

Chapter 6 Discounting Benefits and Costs in Future Time Periods

Net Present Value

is a way of comparing the value of money now with the value of money in the future. In the CBA, we compare the projects or policies with benefits and costs that arise in different time periods by using discount rate. Social discount rate is normally used at the CBA.

Discount Rate

Discount rate reflects the time value of money. In financial analysis, the rate is determined in the market rate of interest. In cost benefit or public project analysis, the rate is social time preference which accounts for intergenerational equity concerns with the view that government has an obligation to provide welfare of unborn generations.

Net Present Value (NPV) of a Project

The discount sum of all future benefit less than the discount sum of all future costs over the appraisal period.

$$NPV = \sum_{t=0}^{t=n} \frac{B_t - C_t}{(1+i)^t} = \sum_{t=0}^{t=n} \frac{B_t}{(1+i)^t} - \sum_{t=0}^{t=n} \frac{C_t}{(1+i)^t} = PVB - PVC$$

Project life runs from 0 to n

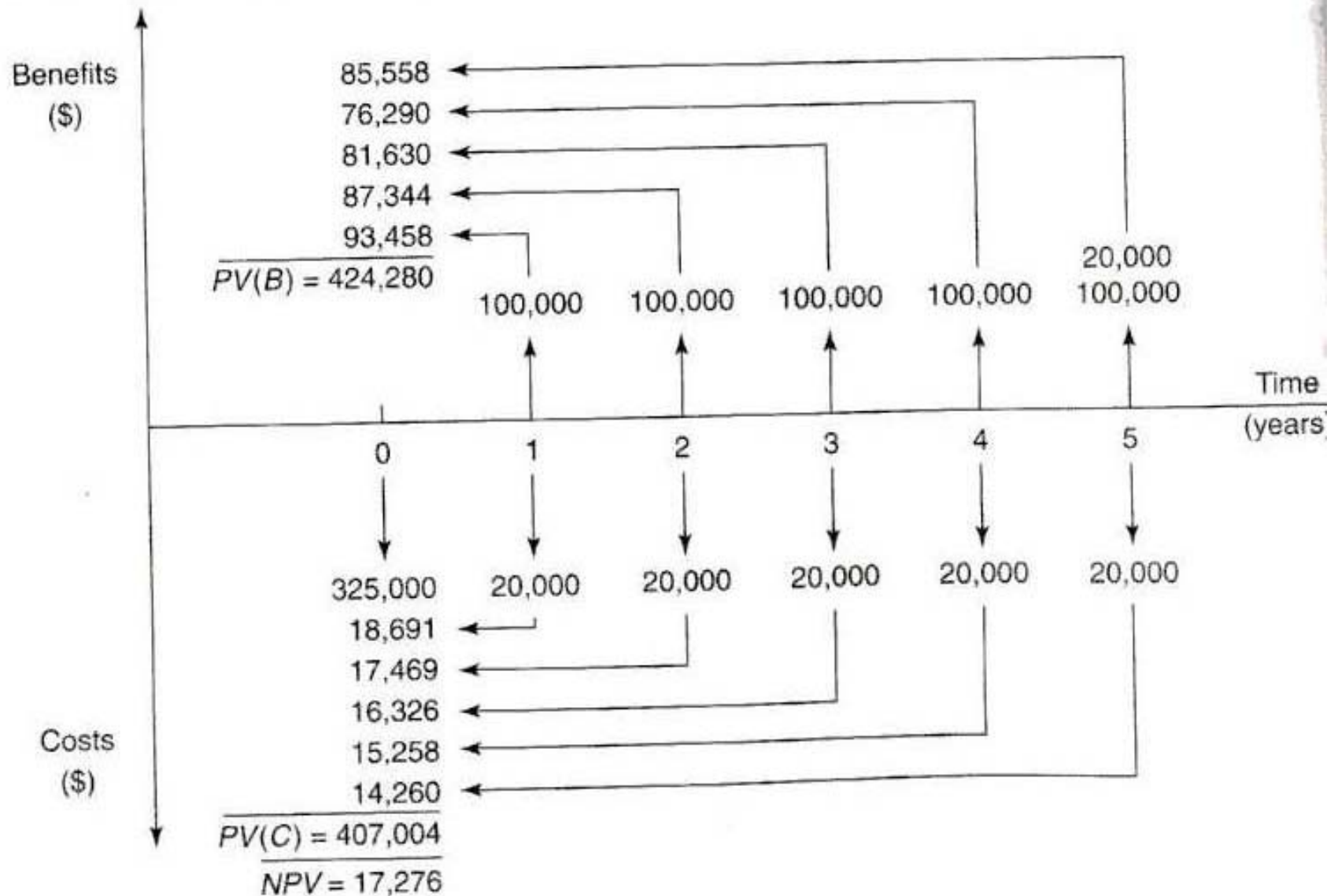
B: Undiscounted benefit in time period t

