ECONOMIC INVESTMENT APPRAISAL

or

Beyond the Bottom Line!

Robert Marks

Week
1. Introduction; Financial Appraisal v. Cost-Benefit Analysis
ECONOMIC INVESTMENT APPRAISAL

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2. Basics of Project Evaluation
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Package
Assessment
Prerequisites
How I Teach —

Topics introduced through lectures:
How I Teach —

Topics introduced through lectures:

— Talk
How I Teach —

Topics introduced through lectures:

— Talk
— Use of PDF slides/ OHP slides
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— Use of PDF slides/ OHP slides
— Use of whyteboard
How I Teach —

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Interaction, discussion, rôle-playing exercise, assignments, mid-term exam, term project. No tutes, but worked exercises are available.
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Topics introduced through lectures:

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IEA is not for everyone — doesn’t directly help the firm’s bottom line. Cost-benefit analysis.
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IEA is not for everyone — doesn’t directly help the firm’s bottom line. Cost-benefit analysis.

No class on Friday 30th April, makeup on Wednesday May 5th. No classes on 21st and 25th May, makeup TBA.
This Week: We Cover ...
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1. Intro — decision-making issues.
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2. Economic efficiency, or the size of the economic pie.
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3. A weak ethical criterion: Pareto Improvement. The efficiency criterion: The Potential Pareto Improvement Criterion (PPIC), in which the size of the pie is the issue, not the sizes of the slices.
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3. A weak ethical criterion: Pareto Improvement. The *efficiency criterion*: The Potential Pareto Improvement Criterion (PPIC), in which the size of the pie is the issue, not the sizes of the slices.
5. The use of *opportunity cost*, not accounting cost, in CBA.
1. Introduction

Five Principles
(See Landsburg in the Package.)
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(See Landsburg in the Package.)

1. Tax revenues are not a net benefit, and a reduction in tax revenues is not a net cost. Tax is a *transfer* = something for nothing.
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2. A cost is a cost, no matter who bears it.
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4. Voluntary consumption is a good thing.
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5. Don’t double count.
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Only Individuals Matter
1. Introduction

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Only Individuals Matter
+
All Individuals Matter Equally
(A $ is a $)
THE WORLD IS COMPLEX:

→ two approaches
THE WORLD IS COMPLEX:

→ two approaches
  □ deductive, reductionist
THE WORLD IS COMPLEX:

→ two approaches

- deductive, reductionist

• systems (holistic)
THE WORLD IS COMPLEX:

→ two approaches
  - deductive, reductionist
  - systems (holistic)

Analyst/Decision maker can
  1. set priorities → weightings
  2. generate a set of alternatives
  3. choose “best” alternative
  4. need a performance measurement, however
Is this a tall order?

e.g. choosing chemical-processing equipment

e.g. choosing a word-processing system
Is this a tall order?

e.g. choosing chemical-processing equipment

— $ cost

e.g. choosing a word-processing system
Is this a tall order?

e.g. choosing chemical-processing equipment
e.g. choosing a word-processing system

— $ cost
— performance
Is this a tall order?

e.g. choosing chemical-processing equipment
e.g. choosing a word-processing system

— $ cost
— performance
— servicing
Is this a tall order?

e.g. choosing chemical-processing equipment
e.g. choosing a word-processing system

— $ cost
— performance
— servicing
— training
Is this a tall order?

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e.g. choosing a word-processing system

— $ cost
— performance
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— training
— documentation
Is this a tall order?

e.g. choosing chemical-processing equipment
e.g. choosing a word-processing system

— $ cost
— performance
— servicing
— training
— documentation

(emergence of standards
e.g. MS Word)
2. How Can We Compare:
   - the pluses & minuses?
   - the advantages & disadvantages?
   - the benefits & costs?
2. How Can We Compare:
   • the pluses & minuses?
   • the advantages & disadvantages?
   • the benefits & costs?

_The finance boys & girls:_ “The $ bottom line!”
2. How Can We Compare:

- the pluses & minuses?
- the advantages & disadvantages?
- the benefits & costs?

_The finance boys & girls:_ “The $ bottom line!”

but is that sufficient?

