Chapter 2
The role of financial markets

Fisher's optimal investment analysis:

- Elegant illustration of the role of financial markets in decision making
- Investigates choice between investment and consumption over time
- Decisions made with indifference curves

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Setting of Fisher's analysis:

- simple: 2 periods, no uncertainty, makes graphical analysis possible
- individuals decide what to do with their budgets (consume, save, invest)
- first without, then with financial market

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- looks absurdly restricted
- is a common, real life situation for employees in bureaucracies

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Example: Institute of Economics

- Teaches economics, practices otherwise
- teachers get budget of 10.000 per year
- not enough to buy good computer
- cannot save or hoard budget, cannot borrow either
- can only be spent...

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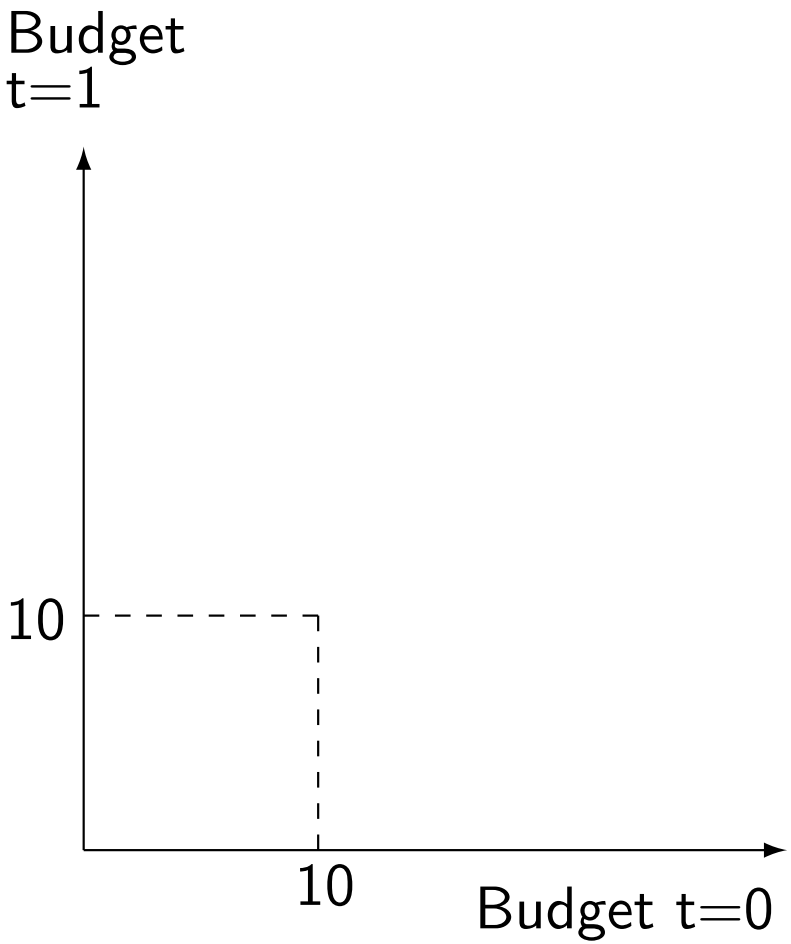
Consider budget space over 2 years (consisting of 1 point):



Budget space

Without possibility to move consumption over time

- individuals have no other option than to spend
- the whole budget every year

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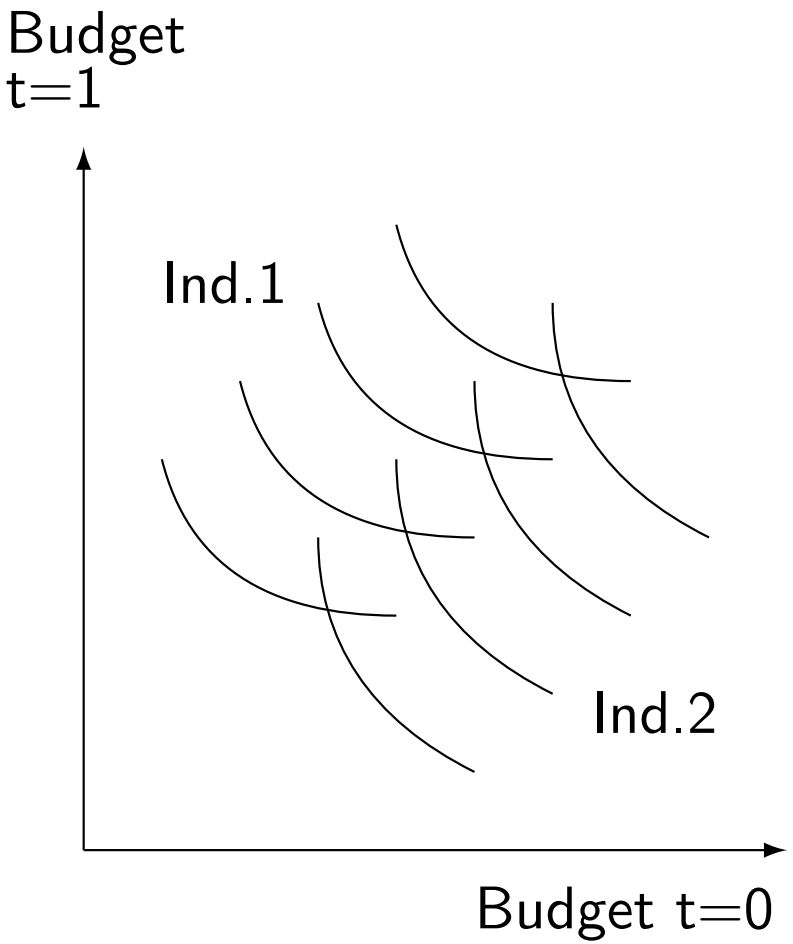
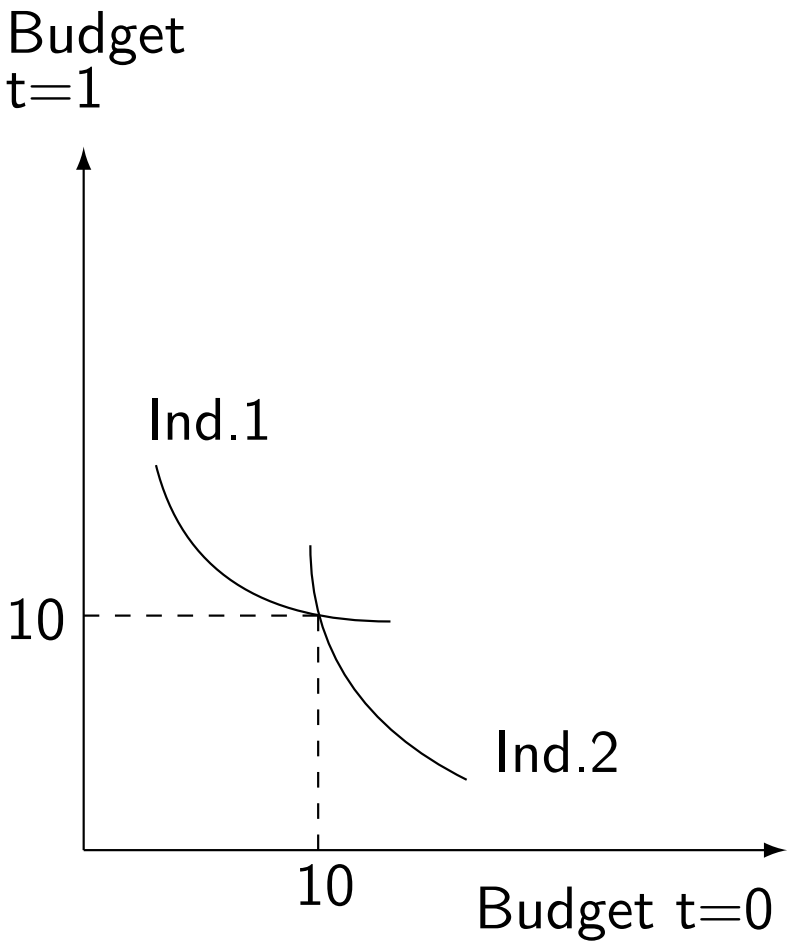
- What assumption would be violated if not everybody spends whole budget every year?
- Imagine two teachers at the institute, one with a very old computer and one with a new machine.
  - What would their indifference curves look like in this budget space?
  - In the next figure, does Ind. 1 need a new computer or Ind. 2?



Indifference curves in a budget space



Consumption choices in a budget space

Now we introduce a financial market:

- means the possibility to borrow and lend
- means also: move consumption back and forth in time
- often taken for granted, but has large impact: try buying a house without a mortgage loan.

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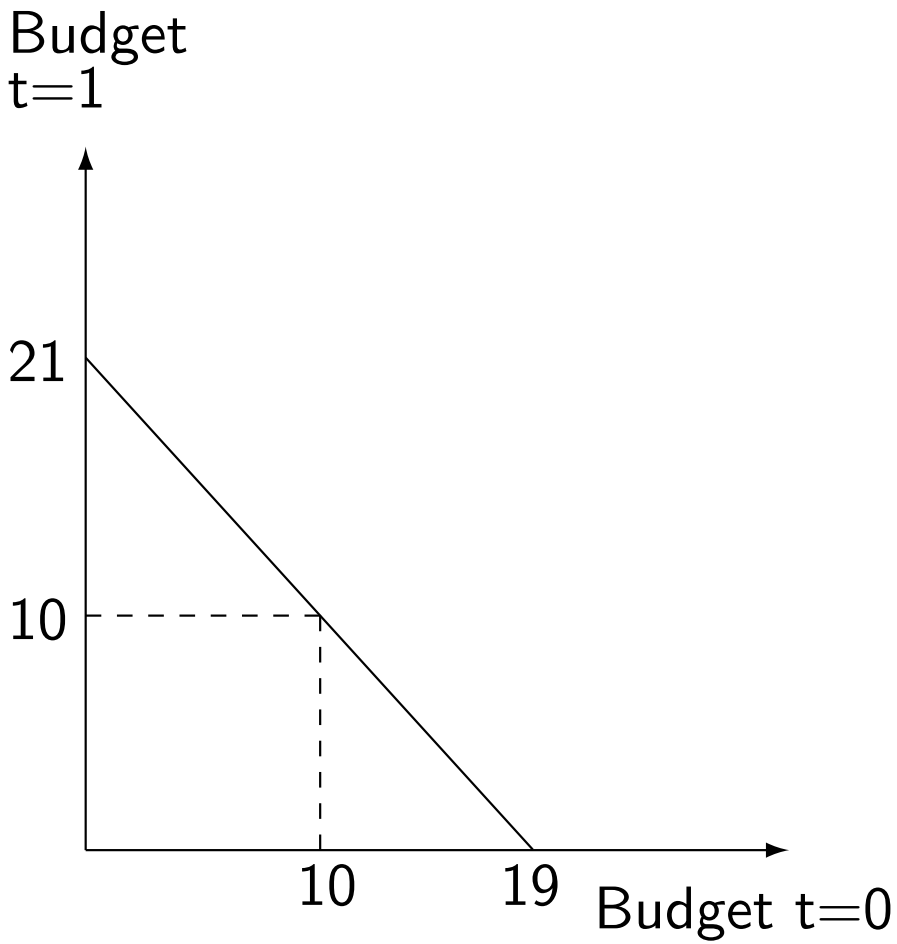
Given 10% interest, what are max. amounts that we can spend in each period?