C: Undiscounted cost in time period t

i : Social discount rate

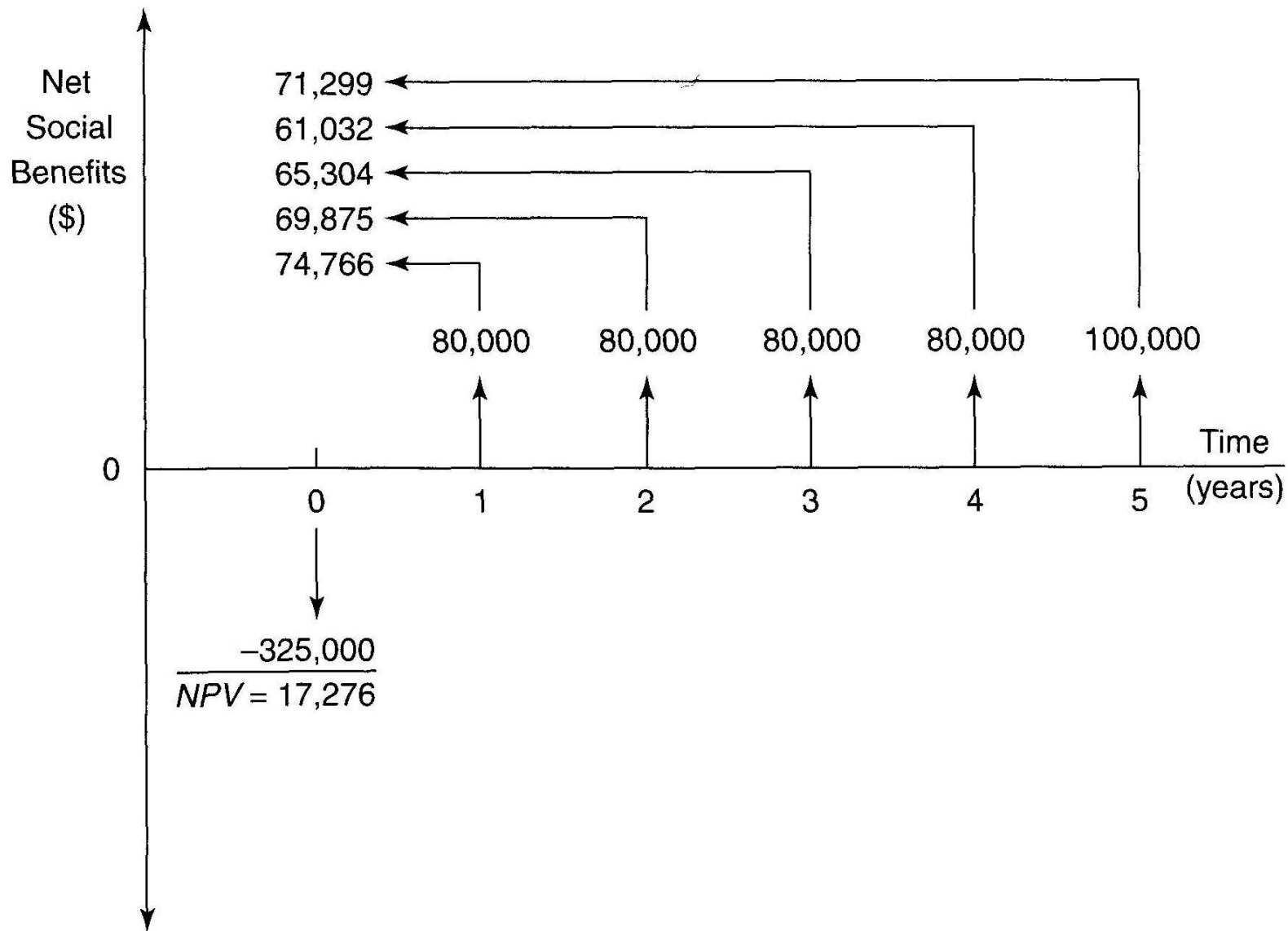
* NPV is the prime indicator of social benefit, where project alternatives are mutually exclusive.

