Chapter 2: Overlapping generation model of money

Reference: Champ and Freeman (ch. 1/3)

Objectives:

1) To understand the dynamic structure in an overlapping generation model
2) To understand the inefficiency of competitive equilibrium
3) To understand the essential role of money

1. Motivation

- **This lecture discusses about a model of demand for money.**

- **Problem with traditional approach for demand analysis**

  - Preference set, utility over consumption goods, and utility maximization.

  - However, money does not give us any direct utility, but only facilitate the transaction. Therefore, traditional approach wouldn't make sense as the model that explain behaviors of demand for money, or why money is used as the first place.

  - So, we need to model decision problem from the very foundation. We ask "Under what situation, does the money make a good use in the economy?" or "When does the money play an essential role to the allocation, and hence justify for its use and demand?"

  - By essential, this means " when does the introduction of money better-off the social welfare?

Idea: Money facilitates transaction and enhances the allocation under exchange economy.

  - In the trading economy where there exists no trading frictions, money is NOT essential.

- This arises under an idealistic world where we have a Walrasian auctioneer. Everyone in the economy submit their bidding to a centralized market clearing house.
- Practically, trading usually occurs at a decentralized level, and thus render to exist several types of ***trading frictions*** that agents actually encounter.

- Capturing/modeling the economic environment under which money arises to play its essential role in the allocation of competitive market is the purpose of this lecture.

- By the essential role of money, this is meant to refer to the situation when money is needed and improve the welfare of the allocation under an otherwise situation. (FFWT fails)

- **Technically, features needed for modeling the essential role of money :**

  - Friction(s) is needed!

Paper or fiat money is intrinsically useless in the sense that they do not directly yield utility and/or cannot be used as input in production. They do however lead to higher consumption/production by facilitating trading in real world. Now the question is what feature of real world leads to use of money as a facilitator of trading processes: ***Problem of the Double Coincidence of Wants*****:** In the absence of money it is difficult to acquire desired consumption good or input for production or sell goods.

➔ **Search-theoretic approach for money (will not be discussed in this class as it's a bit too difficult.)**

  - Dynamic setting *and* imperfect credit system

However, mere presence of the problem of double coincidence of wants is not enough. ***People should be willing to hold money as an asset (store of value).*** When a buyer buys good from a seller using money, then the seller is left with money which he/she cannot directly consume. ***The seller can potentially use the money to buy goods in future.*** Thus, if a seller is willing to sell his/her good for money, he/she must believe that others will also accept money in exchange for goods in future. A necessary condition for that is that there is always someone who will live in the next period.

2. Overlapping generation model of money

2.1) Structure of the model

- Infinite-lived economy; economy lasts forever. t = 1, 2, 3, ... , ...
- Agents are finite-lived, i.e. *2 periods*.
  - ➔ In the first period of their life, the agent is called "**YOUNG**" agent; meanwhile, in the second period of their life, the agent is called "**OLD**".
- For each period "t", a mass of "N_t" households are newly born.
  - ➔ Period t = 1 is special. There is an initial old agent!
    - N_0 : $\#\ of\ initial\ old\ agents$
  - ➔ For a given period "t", two different generations of people have lived together; the total population is $N_t + N_{t-1}$.
- Each newly-born agent is endowed with "y" units of output, and "0" in the next period.
  - ➔ Output is not storable, i.e. fully *perishable* over one period of time. (e.g. banana!)

Generation \ Period	1	2	3	4	5	6	7	
Initial old 0	0							
1	*y*	0						
2		*y*	0					
Future generations 3			*y*	0				
4				*y*	0			
5					*y*	0		
						...	...	

- **Preference**:

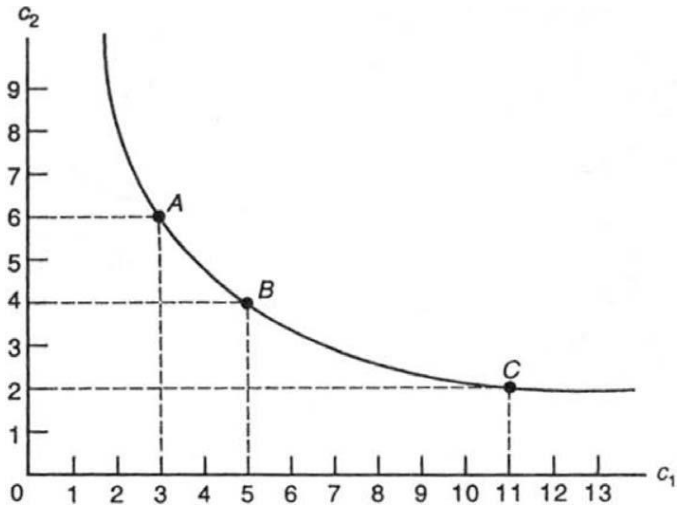
Future generations:

➔ For a new born agent in period "t", who lives for two periods (t and t+1), the said household/agent derives utility from consumption in the two periods (while alive)

$$U(C_{1,t}, C_{2,t+1})$$

- $C_{1,t}$: the amount of consumption in period "t" for the agent who is classified as "young" generation. (index by "1" = Young)
- $C_{2,t+1}$: the amount of consumption in period "t+1" for the agent who is classified as "old" generation (index by "2" = old)

As usual, we assume that $U(C_{1,t}, C_{2,t+1})$ is increasing and concave!



