

## 202 ECONOMIC INVESTMENT APPRAISAL

or: *Beyond the Bottom Line!*

3 September 1996

R. E. Marks

### ***Reading/Reference List and Subject Outline.***

The grind of the assignments in the Gateways is over. Now you can begin to apply the new knowledge and techniques to real issues and decisions — the main piece of work for this subject is a project on a topic of your choice, done individually or with one or two colleagues.

EIA is designed to help today's private- or public-sector manager reach "bottom-line" decision — in which *all* aspects of a project can be expressed in dollar terms — in an increasingly complex world in which he or she must cope with the effects of such things as

- inflation,
- exchange-rate movements,
- taxation, and
- environmental constraints, in addition to
- the pervasive uncertainty attached to any long-term project.

Unfortunately, even being able to cope with these complexities is not enough. Increasingly, decision makers must pay heed to *non-monetary costs and benefits* of projects, and to conflicting claims and effects which have ramifications beyond the direct environs of the project itself. Because of the interaction among the multitude of factors affecting small and large projects, it is essential for the manager to identify the important ones and to determine the degree to which they affect each other before making a clear decision. This subject will also examine ways of evaluating such projects, to identify the decision criteria and other factors—whether intangible or concrete—to measure the interactions among them in a simple way, and to synthesize all information in order to achieve a simpler decision.

The subject is divided into three sections:

- a. cost-benefit analysis from the perspective of both private- and public-sector organizations;
- b. multi-attribute decision analysis, which extends cost-benefit analysis to situations in which complex projects with uncertainty cannot be reduced to a single criterion or unit of account such as dollars; and
- c. class discussion of a variety of actual projects and case-studies, in which learning takes place by a consideration of the often severe problems which confront those who evaluate projects and make decisions. Ways in which studies and decisions might have been improved upon will be a feature of these discussions.

The subject will culminate with sessions in which students present and if need be defend their own draft evaluations of private- or public-sector projects or decisions. One example of an excellent study done for the subject in 1985 critically evaluates the site for the second Sydney airport (section 7.5 below and Package, 5).

The recommended prerequisite for this subject is AGSM 200 Markets and Prices or its equivalent (such as AGSM 206 Microeconomic Analysis). Teaching will mostly be lectures, with student presentations. There will be no final exam. Assessment will be based on a term project, on a midterm and two assignments, and on a classroom rôle-playing exercise on a topic to be announced. A Package of readings is on sale at Reception.

### **Outline:**

#### *Week*

1. Introduction
  - Decision-maker's objectives: efficiency v. equity.
  - Financial appraisal v. cost-benefit analysis.
2. Basics of Project Evaluation
  - Criterion: NPV (VOC, annuities), IRR, payback period, B/C ratio.
  - Inflation, taxes, discount rates.
  - Capital rationing.
3. Shadow Pricing
4. Effects of Price Changes & Welfare Economics
  - Producer's and consumer's surplus.
5. Indirect Price-Change Effects
  - Pecuniary external effects.
6. Valuing the Environment & Other Unmarketed Goods
  - Value of time saved.
  - Valuing the environment.
  - Contingent valuation
  - Value of human life.
7. Risk-Benefit Analysis
  - Encoding uncertainty.
  - Certainty equivalent.
  - The value of perfect information.
8. Multi-Attribute Decision Analysis
  - Pairwise comparisons, satisficing.
  - Lexicographic ordering.
  - Additive value models.
9. Case Studies & the Rôle-Playing Exercise
10. Student Presentations

### **Readings:**

The required text is:

Department of Finance, *Handbook of Cost-Benefit Analysis*, Canberra: AGPS, 1991.

