Project Appraisal

1

DUSHYANT MAHADIK

CENTRE FOR ECONOMICS AND FINANCE
ADMINISTRATIVE STAFF COLLEGE OF INDIA

Why Appraise Projects?

- Optimum allocation of available resources
- Objective parameters for decision making
- Coordination and prioritization of initiatives
- Agree on and commit to project benefits

Classification of Projects

Commercial products and services

- Telecommunications, FMCG, hotels, etc.
- Markets forces are best suited for efficient delivery

Infrastructure

- Ports, roads, education, etc.
- Financially viable but other considerations – monopoly, time horizon, etc.

Social obligations

- Healthcare, safety, food, water, shelter, etc.
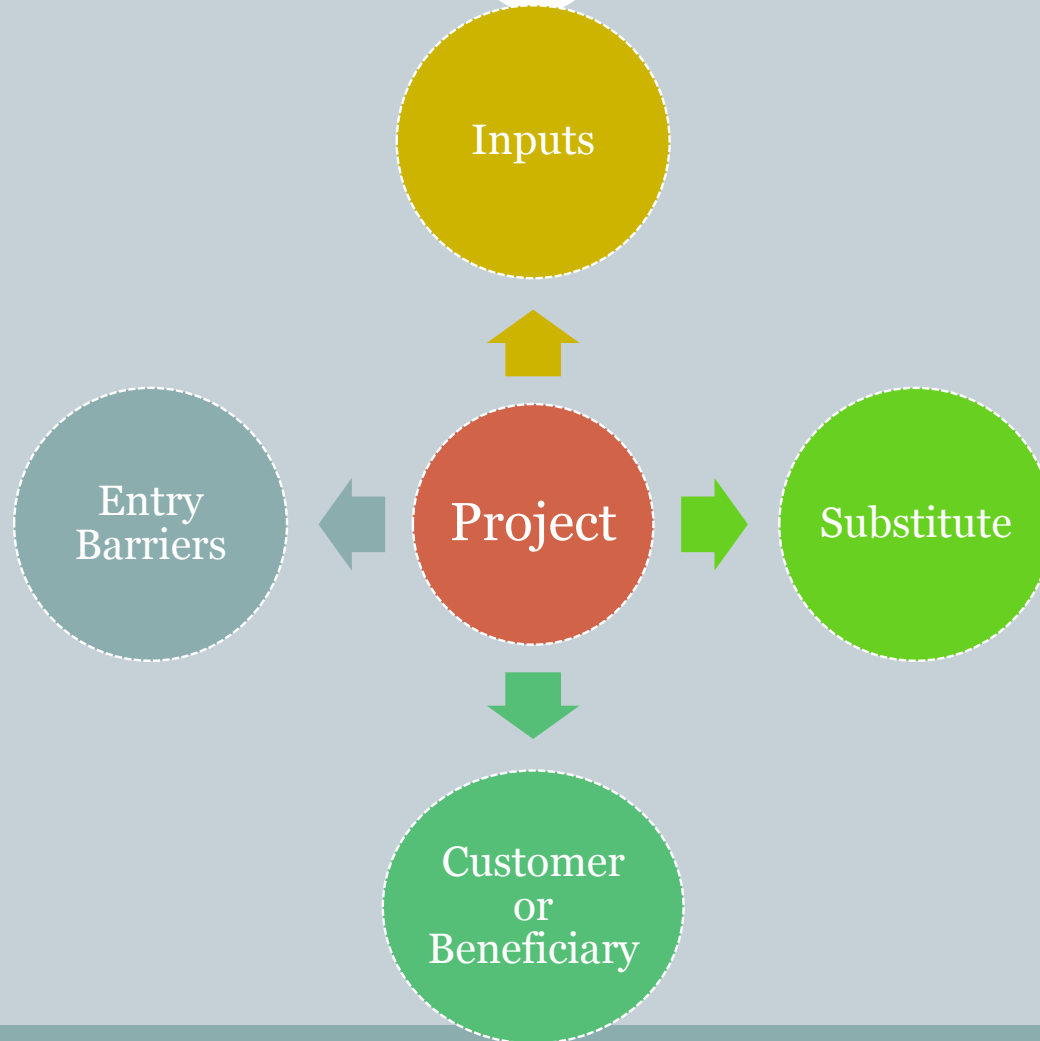- Financially unviable but social necessity

Regulate

Private finance with state concession

Publicly finance

Economic Environment

Justification for a Project

- Are the project benefits greater than the costs?
  - Are MY benefits greater than MY costs?
- Is this the best way to achieve these benefits (engineering or institutional options)?
  - Can similar benefits be achieved more efficiently by some other approach?
- Is this the best place to allocate resources?
  - Do other projects have greater benefits?
  - Are other types of benefits more important?