Ex. Library Information System Accounting



Social discount rate is 7%.

FIGURE 6-5 Time Line of the Net Social Benefits of the Library Information System



Methods for Estimating Horizon Values

Useful Life (discounting period) + present value of Horizon Values.

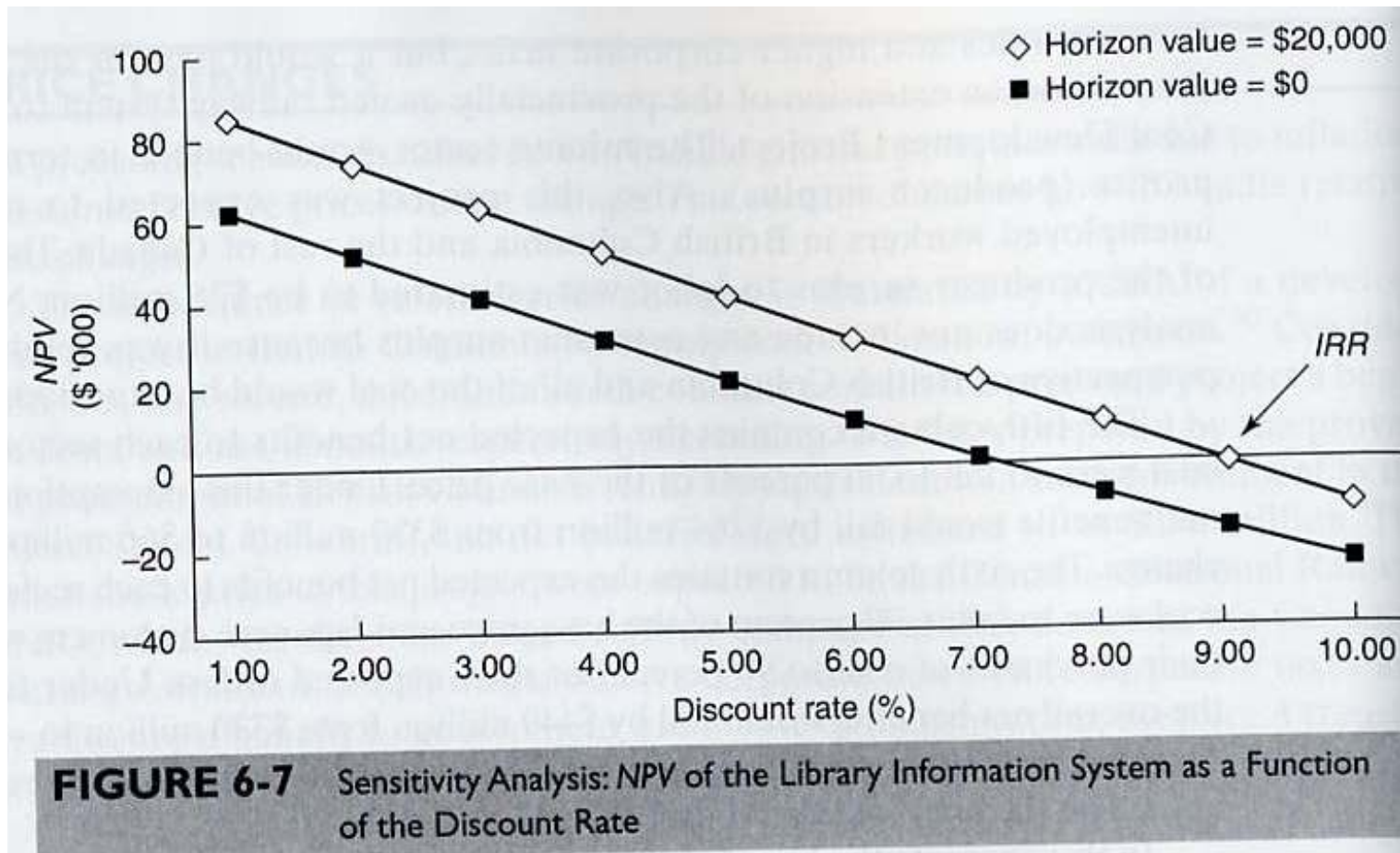
$$NPV = \sum_{t=0}^k \frac{NB_t}{(1+i)^t} + PV(H_k) \quad \text{Value at the end of discounting horizon}$$

