Oleksiy Kryvtsov

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Summary from previous lecture

How much individuals (or society) want to consume?

- Preferences describe how individuals rank consumption bundles
- Feasible allocations are those that society can afford
- Optimal, or "golden rule", allocation is the most preferred feasible allocation
  - consider stationary per capital allocations: $(c_{1,t}\ ,\ c_{2,t+1}) = (c_1\ ,\ c_2)$

Today

Question: Can economy reach the optimal allocation through operation of markets where individuals trade goods?

Motivation: We will see that it can if market trades are conducted with help of money

1. Competitive equilibrium
2. Equilibrium without money
3. Equilibrium with money
4. Demand for money

Competitive equilibrium

Competitive equilibrium is a way of describing how markets work (goods, money, etc.):

1. Each individual makes trades to achieve his best affordable consumption...
2. ... taking prices as given
3. Supply equals demand ("markets clear")

Overlapping generations model (OLG)

		period					
generation	**size**	1	2	3	4	5	…
0	N0	0					
1	N1	y	0				
2	N2		y	0			
3	N3			y	0		
4	N4				y	0	
5	N5					y	…
6	N6						…
…							

Endowments:

young - y units

old - 0 (zero) units

Equilibrium without money

- Go back to OLG model diagram
- What is competitive equilibrium without money?
- Will young trade with:
  - current old? $\longrightarrow$ NO: current old have nothing to sell
  - current young? $\longrightarrow$ NO: they have same endowment, no benefit from trade
  - future young? $\longrightarrow$ NO: they are not born yet
  - cannot save either, because the good is perishable
- Equilibrium is *autarky*: no trade, consume endowment, $(c_1, c_2) = (y, 0)$
- In OLG model without money markets fail to implement optimal allocation

Game: Equilibrium without money

- Setup:
  - consumption good: orange, endowments: $(2, 0)$
  - preferences such that optimal allocation is $(1, 1)$
  - money supply: $(0, 0)$
  - 3 volunteers from class representing: current old, current young, future young
- Illustrate that equilibrium is *autarky*: no trade, consume endowment, $(c_1, c_2) = (2, 0)$
- In OLG model without money markets fail to implement optimal allocation

Equilibrium with money

- Introduce *fiat money*:
  - cannot be used for consumption or production
  - government can produce money at no cost
  - individuals cannot produce or counterfeit money
- Initial old endowed with M dollars
- Young exchange some of its endowment for money from current old...
- .... hold money till they are old...
- ... exchange money for some consumption from young
- ... etc. ...

Equilibrium with money

- Let p_t be the price of consumption good
  - note that value of money is inverse of price of the good: $v_t = 1/p_t$
  - if 1 apple costs 50 cents, than $v_t = 2$ apples
- Assume that fiat money will have a positive value in the future
  - $v_t > 0$ for all t
  - otherwise, people have no incentive to want money today

Individual budget constraint

- Young in t acquire m_t dollars of money by giving up m_t / p_t units of their endowment
- Young face budget constraint for c_1:

$$c_1 + m_t / p_t \leq y$$

- When they become old they face constraint for c_2:

$$c_2 \leq m_t / p_{t+1}$$

- Combining two constraints above yields *lifetime budget constraint*:

