LOWER MEKONG PUBLIC POLICY INITIATIVE

Technical Training in Project Appraisal for the Lower Mekong Basin

PRINCIPLES OF FINANCIAL APPRAISAL

Ho Chi Minh City

Nov 28 - Dec 09, 2016

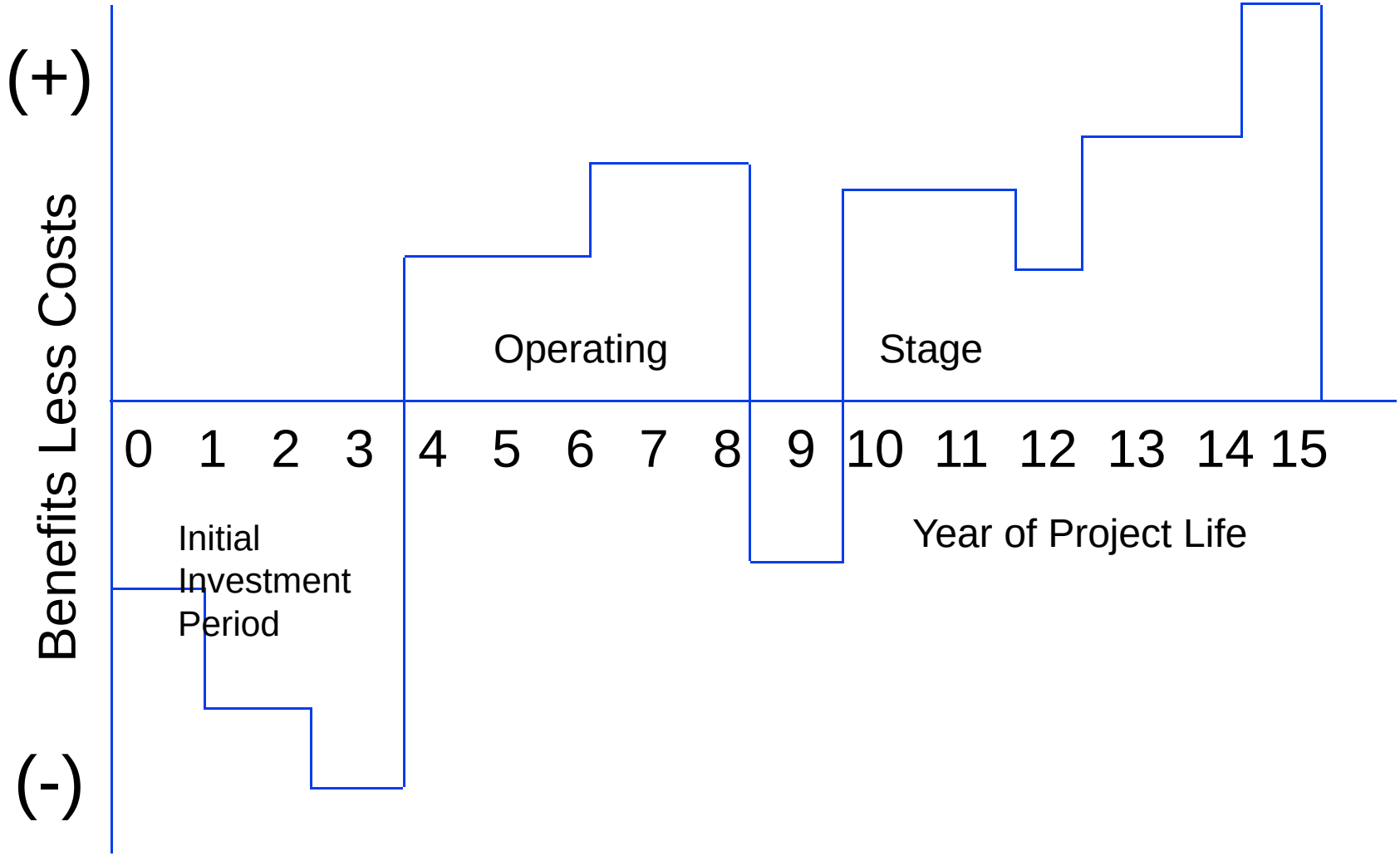
Financial Analysis: Basic Principles

- Appraisal done in a sequence: Financial, Economic, Stakeholder (social), Risk analyses
- Cash flow approach to project / program appraisal: any sales (receipts) creates is cash inflow, any purchase (payment) cash outflow
- Starting point for project appraisal is construction of cash flows over the project life cycle whether:
  - New investments
  - Replacements, expansions, mergers -- use of existing assets or resources
- Issue of opportunity cost in case of existing resources
- Cash flows from different perspectives

Construction of the Cash Flow Statement for a Project/Program

- Investment projects can be simple or complex, programs are generally complex
- **Simple investment**: single capital purchase (asset) with a simple benefit stream such as
  - Purchase farmland and rent to tenant farmers
  - Purchase motor vehicle to operate as a taxi
- **Complex investment:** most public sector projects
  - Agricultural processing plant, fertilizer factory, hydro power plant, public utility, rural development program
  - Investment and operating phases over many years with multiple revenue and expenditure items
  - Requires detailed investment and operating plans

Complex investment:
Cash Flow Profile of Project



Components of project cash flows

A. Investment Plan

- Construction phase that reconciles technical plans with financing plan and manpower availability

B. Operating Plan

- Operating phase that reconciles market demand or sales with costs for operation of project

C. Treatment of prices levels over project time horizon

- Cash flows capture complex pattern of all revenues and costs over life of project
- discounting future flows allows consolidation at a particular point of time for decision making
- Changes in real prices, inflation and exchange rate are relevant

D. Cash flow vs. balance sheet and profit-loss account

- Data from profit-loss account and balance sheet often helpful in making cash flows

Key Variables in Cash Flow Statement

a. Issue of the opportunity cost

- All resources used in a project should be charged as the project cost since public or private investor is forgoing value that could be earned in alternative uses – concept of **"opportunity cost"**

- While most "cash flows" are actual flows of cash, some cost items don't show as cash. Where existing resources are used, opportunity cost or the forgone "cash flows" are charged as costs to the project for using these resources
  - Existing land, building and machinery
  - Time of owner-manager of business