Budget line in budget space

- Slope of the budget line is $-(1+r)$, where r is interest rate (10%).
- Borrowing against next period's budget, we can spend 10+10/1.1=19 this period
- Putting this period's budget in the bank we can spend 10+10×1.1=21 next period
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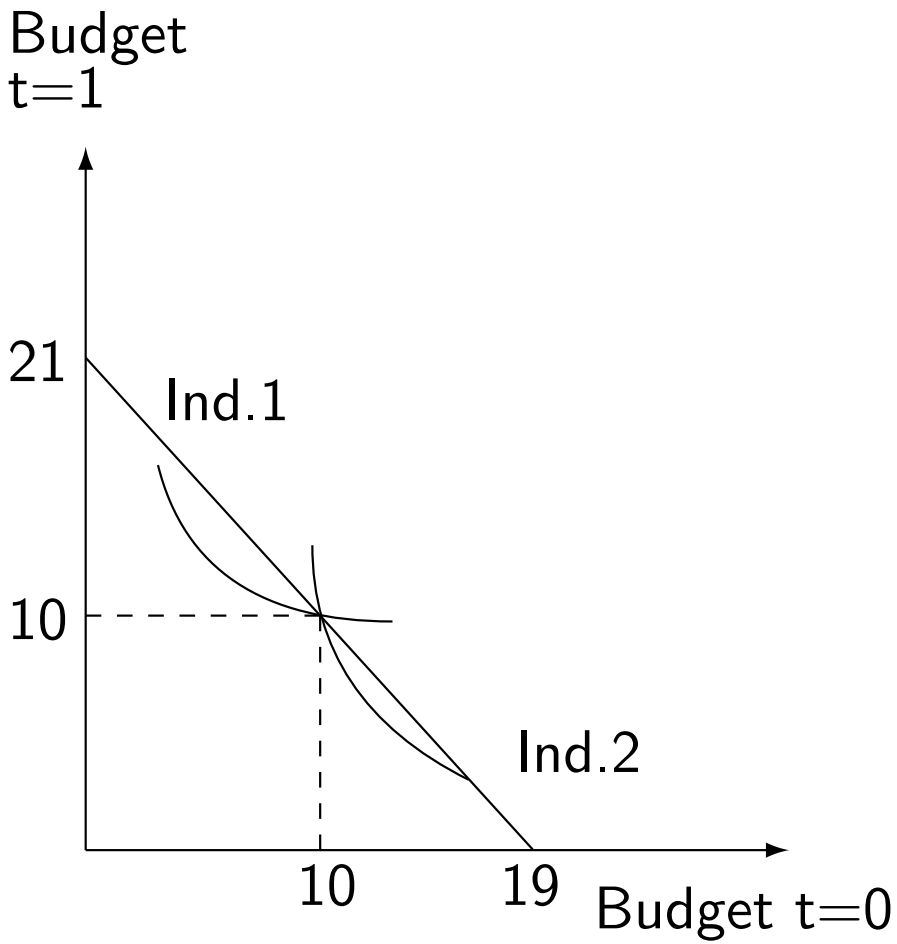
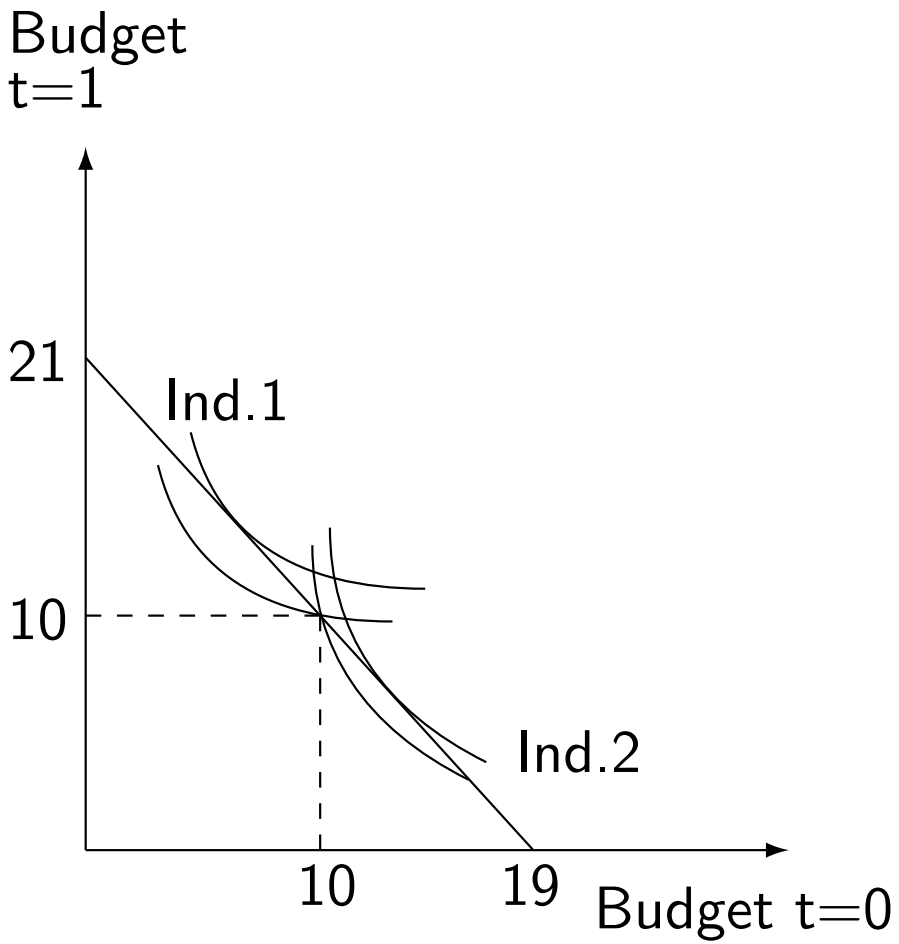
Financial markets enable people to jump to higher indifference curve:



Consumption choices in a budget space



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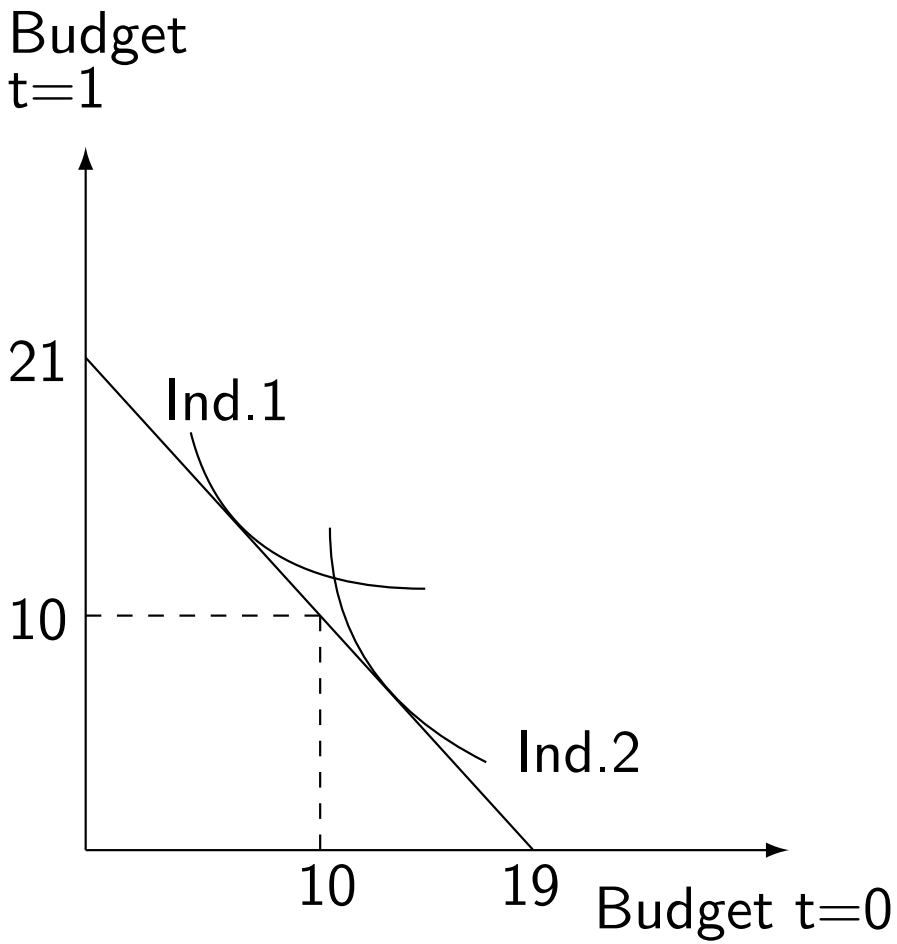

Consumption choices in a budget space

Financial market increases possibilities to choose:

- Ind. 2 can now buy her computer:
  - borrow ±2.5K against next period's budget
  - spend ± 12.5K this period
  - spend ± 7.5K next period
- Ind. 1 can put the unused part of t=1 budget on the bank:
  - spend less now (± 5K)
  - more next period (± 15K)

Next step is to introduce possibility to invest in productive assets/projects:

- good projects earn much more than interest rate
- not many good projects available
- next category of projects earns less, etc.
- worst projects earn much less than interest rate

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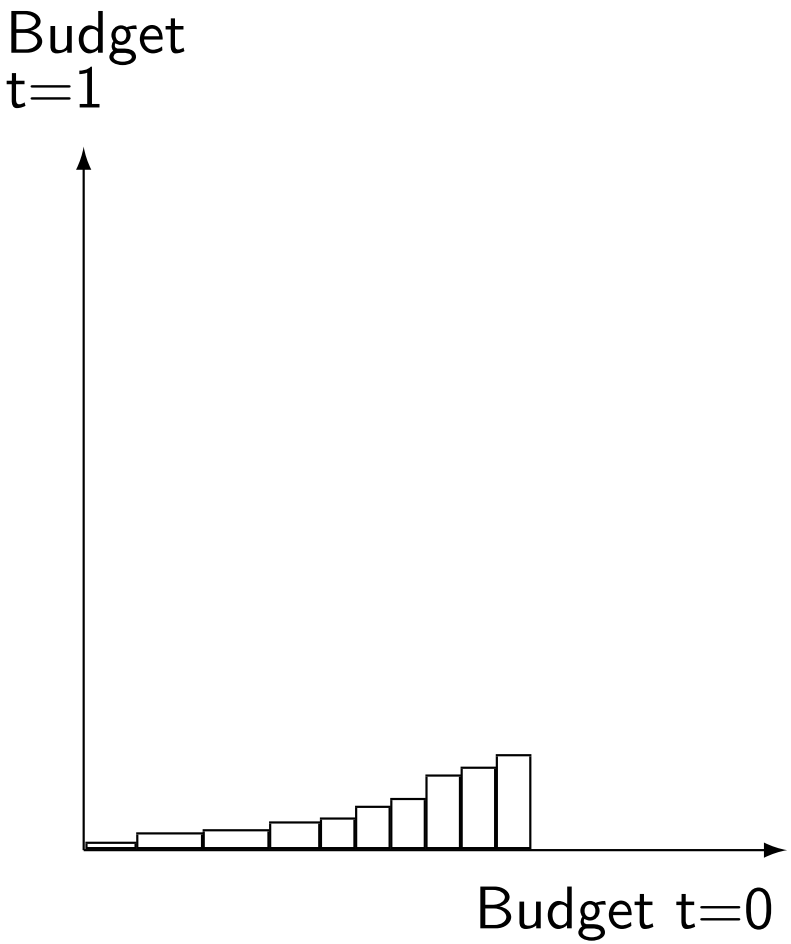
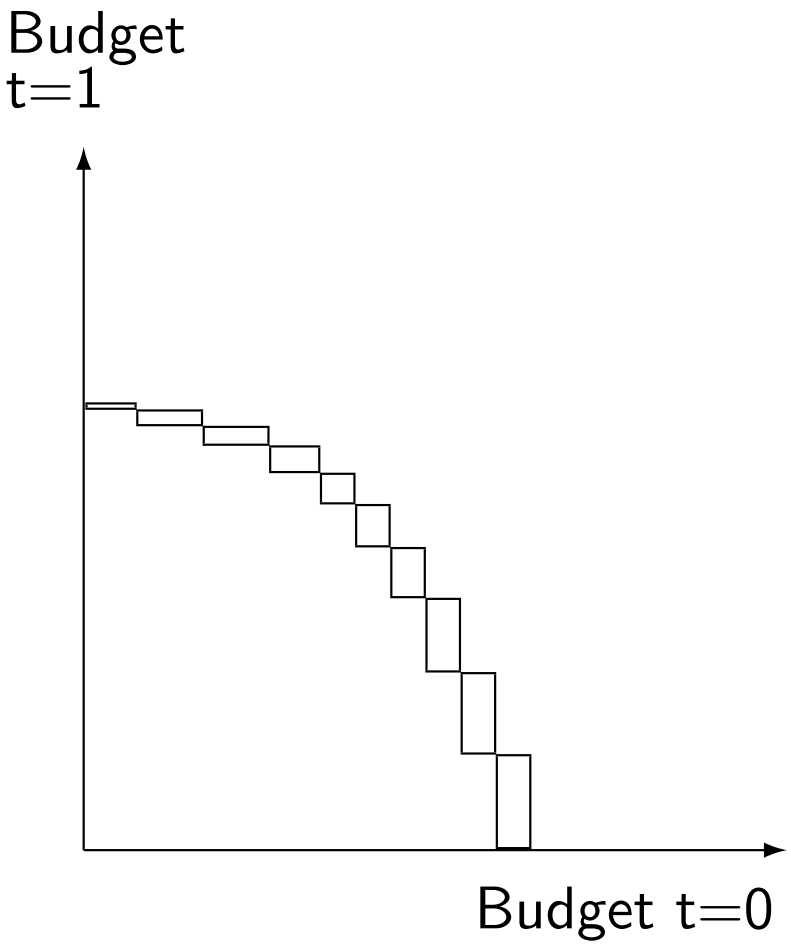
Stylized shape of production possibilities obtained by:

