Key Concepts: Discounting

Cost-Benefit Analysis training workshop – Samoa,

6-9 February 2012

Objectives

Understand:

1. Why we discount
2. How we discount
3. What discount rate to use

Introductory exercise

Time value of money

- There are three reasons why a dollar tomorrow is worth less than a dollar today:

1. Time preference
2. Inflation
3. Uncertainty/risk

Discounting over Time

- Many projects stretch over time (years)
- Need mechanism to value costs and benefits in different time periods – so we can make comparisons and aggregations

Discounting over Time

- If invest in the market today, you will have (1+r) more value next year where r is the interest rate
- In year t the value of your investment will be $(1+r)^t$
- Something in year t is therefore worth $1/(1+r)^t$ today
- Adjusting future dollars to make them equivalent to today is "discounting"

Example of Discounting

- Invest $100 today at 4% real interest rate

  Funds worth $149 in 10 years and $219 in 20 years

- $149 in 10 years discounted to today =$100 today
- $219 in 20 years discounted to today = $100 today

- $100 in ten years, discounted to today = $100/149=$67
- $100 in 20 years, discounted to today = $100/219=$46

Is Discounting Controversial?

- Economists do not view discounting as controversial

Is Discounting Controversial?

- Discounting viewed as controversial by some because it makes projects with high initial costs and far distant benefits look less attractive
- People who want the project will argue for using a lower discount rate and people who do not want the project will argue for using a higher discount rate
- Discount rate should be set equal to the market rate of interest- should not vary from one project to another

What Rate Should Be Used?

- **The Real Interest Rate** (r) should be used for discounting
- The real rate is the interest individuals get from savings and the rate used for borrowing taking out inflation (rise in all prices relative to a currency)
- If nominal interest rate (n) used, need to include inflation (I) in every calculation
- r = n-I

How is interest rate chosen?

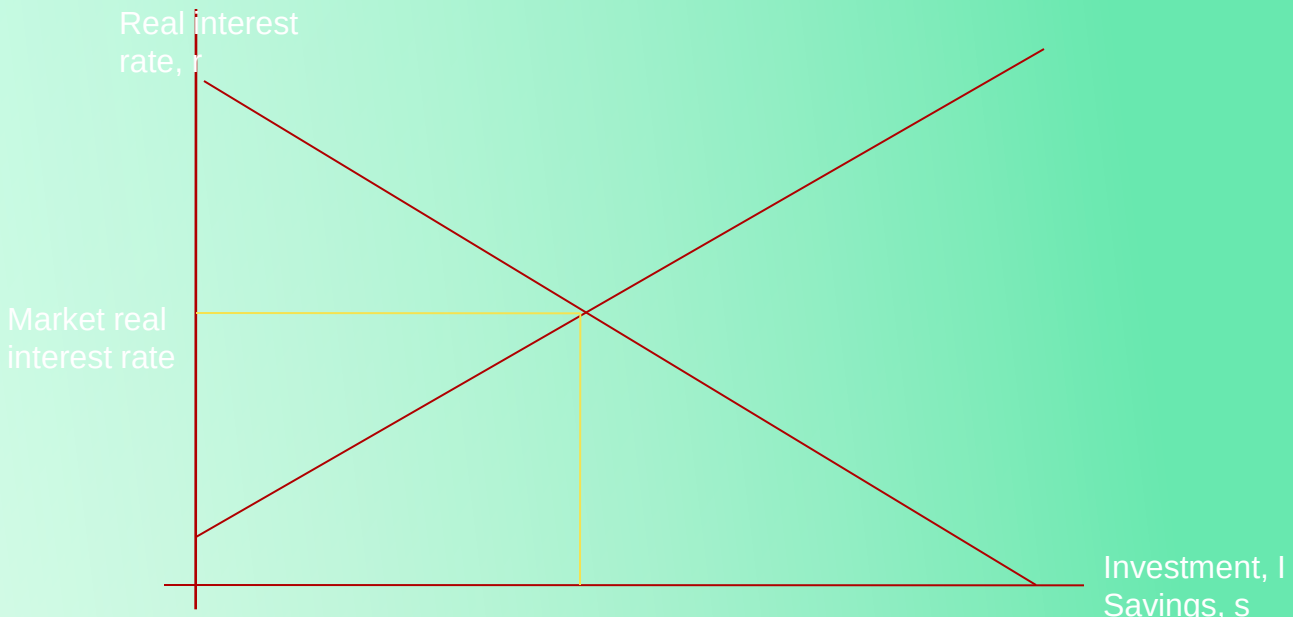
- Assemble all possible choices of investments (equipment, buildings, infrastructure, education) from best (highest return) to worst (lowest return)

How is Interest rate Chosen?

- How much each person would save depending on interest rate promised

How is Interest rate Chosen?

- The real interest rate is determined by the balancing of investment and savings- averaged 4% for last 150 years



Discounting and Present Value

- Discounting is a calculation that tells us how much future benefits/costs are worth today (their present value):

Present Value = Future Value * 1 / [(1+r)^t)]

r = real interest rate

t = time period for future value

Discounting – Another Example

	Year 0 (Today)	Year 1	Year 2	Year 3	Year 4	Total Benefits
Future benefit received	100	100	100	100	100	500
PV of benefit @ 4%	100	96.15	92.46	88.90	85.48	462.99

Discounting - Caution

- Although society may wish to change their market rate of interest (and thus their discount rate) by changing their overall saving, one should not use a different value of time (discount rate) for different projects

- Using a lower (higher) discount rate for a single project implies that project will earn less (more) than all other investments facing society

Key messages

- Why discount? Because we need mechanism to value costs and benefits in different time periods – so comparisons and aggregations can be made.
  - Cost or benefit in future is worth less than same cost or benefit now. Need to account for this.

- How discount? Calculate present values.

- What discount rate to use? Market real interest rate.

Additional materials

- Online tutorial: http://hspm.sph.sc.edu/COURSES/ECON/Dis/Dis.html

- Boardman, E.A., Greenberg, D.H., Vining, A.R. and Weimer, D.L. 2006 *Cost-Benefit Analysis: Concepts and Practice*, 3rd edition.
  - Chapter 10

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Questions?