(it’s necessary—why?)
But what if:
  • market prices ≠ social values?
But what if:

- market prices $\neq$ social values?
- the project would alter prices?
But what if:

- market prices ≠ social values?
- the project would alter prices?
- there exist unpriced externalities (spillovers)?
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Then use techniques of Cost-Benefit Analysis
(Examples)

$\rightarrow$ Prescriptive “ought”
But what if:

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(Examples)

→ Prescriptive “ought”

not
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Then use techniques of Cost-Benefit Analysis
(Examples)

→ Prescriptive “ought”

not

Descriptive “is”
Objectives of the Decision Maker

Let us distinguish first:
Objectives of the Decision Maker

Let us distinguish first:

“what is” – descriptive from
Objectives of the Decision Maker

Let us distinguish first:

“what is” – descriptive from
“what ought to be” – prescriptive

1. Financial objectives — the bottom line
Objectives of the Decision Maker

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1. Financial objectives — the bottom line
2. Broader objectives of Cost Benefit Analysis (CBA) or: Beyond the bottom line!
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   – when the organisation provides non-sold services e.g. defence forces
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2. Broader objectives of Cost Benefit Analysis (CBA) or: Beyond the bottom line!
   - when the organisation provides non-sold services e.g. defence forces
   - when there are external costs/benefits
   - when prices change because the project is sufficiently large
   - social discount rate ≠ private discount rate
Cost-Benefit Analysis:
Cost-Benefit Analysis:

CBA: all the effects of a project on society,
Cost-Benefit Analysis:

CBA: all the effects of a project on society, not just the direct (usually financial) effects.
Q: objective, measurement?
A: welfare of each individual ideally
Cost-Benefit Analysis:

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CBA: “market” mimicked where it doesn’t exist, or is only imperfect in its information
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CBA: “market” mimicked where it doesn’t exist, or is only imperfect in its information

→ common unit to measure aggregate costs & benefits shadow prices
Shadow Prices

market prices ≠ necessarily shadow prices
(social benefits & costs at the margin)

how to identify measure compare changes in people’s welfare?
Shadow Prices

market prices \( \neq \) necessarily shadow prices
\((social\ benefits \ & \ costs \ at \ the \ margin)\)

how to identify changes in measure compare people’s welfare?

→ Pareto Principle
2. Potential Pareto Improvement Criterion (PPIC)
[see C&B Ch. 1, FP Ch. 1.5, 4.1; S&W, Ch. 7]

A *Pareto Improvement* = a change that makes at least one person better off & no-one worse off (a measure of increasing economic efficiency, or reducing waste)
2. Potential Pareto Improvement Criterion (PPIC)  
[see C&B Ch. 1, FP Ch. 1.5, 4.1; S&W, Ch. 7]  

A Pareto Improvement = a change that makes at least one person better off & no-one worse off (a measure of increasing economic efficiency, or reducing waste)

A project is OK under PPIC (or Kaldor-Hicks criterion) if in principle it is possible to secure an actual Pareto improvement by linking the project to a set of money transfers between the “gainers” and the “losers”, in such a way that in principle no-one is worse off, even if these transfers don’t actually take place, i.e., a potential improvement.
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E.g. the noise cost of airport expansion.
Example: The noise cost of airport expansion.

Questions:
Example: The noise cost of airport expansion.

Questions:

• losers: minimum amount ($) you’d accept to put up with the project?
Example: The noise cost of airport expansion.

Questions:

- **losers:** minimum amount ($) you’d accept to put up with the project?
  (Willingness to accept, WTA.)
  (or: your willingness to pay to stop the project)
Example: The noise cost of airport expansion.

Questions:

• losers: minimum amount ($) you’d accept to put up with the project? (Willingness to accept, WTA.) (or: your willingness to pay to stop the project)

• gainers: maximum amount ($) you’d pay for the project
Example: The noise cost of airport expansion.

Questions:

- **losers:** minimum amount ($) you’d accept to put up with the project?
  (Willingness to accept, WTA.)
  (or: your willingness to pay to stop the project)
- **gainers:** maximum amount ($) you’d pay for the project
  (Willingness to pay, WTP.)
Example: The noise cost of airport expansion.

Questions:

- **losers**: minimum amount ($) you’d accept to put up with the project?
  (Willingness to accept, WTA.)
  (or: your willingness to pay to stop the project)

- **gainers**: maximum amount ($) you’d pay for the project
  (Willingness to pay, WTP.)

Then: If \( \sum \text{gainers} \$ > \sum \text{losers} \$ \)
then the PPIC is satisfied.
Assumptions underlying the PPIC:
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1. that every taste can be valued in money (everyone has their price) ("pricing out")
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1. that every taste can be valued in money (everyone has their price) ("pricing out")
2. that changes in people’s welfare (measured by their Consumer Surplus) can be measured by their “willingness to pay” (their preferences)
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3. that these individual preferences are to be weighted by the individual’s ability to pay ("a dollar is a dollar")
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3. that these individual preferences are to be weighted by the individual’s ability to pay ("a dollar is a dollar")
4. truthfulness (although perhaps there are techniques to reward truthfulness)
How appropriate is the PPIC as a “social objective”?