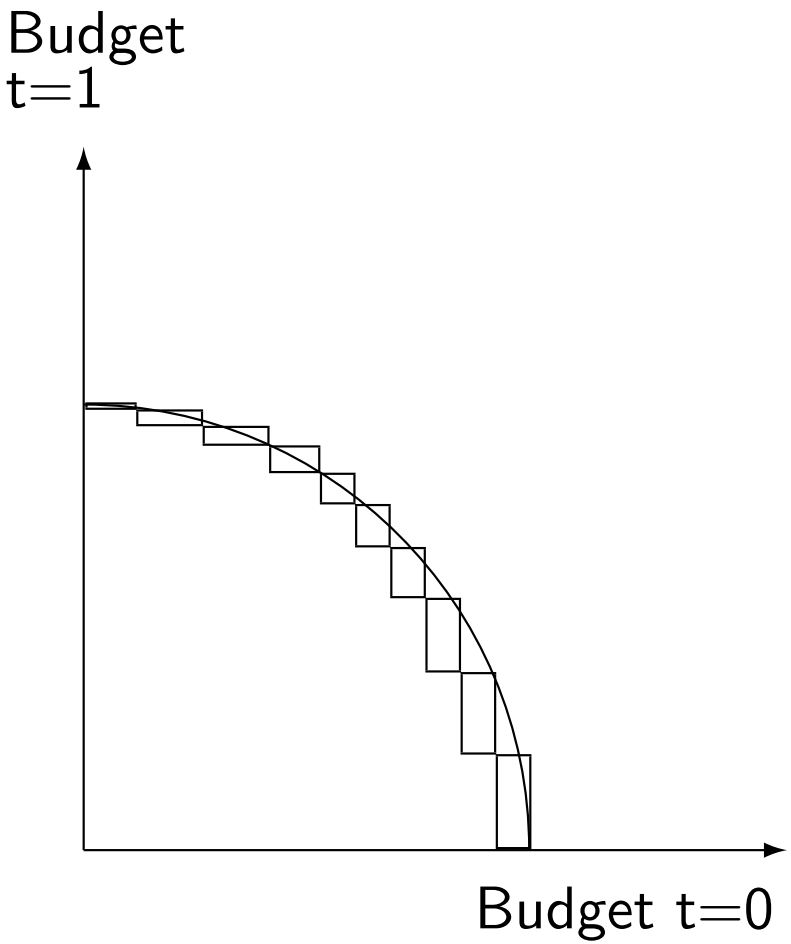
1. order projects bad-good (left-right)
2. take them cumulatively (right-left)
3. approximate with smooth line, called *investment frontier*



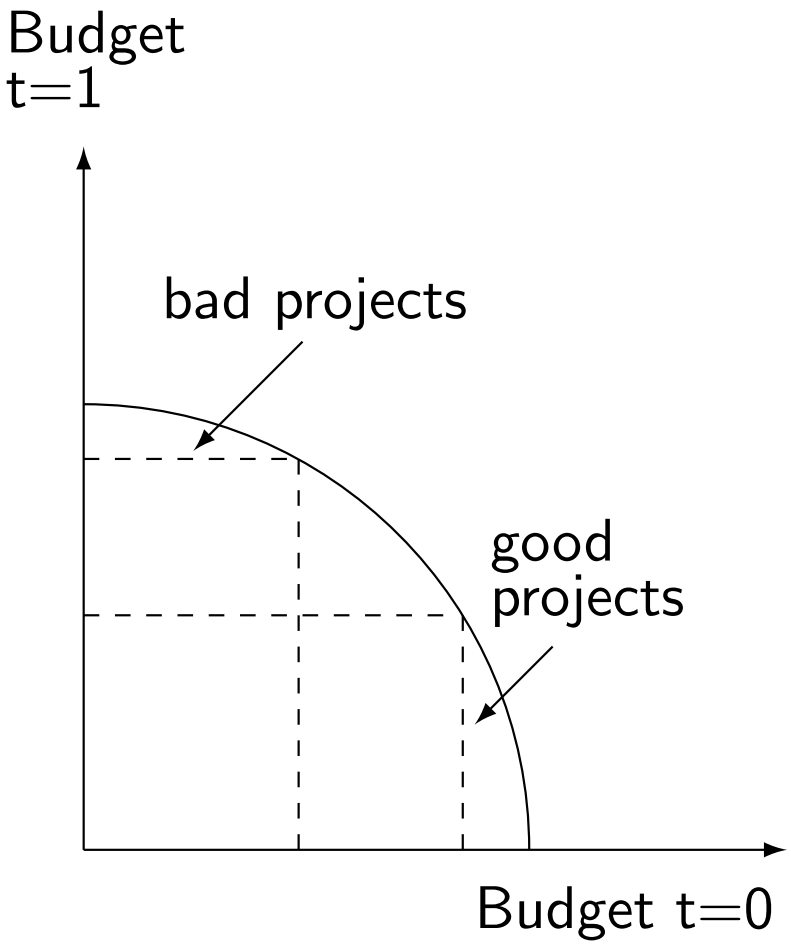
Investment opportunities



Investment opportunities, cumulative



Investment opportunities, cumulative + continuous approximation



Investment frontier

Good productive investments create wealth:

- by giving up consumption this period
- we can increase consumption next period
- with *more* than we give up this period

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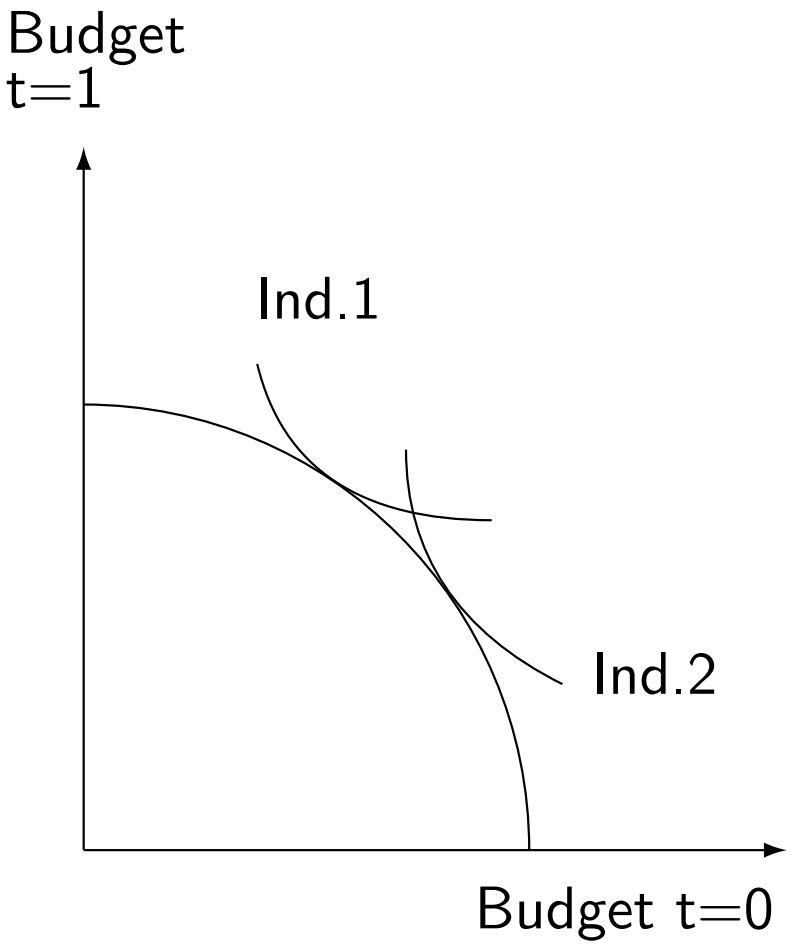
How is the investment level chosen?

Without financial markets the optimal investment plan depends on individual indifference curves:

- Ind. 2, who needs money, wants to invest little
- Ind. 1, who has money to spare, wants to invest more



Choices along investment frontier

Looks trivial, but has important consequence:

- Different investors have different ideas about which projects should be taken into production.
- 'Value' of a project depends on who wants to carry it out, i.e. it matters *'where the money comes from'*
- So there is *no* general rule saying which projects are worth while.
- Professional manager has to know the preferences of his or her clients or stockholders to make an optimal decision about investment plan.

The introduction of a financial market remedies this all.

With a financial market optimal choices are made in 2 steps:

1. The optimal investment plan is chosen
2. Optimal consumption is chosen

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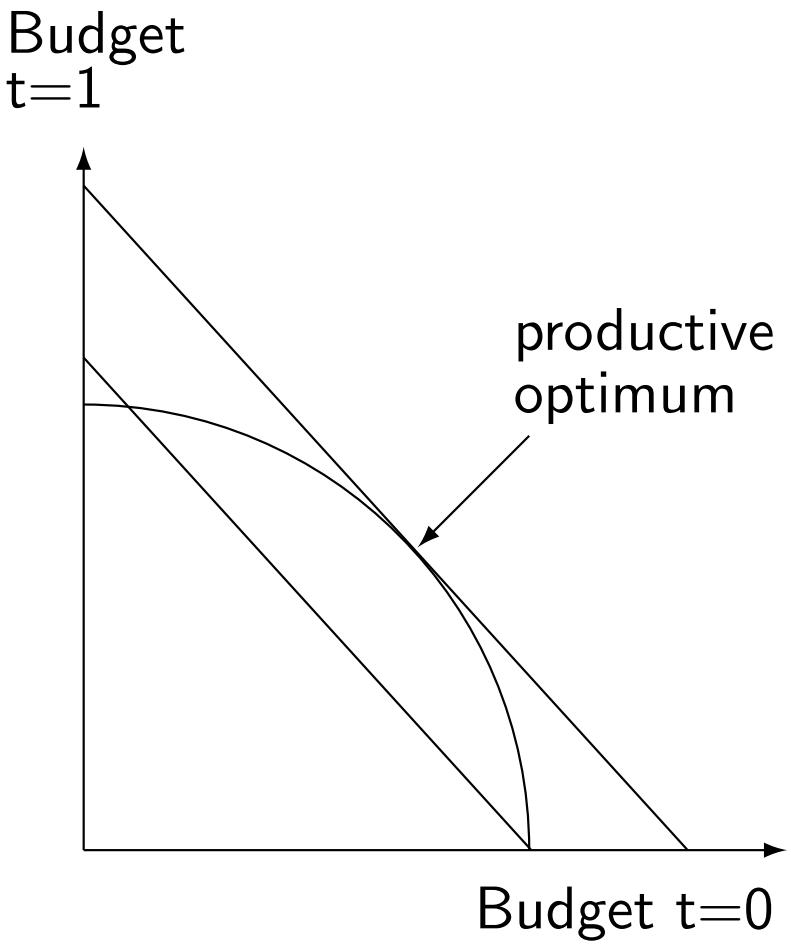
To choose the optimal investment plan:

- start with the best projects and keep on investing until marginal rate of return on projects equals interest rate
- same as: select all projects with NPV ≥ 0
- is point where new budget line is tangent production opportunity curve
- both alternative allocations same marginal return
- cannot increase budget by changing: optimum



Optimal investment plan

The optimal investment plan:

- gives the maximum budget for a given interest rate
- is familiar micro-economic result: optimum when marginal costs = marginal revenue

note that locus of optimum depends on slope budget line

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Are more or less projects taken into production?

