

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

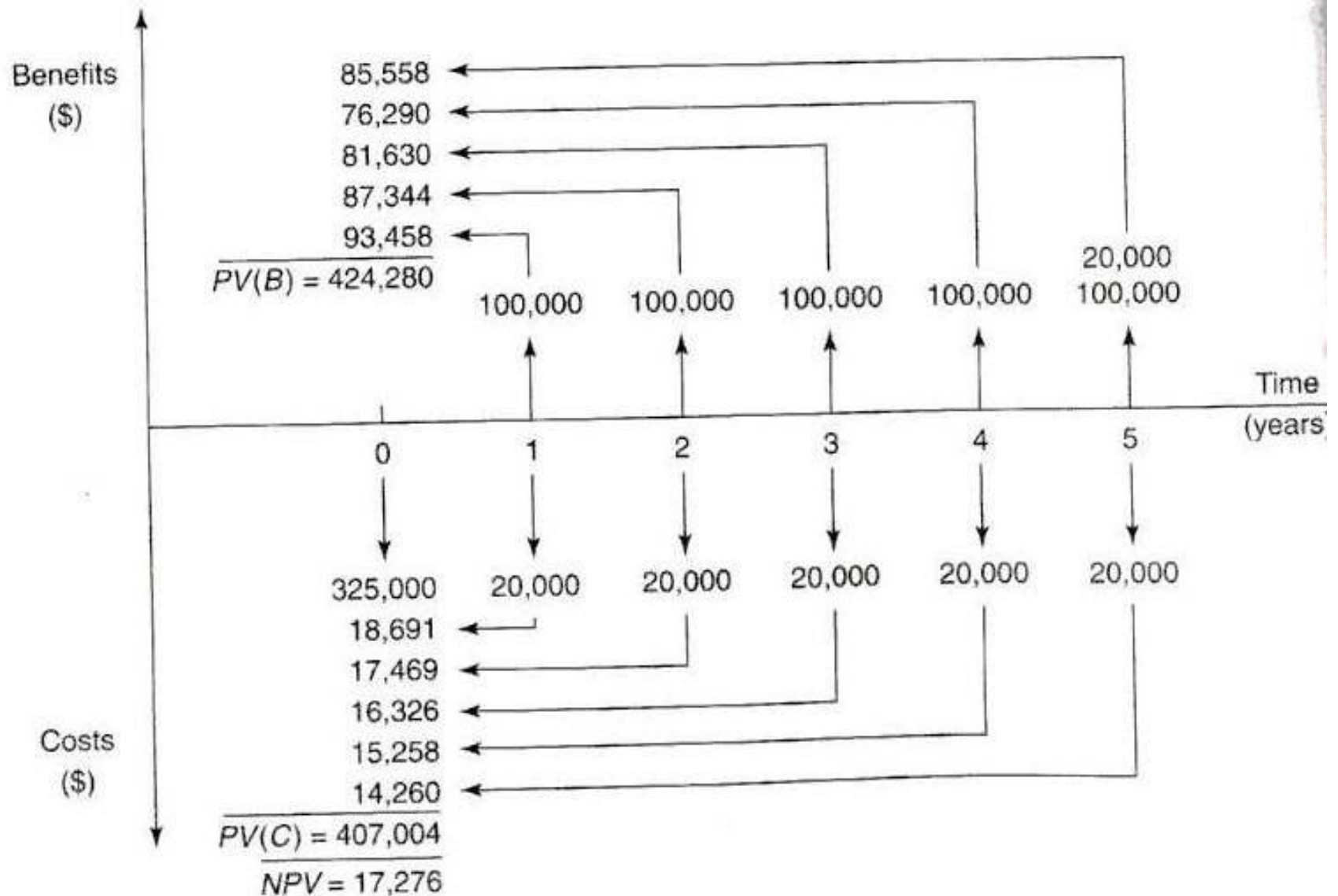
B: Undiscounted benefit in time period t