Key Variables in Cash Flow Statement (2)

b. Interest During Construction

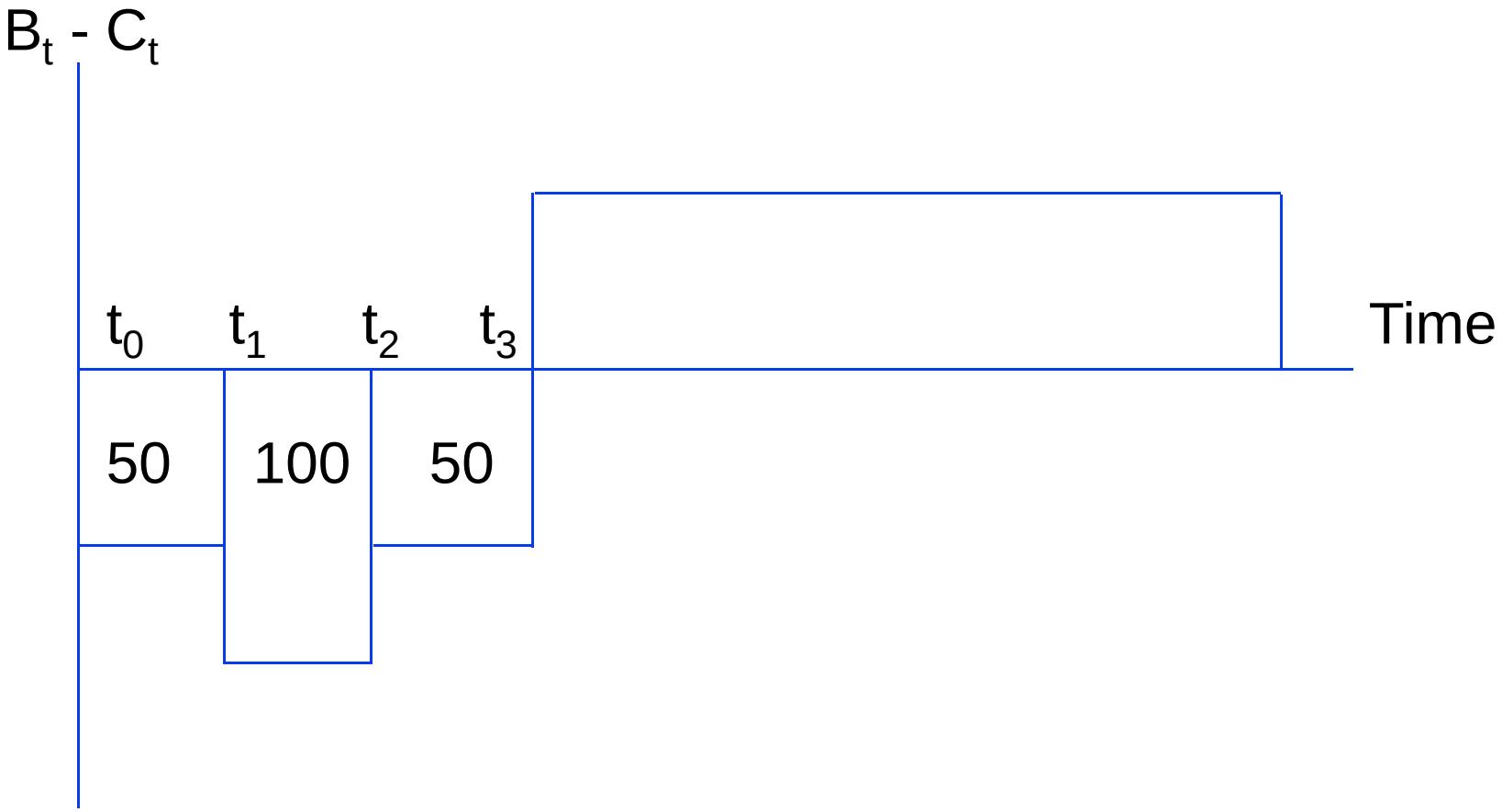
- Opportunity cost of investment funds when construction extends over more than one period
- Is it an investment cost?

  It increases cost of investment but it is accounted for as a cash outflow when it is paid.

C. Depreciation expense

- Not a cash flow item as it is not paid. So how is depreciation accounted for?
- Use of depreciation expense in cash flow profile:
  - To estimate taxes (tax depreciation)
  - To estimate residual values of assets when the project is terminated (economic depreciation)

Measuring Investment Costs: What Is The Total Cost of a Three Year Investment?

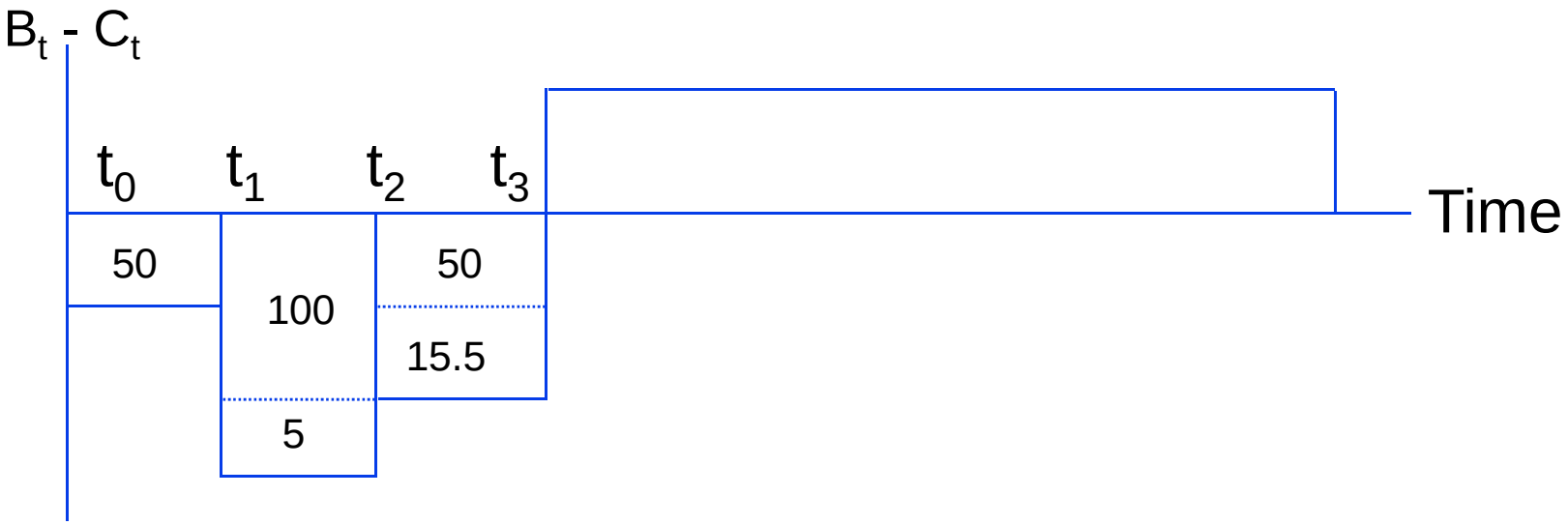


Compounding and Discounting

- We compound capital using the market interest rate as opportunity cost of funds

  e.g: $\$_0$ 100 deposited now at 10% for one year, becomes $\$_1$ 110 next year.
- Alternatively, we can discount the $\$_1$ 110 received next year back to year 0 values by "discounting" with the discount factor of [1/(1+i) = 1/(1+0.10) = 0.909] Multiplying $\$_1$ 110*[1/(1.10)] = $\$_0$ 100.
- We have discounted the 110 of year one, to a "present value" of 100 in year 0.