A Typical Project

Financial Criteria

- Cost-Benefit Analysis
- Payback period
- Net Present Value
  - Economic Value Added
  - Adjusted Present Value
- Rates of return
  - Return on Investments
  - Accounting Rate of Return
  - Internal Rate of Return

Exercise: Capital Investment Project

Option 1 : 20,000 sq ft	Option 2 : 50,000 sq ft
• You have a proposal to build an office complex • The expected life of the project is 10 years, during which, there is adequate demand • Site available is perfectly suited	• You have a proposal to build a commercial complex • The expected life of the project is 10 years, during which, there is adequate demand • Site available is perfectly suited

Exercise: Capital Investment Project

| Option 1 : 20,000 sq ft	Option 2 : 50,000 sq ft
• Entire project costs Rs 10 million (1 Crore) • Over next 10 years, the facility is expected to generate revenue of Rs 35 MN (3.5 MN/year) and incur cost worth Rs 15 MN	• Entire project costs Rs 15 million (1.5 Crore) • Over next 10 years, the facility is expected to generate revenue of Rs 48 MN (4.8 MN/ year) and incur cost worth Rs 20 MN

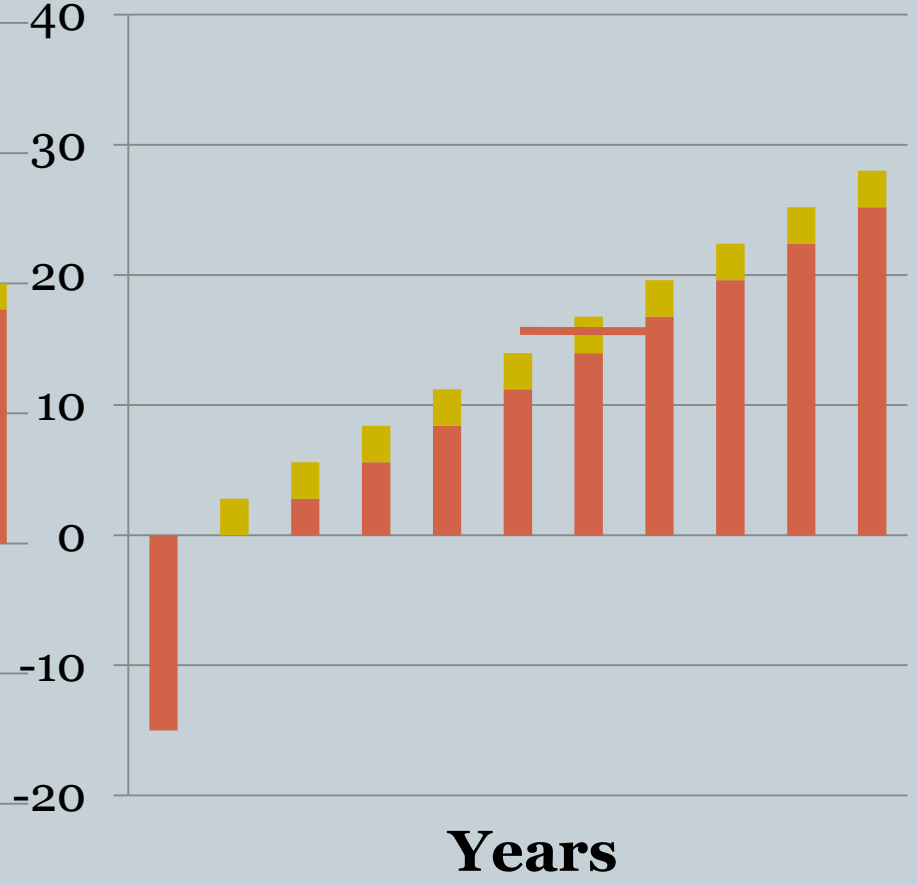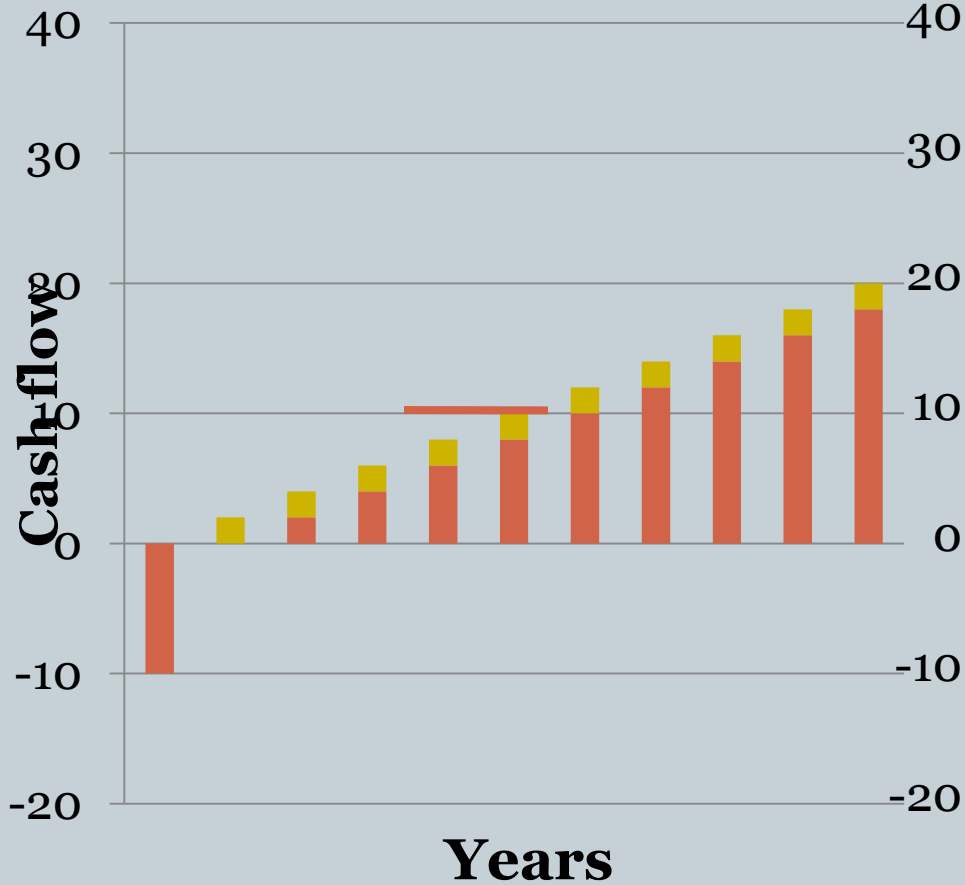# Cost-Benefit Analysis
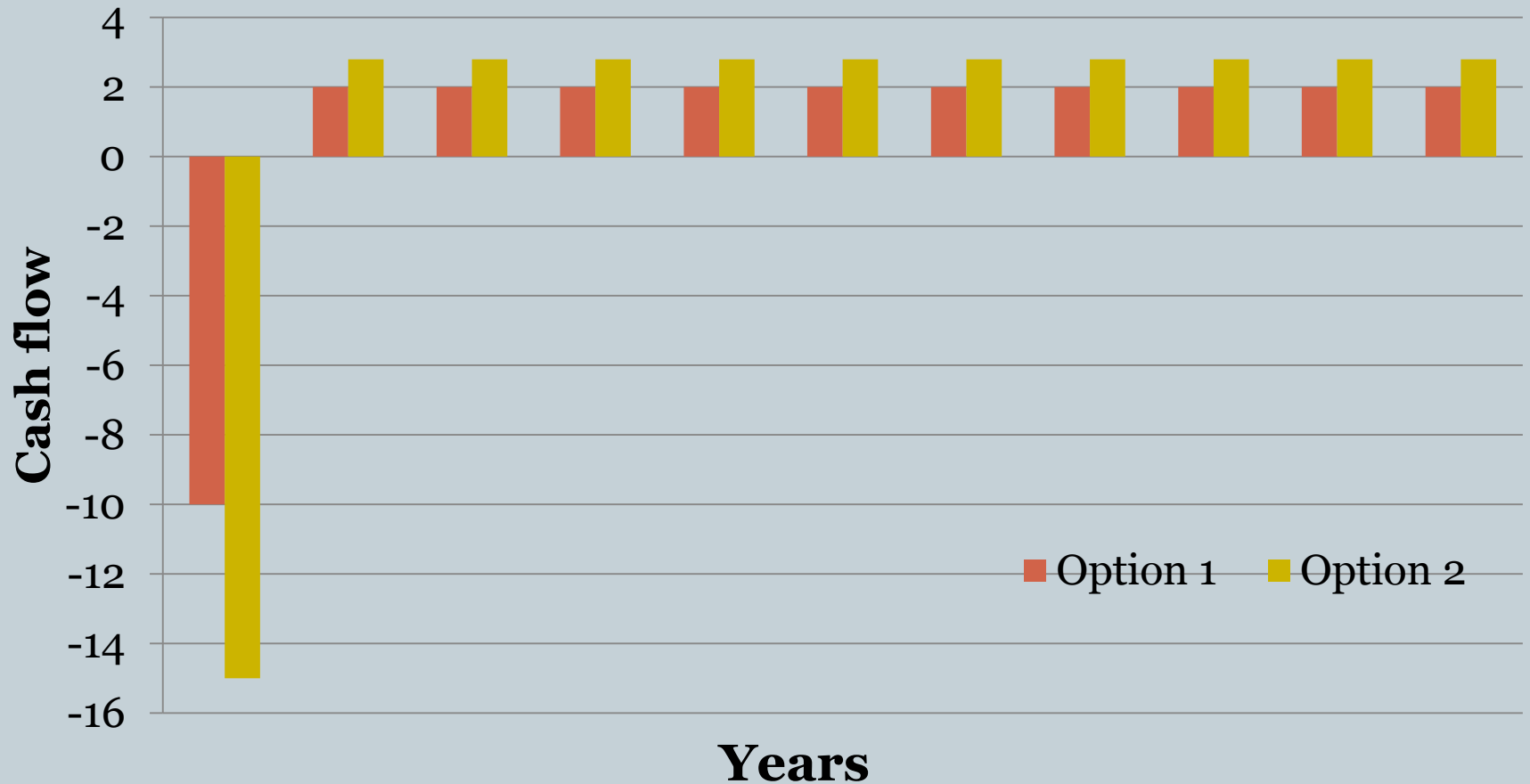
Cost Benefit Analysis