C: Undiscounted cost in time period t

i : Social discount rate

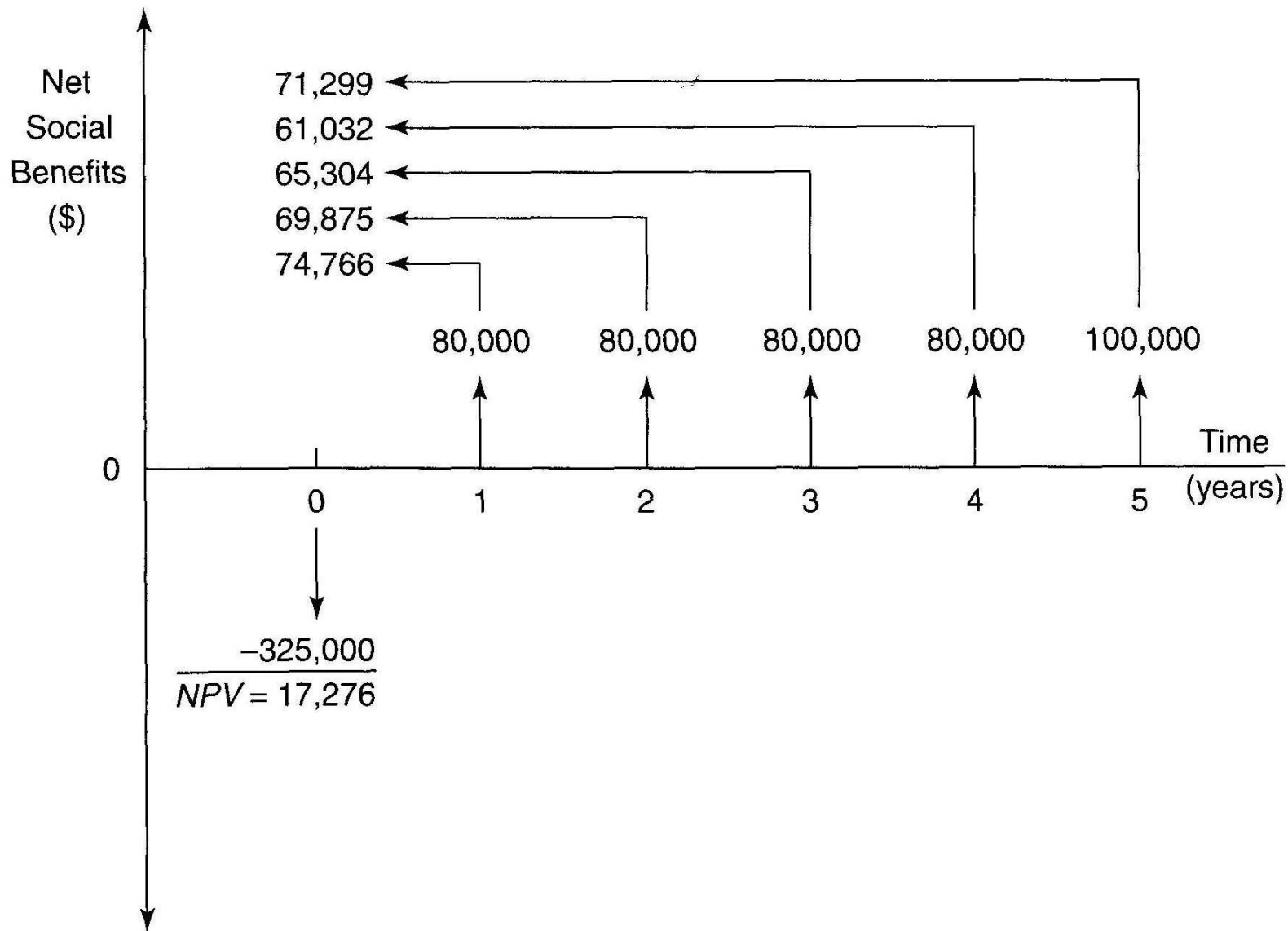
* NPV is the prime indicator of social benefit, where project alternatives are mutually exclusive.