What Is the Total Cost of a Three Year Investment? (Cont'd)



Opportunity Cost of Funds = 10%

Investment Costs:

a. Simple Sum = $200

b. At t_0 = $50/1.1 + 100/(1.1)^2 + 50/(1.1)^3$
=45.45 + 82.64 + 37.57 =$165.66

c. At t_3 = $50 + 100(1.1) + 50(1.1)^2$ = $220.50

Interest during construction is equal to $20.50

d. Cash Receipts Versus Sales

Sales for Period

+

Accounts Receivable for Beginning of Period

-

Accounts Receivable for End of Period

Cash Receipts for Period (Inflow)

For Example:

$Sales_1 = 10{,}000$

$Accounts\ Receivable_0 = 5{,}000$

$Accounts\ Receivable_1 = 8{,}000$

$Receipts = 10{,}000+(5{,}000-8{,}000) = 7{,}000$

e. Cash Expenditures Versus Purchases

Purchases for Period

+

Accounts Payable at Beginning of Period

-

Accounts Payable at End of Period

=

Cash Expenditures for Period (Outflow)

For Example:

$Purchases_1 = 11{,}000$

$Accounts\ Payable_0 = 6{,}000$

$Accounts\ Payable_1 = 4{,}000$

$Expenditures = 11{,}000+(6{,}000-4{,}000) = 13{,}000$

f. Cash Held to Carry Out Transactions

- Cash held to carry out transactions is a use of cash
- Increases in cash holdings is a cash outflow
- Decreases in cash holdings is a cash inflow

For Example:

Desired stock of cash = 20% of sales

Year	**0**	**1**	**2**	**3**	**4**
Sales	2000	2500	3200	5000	0
Desired Cash	400	500	640	1000	0
Impact on Net Cash Flow	-400	-100	-140	-360	+1000

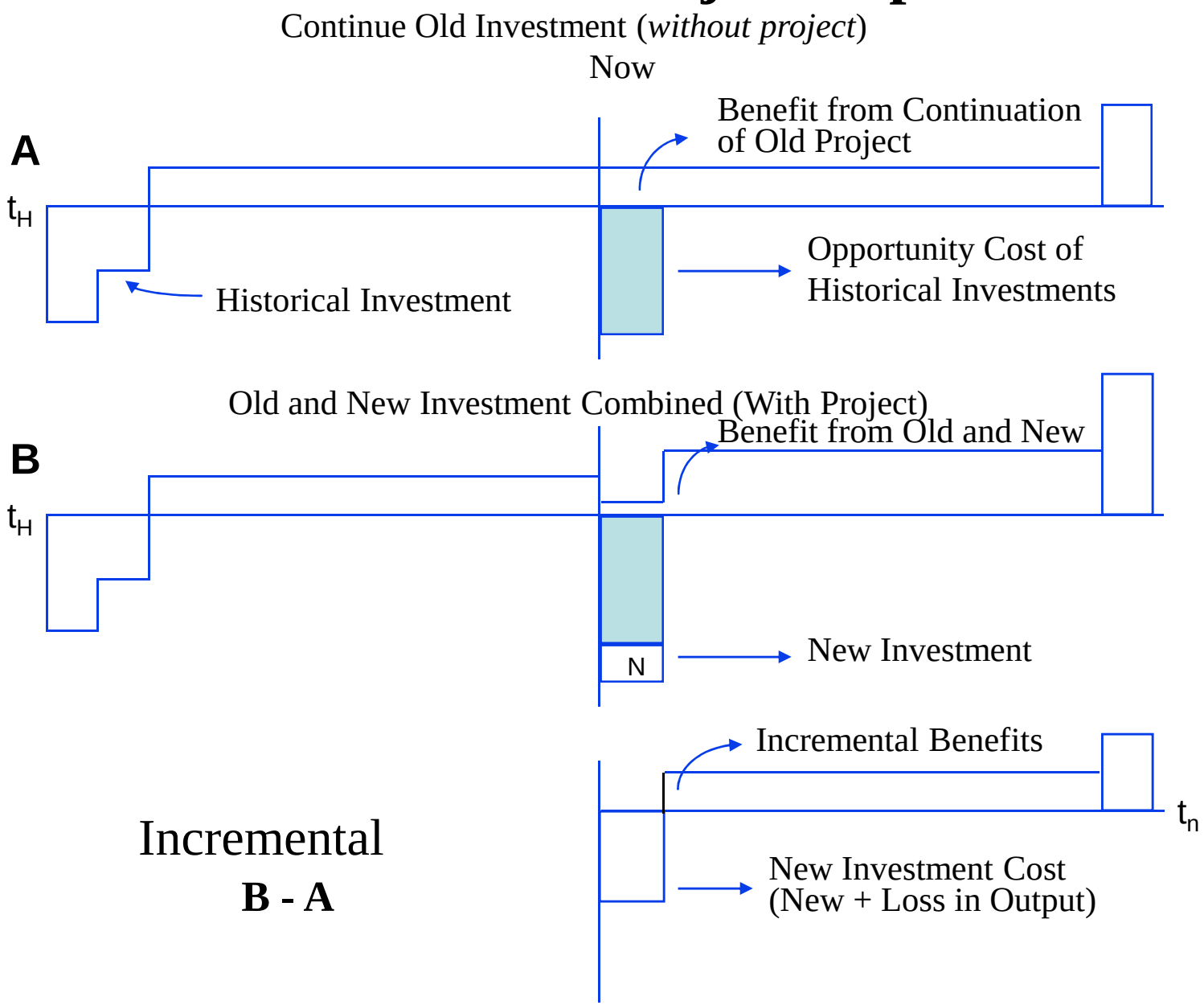
g. Accounting for Working Capital

- Working Capital= Cash + Accounts Receivables
  - Accounts Payables + Inventories
  + Prepaid Expenses - Accrued Liabilities
- No further calculation needed to determine cash flow impact of working capital except for cash
- Important to properly plan for adequate financing and accounting for working capital for survival of projects
- Often need for working capital understated in project proposals

VALUATION OF EXISTING ASSETS

- Seldom start with ***"green field":*** usually some existing assets
- Need to determine ***opportunity cost*** of existing assets being employed in activity
- ***Opportunity cost*** of particular use of assets is **highest value** in **alternative uses.** It could be either in-use value by estimating present value of future cash flows or market value if sold in operating condition or liquidated and then sold.