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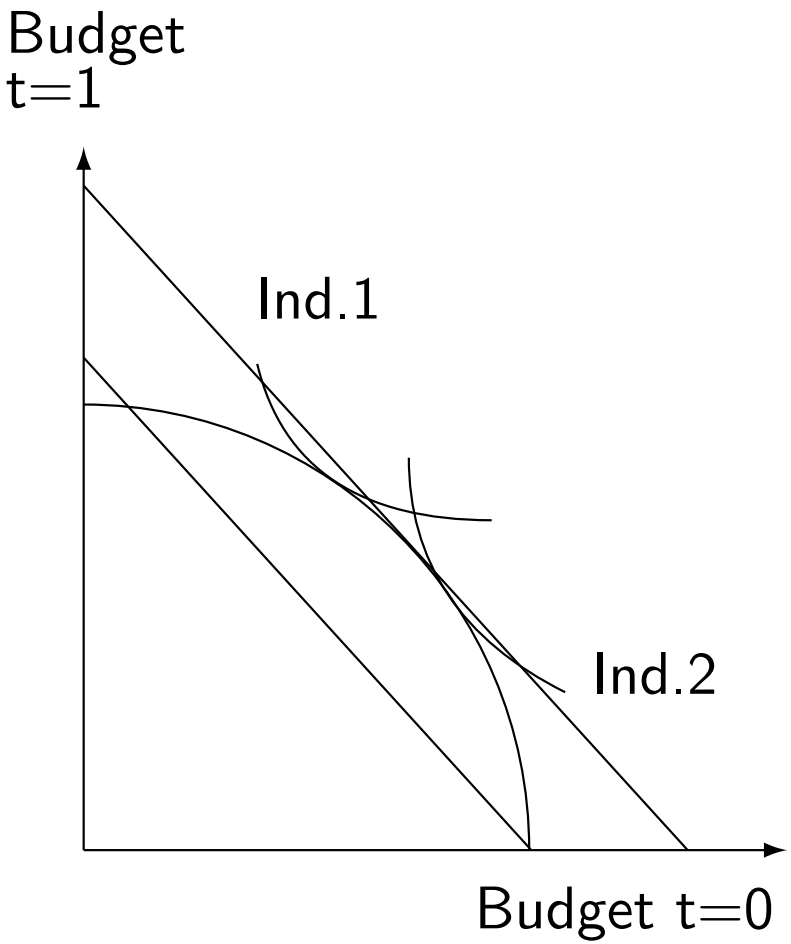
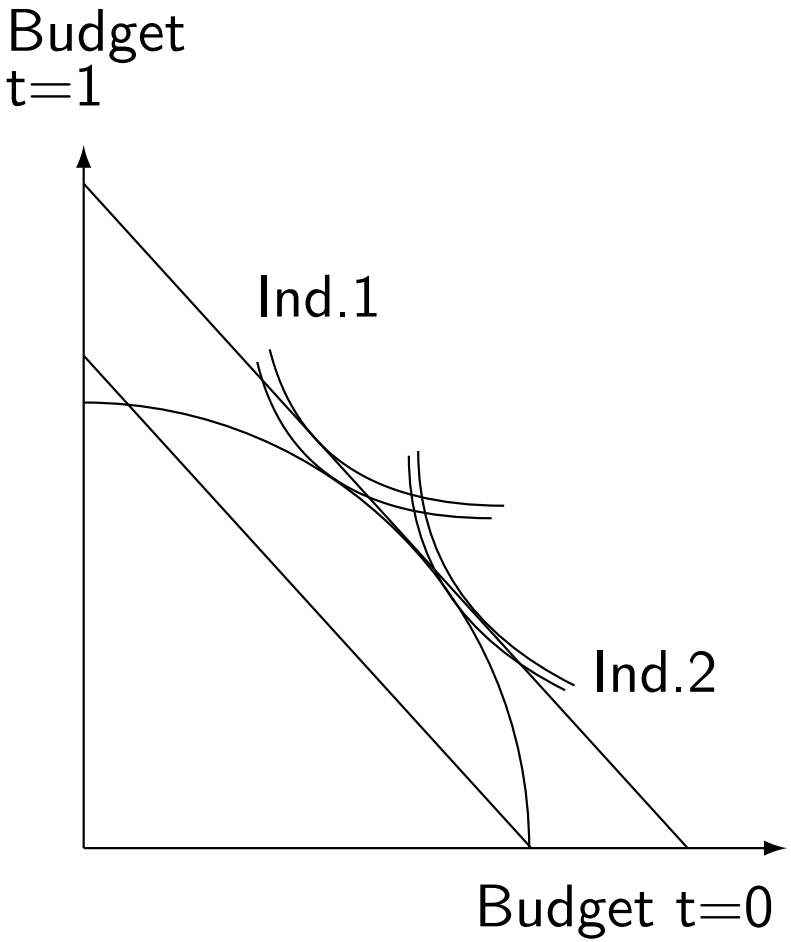
Optimal spending of this budget (= optimal consumption):

- reached by allocating wealth over time by borrowing and lending on financial market
- allows investors to jump to higher indifference curve



Optimal consumption choices



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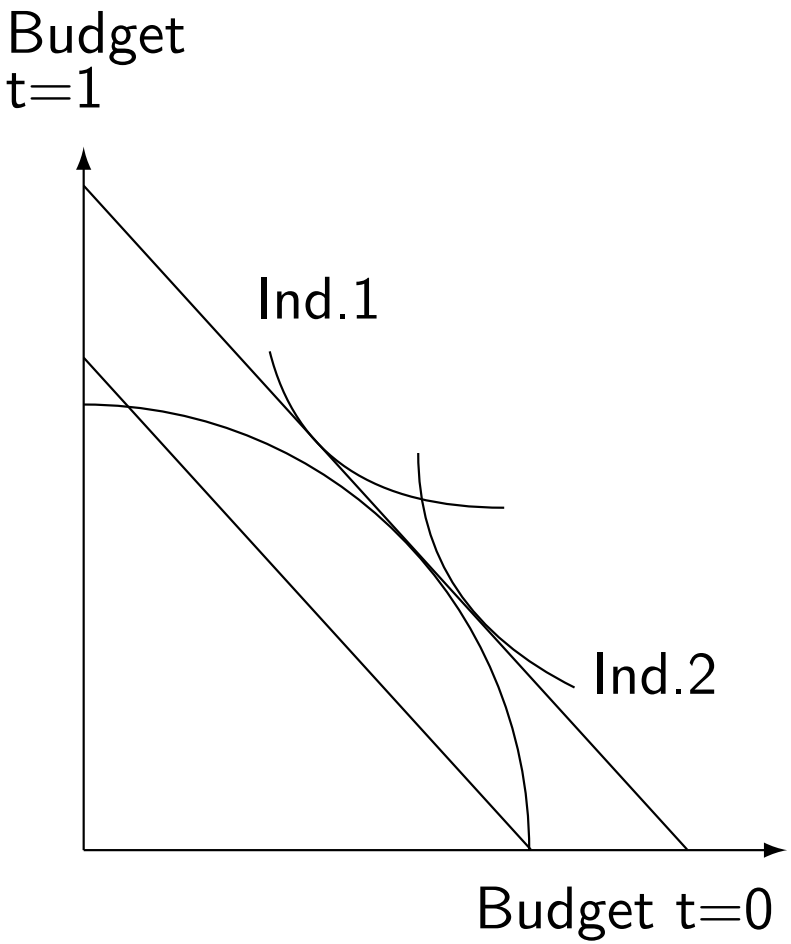


Optimal consumption choices

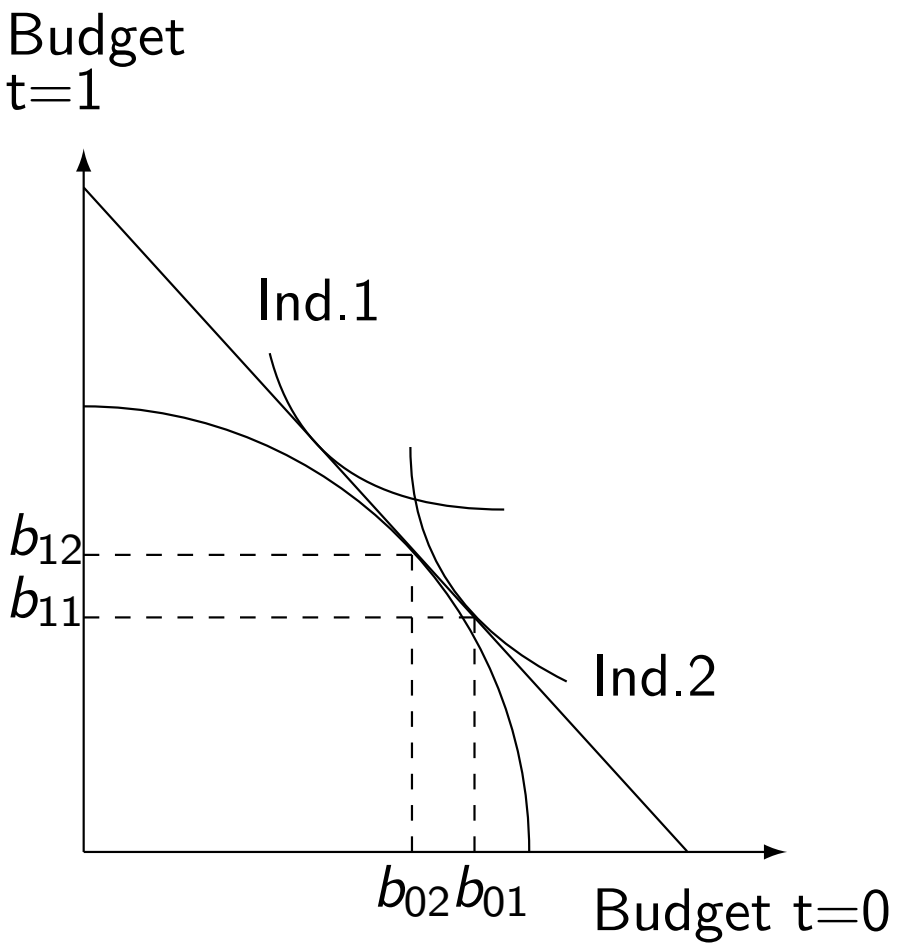
Introduction financial market has far reaching consequences:

- Again: nobody is worse off, most are better off
- Everybody agrees on the optimal investment plan
  - everybody prefers more budget to less
  - nobody needs productive investments to allocate consumption over time
- Investment and consumption decision can be separated
  - called Fisher separation
  - professional manager does *not* have to know preferences of clients or stockholders to make optimal decision about investment plan
  - makes separation of management and ownership possible

Some more important consequences:

- Managers can use objective market data (ROI, interest rate), ignore subjective preferences
- Doesn't matter where money comes from, only where it goes to
- Gives general rule which projects are worth while i.e. simple instruction to managers = goal of the firm:
  - *Maximize Net Present Value*
  - equivalent to: select all projects with NPV≥ 0
- Also shows why NPV is superior criterion:
  - max. profitability (%) would only include 'first' project
  - NPV only includes projects that earn more than interest rate
  - NPV gives proper allocation of investments

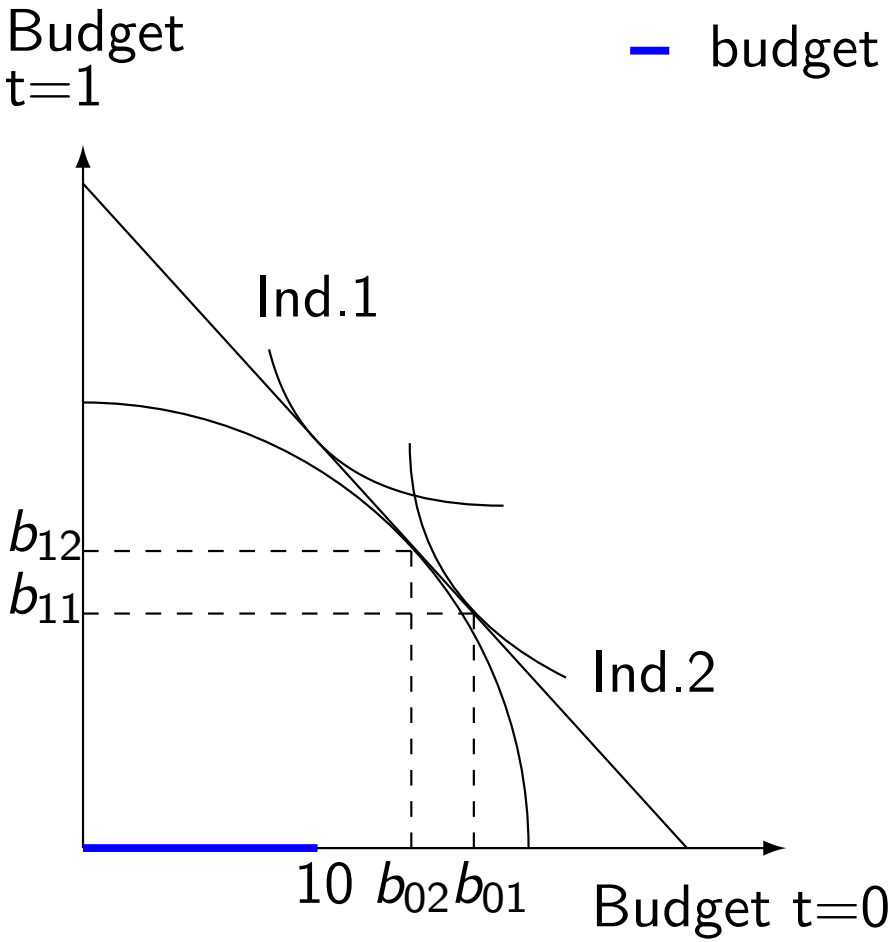
How does Ind. 2 reach her optimal spending pattern?