1. Simple Projection
2. Salvage Value (or Liquidation Value)
3. Depreciated Value
4. Initial Construction Cost
5. Equal to Zero

Sensitivity Analysis in Discounting

Internal Rate of Return (IRR) $IRR: \sum_{t=0}^{t=n} \frac{B_t - C_t}{(1+i)^t} = 0$

Average rate of return on investment costs over the discount period.



Chapter 9 Existence Value

Nonuse Value or Passive Use

People may place a value on the very existence of “unique phenomena of nature”. e.g. Wilderness Area

> Possible motivations for nonuse value: **Altruism**

Individualistic altruism / Paternalistic altruism

TABLE 9-1 Taxonomy of Benefits: Possible Partitioning of Willingness-to-Pay

<i>Type of Use</i>	<i>Benefit Category</i>	<i>Example</i>
<i>Active use</i>	Rivalrous consumption	Logging of old-growth forest
	Nonrivalrous consumption: direct	Hiking in wilderness
	Nonrivalrous consumption: indirect	Watching a film of wilderness area
<i>Passive use (nonuse)</i>	Option value	Possibility of visiting wilderness area in the future
	Pure existence value: good has intrinsic value	Perceived value of natural order
	Altruistic existence value: gift to current generation	Others hiking in wilderness
	Altruistic existence value: bequest to future generation	Future others hiking in wilderness

Measurement of Existence Value

Annual Benefits:		\$3.36 million
Job creation	\$0.48 million	
Out-of-stadium incremental taxes	\$1.25 million	
Incremental admission tax	\$1.20 million	
Sales tax on incremental stadium spending	\$0.43 million	
Annual Costs:		\$14.00 million
Annual Net Benefits:		−\$10.64 million

Net Cost (= negative net benefit)

\$ 10,640,000 = \$14.20 per household

However, it may place a value on the stadium because people get pleasure from simply having the Orioles in Baltimore.

> **“Public Consumption Benefits”**

Restoration of Cheonggyecheon (清溪川)



Before



After(Sep. 2005)

Make a Fun for EST



Lee Myung-bak

Cheongyecheon Restoration

❑ Fundamental Solution to Safety Problem

- **Obsolescence of Expressway and Covering Structures**

❑ Create an Environment-friendly City Space

- **Deterioration of City Environment**

❑ Recovery of Seoul's Historic and Cultural Space

- **Loss of Historic and Cultural Relics**

❑ Balance Regional Development

- **Area Development Falling Behind Other Area of Seoul**

Achievement : Air Pollution

	2003	2004	2005	Ratio (’03 -> ’05)
CO(Ton)	748.3	623.8	488.0	▼ 34.8%
NO _x (Ton)	2,074.6	1,799.7	1,694.1	▼ 18.3%
HC(Ton)	356.6	358.6	332.4	▼ 6.8%
PM(Ton)	45.1	36.2	27.3	▼ 39.5%