Initial old:

➔ Maximize the level of current consumption (consumption at the time they are old!)

2.2) Competitive equilibrium: a decentralized solution!

Without money, can the credit market exist under this environment?

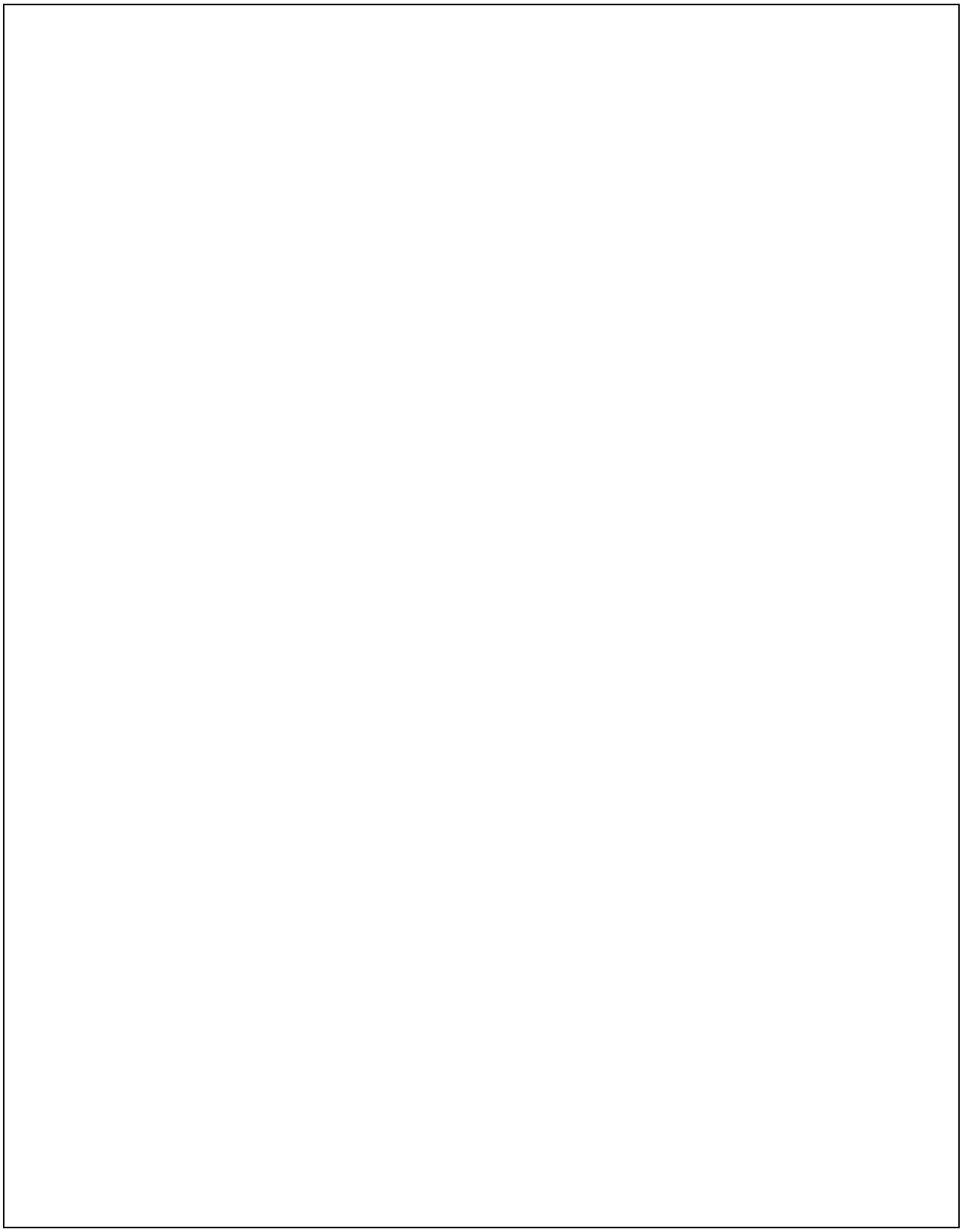
Equilibrium allocation

2.3) Competitive Equilibrium with money

- What would happen if the government intervene the system and introduces "***fiat money***" into the market economy.
    - Fiat money = intrinsic valueless currency, and can be ***costlessly*** produced by the government
    -
- ***This section will analyze the consequence of introducing a fixed amount of fiat money into the market economy, i.e. monetary equilibrium with fixed money supply***

Assumptions:

Individual budget constraint



Optimality conditions

Equilibrium return of money (Value of the money in the Equilibrium)

2.4) Is monetary equilibrium socially desirable?

