

## Benefit - Cost Analysis

- decision rule -  $NPV > 0$

$$NPV = \sum_{t=0}^T \frac{B_t - C_t}{(1+r)^t} = \sum_{t=0}^T \frac{(B-C)_t}{(1+r)^t}$$

$t=0$  Decision point

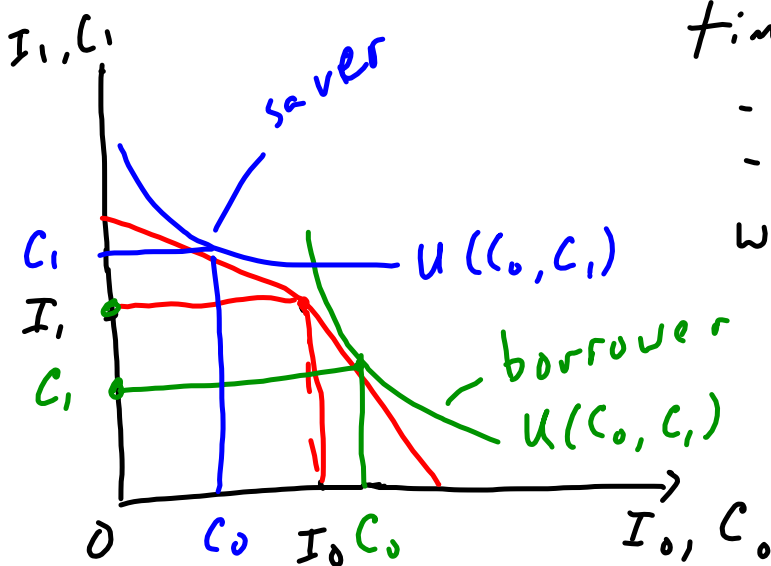
How to compute  $r$ ?

opportunity cost of spending today  
vs future?

- Soc. Rate of Time Preference?

→ long rate of growth - (real)

3% in US



time periods  
 - earn  $I$   
 - spend  $C$   
 without saving

borrowing  
 $C = I$

$r_b$	$r_s$
$\parallel$	$\parallel$
$.1$	$.05$

$$C_1 = I_1 + (I_0 - C_0) \cdot (1 + r_s) \quad \text{if } I_0 - C_0 > 0$$

$$C_1 = I_1 - (C_0 - I_0) \cdot (1 + r_b) \quad \text{if } I_0 - C_0 < 0$$

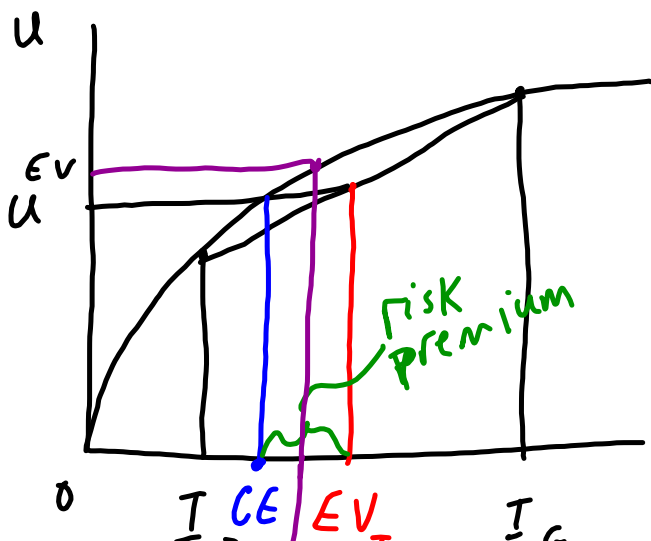
Rate of time preferences - social rate  
 of time preference  
 opportunity cost of capital.

rate of growth  $\rightarrow$  social opportunity cost  
of spending money on a project  
 $r = g \approx 0.03$   $(1 + 0.03) 1.03 = r$

uncertainty not present

risk averse - avoid risk in large items

- diminishing marginal utility of income  
 $I_G$  - good state  
 $I_B$  - bad.



$P_G = 0.5$   
 $EV = 0.5 \cdot I_G + 0.5 \cdot I_B$   
 $U(EV) \rightarrow U^*$

$U_{CE} = U^{EV}$   
Example

$$r = 0.03 + \text{risk premium}$$

$$NPV = \sum_{t=0}^T \frac{(D-C)_t}{(1+r)^t}$$

$$r = g + x \cdot x + y \text{ risk premium}$$

$$r = g + y$$

↑  
growth  
rate

Distributional effects

$$W = W(U_i) - \text{social welfare}$$

$$W = \sum_{i=1}^n U_i - \text{Berntham}$$

$$W = \sum_{i=1}^n \alpha_i U_i$$

$\alpha_i$  decreasing in  
wealth  
pro redist.

- economic impacts - not equal.
- total -
- state level.

Intangibles - cultural effects } difficult to  
 - aesthetics } quantify

Benefits → losses avoided

- levees
- redundancies
- DoD

Geologic Maps USGS



London County - 3 types of rock } old  
 → 10% sampling grid

- 11 types of rock new
- dense sampling

landfill site } avoided losses

road } leak → \$10 million - water lines

cost of map \$50K

Public Safety - TSA  
avoid losses  
 - Homeland Security

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Prices when markets don't reveal values

- ⇒ safety / security
- natural disasters -
  - property values - comparables
  - Personal - life

Value of Statistical Life (VSL)

EPA - VSL  $\approx$  6 million

Reduces expected deaths by X

Illness - treatment cost

- days lost productivity

Errors

Jobs - not a benefit. / are cost

Double counting -

Prices non-competitive markets

$P \neq$  social cost

\*  $\rightarrow$  excise tax -  $P$  includes tax - net out tax

$\Rightarrow$  monopoly power  $P > \text{cost}$

$\downarrow$   
Price-cost margin.

Costs  $\rightarrow$  social (resource) costs

- rely on studies -

writing assignment on weebly site.