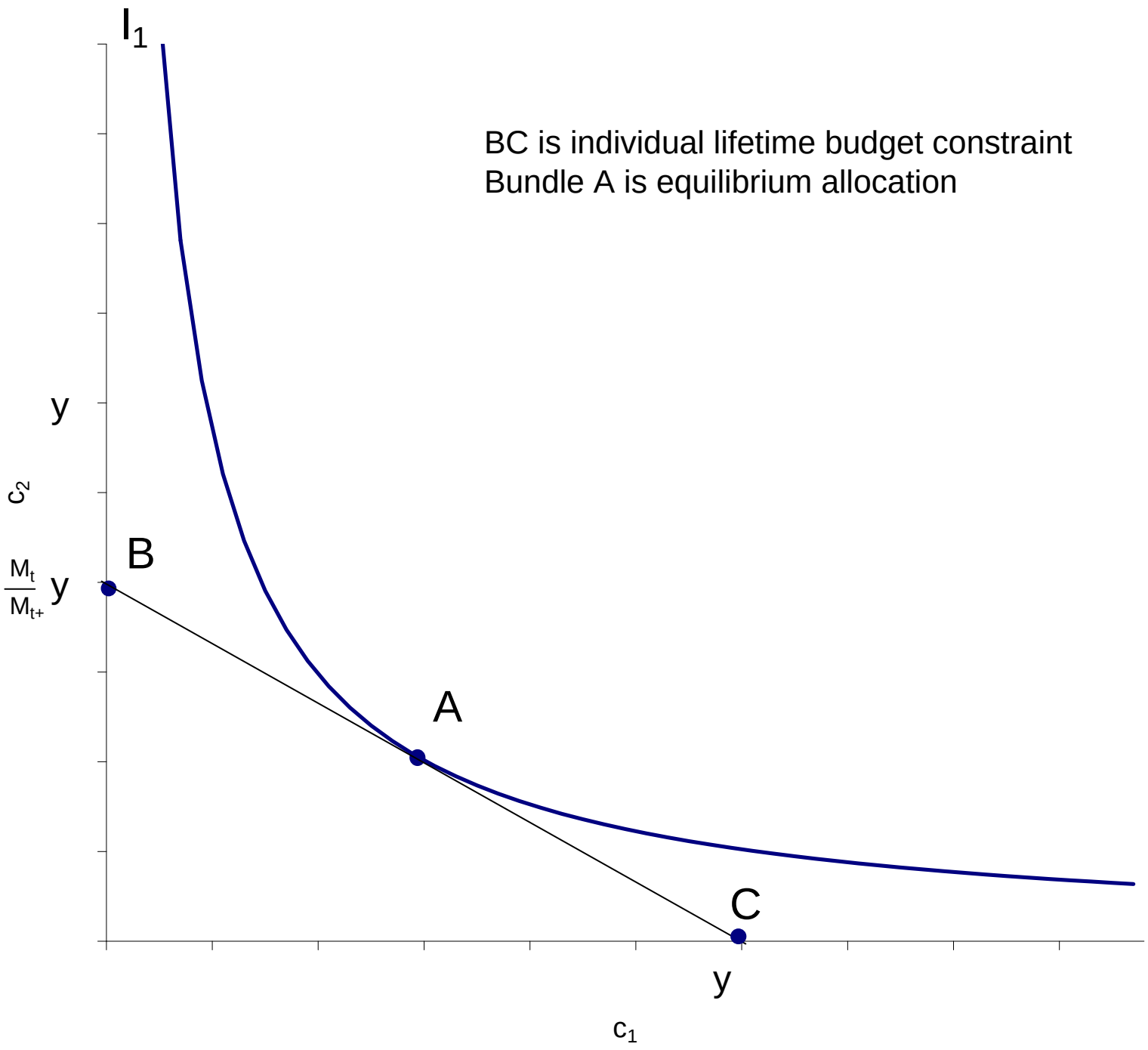
$$c_1 + \frac{p_{t+1}}{p_t} c_2 \leq y$$

- $\frac{p_t}{p_{t+1}}$ - *real rate of return of fiat money*

Game: Equilibrium without money

- Same setup, except initial old endowed with money $M = 5\$$
- What's individually optimal trade?
  - current old exchange 5\$ for 1 orange with current young
- Why 5\$ and not less?
  - because old will die next period
- Why 1 orange and not more or less?
  - because it is optimal for young
- Why accept 5\$?
  - because can use it when old to buy 1 orange
- What is the price of orange?
  - price of orange is 5\$
- What is return on money for the young?
  - invest in 5\$ 1 orange when young, buy 1 orange for 5\$ when old: return is $\frac{\text{return 1 orange when old}}{\text{invest 1 orange when young}} = 1$

Lifetime budget constraint and equilibrium allocation



Finding the real rate of return on fiat money

- In monetary equilibrium money market clears
  - total money demand in t = total money supply in t
- Total money demand in t is $N_t(y - c_1)p_t$ dollars
- Total money supply in t is M_t dollars, so

$$N_t(y - c_1)p_t = M_t$$

- We can use it to find return on money:

$$\frac{p_t}{p_{t+1}} = \frac{N_{t+1}}{N_t}\frac{M_t}{M_{t+1}}$$

- for constant population price is proportional to total money supply
  - Quantity Theory of Money

Is monetary equilibrium allocation optimal?