Option 1 :

- Total cost = $3 MN x 3 + $1 MN + $15 MN = $25 MN
- Total benefit = $35 MN
- Benefits > Costs

Option 2 :

- Total cost = $13 MN + $2 MN + $20 MN = $35 MN
- Total benefit = $48 MN
- Benefits > Costs

Pay-back Period

Payback Period

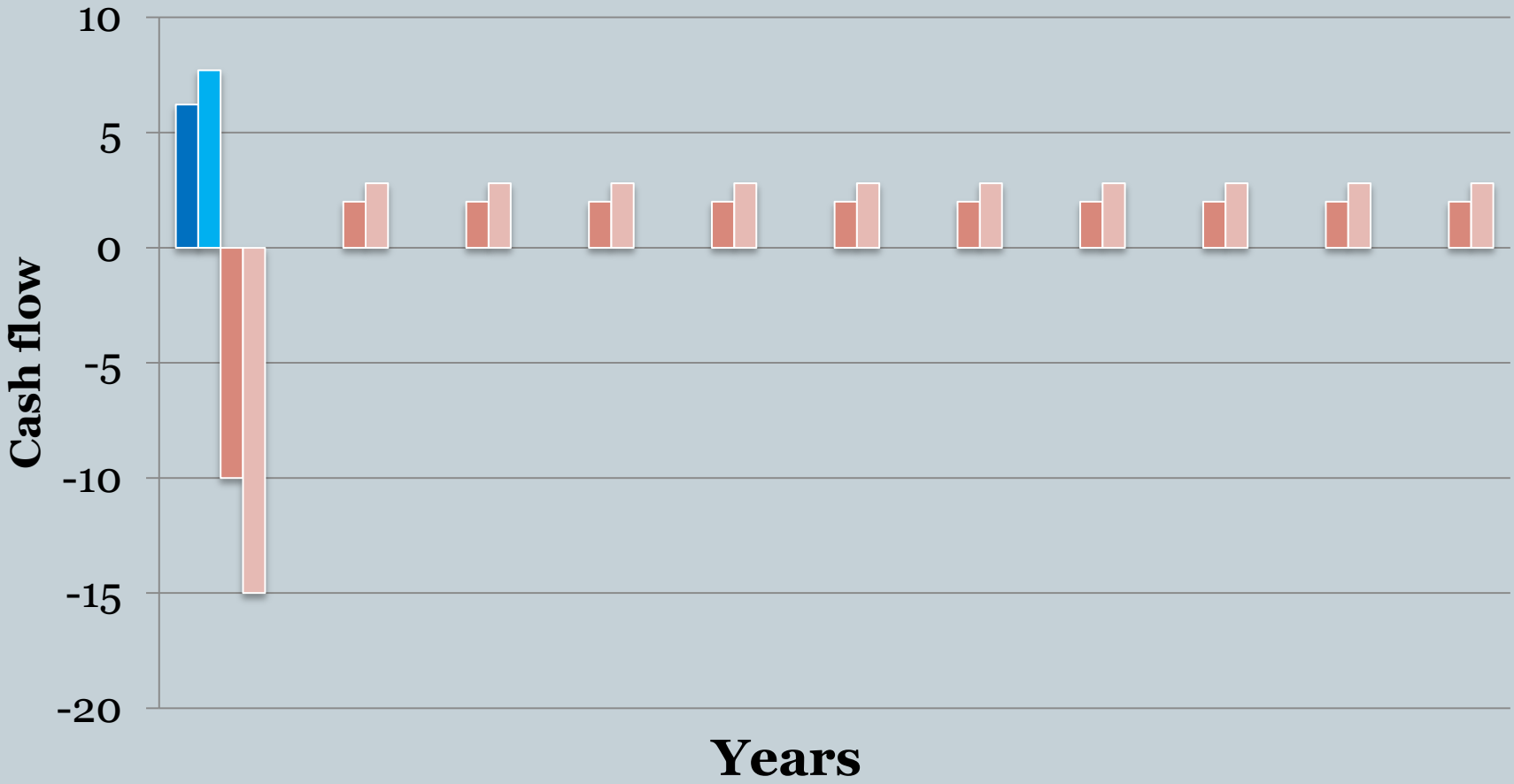**Option 1 :**

- Initial Investment = $10MN
- Yearly profit = $3.5 - $1.5 = $2.0 MN
- It takes 5 years to recover initial investment of $10 MN