Evaluation of Incremental Project Improvements



Land Costs

- Land cost to project is its opportunity cost as paid by project, either annual rental value or capital cost to project for time that it uses land
- Analysis needs to separate **investment in land** *versus* **investment in project** (one potential use of land)
- **Need to treat land as a separate investment**. Never include capital gains or losses on land as a benefit or cost to investment placed on land unless direct land improvement or development (for, example, new landscaping or utilities by property developer) or destruction caused by project (such as with some mining projects)
- Land can be held undeveloped as separate investment project from development or use of land

Alternative Ways of Including Cost of Land in Cash Flow of Project

A. Preferred Method: Rental Charge Approach

- Levy implicit rental charge each period as a cost. For example, if the annual rental value is 8% of current market value then:

Year	**0**	**1**	**2**	**3**	**4**	**5**
Land Rental		**-8**	**-8**	**-8**	**-8**	**-8**

- If anticipated real capital gains, then market rental rate (which will be lower to begin with) will increase overtime as real value of land increases. If this approach is used, then need to include value of land improvement or damage in final year of cash flow.

B. Alternative Method: Capital Charge Approach:

- Assume no anticipated real capital gains and 100 is the initial purchase price of land.

Year	0	5
Land Investment	**-100**	**+100**

- Final year benefit should be different than 100 only if land physically improved or damaged.

Determination of End Year Values

- Usually end of project appraisal period does not mean end of life of business
- Often the life of the project extends beyond our ability to forecast future
- The problem is solved if we estimate values for assets in final year of analysis of cash flows
- Use same estimation procedures just as for initial values of historical assets – in-use value or market sale price

Analysis of Financial Profiles from Alternative Points of View

- Critical to evaluate financial outcome of project from the point of view of each interested party
- Conventional financial analysis considers:
  - **a. Point of view of owner or equity holder**
  - **b. Point of view of all investors combined**

    (Banker's point of view or total investment point of view)

Other Perspectives

- Point of view of government budget
- Point of view of suppliers of inputs
- Point of view of downstream processors
- Point of view of competitors
- **Point of view of economy as a whole**

Cash Flows to Equity and Total Investment

- Cash flows to equity holders are important since equity holders are owners and bearers of the residual risk in the projects – as such are the ultimate decision makers
  - Cash flows are
    - Net of interest charges and debt flows
    - Net of taxes
  - Cash flows to equity need to be discounted by the required rate of return of the equity holders reflecting the risks of the project
- Cash flows to total investment are before (or excluding) cash flows to debt holders. They represent the free cash flows out of which the combined financiers (debt and equity holders) have to be paid.
- Bankers (debt holders) analyze cash flows to check how well these flows will cover the debt service payments.

Analyses of Investment Decisions From Different Viewpoints

Type of Analysis

Viewpoint:	Financial (I)	Economic (II)	Stakeholder (III)	Basic Needs (IV)
Banker (Total Investment)	Yes	No/Yes	Yes	No
Owner	Yes	No/Yes	Yes	No
Government Budget Office	Yes	No	Yes	No
Country/economy	No	Yes	Yes	Yes

Analyses of Investment Decisions from Different Viewpoints

Note: Exchange premium=10%;Receipts & Equipment 100% tradeable; Tradeable Operating cost =100

Analysis ì	**Financial**				**Economic**		**Budget**	
Viewpoints:	**Banker's (Total Investment) (A)**		**Owner (B)**		**Country (C)**		**Govt. Budget (D)**	
Year:	**0**	**1**	**0**	**1**	**0**	**1**	**0**	**1**
Receipts		400		400		440		40
Operating Cost		-140		-140		-150		-10
Equipment	-1000	950	-1000	950	-1100	1045	-100	95
Operating Subsidy		50		50		0		-50
Taxes		-100		-100		0		100
Loan			500	-500		0		
Interest				-50		0		
Environ. Externality						-190		
Opp. Cost of Land	-30	-30	-30	-30	-30	-30		
Net Resource Flow	-1030	1130	-530	580	-1130	1115	-100	-175