Two alternatives suggested by S&W:
How appropriate is the PPIC as a “social objective”?

Two alternatives suggested by S&W:

1. decision-making approach (DMA)
How appropriate is the PPIC as a “social objective”?

Two alternatives suggested by S&W:

1. *decision-making approach* (DMA)
2. *Paretian approach* (PA)
How appropriate is the PPIC as a “social objective”?

Two alternatives suggested by S&W:

1. decision-making approach (DMA)
2. Paretian approach (PA)

1. DMA: The decision maker’s objectives are the social objectives, by definition
How appropriate is the PPIC as a “social objective”?

Two alternatives suggested by S&W:

1. decision-making approach (DMA)
2. Paretian approach (PA)

1. DMA: The decision maker’s objectives are the social objectives, by definition

CBA: process of appraising projects, given the DM’s chosen objectives can be private
The Paretian Approach
The Paretian Approach

2. PA: objectives of the decision maker should be distilled from a consensus of the value judgements of the individuals in society
The Paretian Approach

2. PA: objectives of the decision maker *should* be distilled from a consensus of the value judgements of the individuals in society

– independent of political process
The Paretian Approach

2. PA: objectives of the decision maker *should* be distilled from a consensus of the value judgements of the individuals in society

- independent of political process
- a “consensus value-judgement”, which can be identified using welfare economics
  i.e. using *Consumers’ Surplus* (revision)
Comparing the DMA with the PA
Comparing the DMA with the PA

1. DMA: “PPIC (i.e. efficiency) is one objective of DM”
Comparing the DMA with the PA

1. DMA: “PPIC (i.e. efficiency) is one objective of DM”
2. PA: (anyone has a veto in the Pareto Optimal sense e.g. the king)

Welfare Economics
Comparing the DMA with the PA

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Welfare Economics
→ economic efficiency: size of the cake v.
Comparing the DMA with the PA

1. DMA: “PPIC (i.e. efficiency) is one objective of DM”

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→ economic efficiency: size of the cake

v.

distributional justice: relative size of the slices
Comparing the DMA with the PA

1. DMA: “PPIC (i.e. efficiency) is one objective of DM”

2. PA: (Anyone has a veto in the Pareto Optimal sense e.g. the king)

Welfare Economics

→ economic efficiency: size of the cake

v.

distributional justice: relative size of the slices

PPIC: a change is “good” if → greater economic efficiency

winners v. losers

[C&B Ch. 5, DoF Ch.2]

PA: “economic rationalism”
### Efficiency v. Equity

<table>
<thead>
<tr>
<th>Efficiency</th>
<th>Equity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less efficiency, greater equality.</td>
<td>Smaller cake, more even slices.</td>
</tr>
<tr>
<td>More equal</td>
<td>Larger cake, more even slices.</td>
</tr>
<tr>
<td>Greater efficiency, greater equality.</td>
<td>Status Quo Ante</td>
</tr>
<tr>
<td>Smaller cake, less even slices.</td>
<td>Efficiency</td>
</tr>
<tr>
<td>Less equality.</td>
<td>Greater efficiency, less equality.</td>
</tr>
<tr>
<td>Larger cake, less even slices.</td>
<td>less equal</td>
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</table>

**Efficiency v. Equity or Fairness**

(lexicographic ordering)
Two questions:
Two questions:

1. Can an unbiased decision maker exist?
Two questions:

1. Can an unbiased decision maker exist?
2. How should the decision maker choose between:

\[
\begin{align*}
\text{economic growth} \\
? \\
\text{environmental protection}
\end{align*}
\]

assuming there is a conflict?
4. Comparison of FA & CBA

[C&B Ch. 4, FP Ch. 1, 6]

Often Cost-Benefit Analysis (CBA) ~ Financial Appraisal (FA)

e.g.
4. Comparison of FA & CBA

[C&B Ch. 4, FP Ch. 1, 6]

Often Cost-Benefit Analysis (CBA) ~ Financial Appraisal (FA)

e.g. A large project requires the purchase and use of 1000 t of bricks
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Often Cost-Benefit Analysis (CBA) ~ Financial Appraisal (FA)

e.g. A large project requires the purchase and use of 1000 t of bricks

FA: know market prices (bricks cheapest)
4. Comparison of FA & CBA

[C&B Ch. 4, FP Ch. 1, 6]

Often Cost-Benefit Analysis (CBA) ~ Financial Appraisal (FA)

e.g. A large project requires the purchase and use of 1000 t of bricks

FA: know market prices (bricks cheapest)
CBA: welfare of owners of brickworks
      employees of brickworks
      other users of bricks
      etc.