Option 2 :

- Initial Investment = $15 MN
- Yearly profit = $4.8 - $2.0 = $2.8 MN
- It takes $15/$2.8 = 5.36 years i.e. 5 years and 4 months to recover $ 15 MN

Net Present Value

Discounting the future cash flows

- *Money today is worth more than having money tomorrow*

$$\text{Present Value of } C_i = \frac{C_i}{(1 + r)^i}$$

where,

- r is the discount rate
- C_i is the net cash flow coming in during the ith year

- More distant cash flows are more risky, hence they are discounted more

Exercise: Capital Investment Project

all figures in million $

Option 1 :

Year	0	1	..	10
Plant	-9 .0			
Accessories	-1 .0			
Revenue		3.5	..	3.5
Operating Cost		-1.5	..	-1.5
Discounted Value @ 4%	-10.0	1.9	..	1.4

NPV = $6.22 M > 0

Option 2 :

Year	0	1	..	10
Plant	-13.0			
Accessories	-2.0			
Revenue		4.8	..	4.8
Operating Cost		-2.0	..	-2.0
Discounted Value @ 4%	-15.0	2.7	..	1.9

NPV = $7.71 M > 0

Internal Rate of Return

IRR 1 = 15.1 %   **IRR2 = 13.3 %**

Weighted Average Cost of Capital

- Returns for the operator should be greater than the operator's post-tax WACC

$$\text{WACC} = \frac{D}{D+E} \times (1-t) \times r_D + \frac{E}{D+E} \times r_E$$

where,

- *D – value of debt*
- *E – value of equity shares*
- *t – corporate tax rate (marginal)*
- *r_D – average rate of interest on debt*
- *r_E – returns required by the shareholders*

Appraising Project Risks

- Impact of risks on the project viability
- Identify downward slide at the earliest
- Reassess crucial factors after sensitivity analysis

Highways Project

- � Labour costs
- ✖ Material costs
- ✖ Toll revenues
- ✖ Traffic growth rate

- Project viability assessed under different scenarios

Highways Project

- ✖ Land acquisition problems
- ✖ Shortage of materials/labour
- ✖ Economic downturn

- Use of simulation for analysing complex projects

Project Risks

- Schedule Risks
  - Time overruns
- Performance Risks
  - Need for redesign
  - Counterparty risk
- Cost overruns
- Socio-political risks
- Price Risk
- Macroeconomic Risks - Exchange Rate/Interest Rate
- Force majeure