As well, the following books may be found useful:

- Frances Perkins, *Practical Cost Benefit Analysis: Basic Concepts and Applications*, Melbourne: Macmillan, 1994. UNSW S658.1554/40
- Sugden R. and A. Williams, *The Principles of Practical Cost-Benefit Analysis*, Oxford: OUP, 1978. AGSM 339.41/6,12,13
- Pearce D. W. and C. A. Nash, *The Social Appraisal of Projects: a Text in Cost-Benefit Analysis*, NY: Wiley, 1981. AGSM 658.1554/14
- Stokey E. and R. Zeckhauser, *A Primer for Policy Analysis*, NY: Norton, 1978. AGSM 350/34,36
- Zeleny M, *Multiple Criteria Decision Making*, NY: McGraw-Hill, 1982. AGSM 658.403/148
- Majone G. and E. S. Quade (eds), *Pitfalls of Analysis*, NY: IIASA/Wiley, 1980. AGSM 003/10
- Pearce, D., A. Markandya and E. B. Barbier, *Blueprint for a Green Economy*, London: Earthscan Publications, 1989.
- NSW EPA, *ENVALUE NSW EPA Environmental Valuation Database*, Chatswood: NSW EPA, 1995. AGSM SW 3

Additional readings will be found below. Recommended readings are marked with an asterisk (\*); the others are included for your interest.

## 1. Introduction

- Dept. of Finance, Chapter 1, Cost-benefit analysis as a process; Chapter 2, The conceptual basis of cost-benefit analysis.
- \*Perkins, Chapter 1, An introduction to the cost benefit analysis of projects; Chapter 6, The rationale for economic cost benefit analysis.
- Sugden & Williams: Chapter 1, The framework; Chapter 3, Costs and returns in financial appraisal; Chapter 7, The objective in cost-benefit analysis.
- Pearce & Nash: Chapter 2, The rationale of cost-benefit analysis.
- Majone G, A anatomy of pitfalls, in Majone & Quade: Chapter 2.
- \**Economist*, Private profit, public service, 9 Dec 1995 (Package, 3)

## 2. Basics of Project Evaluation

- \*Perkins, Chapter 2, The valuation of financial costs and benefits; Chapter 3, The cash flow in financial analysis; Chapter 4, Time preference, discounting, and the financial discount rate; Chapter 5, Discounted project assessment criteria.
- \*Layard R. and Glaister S., Introduction, to their *Cost-Benefit Analysis*, 2nd edition, Cambridge U.P., 1994. (Package, 2)
- Dept. of Finance, Chapter 4, Computing present values; Chapter 5, Setting discount rates.
- Sugden & Williams: Chapter 4, The discount rate in financial appraisal, Chapter 2, Time; Chapter 15, The discount rate in cost-benefit analysis.
- Pearce & Nash: Chapter 3, The welfare foundations of cost-benefit analysis; Chapter 4, Investment criteria in the public sector.
- Stokey & Zeckhauser: Chapter 9, Project evaluation: benefit-cost analysis.

### **3. Shadow Pricing, and the Direct & Indirect Effects of Price Changes & Welfare Economics**

\*Dept. of Finance, Chapter 3, Valuing costs and benefits.

Perkins, Chapter 7, Economic evaluation in a closed economy; Chapter 8, The economic evaluation of tradeables; Chapter 9, The economic valuation of foreign exchange; Chapter 10, The economic cost of primary factors — labour, land, and natural resources.

Sugden & Williams: Chapter 8, Shadow pricing; Chapters 9,10, The direct and indirect effects of price changes.

Pearce & Nash: Chapter 6, Valuing costs and benefits when prices change.

Dixit A.K. and Pindyck R.S., *Investment Under Uncertainty* Princeton: PUP, 1993.  
AGSM 658.1554/3

### **4. Valuing the Environment and Other Unmarketed Goods**

\*Perkins, Chapter 11, Valuing externalities including environmental impacts.

\*Diamond & Hausman, On contingent valuation measurement of nonuse values.  
(Package, 9)

\*Pearce, Markandya and Barbier, Valuing the environment. (Package, 14)

*Techniques to Value Environmental Resources: An Introductory Handbook*, Canberra: AGPS, 1995.

*The Economic Appraisal of Environmental Projects and Policies*, Paris: OECD, 1995.