Achievement : Fuel Consumption

		2003	2004	2005
Diesel	Usage(1,000ℓ)	148,059	126,485	118,783
CNG	Usage(1,000 m³)	33,955	41,731	44,671
Total Fuel Cost (KRW M)		64,816	58,685	56,033
Difference of Cost(%)		-	▽ 9.5	▽ 4.5

Restoring the Cheonggye stream in Seoul

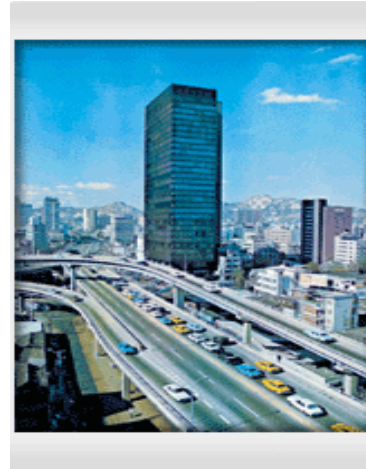
By 1945



1958~1977



1990s



2007



Past

Present

The restoration work for the Cheonggyecheon was focusing on shifting to the paradigm for a sustainable urban development for Seoul, i.e. from a development/vehicle-oriented city to a nature/human-oriented city

Restoring the Cheonggye stream in Seoul

By 1945



It was a symbol of poverty and slovenliness, being filled up with trash and wastes. Those living in houses near the stream suffered a lot due to the stench caused by the large amount of wastes flowing into the stream.

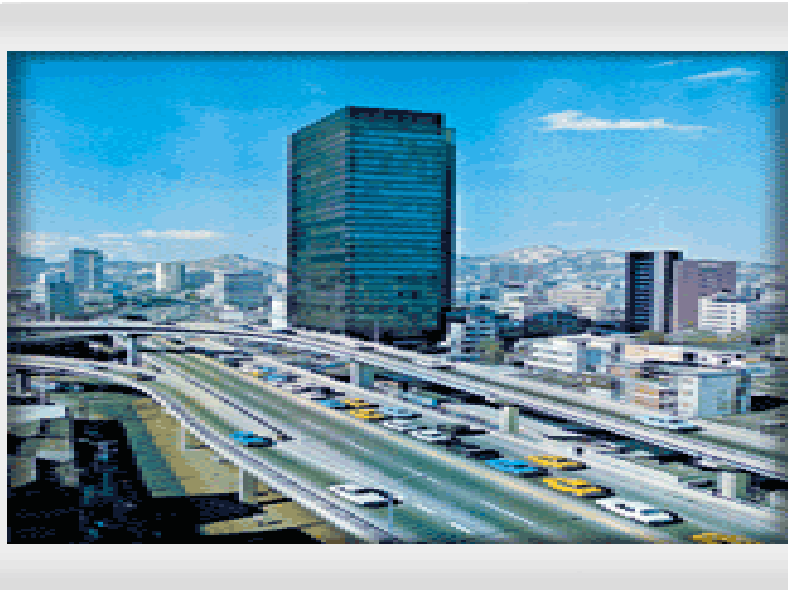
1958~1977



The multitude of shabby, makeshift houses and the dirty smell was to cover up the stream with concrete. During the 1960s and 1970s, it was regarded as an example of successful industrialization and modernization.

Restoring the Cheonggye stream in Seoul

1980s~1990s



Then, in the 1980s and 1990s, it came to be regarded as a source of intense traffic, health and environmental issues.

2007



Seoul local government restored the Cheonggyecheon and now, The stream regarded as great innovation in urban planning paradigm.