Figure 1: Project Parameters

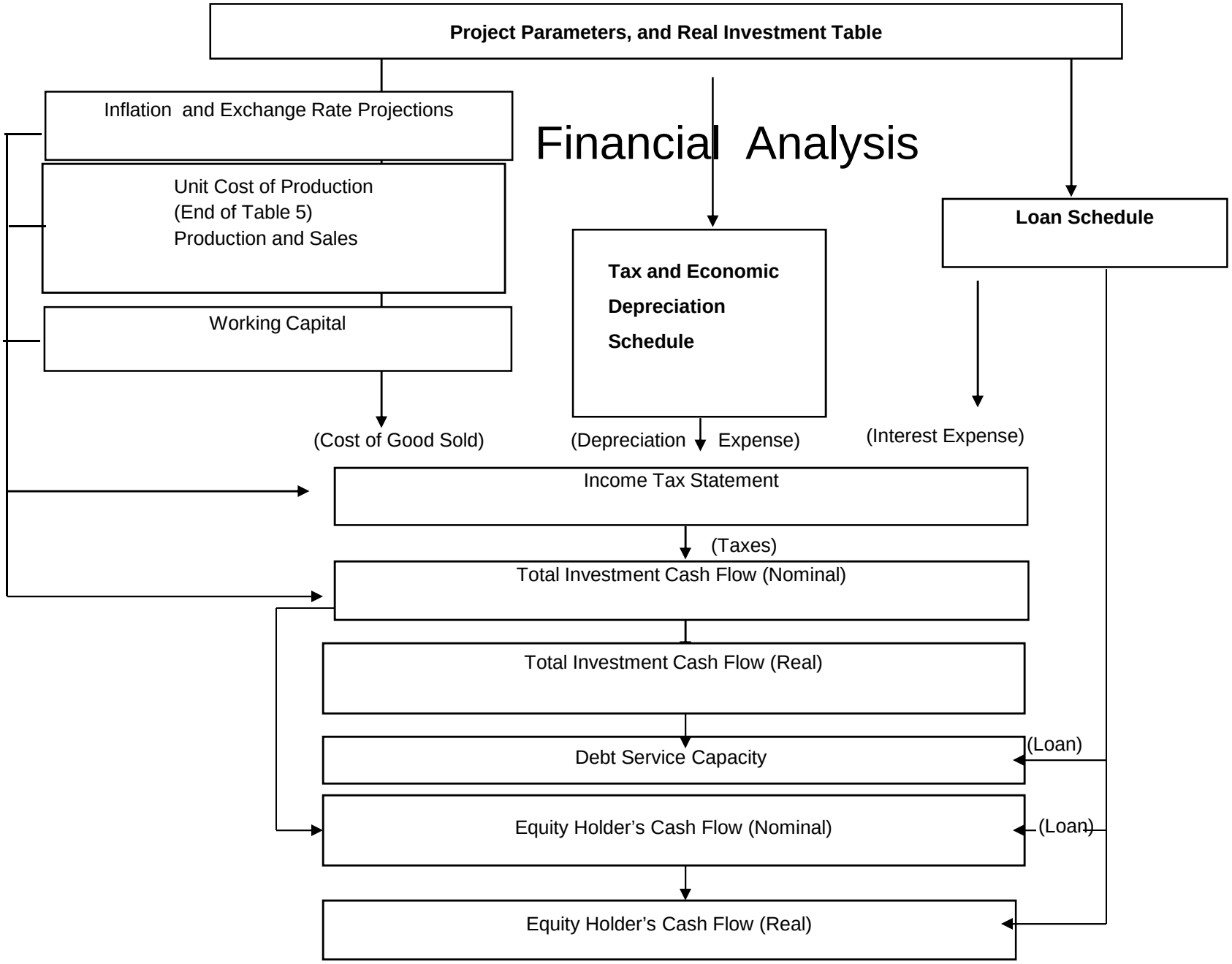


Figure 2: Economic Analysis

Step One: National Economic Parameters:

a. Economic Opportunity Cost of Capital

b. Foreign Exchange Premium

+

Step Two: Economic Conversion Factors for:

a. Project Output(s)

b. Project Inputs, including

- Investments
- Operating Expenses
- Labor

c. Working Capital

d. Taxes, Tariffs, Subsidies, and Loans

(Applied to Real Financial Cash Flow Statement)

Statement of Economic Costs and Benefits

Figure 3: Distribution Analysis

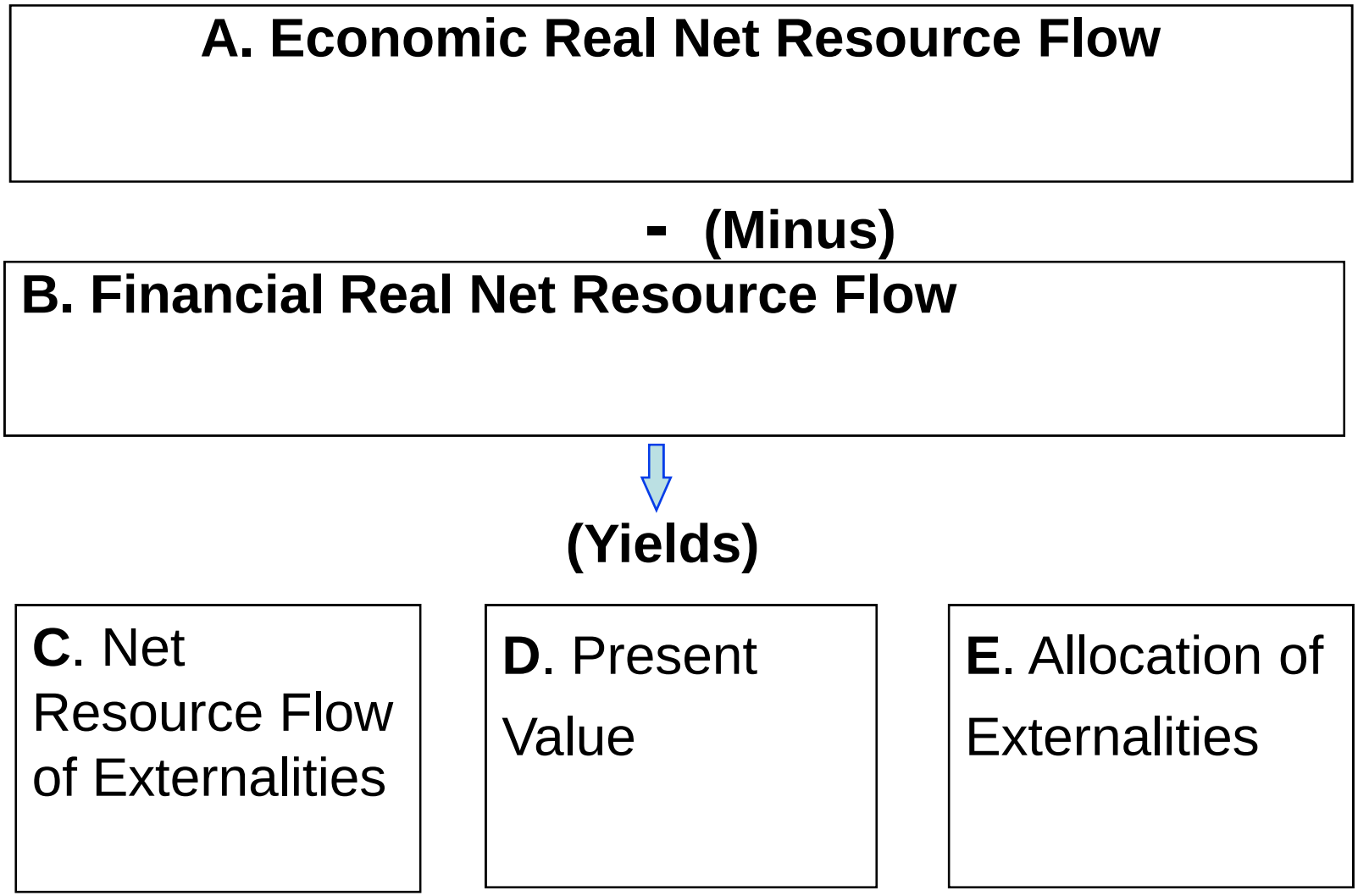


Figure 3: Distribution Analysis (Continued)