Conclusion : Broader Issues in Project Selection

- Financial Analysis using NPV technique provides the skeleton for project selection, but not the meat
- There may be other projects that are even better for achieving the same objectives:
  - Better materials & technologies to build the same facility
  - Different design for a structure to serve the same purpose
  - Different location for a similar structure
  - Different scale (larger or smaller)
- In general, you cannot prove that your design is the best, you can only defend and refine (or abandon) your design in response to other options
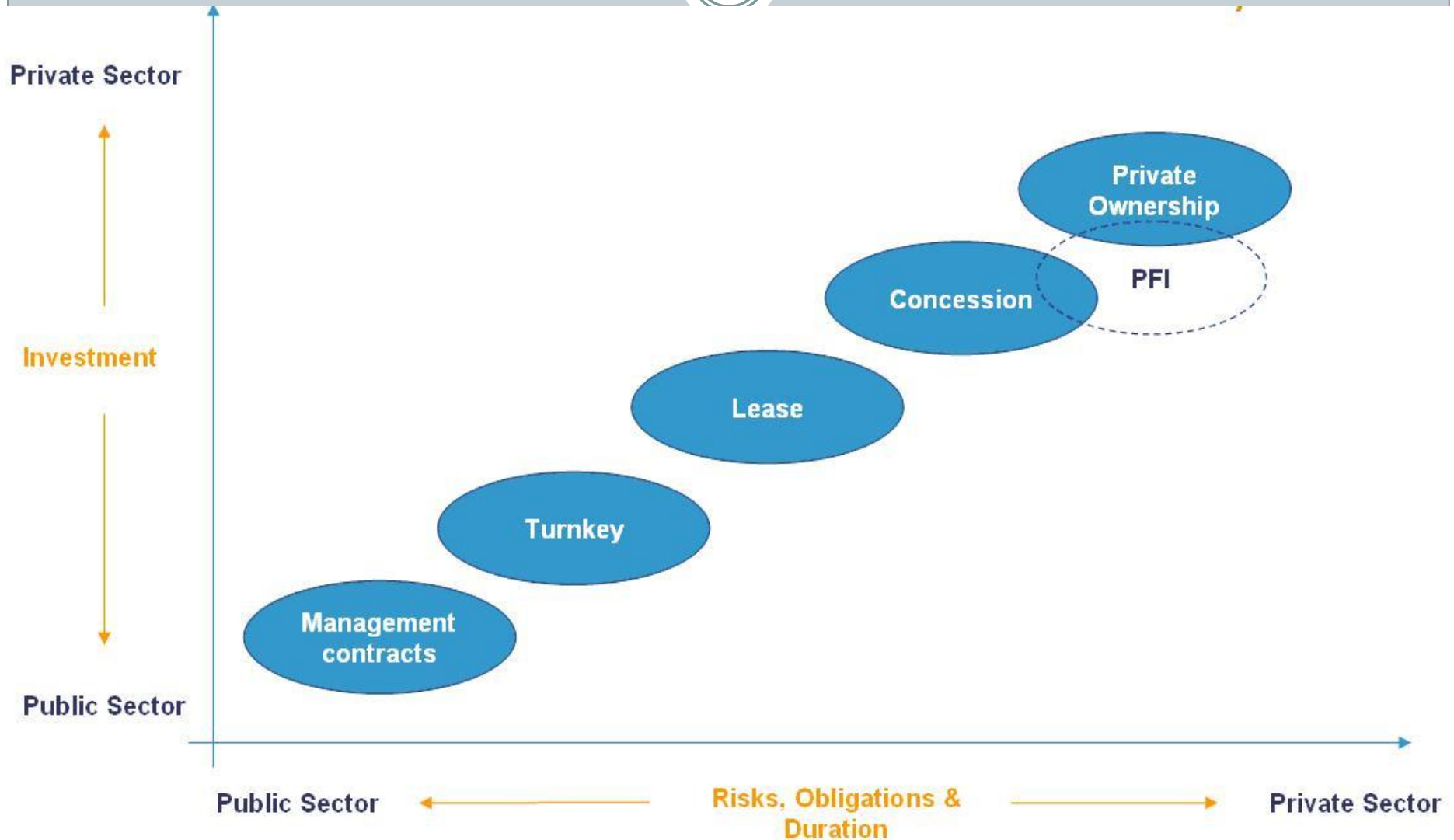
- Carl D. Martland, MIT

Back-up Slides

Identification of Projects

- Gap in infrastructure by benchmarking
  - Human development indicators
  - Per capita availability
- Demand from community
  - Request / suggestions by community leaders
  - Proxy indicators for demand
- Stakeholder consultations
  - District level, block level, village level
  - Providers, beneficiaries, NGOs, department, etc.

  - .

Spectrum of PPP Projects

Private Sector

Investment

Public Sector

Management contracts

Turnkey

Lease

Concession

PFI

Private Ownership

Public Sector ← → **Risks, Obligations & Duration** → **Private Sector**

What is relevant in financial analyses

- Future cash flows – ignore sunk cost
- Operating cash flows
- Incremental cash flows over status quo
- Non-cash expenses like depreciation, overheads, etc.
- Changes in capital (working capital)
- Include opportunity cost
- Expectations about inflation
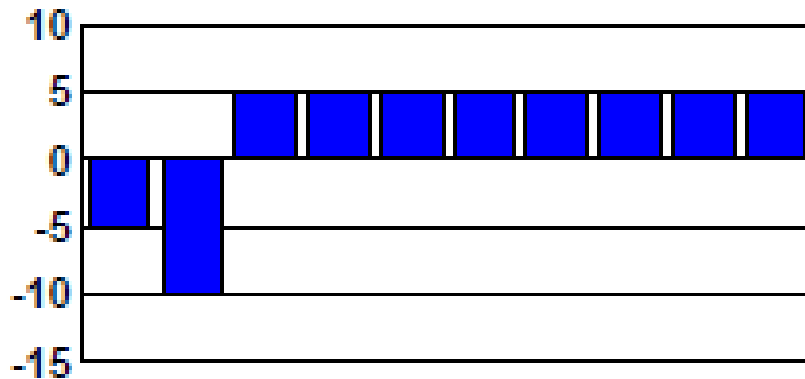- Effects of tax