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.

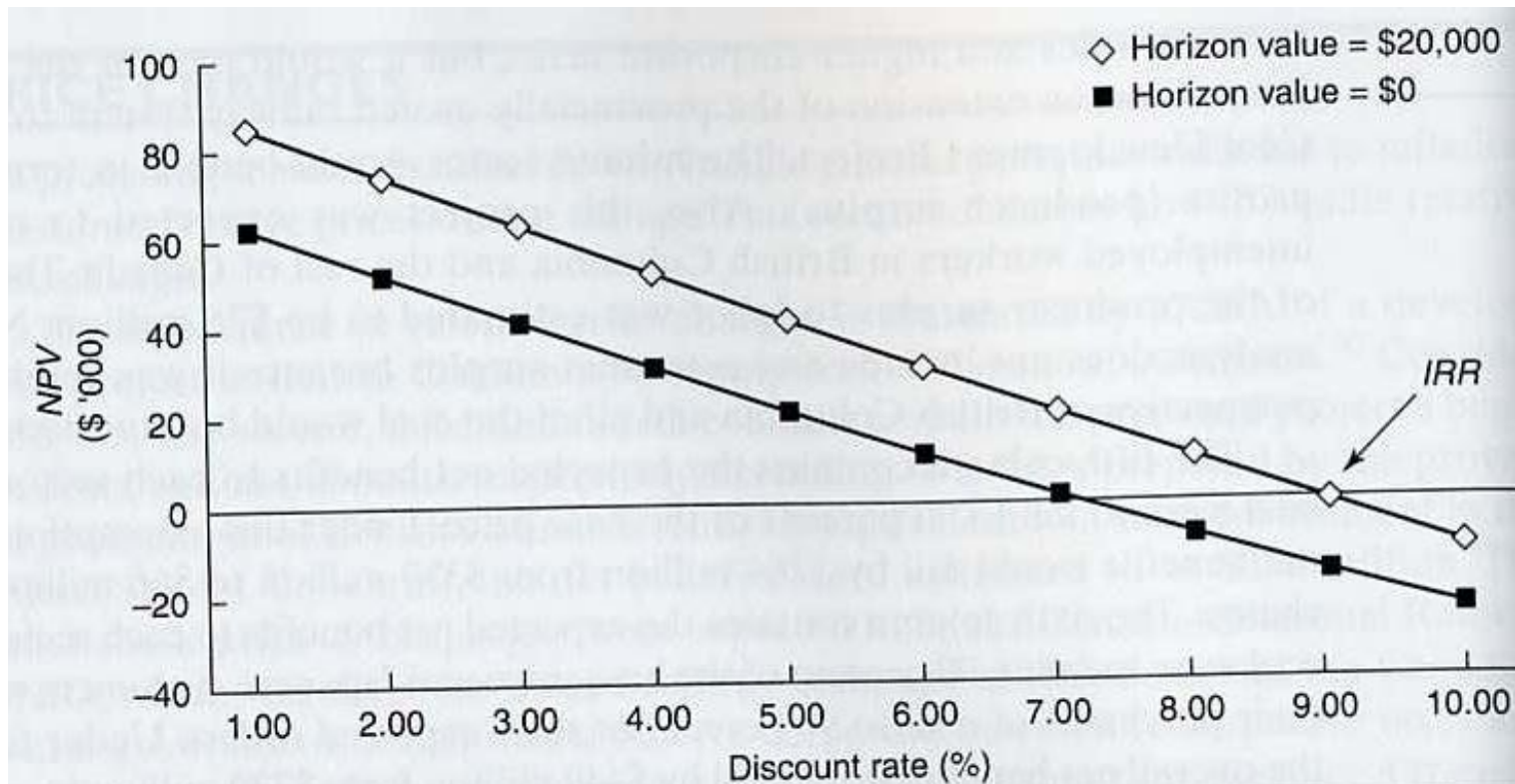


FIGURE 6-7 Sensitivity Analysis: NPV of the Library Information System as a Function of the Discount Rate

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”**