F. Summary of Distribution Project's Net Benefits

G. Reconciliation of Economic and Financial Analyses:

Economic NPV = Financial NPV + sum(PV Externalities)

Figure 4: Risk Analysis

A. Sensitivity Analysis

B. Risk Variables

C. Results

Alternative Investment Criteria

- **Net Present Value**
- **Internal Rate of Return**
- Cost-Benefit Ratio
- Pay-Back Period
- Cost-effectiveness

Alternative Investment Criteria

Basic Concepts:

A. Discounting

- Recognizes time value of money
  a. Funds when invested yield a return
  b. Future consumption worth less than present consumption

$NPV_r^o = (B_o-C_o)/(1+r)^o+(B_1-C_1)/(1+r)^1+\ldots\ldots+(B_n-C_n)/(1+r)^n$

B. Cumulative Values

- The calendar year to which all projects are discounted to is important
- All mutually exclusive projects need to be compared as of same calendar year

If $NPV_r^1 = (B_o-C_o)(1+r)^1+(B_1-C_1) +..+..+(B_n-C_n)/(1+r)^{n-1}$ and

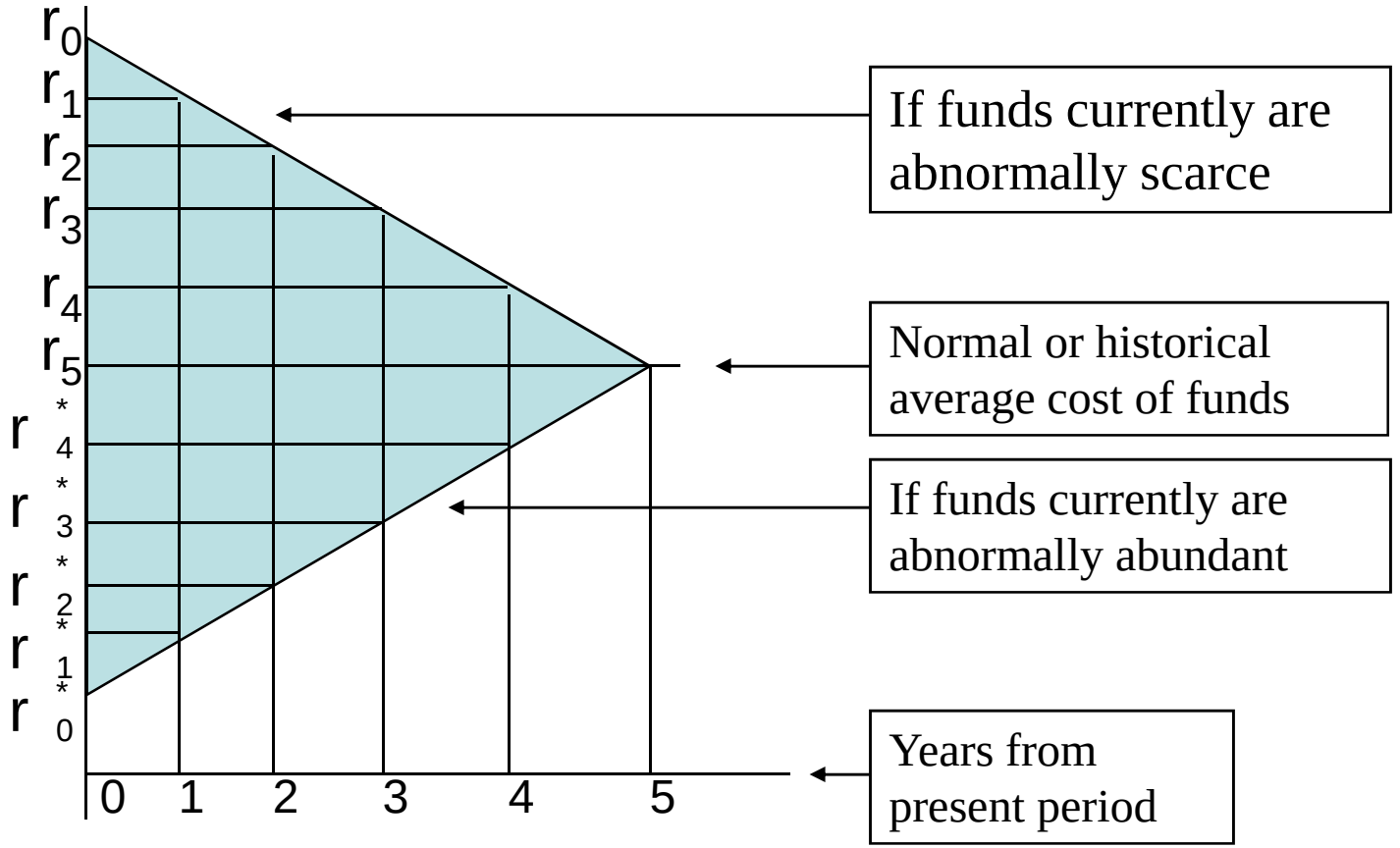
$NPV_r^3 = (B_o-C_o)(1+r)^3+(B_1-C_1)(1+r)^2+(B_2-C_2)(1+r)+(B_3-C_3)+...(B_n-C_n)/(1+r)^{n-3}$

Then $NPV_r^3 = (1+r)^2\, NPV_r^1$

Alternative Investment Criteria: Basic Concepts (Cont'd)

C. Variable Discount Rates

- Adjustment of Cost of Funds Through Time



•For variable discount rates r_1, r_2, & r_3 in years 1, 2, and 3, the discount factors are, respectively, as follows:

$$1/(1+r_1), \quad 1/[(1+r_1)(1+r_2)] \quad \& \quad 1/[(1+r_1)(1+r_2)(1+r_3)]$$

Alternative Investment Criteria

First Criterion: Net Present Value (NPV)

- What does net present value mean?
- Measures change in wealth or net worth or value of equity: ***NPV > 0 means increase in value of firm***
  - **Basic aim of increasing shareholder value**
- Used as a decision criterion to answer following:
  a. When to reject projects?
  b. When you have a budget constraint?
  c. When you need to compare mutually exclusive projects?

Net Present Value Criterion

a. When to Reject Projects?