Net Present Value

- Appreciates time value of money

- Only cash profits are important

- Additive method

- Provides a direct link between management decision and shareholder value

- Mutually exclusive projects are handled better

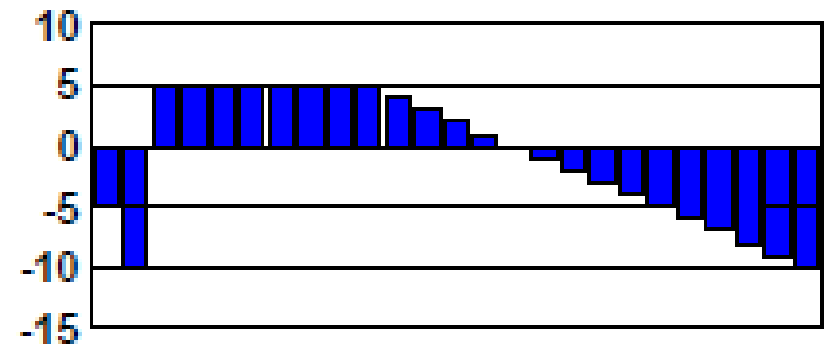- Able to absorb term structure of interest rates
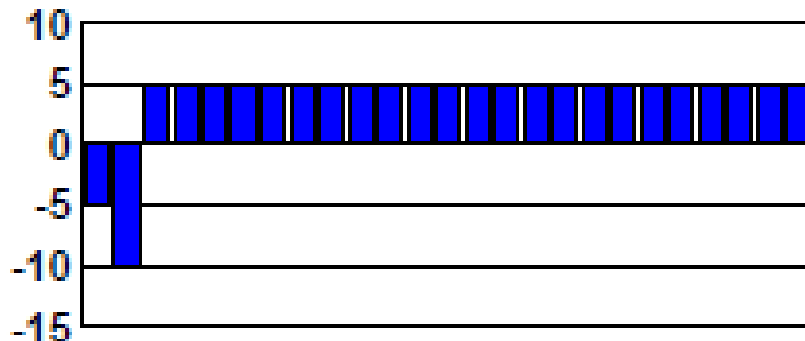
Problems with Payback Period as Criterion
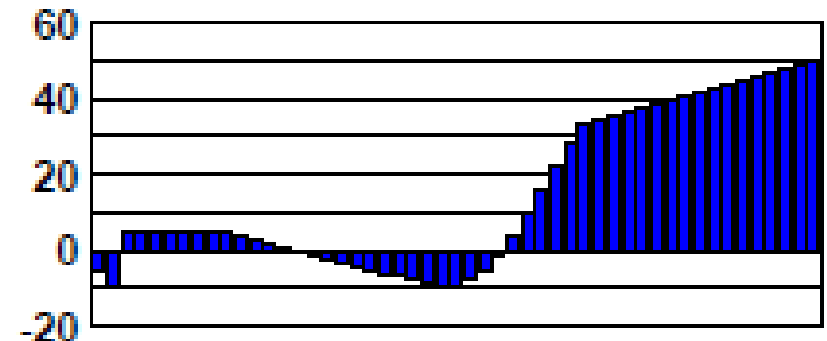
A. Net Cash Flows Over a 10-Year Life

B. Net Cash Flows Over 25 Years (Assuming Steady State After Year 10)

C. Cash Flows Over 25 Years (Increasing Competition & Maintenance)

D. Net Cash Flows Over 50 Years (Rehab and Expansion in Prime Location)

Option 1	Option 2
• In the market, money can be lent or borrowed at 8% interest rate	• In the market, money can be lent or borrowed at 8% interest rate
• Initial investment = 100 Rs	• Initial investment = 1000 Rs
• Returns from project = 12 Rs	• Returns from project = 100 Rs
• IRR = 12%	• IRR = 10%