Arrow K, Solow R, Leamer E, Portney P, Radner R, Schuman H, Report of the NOAA Panel on Contingent Valuation, *Federal Register*, **58**(10): 4601-4614, Jan 15, 1993. (On reserve)

Hanley N and Spash C L, *Cost-Benefit Analysis and the Environment*, Edward Elgar, 1993.

Johansson P-O, *The economic theory and measurement of environmental benefits*. Cambridge: Cambridge University Press 1987 AGSM 339.4/8

Sugden & Williams: Chapter 11, Unmarketed Goods.

Hatry H. P, Pitfalls of evaluation, in Majone & Quade: Chapter 10.

Schelling T. C, The life you save may be your own, in S. B. Chase Jr (ed.), *Problems in Public Expenditure Analysis*, Washington: Brookings, 1968. AGSM 336.39/7

Sinden J. A. and A. C. Worrell, *Unpriced Values: Decisions without Market Prices*, NY: Wiley, 1979. AGSM 338.521/12

Pearce & Nash: Chapter 8, Externalities and public goods.

### **5. Decision Analysis and Risk-Benefit Analysis**

\*Howard R. A, A party problem, mimeo. (Package, 25)

\*Stokey & Zeckhauser: Chapter 12, Decision analysis. (Package, 26)

\*Morgan M. G., Risk analysis and management, *Scientific American*, July 1993, pp. 32-41. (Package, 27)

\**Economist*, The price of life, Dec. 4, 1993, and Putting a value on life. (Package, 28).

Perkins, Chapter 15, Handling risk and uncertainty in cost benefit analysis.

Pearce & Nash: Chapter 5, Risk and uncertainty.

Keeney R.L., Chapters 4,5,7,8 in his *Value-Added Thinking: A Path to Creative Decision Making*, Cambridge: Harvard UP, 1992. AGSM 658.403/176

Clement R.T., *Making Hard Decisions: An Introduction to Decision Analysis*, Van

Nostrand, 1990.

## **6. Multi-Attribute Decision Analysis**

\*Perry C. and J. L. Dillon, Multiple objectives and uncertainty in ex-ante project evaluation, in McMaster J. C. and G. R. Webb (eds), *Australian Project Evaluation*, Sydney: ANZ Book Co, 1978: Chapter 9. AGSM 658.1554/7. (Package, 31)

Howard R. A, Social decision analysis, in G. M. Kaufman and H. Thomas (eds), *Modern Decision Analysis*, Penguin, 1977: Chapter 4. AGSM 658.403/14,15,34-37

Zeleny: Chapter 3, The decision process and its stages; Chapters 7, Measuring attribute importance; 12, Multiattribute utility theory.

## **7. Case Studies**

### *7.1 Greenhouse*

\*Marks and Swan, Abatement. (Package, 15)

\*Nordhaus, Greenhouse. (Package, 16)

\**Economist*, Reading the patterns, 1 April 1995 (Package,17).

### *7.2 Drugs Policy*

\*Marks, R. E.: The costs of Australian drug policy. (Package, 18)

\*NORC, Executive Summary, *Evaluating Recovery Services: The California Drug & Alcohol Treatment Assessment*. (Package, 19)

Marks, R. E.: Prohibition or regulation, *Australian and New Zealand Journal of Criminology*, 65–87, 1990. (Reserve)

### *7.3 General cost-benefit studies*

\**Economist*, The MBA cost-benefit analysis, 1 April 1995 (Package, 6).

\**Economist*, Dam good business this, chaps, 26 Aug. 1995 (Package, 4).

\*Wilson R. A., Is it worth becoming an architect? *Applied Economics*, 1986. (Package, 7)

\**Economist*, The price of imagining Arden — valuing the environment, 3 Dec 1994 (Package, 8)

\*Pearce D., A case study: the Gordon-below-Franklin dam. (Package, 10)

\*Emerson C., Economic evaluation of mineral-processing projects. (Package, 12).