We need to define the notion that captures the first-best allocation!

In Champ and Freeman, the author refers to the concept of Golden rule allocation

Definition: The social planner allocation (Golden rule allocation)

Allocation of initial olds " $c_{2,1}$" *and* the entire of sequences of the allocation of future generations $\{c_{1,t}, c_{2,t+1}\}_{t=1}^{\infty}$, such that

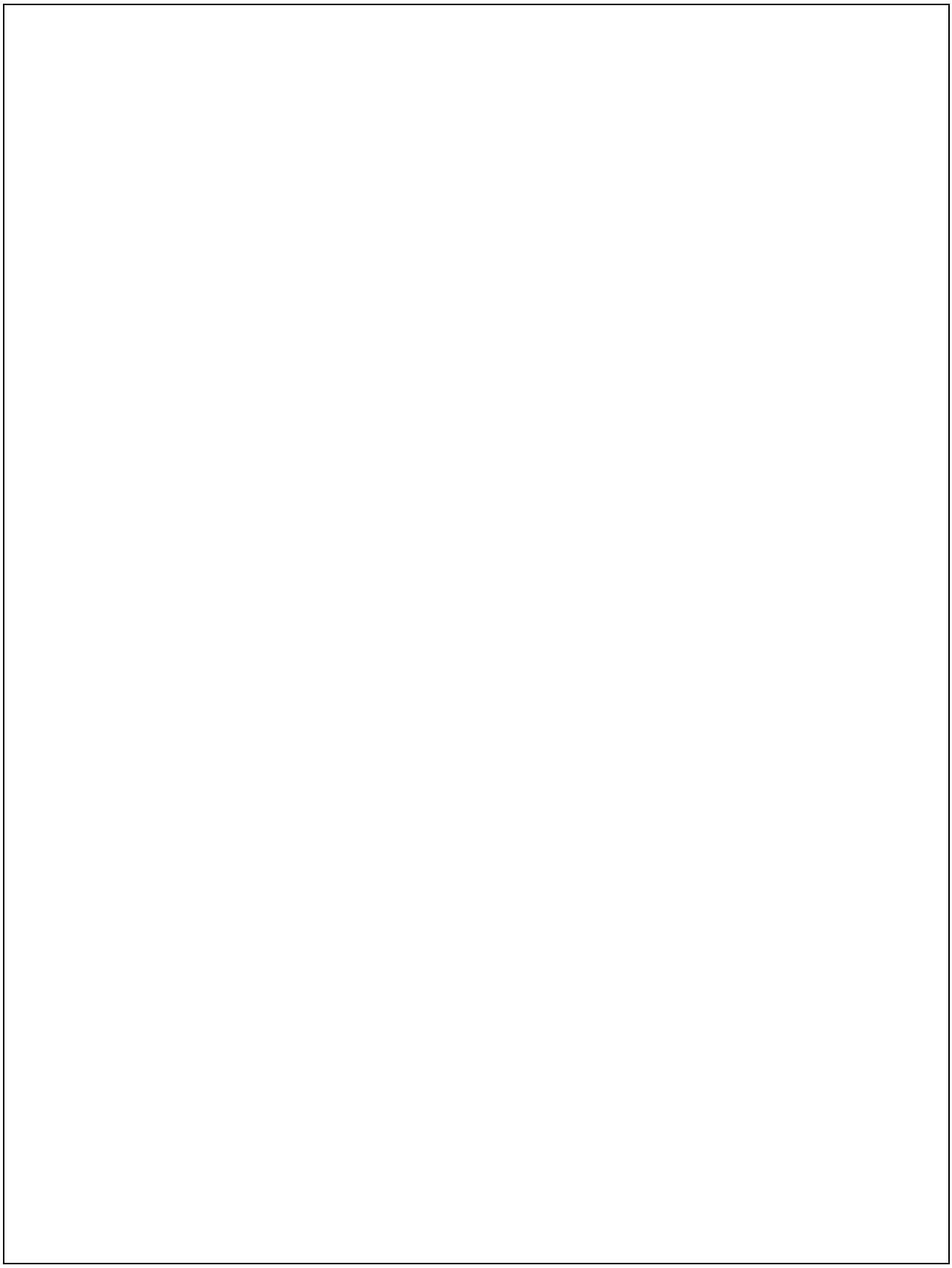
(i) Welfare of the ***future generations*** is maximized.

(ii) Feasible constraint holds for each period

Feasible allocations:

Definition: **Stationary equilibrium**

Characterizing conditions:



Questions:

1) What happen to the monetary equilibrium with growing population economy?

2) Is the monetary equilibrium socially desirable under fixed money supply when you have the economy with growing population?