Interest Rates in India over last 15 years, in %
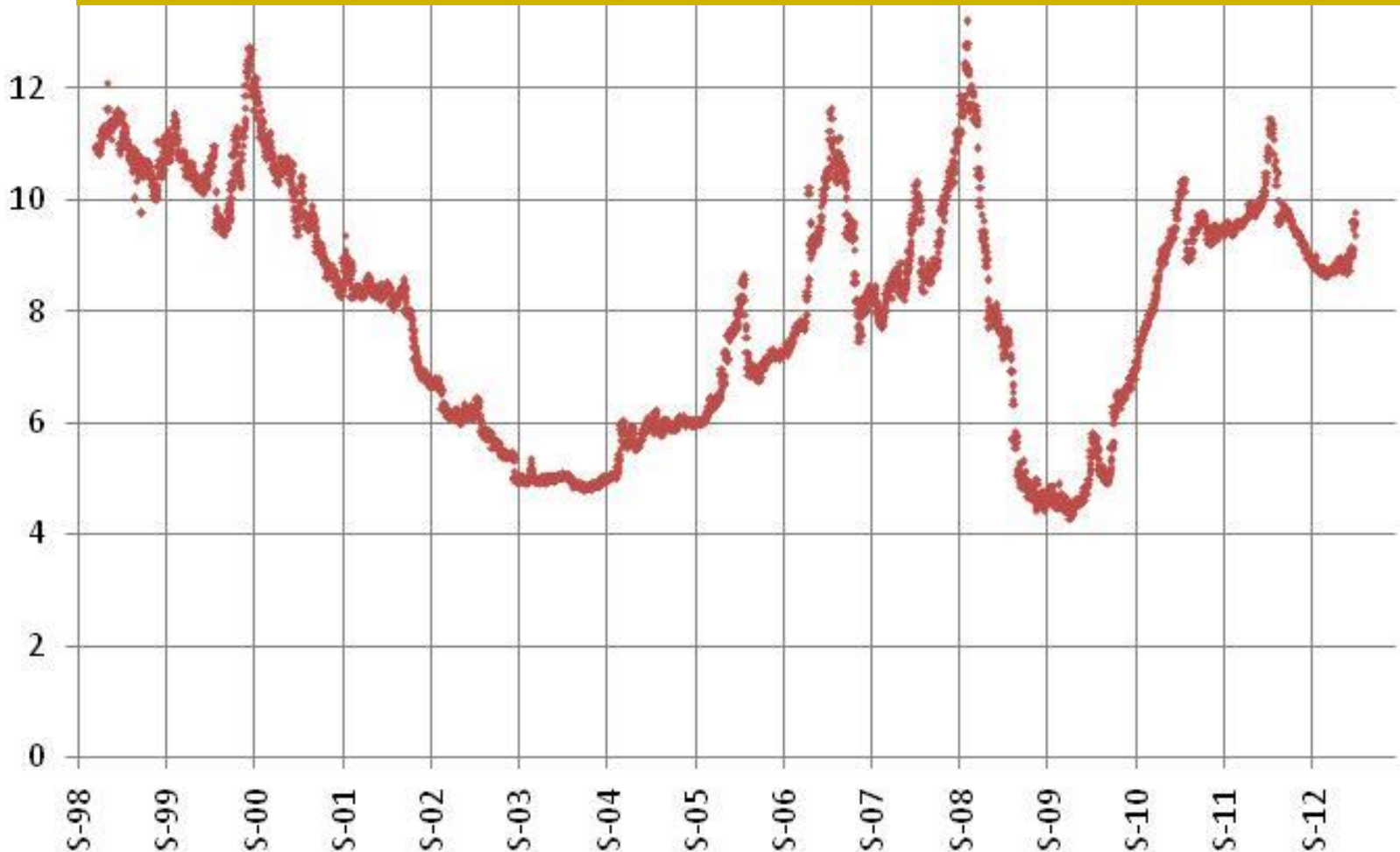
Risk Mitigation

- Contracts
  - Insurance
  - Derivatives
  - Transfer of risks to appropriate partner
- Monitoring
  - Programme Evaluation and Review Technique
- Do nothing !
  - Natural Hedging

Sharing Risks with Partners

- Multiple partners forming a special purpose vehicle (SPV, registered as a company) for the project

- The SPV then takes loan from a bank or a consortium of banks

- Typically the loan is non-recourse to the parent partners

- Thus the partners have an option to walk away in case of failure in the project – additional risk to banks and to the completion of project

Sharing Risks: Example

- Caspian Oil and Pipeline Projects
- Azerbaijan, Georgia and Turkey governments
- Azerbaijan International Oil Consortium (13 firms) : British Petroleum, Amoco, Statoil✤ (Norway), Turkish Petroleum ✤, Amerada Hess, Unocal, Exxon, Pennzoil, Ramco, LUKoil✤ (Russia), Itochu Corporation (Japan), Socar✤ (Az)
- Lenders' consortium

Other Back-up Slides

Cost of Equity

Also known as market capitalization rate or required rate of return by equity investors

Cost of Equity

Dividend discount models

Capital Asset Pricing Model (CAPM)

Dividend Discount Models

- Walter Model
- H Model
- Multi-stage Growth Model
- Gordon Growth Model

$$\text{Market Capitalization Rate} = \frac{DIV1}{P0} + \text{Growth Rate}$$

- where, DIV1 = dividend to be paid in next year
- P0 = Current share price

Growth Rate for Dividend Discount Models

- Security Analysts
- Industry Experts
- Fundamentals of the company
  - Revenue from year *n+1* will be more than revenues from year *n*
  - To the extent to which operating assets are higher

  Growth Rate of Profits = Plough Back Ratio x Return on Equity

  - What is the reinvestment policy of the company ?
  - Plough back = 50% and Return on equity = 12%
  - Growth = 50% x 12% = 6%

Capital Asset Pricing Model

- Equity Market Risk Premium
- Extra Returns (risk premium) from an investment are dependant on the underlying risks
- Security Market Line

$$r - r_f = \beta (r_m - r_f)$$

- β (beta) is the measure of sensitivity of the investment to market movements