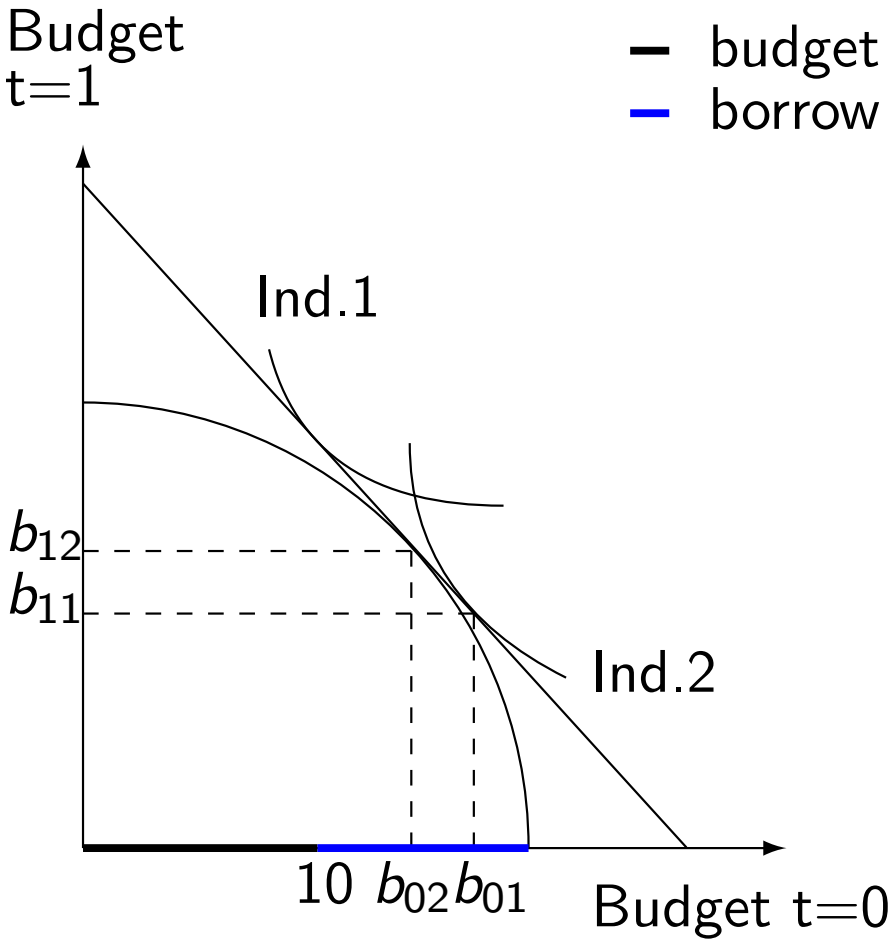


Ind. 2 reaches her optimal spending point as follows:

- at t_0 borrow the maximum against the t_1 budget, giving a total t_0 budget of 19
- of this 19, invest $19 \rightarrow b_{02}$ in productive assets, leaving $0 \rightarrow b_{02}$ for spending in t_1
- borrow against return of investment $(= 0 \rightarrow b_{12})$ the present value of $b_{12} \rightarrow b_{11}$, i.e. $b_{02} \rightarrow b_{01}$
- this gives optimal spending in both periods:
  - $0 \rightarrow b_{01}$ in t_0
  - $0 \rightarrow b_{13}$ in t_1

Or graphically:


Budget
t=1
budget t_0
Ind.1
b_{12}
b_{11}
Ind.2
10
b_{02}
b_{01}
Budget t=0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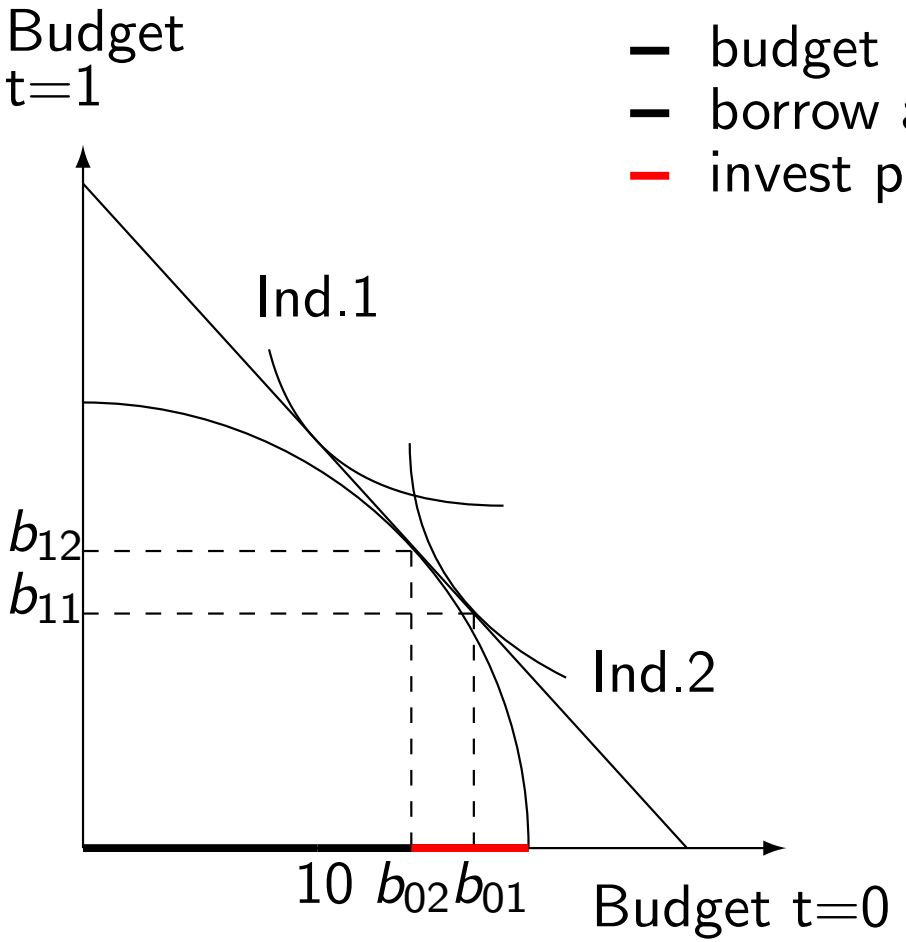
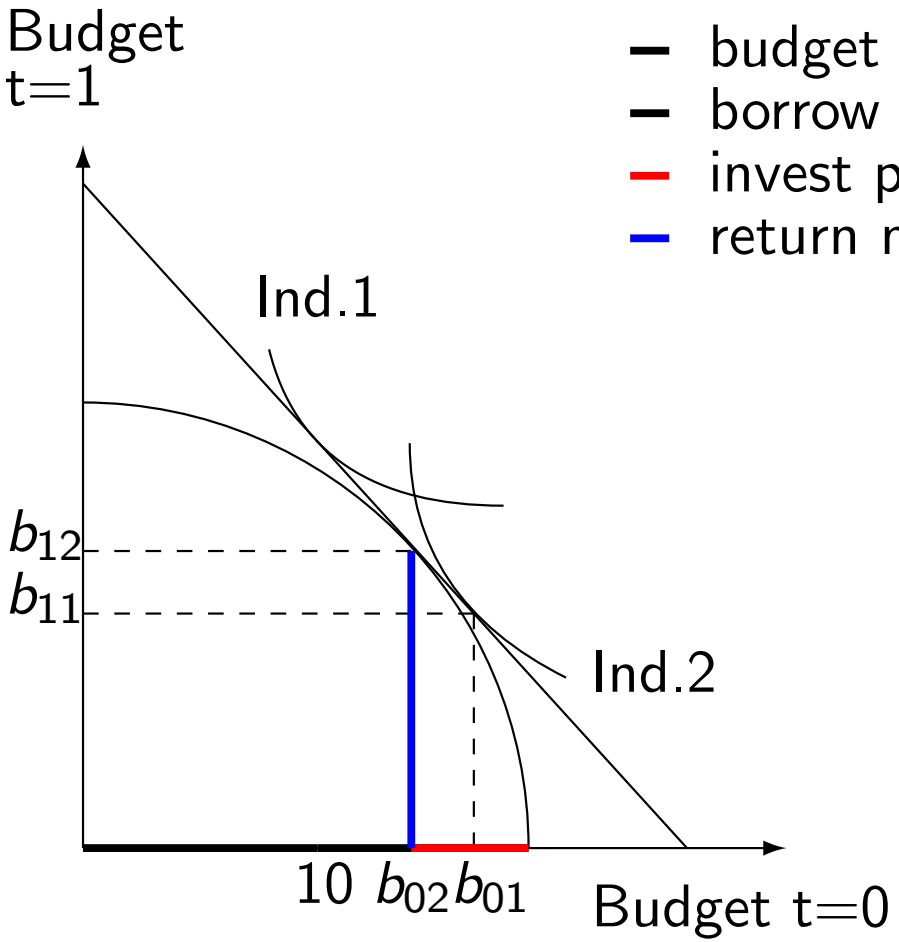


- budget t_0
- borrow against budget t_1
- invest productively


Budget
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budget t_0
borrow against budget t_1
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return next period
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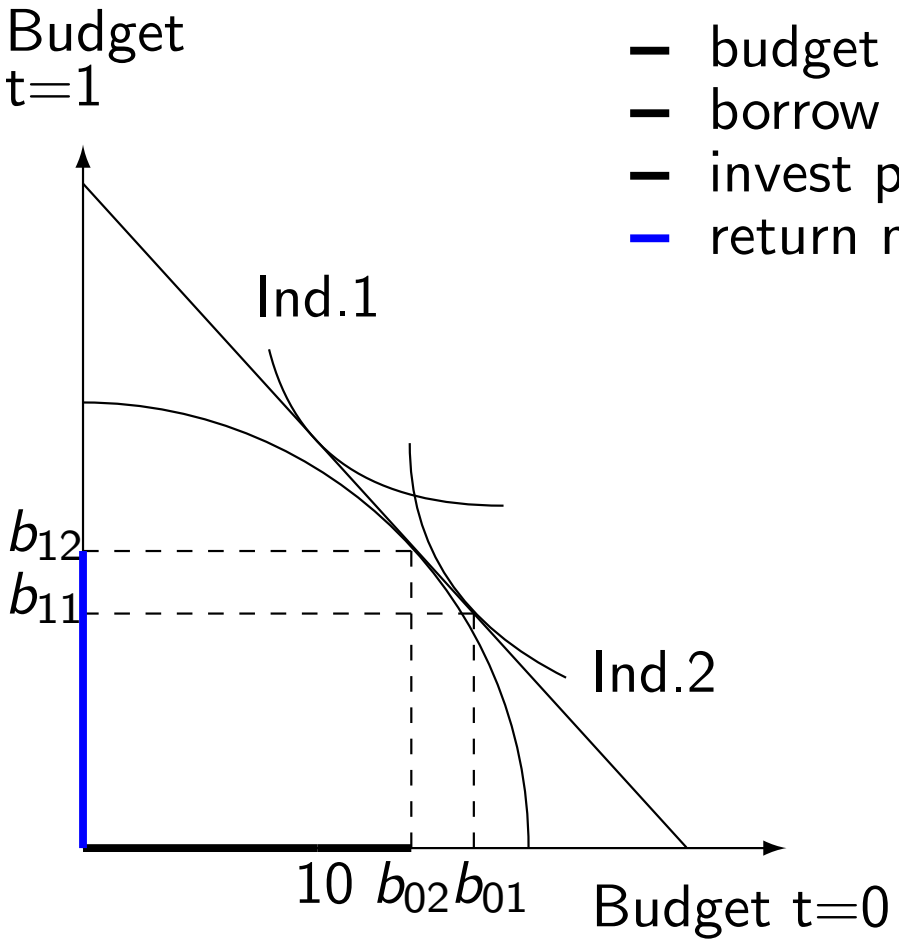