- Lifetime budget constraint:

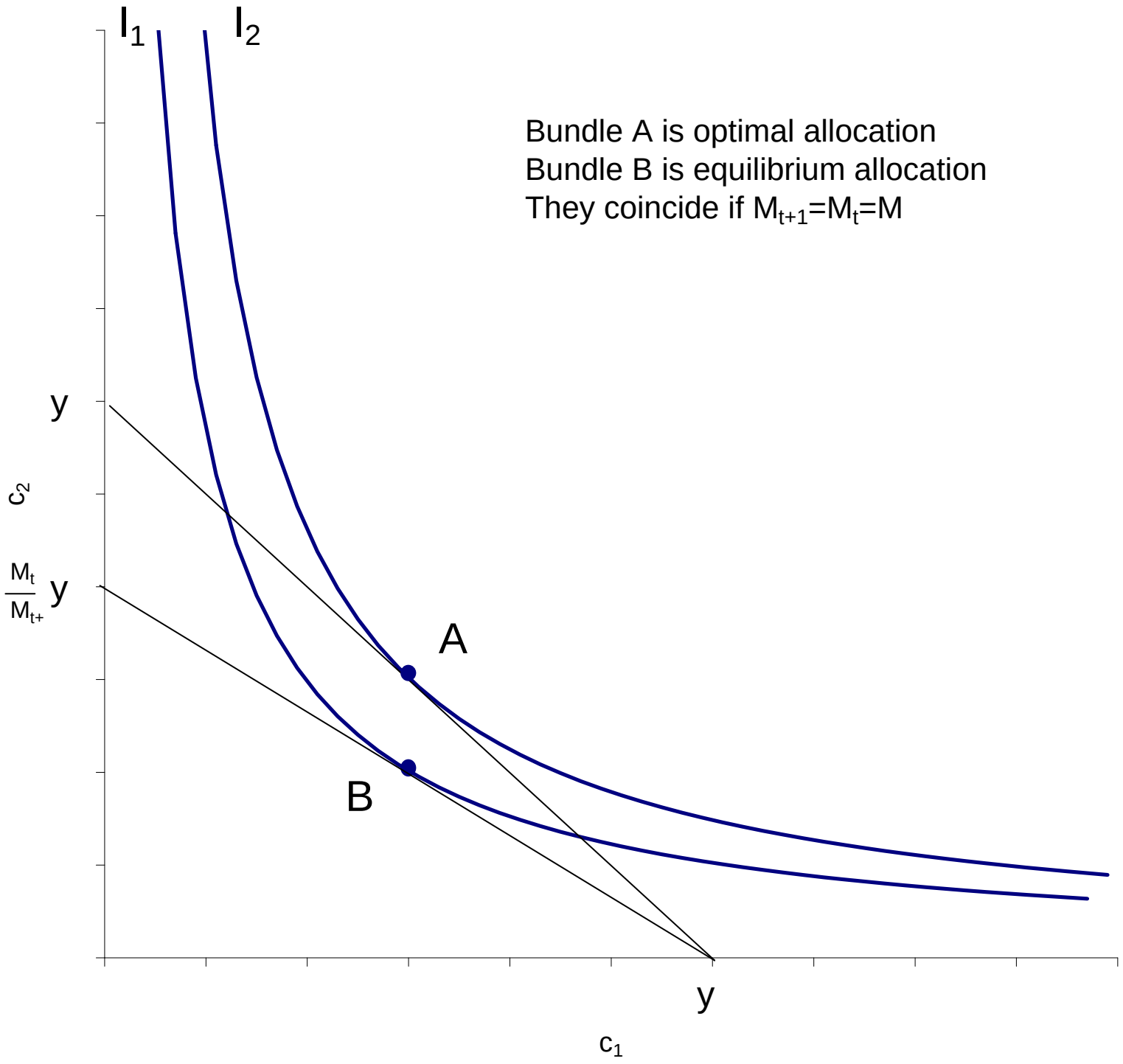
$$c_1 + \frac{M_{t+1}}{M_t} c_2 \leq y$$

- Recall, society's resource constraint:

$$c_1 + c_2 \leq y$$

- When money supply is constant, equilibrium allocation coincides with optimal (see Figure)

Equlibrium allocation is optimal if M is constant



Summary

- In competitive equilibrium individuals make individually optimal trades and markets clear
- In OLG model without money equilibrium is an autarky (no trades)
- In OLG with money equilibrium money facilitates desired trades
- Monetary equilibrium achieves optimal allocation if money supply is constant

Reading

Champ-Freeman Ch. 1