Rule:

"Do not accept any project unless it generates a positive net present value when discounted by the opportunity cost of funds"

Examples:

Project A: Present Value Costs $1 million, NPV + $70,000

Project B: Present Value Costs $5 million, NPV - $50,000

Project C: Present Value Costs $2 million, NPV + $100,000

Project D: Present Value Costs $3 million, NPV - $25,000

Result:

Only projects A and C are acceptable. The investor or the country is made worse off if projects B and D are undertaken.

Net Present Value Criterion *(Cont'd)*

b. When there is a Budget Constraint?

Rule: ***"Within the limit of a fixed budget, choose that subset of the available projects which maximizes net present value"***

Example:

If budget constraint is $4 million and 4 projects with positive NPV:

Project E: Costs $1 million, NPV + $60,000

Project F: Costs $3 million, NPV + $400,000

Project G: Costs $2 million, NPV + $150,000

Project H: Costs $2 million, NPV + $225,000

Result: Combinations FG and FH are impossible, as they cost too much. EG and EH are within the budget, but are dominated by the combination EF, which has a total NPV of $460,000. GH is also possible, but its NPV of $375,000 is not as high as EF.

What to do if project E has NPV of - $60,000?

Net Present Value Criterion *(Cont'd)*

c. When You Need to Compare Mutually Exclusive Projects?

Rule:

*"**In a situation where there is no budget constraint but a project must be chosen from mutually exclusive alternatives, we should always choose the alternative that generates the largest net present value"***

Example:

Assume that we must make a choice between the following three mutually exclusive projects:

Project I: PV costs $1.0 million, NPV $300,000

Project J: PV costs $4.0 million, NPV $700,000

Projects K: PV costs $1.5 million, NPV $600,000

Result:

Projects J should be chosen because it has the largest NPV.

Alternative Investment Criteria

Second Criterion: Internal Rate of Return (IRR)

- **IRR i**s the discount rate (K) at which the present value of benefits are just equal to the present value of costs for the particular project

$$\sum_{i=0}^{t} \frac{B_t - C_t}{(1 + K)^t} = 0$$

Note: the IRR is a mathematical concept, not an economic or financial criterion

Common uses of IRR:

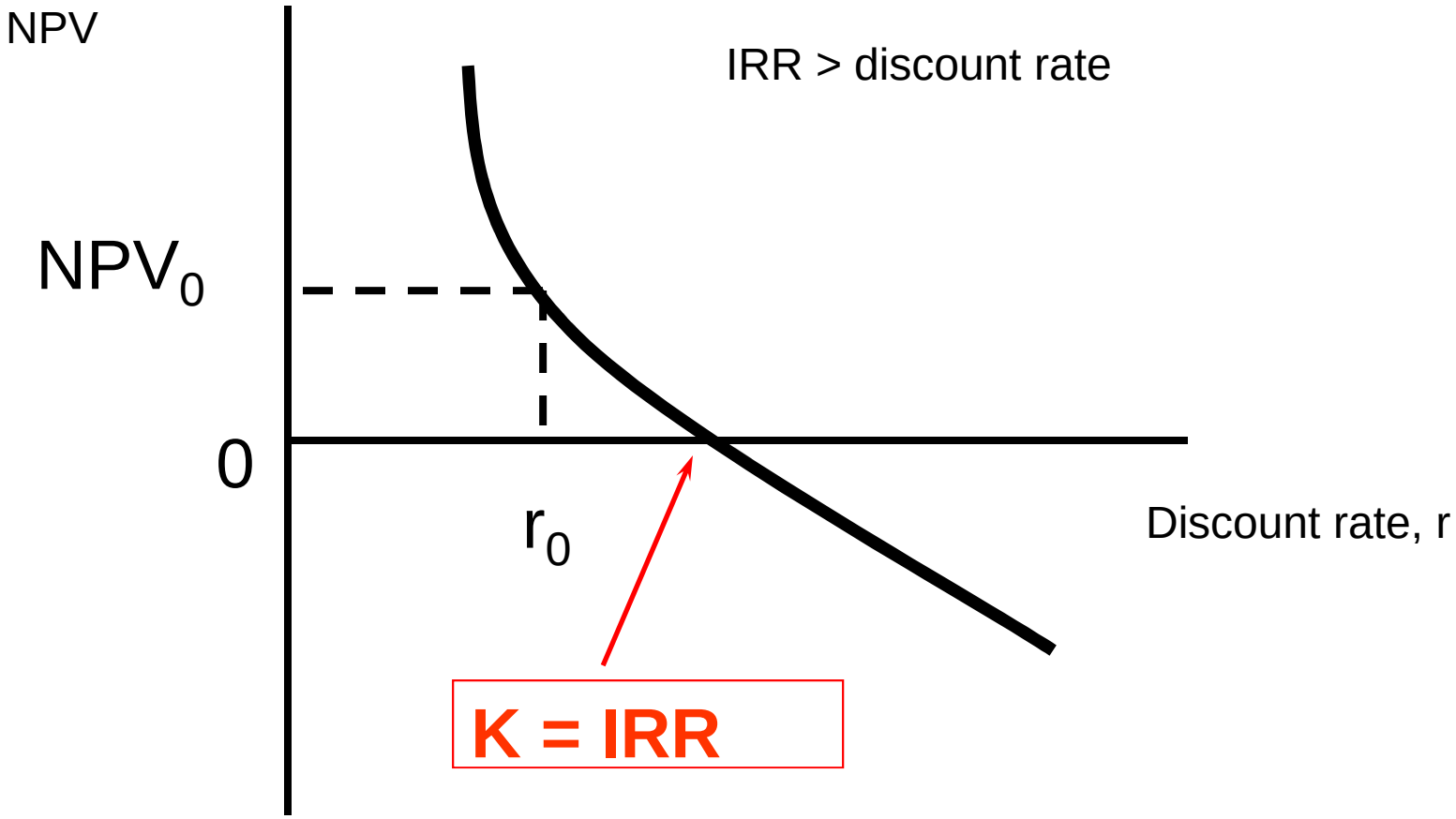
(a). If the IRR is larger than the cost of funds then the project should be undertaken

(b). Often the IRR is used to rank mutually exclusive projects. The highest IRR project should be chosen

- An advantage of the IRR is that it only uses information from the project

Criterion:

IRR > discount rate



Difficulties With The Internal Rate of Return Criterion

- **It is often difficult to correctly rank projects using IRR criterion, specially in the following situations:**
  - The project may has multiple IRRs
  - With projects of different sizes and also strict alternatives: higher IRR but lower NPV is possible
  - Projects of different lengths of life and strict alternatives: again higher IRR but lower NPV possible
  - Same project but started at different times
- **IRR can be used to compare investments when they have the same:**
  - Scale/size; Timing; and Length

Alternative Investment Criteria

Third Criterion: Benefit-Cost Ratio

Benefit-Cost Ratio (R) = Present Value Benefits/Present Value Costs

Basic rule:

If benefit-cost ratio (R) >1, then the project should be undertaken.