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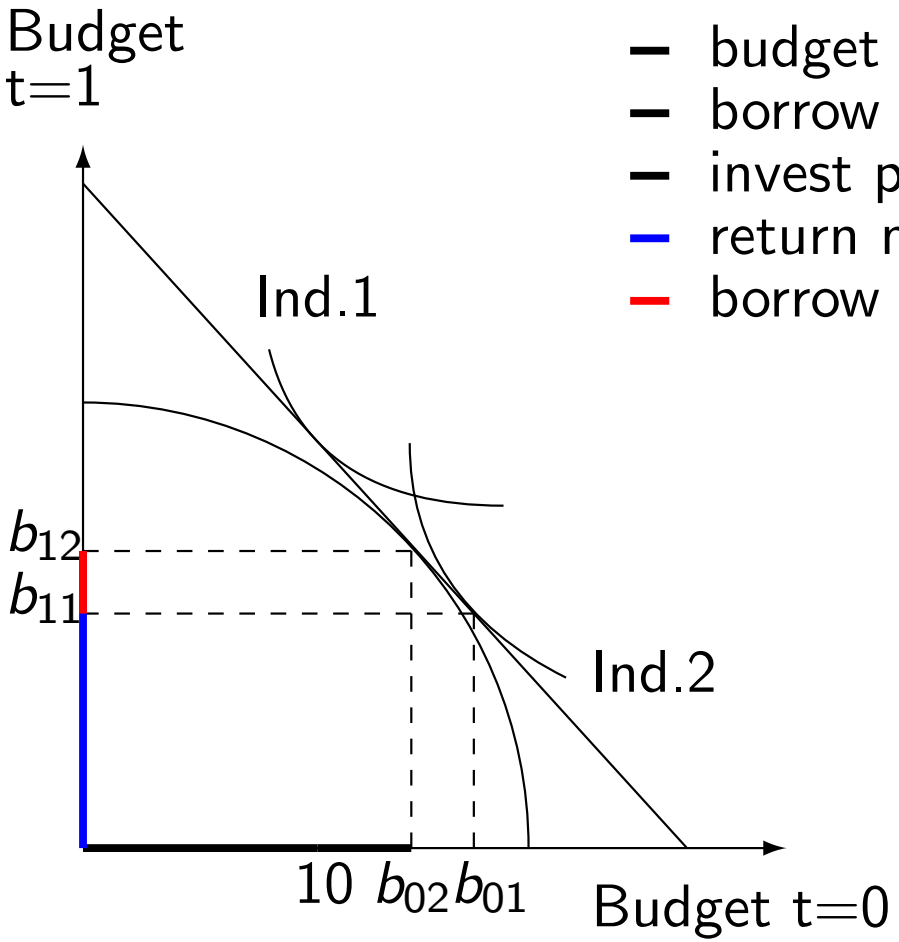
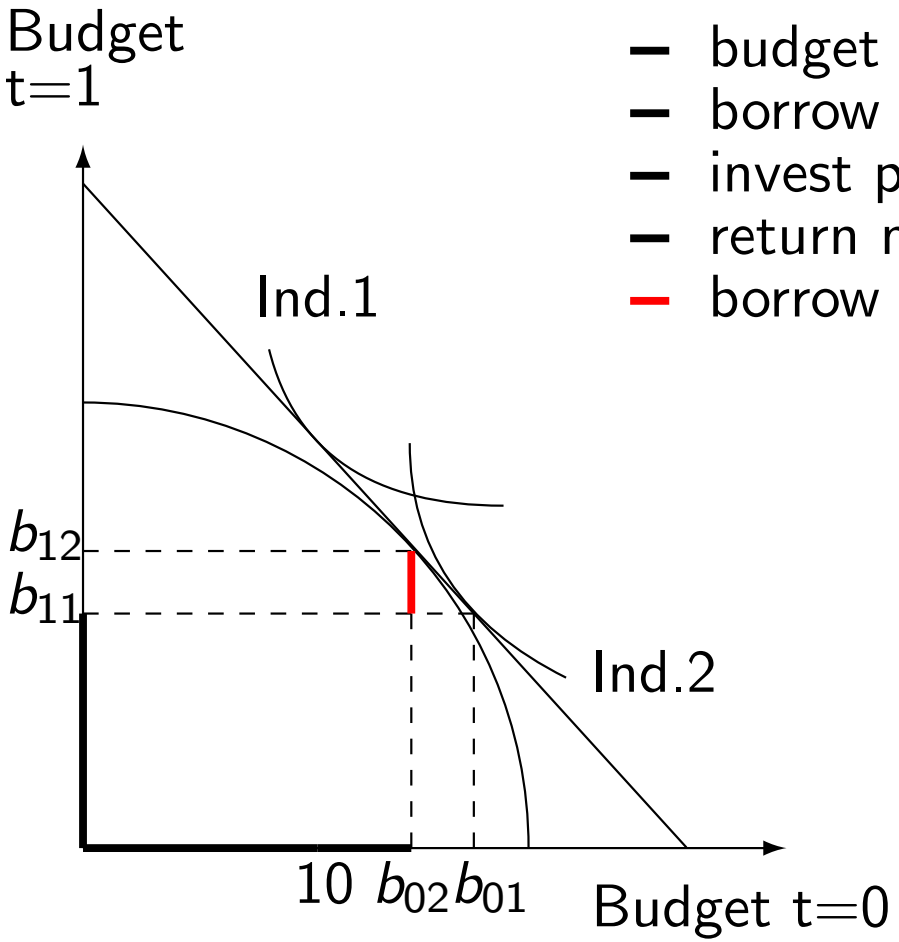


- budget t_0
- borrow against budget t_1
- invest productively
- return next period
- borrow against this part



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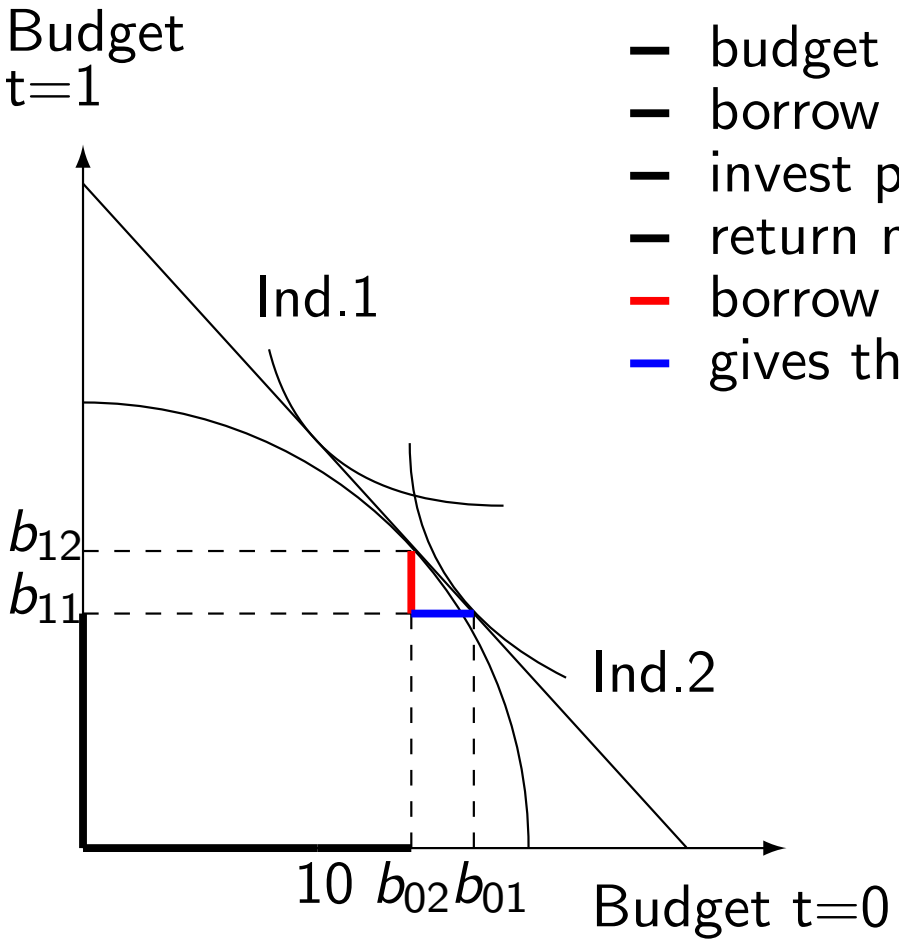

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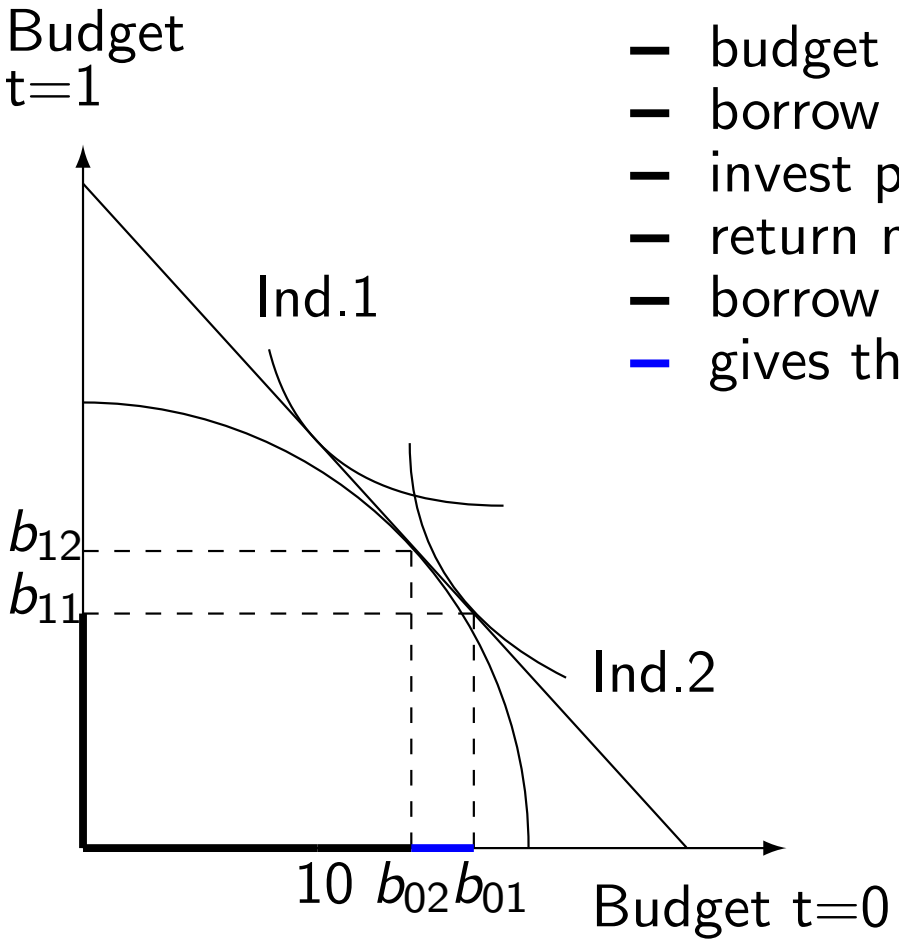

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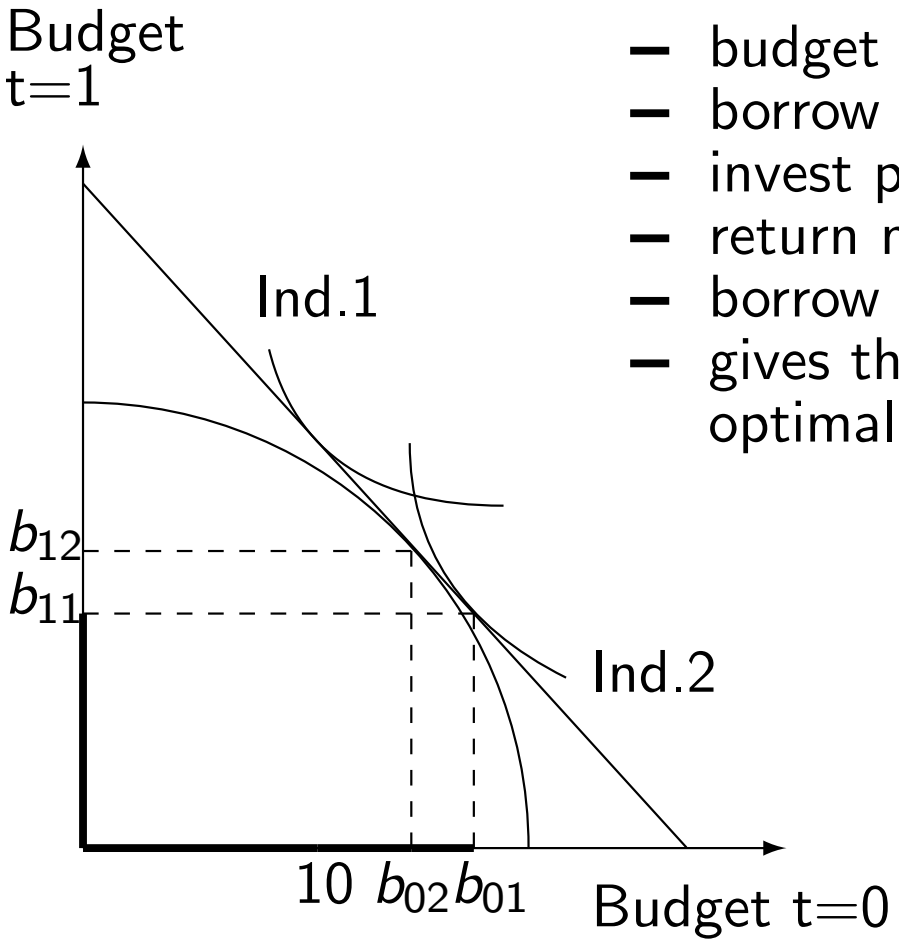