So far, so good ...
Competitive markets → no problems

but if (IF) there is a competitive market economy, (with no externalities)

brick price = MC of brick production = MV to users
wage = MV of leisure = MV of labour
to workers
to brickworks

& so long as no prices change, then
Competitive markets $\rightarrow$ no problems

*but if* (IF) *there is a competitive market economy,* (with no externalities)

brick price $= \text{MC of brick production} = \text{MV to users}$

wage $= \text{MV of leisure} = \text{MV of labour}$

to workers
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& so long as no prices change, *then*

there are no welfare effects

& prices $= \text{marginal social benefits}$

$= \text{marginal social costs}$
Competitive markets $\rightarrow$ no problems

*but if (IF) there is a competitive market economy,*
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brick price $= \text{MC of brick production} = \text{MV to users}$
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& so long as no prices change, *then*
there are no welfare effects
& prices $= \text{marginal social benefits}$
$= \text{marginal social costs}$

and FA $= \text{CBA}$

(so long as there is no price change)
Lack of a competitive market \(\rightarrow\) problems.

*But*
Lack of a competitive market → problems.

But

• perfect competition is rare
Lack of a competitive market → problems.

But

• perfect competition is rare

• prices may adjust to project (because of its size)
Lack of a competitive market → problems.

But

• perfect competition is rare
• prices may adjust to project (because of its size)
• externalities may exist (spillovers +ve or -ve)
Lack of a competitive market → problems.

But

• perfect competition is rare
• prices may adjust to project (because of its size)
• externalities may exist (spillovers +ve or -ve)
• taxes exist
Lack of a competitive market → problems.

But

- perfect competition is rare
- prices may adjust to project (because of its size)
- externalities may exist (spillovers +ve or -ve)
- taxes exist

∴ FA ≠ CBA necessarily
### Differences between economic and financial analysis

<table>
<thead>
<tr>
<th>Viewpoint</th>
<th>Economic analysis</th>
<th>Financial analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CBA</td>
<td>FA</td>
</tr>
<tr>
<td>Society as a whole</td>
<td></td>
<td>Individual, firm, or household.</td>
</tr>
</tbody>
</table>
# Differences between economic and financial analysis

<table>
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<tr>
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Bill asserts that he could not even “give away” (for literally zero dollars) a building that he owns and uses in his business.

In economic jargon, the building has a zero opportunity cost. True/False? Explain.

(Write down your answer.)
5. Use *Opportunity Costs*, not Accounting Costs:

Example [S&W, pp.35–36]: *Service A or B?*

A private bus company:
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Suppose the differences in running costs reported by different bus fleets can be explained quite well by the equation (in $’000):

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C = 250.0 + 1.5b + 0.0038h + 0.00006k
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per year, buses, hours, kilometres
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   per year  
   
   buses  
   
   hours  
   
   kilometres

   \( b = 300 \) buses (typical fleet)  
   \( k = 48,000 \) km/year/bus (both services)  
   \( h = 3,000 \) hr/year/bus (typical)

   \[ \rightarrow C = \$4,984,000/y \text{ excluding costs of buying } \$4,984,000/\text{year} \]
2. **Capital Costs**

$24,000/bus for 15 years (lifetime)

→ $2,804/year/bus @ 8% p.a. (accounting depreciation)

300 buses → $841,000/year

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   \[ \rightarrow \]  accounting cost of $5,825,000/year

4. \[ \therefore \]  Average Accounting Cost
   $5,825,000 \[ \div \] (48,000 \times 300)
   \[ \rightarrow \]  $0.40/bus-kilometre (accounting cost)
Table 3.1  
Characteristics of the two bus services

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### Table 3.2

**Accounting and opportunity costs of the two bus services**

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All costs in $’000. Present value calculated by using a discount rate of 8 per cent.
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So: Using the accounting cost of $0.40/bus-kilometre understates the opportunity cost of Service A and overstates the cost of Service B.
Why CBA?  [C&B Ch. 1, DoF 2.6]
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- To identify *efficient* alternatives.

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So: accept projects whose net social benefits are positive, subject to budget constraints.

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