Problems?

Sometimes it is not possible to rank projects with the Benefit-Cost Ratio

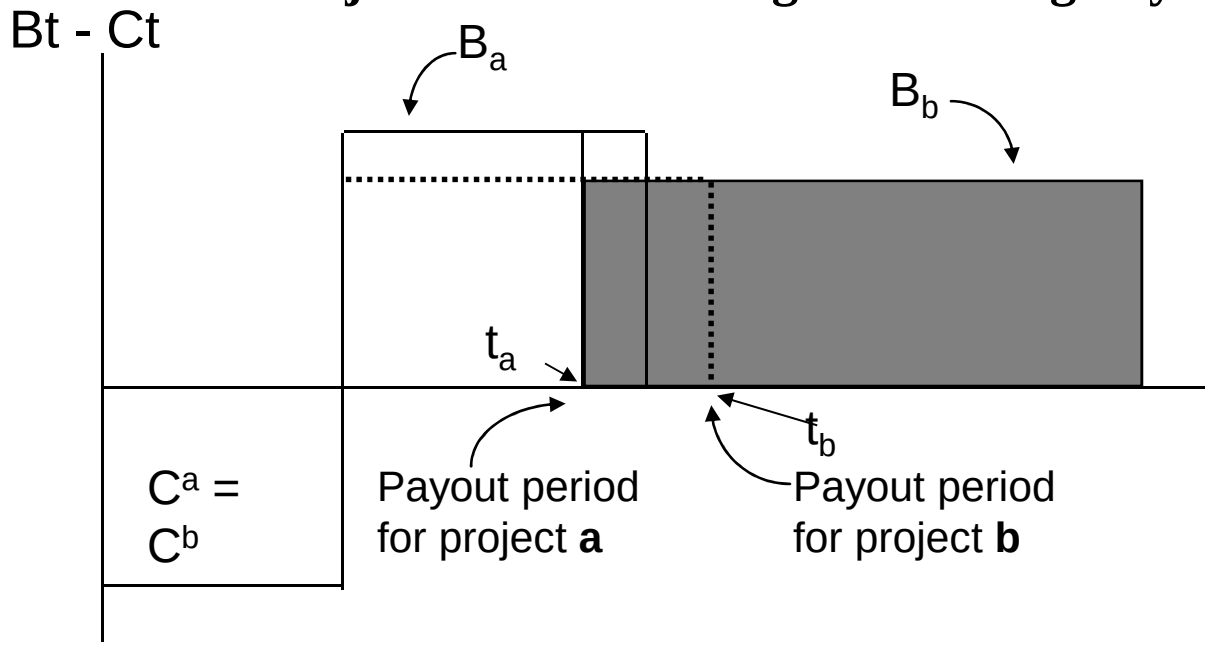
- Mutually exclusive projects of different sizes
- Not necessarily true that $R_A > R_B$ that project "A" is better

Alternative Investment Criteria

Fourth Criterion: Pay-Out or Pay-Back Period

- The number of years before the benefits (discounted) are sufficient to repay the cumulative costs (discounted)
- Project with shortest payback period is preferred by this criteria
- Can reject high NPV projects with delayed pay-out; commonly used in unstable economic environments; **useful in determining length of lease or contract periods in private participation**

Comparison of Two Projects With Differing Lives Using Pay-Out Period



Cost Effectiveness Approach

- An appraisal and program monitoring technique used primarily in social sector programs/ projects (health, nutrition, education) where identification and quantification of benefits in money terms is not straightforward but, at the same time, the desirability of the activity is not in question. The objective is to compare costs per unit of outcome of two or more programs for purposes of capital budgeting.
- This approach also very useful where aim is to choose from a set of alternative technologies/approaches that will provide the same service; e.g. two school systems that impart the same education 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) etc.
- Analysis considers only the costs of two or more alternatives treating benefits as identical. The selection criterion is “choose the alternative that has the lowest present value of costs (PVC)”.

EXAMPLE 1

COST OF HEALTH PROJECT: IMMUNIZATION AGAINST DPT-BCG

(All figures in ' 000 of US$)

Discount rate: 8%

Year	2000	2001	2002	2003	2004	2005
Premature Deaths Prevented	-	8,000	12,000	18,000	25,000	30,000
Capital Costs						
Facilities	2,500					
Equipments	8,500					
Vechicles	5,000					
Training	2,000					
Technical Assistance	6,000					
Recurrent Costs						
Personnel		10,000	16,000	25,000	36,000	42,500
Supplies		15,000	24,000	37,500	55,000	64,000
Training		500	800	1,250	1,800	2,100
Maintanance		2,000	3,200	4,500	7,200	8,000
Others		3,300	5,500	8,200	12,000	14,500
Total Costs	**24,000**	**30,800**	**49,500**	**76,450**	**112,000**	**131,100**

	Discount Rate		
Present value of Total Benefits	8.0%	70,778	[Premature Deaths Prevented]
Present Value of Total Costs	8.0%	327,193	

Cost per unit of Premature Deaths Prevented **4.62** **$/Death Prevented**

EXAMPLE 2

COST OF HEALTH PROJECT: AIDS PROGRAM

(All figures in ' 000 of US$)

Discount rate: 8%

	Year	2000	2001	2002	2003	2004	2005
Deaths Prevented		-	500	750	1,000	1,400	1,750
Capital Costs							
Facilities		200					
Equipments		1,000					
Vechicles		300					
Training		500					
Technical Assistance		1,500					
Recurrent Costs							
Personnel			2,000	2,500	4,000	5,000	6,000
Supplies			40,000	65,000	90,000	120,000	150,000
Training			100	100	100	100	100
Maintanance			250	300	450	600	800
Others			300	500	800	1,250	1,500
Total Costs		**3,500**	**42,650**	**68,400**	**95,350**	**126,950**	**158,400**
	Discount Rate						
Present value of Total Benefits	8.0%		4,120				
Present Value of Total Costs	8.0%		378,441				

Cost per unit of Deaths Prevented **91.86** **$/Death Prevented**