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  optimal consumption pattern

Real world financial markets:

have many different functions, not just borrowing-lending

- Facilitate trade in wide range of financial contracts
- Have an immense, complex infrastructure

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Summarize their role in 4 functions:

1. Facilitate flow of funds
2. Price determination
3. Provide marketability and liquidity
4. Maintain system for settling payments and clearing

1. Flow of funds

- from surplus units (money $>$ investment opportunities)
- to deficit units (money $<$ investment opportunities)

units can be people, businesses and governments

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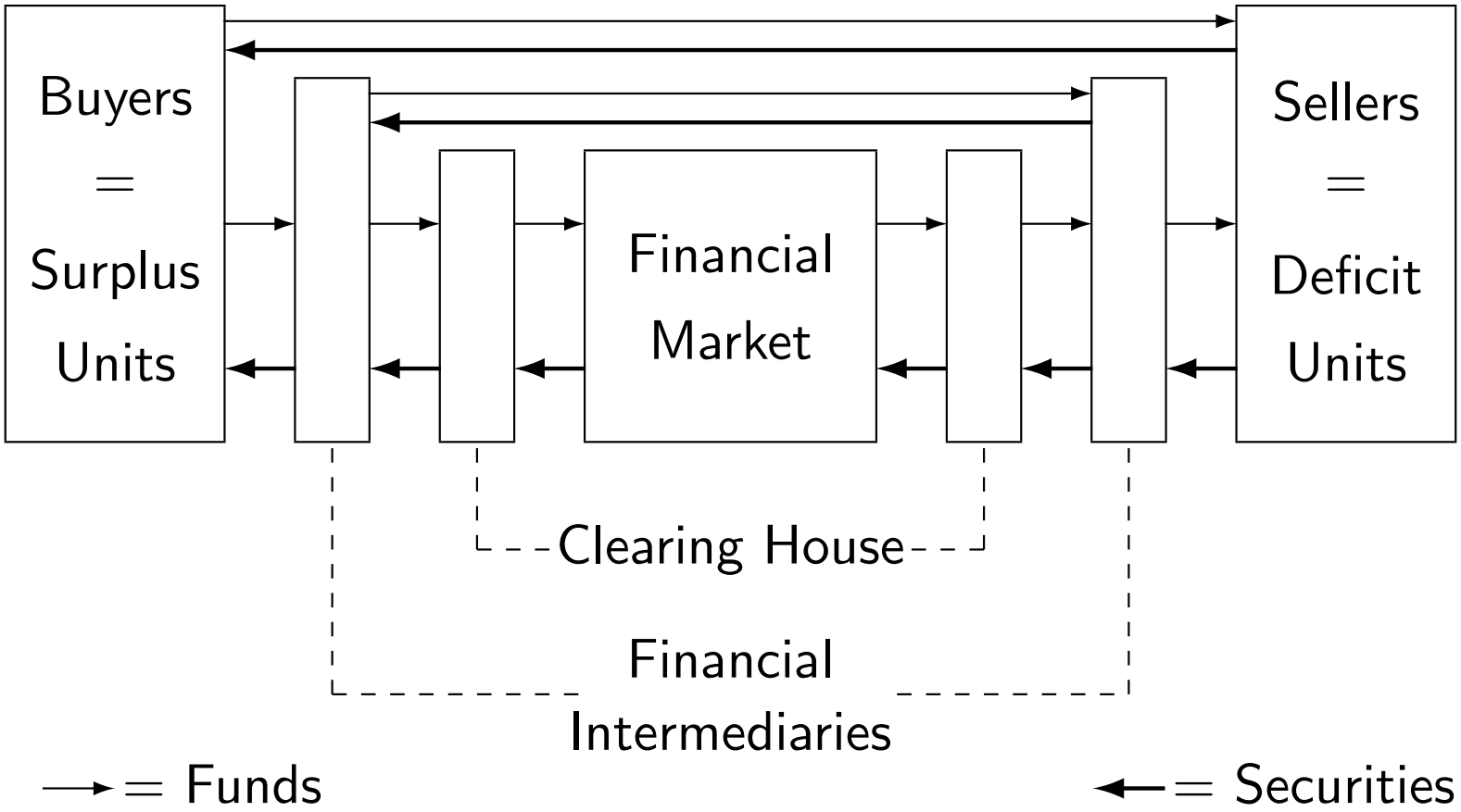
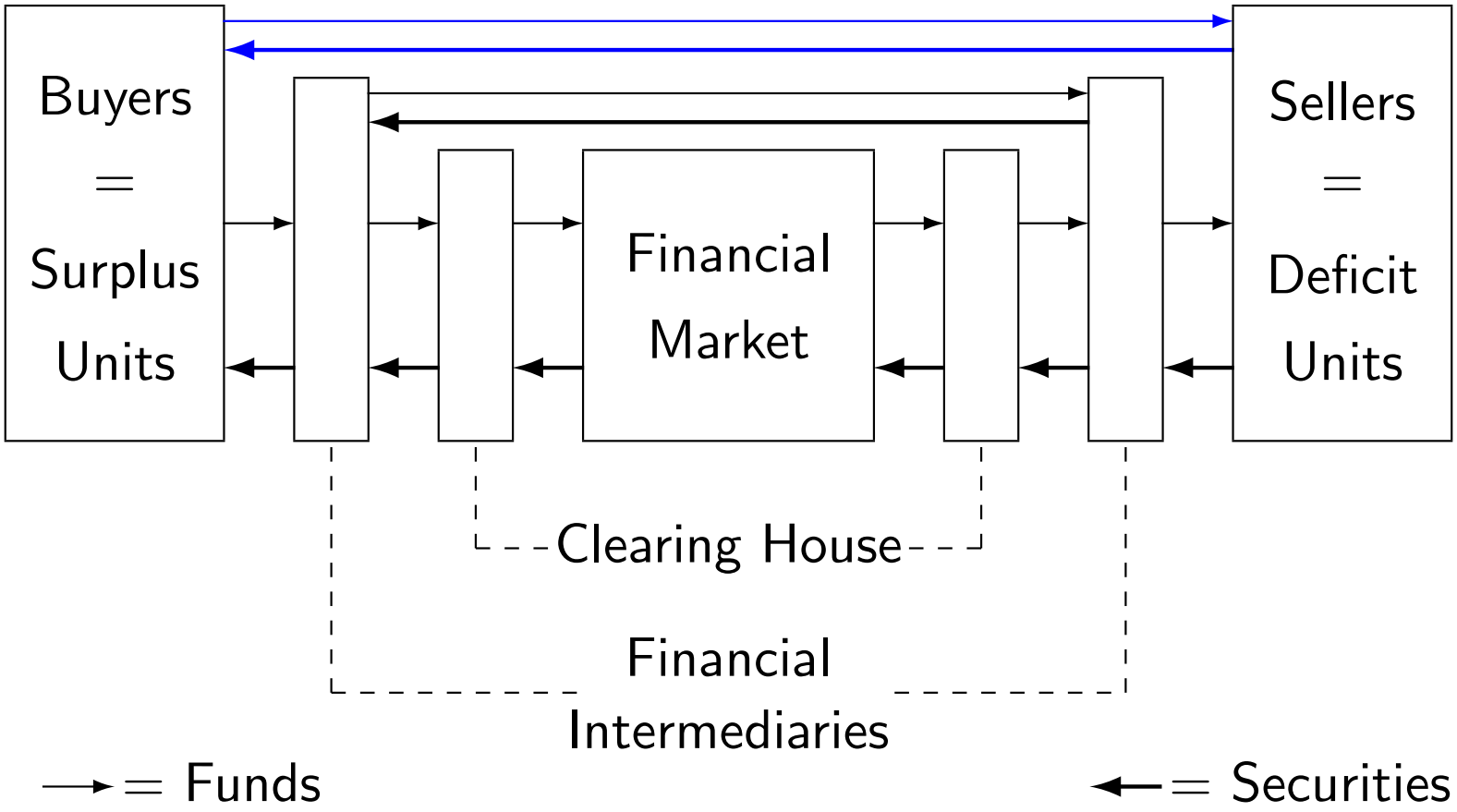
Efficient flow separates time patterns of income and investment/consumption
Has important benefits:

- allocation of capital to most productive uses
- also means: efficient risk transfer
- allows young people to buy house, save for retirement

