Session 2.1
Project Alternatives, Least Cost and Cost Effectiveness Analyses

Introductory Course on Economic Analysis of Investment Projects

5-9 July 2010

ADB

Cost Effectiveness Analysis

- Useful tool where aim is i) to choose from a set of alternative technologies and approaches that will provide the same service
- Or ii) where monetary valuation of benefits is not feasible (eg in social programs and projects) and comparisons must be on cost per unit of impact

Cost Effectiveness Analysis

Examples:

- Choosing from two school systems that give same educational benefits
  - Centralized schools that require bus transportation and more expensive smaller schools to which students can walk
- Two systems of electricity generation
  - Thermal versus hydro
- Two types of court systems with same disposal of cases
  - More court rooms at the headquarters or mobile courts
- Choosing amongst alternative ways of supplying potable water to communities
- Two or more kinds of health treatment to save lives

Discounting required

- PV (costs)/PV (impacts)
- Future costs and impacts must be converted to present by discounting
- Choice of discount rate is controversial
- Opportunity cost rate (eg 12%) normally used where the funds would otherwise be invested productively
- For social sector projects a lower social time preference rate (typically 2%-3%) normally applied

Discounting

- Addresses value of time
- Discount factor in year t
- $DF_t = 1/(1 + i)^t$
- Reduces future values of costs and benefits
- Calculated simply in Excel
  =npv(guess,values1..n)
- Different interpretations of i
- Physical quantities can be discounted

ADB

Case 1
Least Cost Method
Drinking Water: Alternative Delivery System

			(All figures in '000)			
Years	**0**	**1**	**2**	**3**	**4**	**5**
Installation Cost	3000					
Operating Cost		700	700	700	700	700
Total Cost	3000	700	700	700	700	700
PV of Total Cost (at 12%)	**$4,932**					
Alternative B						
Years	**0**	**1**	**2**	**3**	**4**	**5**
Installation Cost	4200					
Operating Cost		400	400	400	400	400
Total Cost	4200	400	400	400	400	400
PV of Total Cost (at 12%)	**$5,037**					

ADB

Cost per health impact

- For Example:

Benefits are measured as effectiveness (the number of Premature Deaths Prevented)

- Two different health programs: DPT-BCG vaccination campaign for children or AIDS treatment program both save lives.
- The cost per child vaccination and per patient will be computed in this case. Here the purpose is to see which programs yield more value per dollar of expenditure

Cost of health Project: Immunization Against DPT and BCG

Year	2000	2001	2002	2003	2004	2005
Premature Deaths Prevented	-	8000	12000	18000	25000	30000
Capital Costs						
Facilities	2500					
Equipments	8500					
Vehicles	5000					
Training	2000					
TA	6000					
Recurrent Costs						
Personnel		10000	16000	25000	36000	42500
Supplies		15000	24000	37500	55000	64000
Training		500	800	1250	1800	2100
Maintenance		2000	3200	4500	7200	8000
Others		3300	5500	8200	12000	14500
Total Costs	24000	30800	49500	76450	112000	131100
PV of Toral Benefits	12%	62,431.00				
PV of Total Costs	12%	$259,771.77				
Cost per unit of Premature Deaths Prevented			$4.16			

ADB

Cost of Health Project: AIDS Program

Year	2000	2001	2002	2003	2004	2005
Premature Deaths Prevented	-	8000	12000	18000	25000	30000
Capital Costs						
Facilities	200					
Equipments	1000					
Vehicles	300					
Training	500					
TA	1500					
Recurrent Costs						
Personnel		2000	2500	4000	5000	6000
Supplies		40000	65000	90000	120000	150000
Training		100	100	100	100	100
Maintenance		250	300	450	600	800
Others		300	500	800	1250	1500
Total Costs	3500	42650	68400	95350	126950	158400
PV of Toral Benefits	12%	62,431.99				
PV of Total Costs	12%	$298,692.95				
Cost per unit of Deaths Prevented			$4.78			

ADB

Incremental (or Marginal) Cost-Effectiveness Ratio

- The decision makers need to compute marginal cost-effectiveness ratios when a new larger alternative is compared with existing situation.
- The numerator now contains the difference between the cost of the new and old alternatives, and the denominator is also the difference between the effectiveness of the new and old alternatives:

$$\text{Marginal CE}_i = \frac{C_i - C_0}{E_i - E_0}$$

- This ratio in PV can be interpreted as the incremental cost per unit of effectiveness. When there are several alternatives available, the marginal cost-effectiveness ratio can be used to rank the new measures versus the existing one.

ADB

Marginal Cost-Effectiveness Ratios in Prevention of Traffic Fatalities

	Policy Measures	Total Lives Saved	Incremental Effective-ness (Deaths Prevented in a Year)	Total Cost (M $)	Incremental Cost (Rand per Year) (M $)	Marginal CE Ratios ($)	Ranking
A	Existing	500		20.0		40,000	
B	Existing plus Enforcement	600	100	25.5	5.5	55,000	2
C	Existing plus Road Safety	1000	500	31.5	11.5	23,000	1
D	Existing plus Public Campaign	585	85	25.0	5.0	58,824	3

Limitations of cost effectiveness

Does not measure Benefits (eg WTP) in monetary terms, unless benefits are treated as costs avoided.

Has to assume the activity is desirable and suggests how it can be delivered at the lowest unit cost

Often analyses exclude externalities, on both cost and benefit side

Limitations of cost effectiveness

- Does not always account for difference in scale of project and scale difference may distort the choice
- A project with smaller size but higher efficiency level may get accepted, while another project may provide more quantity of output at a reasonable cost.
- Ranking by CE only strictly correct where activities are divisible so more than one small cheaper alternative can produce the same output as one larger more expensive one.

Scale and implicit valuation

- Lack of perfect divisibility can lead to unacceptable valuations
- For example, alternative A costs $1 mill saves 10 lives
- Alternative B costs $ 0.4 mill saves 5 lives
- A = $0.1 mill/life and B = 0.08 mill/life
- But accepting B means saving $0.6 mill at cost of 5 lives or $0.12 per life
- Thus caution is required

Thank you.