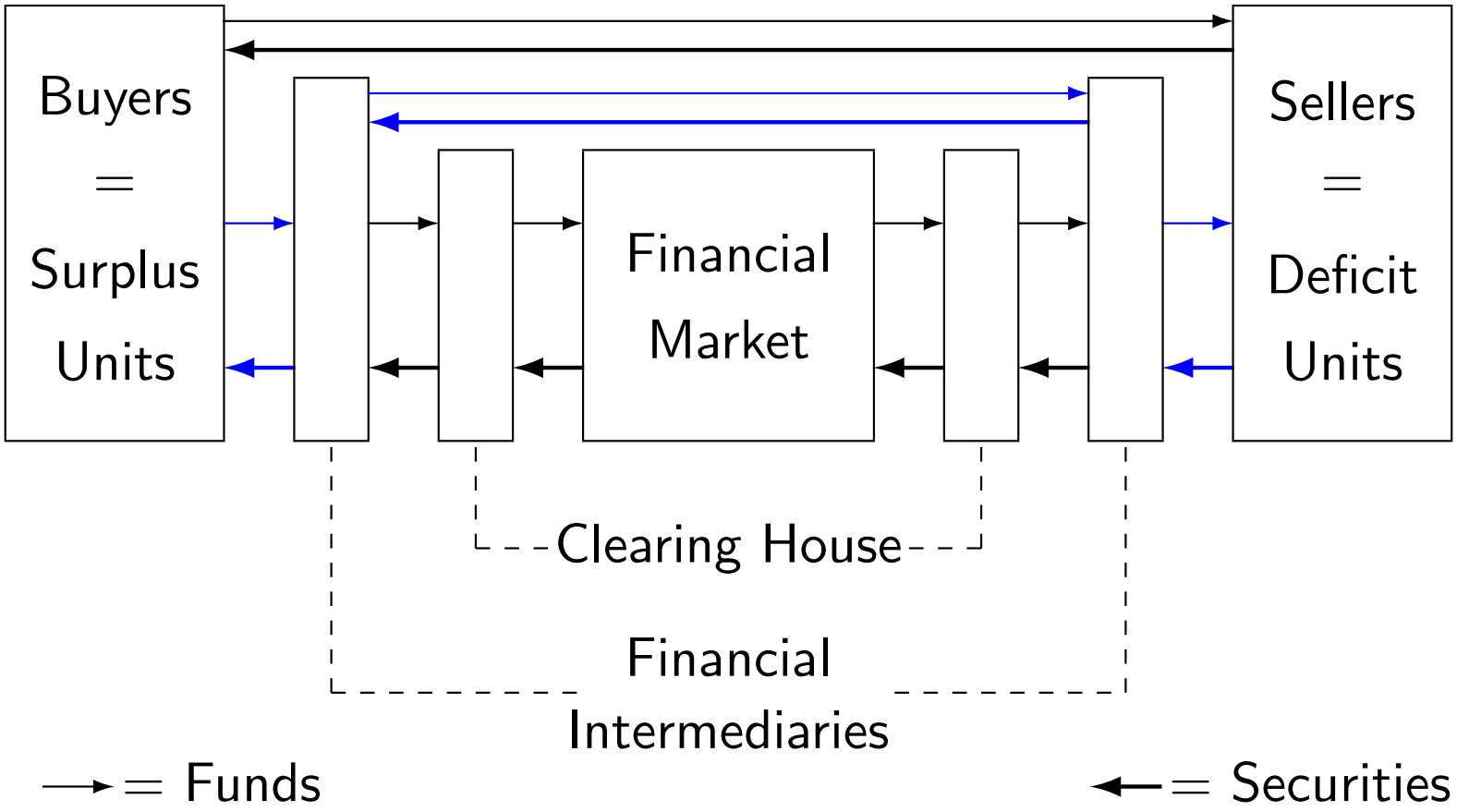
Flow can take many different routes



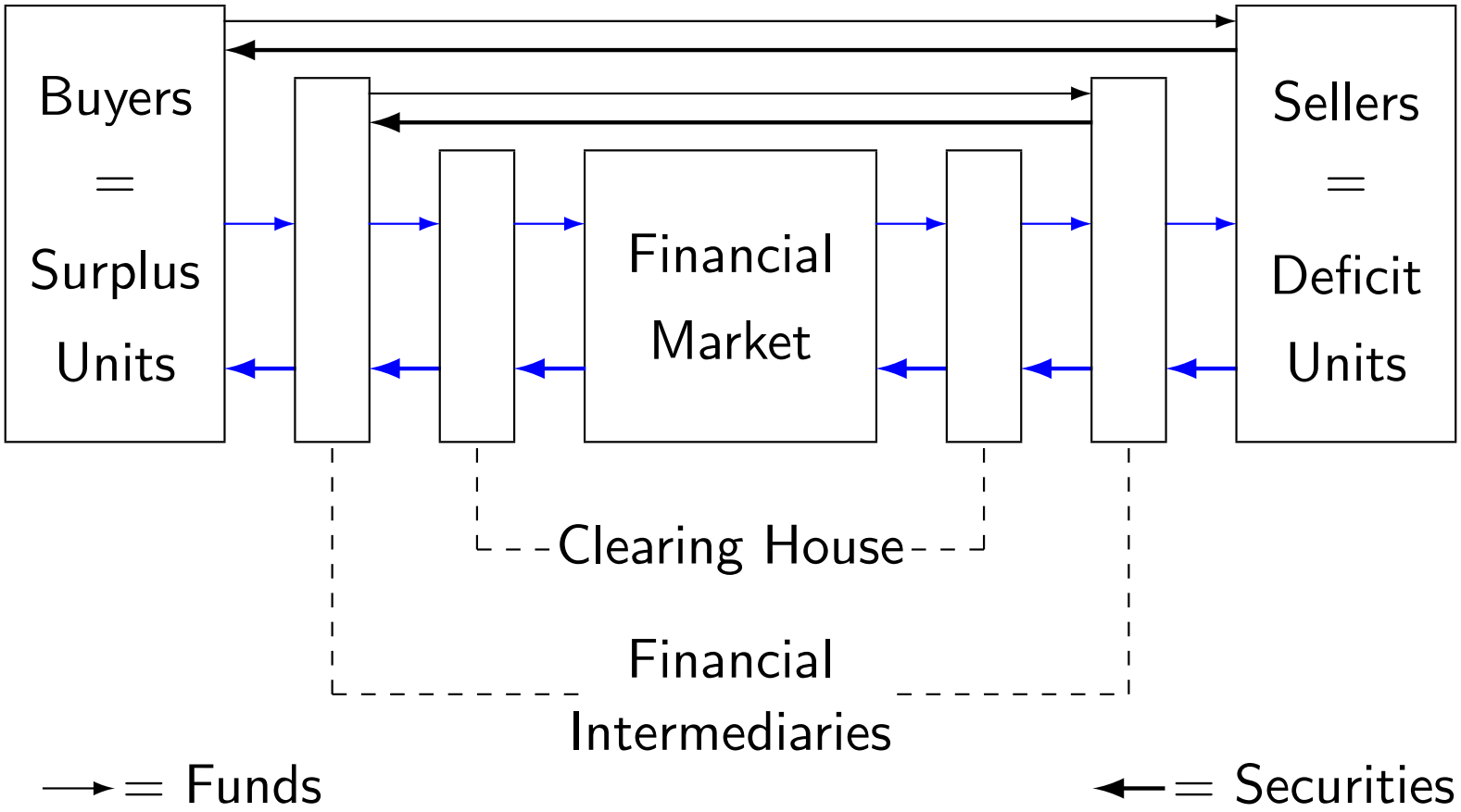
A schematic view of financial markets



Direct finance: straight from issuer to buyer, e.g.:
private placement: company sells block of shares to insurance company



Indirect finance: from issuer to buyer through financial intermediary without passing financial market, e.g.:
bank takes deposits from savers, makes loans to businesses



Stock market transaction: from seller to buyer through broker and clearing house, e.g.:
private investor sells shares to other private investor

2. Price determination

- Time value of money
- Market price of risk

Process of establishing market prices is called *price discovery*

- can be organized in different ways (see later)
- if organized properly: market prices reflect all information

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How can prices reflect all relevant information?

- traders reveal private info in prices they ask and bid
- adjust their bid-asks in reaction to other traders' bid-asks
- all this affects market prices, called *information aggregation*

Markets where prices reflect all info are called *efficient*

Example from old days: vegetables auction

- Farmers produce cabbages, bring them to market
- each lot is numbered, moved through the trading floor
- Buyers sit on trading floor:
  - individual greengrocers
    (who may have had demand for cabbage)
  - wholesalers
  - buyers from sauerkraut canneries
    (who have to fill their production capacity)
- express their info in prices they bid (by pressing button)
- they observe who buys at what price
- adjust their bids for next lot $\Rightarrow$ *information is aggregated!*

This is how it works in many agricultural markets

3. Provide marketability and liquidity

Marketability: easiness of selling financial contracts
Liquidity: how much value is lost in the transaction

- Allows investors to switch from and to cash
- Allows investment period $\neq$ security's maturity

Markets increase liquidity/marketability:

- primarily by size:
  - attract large number of buyers and sellers
  - more or less continuous trading
  - spread costs over very many transactions
- also by effectiveness, infrastructure, environment ('city')

4. System for settling payments and clearing

- Start in 1700s: bank clerks exchanging cheques
- Today: enormous number of transactions every day
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Exchanges have *clearing houses* to settle transactions:

- see to it that deals are properly executed
  - sellers get paid, buyers receive securities
- position themselves between buyer and seller
- take over counter party risk

Financial markets have many segments:

Classified by security and organization:

- Maturity of securities:
  - Money markets: maturity $<$ 1 year
  - Capital markets: maturity $>$ 1 year

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- Maturity of securities:
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  - Capital markets: maturity $>$ 1 year
- Newness of securities:
  - Primary markets: companies sell new issues to investors
  - Secondary markets: investors trade with investors

Financial markets have many segments:

Classified by security and organization:

- Maturity of securities:
  - Money markets: maturity $<$ 1 year
  - Capital markets: maturity $>$ 1 year
- Newness of securities:
  - Primary markets: companies sell new issues to investors
  - Secondary markets: investors trade with investors
- Nature of securities:
  - Spot markets for immediate payment and delivery:
    - stocks, bonds, currencies, etc.
  - Derivative markets for future payment and delivery:
    - options, futures, forwards, etc.

- Organization of the market:
  - Exchanges have a central meeting place
    - traditionally, demand and supply met on trading floor
    - today, demand and supply are largely matched electronically
  - Over-the-counter markets are networks of dealers
    - dealers stand ready to buy-sell at bid-ask prices
    - more loosely organized than exchanges

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    - more loosely organized than exchanges
- Price discovery process:
  - Order driven markets*:* buyers & sellers trade with each other
    - both send their orders to market through brokers
    - if prices match, deal is executed
  - Quote driven markets: buyers & sellers trade with dealers
    - dealers act as *market makers* by quoting bid-ask prices
    - keep an inventory of securities

Most markets are a mixture of segments and systems

Financial intermediaries facilitate transactions

Modern markets are large and complex

- participants cannot do all deals themselves
- Intermediaries provide professional assistance

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Summarize their role in three categories:

1. Transformation of flow of funds
2. Reduction transaction and information costs
3. Provision of investment services

1. Transformation of the flow of funds

- Surplus flow does not match deficit flow
  - intermediaries make them match
- concerns all characteristics of flow:
  - denomination (size), currency, maturity, risk
- mainly done by pooling and repackaging
  - intermediaries are 'buffer'

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Commercial banks are good example

- Commercial banks take deposits, make loans + services
- Investment banks don't take deposits, specialize in services
- old American regulation, now abolished (back in?)

Transformation of deposits into loans

	Deposits	Loans
Number	large	smaller
Denomination	small amounts	larger amounts
Maturity	short	long
Currency	domestic	also foreign
Risk	risk free	risky

Pooling gives diversification effect

- many small short-term loans give stable long term pool
- pooling loans reduces impact of defaults

2. Reduction of transaction/information costs

Consider following situation:

- 10 private households with small savings of €30 000 each
- want to make a €300 000 loan
- to a small company at the other end of town

How do households handle contract, creditworthiness, terms, uncertainty (household may suddenly need money), etc.?

- practical problems virtually insurmountable

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Role of financial intermediaries:

- reduce problem to choosing a bank

Financial contracting is difficult, requires expertise:

- contracts themselves change incentives and behaviour

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Example 1: Debt financing

- debt obligations give equity an option-like payoff structure
  - debt obligations have priority, equity holders get what is left
  - equity holders have limited liability, minimum payoff is zero
  - same payoff structure as call option
- option value increases with risk
  - options profit from upward potential
  - downside risk stops at zero
- consequence:
  taking up a bank loan makes equity holders risk seeking

Example 2: Insurance

- insurance contract gives *moral hazard*:
  - incentive to reduce management/control of risks
  - buying sprinkler installation may not be good investment if it gives too little premium reduction
- insurance contract gives *adverse selection*:
  - only clients with above average risk buy insurance
  - e.g. only clients without sprinkler installation buy fire insurance
- May lead to market failure
  - inability to efficiently allocate resources
  - described in Nobel prize laureate Akerlof's 'The Market for Lemons'

3. Provision of investment services, a few examples

Brokers (stock brokers) provide access to financial markets

- route clients' orders to trading-floor or -system
- safeguard the process (check client's account)
- can also give advice
- charge a fee, called *commission*
- do not hold positions in securities (like *dealers* do)

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Investment banks work at the other end

- help companies in issuing securities
- also assist in large corporate deals, e.g. mergers

Mutual funds provide portfolio services

- holding well diversified portfolio requires size and skills
- mutual funds provide that expertise to small investors
  - allows them to hold diversified small portfolios
  - allows them to increase/decrease holdings with small amounts
- can also provide active management:
  - try to outperform market as a whole
  - by stock picking or timing
- index funds have passive management
  - follows index at minimal costs
  - doesn't try to beat the index
- little evidence that active management gives superior performance (markets are efficient)

Suppose you want to invest in the stock market

what steps must you take?

1. Open a brokerage account and deposit money
   - brokers provide access to stock markets
   - broker checks your account and carries out your order
   - charges your account for expenses and commission
   - stores the shares for you

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2. Decide what position you want: long or short
   - Long position: buy shares and hold them
     - profits from price increase
     - very common, especially for (very) long run
   - Short position: borrow shares from broker and sell them
     - buy them back in market after agreed period
     - profits from price decrease

Short selling in practice

In practice, you and I cannot short sell:

- broker will not agree
- if he does, will demand a safety deposit
  - called *margin* of, say, 30%
  - also retains proceeds from selling stock
- will also charge a fee
- authorities forbid short selling in turbulent times

Financial models usually assume perfect markets:

- no restrictions on short selling
- no margin or other costs

3. Decide what order you want to give to your broker
   - a *limit order*:
     - specifies number of shares at what price or better
     - guarantees max./min. price you pay/get
     - not guaranteed to be executed
     - more expensive than market order (higher commission)
   - a *market order*:
     - specifies number of shares at best available prices
     - specifies no max./min. price
     - guaranteed to be executed
   - you can add more details to your order (at a price)
     - time period for which a limit order is valid
     - *all-or-nothing* order: precise number of shares or none
     - *stop-loss* order: market order to sell, activated at a certain price level

4. If your broker receives your order:
   - broker will check your brokerage account
   - send your order to the market, different routes
     - broker may have access to trading floor exchange
     - if not, send order to broker who has
     - or to third market maker (dealer)
     - or send to dealer in OTC market
     - or to electronic trading system
   - If your order finds a match in the market
     - clearing house will execute the order
     - you have established your position in the stock market!