\*Swan, Peter, The compact fluorescent light bulb: a case study of the relationship between the value of an asset and its associated service flow. May 1991. (Package, 13)

\*Corcoran E., The return on infrastructure, *Scientific American*, January 1993. (Package, 21).

\*Guteri F., Paying for the light at the end of the Chunnel, *Scientific American*, February 1994. (Package, 22).

\*Dept. of Finance, The new international gateway at Townsville, (Package, 23).

### *7.4 Case studies in decision analysis and risk*

\**The Independent*, The certainty of risk, etc, Sept. 9, 1992. (Package, 29).

\**Economist*, Apocalypse maybe, 30 March 1996 (Package, 30).

Keeney R.L.: Chapters 11,12,13

Hax A. C. and K. M. Wiig, The use of decision analysis in capital investment

problems, in D E. Bell *et al* (eds), *Conflicting Objectives in Decisions*, NY: Wiley, 1977. AGSM 658.403/69

de Neufville R. and R. L. Keeney, Systems evaluation through decision analysis: Mexico City Airport, in Kaufman & Howard: Chapter 14.

Howard R. A. *et al.*, The decision to seed hurricanes, in Kaufman & Thomas: Chapter 15.

#### *7.5 The Second Sydney Airport/The Third Runway*

\*Conde, Peter, Paul Collings, and Jeff Oughton, Site selection for a second Sydney airport: a cost-benefit analysis, August 1985. (Package, 5)

Kinhill Engineers Pty. Ltd., Summary, *Proposed Third Runway, Sydney (Kingsford Smith) Airport, Draft Environmental Impact Statement*, Sydney: Federal Airports Corporation, Sept. 1990.

Sanders, Will, Sydney's airport needs: a comparative and historical perspective, *Current Affairs Bulletin*, vol. 66, no. 6, pp. 19–27, Nov 1989. (Reserve)

Taylor, David, Why Sydney Airport needs its third runway now, *Australian Director*, Feb/March 1989. (Reserve)

#### *7.6 Alternative transport modes: road versus buses.*

\*Pearce & Nash: Chapter 11, The social appraisal of transport projects. (Package, 11)

\*Bureau of Transport & Communications Economics, Forgone production costing model, *Social Cost of Transport Accidents in Australia*, Canberra: AGPS, 1992. (Package, 20)

#### *7.7 The Games of the XXVII Olympiad*

\**Sydney Morning Herald*, Sydney projects, August 1995. (Package, 24)

Plus additional items.

AGSM

Spring Term, 1996

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### *Assessment*

There will be no final exam. Instead there will be:

- two assignments (each 5%)
- an exam (30%) in Week 6,
- a rôle-playing exercise (5%), and
- a term project (55%).

The rôle-playing exercise, on a topic to be announced, will be performed and marked in designated groups; each group will assess the performance of all other groups, which will provide the basis for students' assessments in the exercise.

The term project should be an attempt to apply some of the theory covered in the subject to a particular project/decision or evaluation/decision-making procedure. If you wish, you may form groups of two (or with my permission of three) for the term project. I'd like an outline of the topic and the approach to be adopted (no more than two pages, please) by Friday, September 27th: the complete paper is due by 4pm on Friday, November 15th. (See the Notes on Writing in the Package.) Each student will give a short briefing (worth 10% of the term-project mark) to the class before the end of term on the contents and conclusions of the paper.

Some possible (but by no means exclusive) areas for projects are:

1. Privatising the AGSM.
2. Using the Internet and its multi-media possibilities to deliver the AGSM's MBA, EMBA, etc.
3. Faster access to Sydney's northern beaches.
4. The Sydney airport link railway.
5. The Sydney Olympics.
6. The Melbourne Grand Prix.
7. A trans-Australia gas pipeline.
8. Oil drilling on the Great Barrier Reef.
9. Extending daylight-saving time ("summertime").
10. The Darwin–Alice Springs railway.
11. Large-scale water desalinisation projects.
12. The Third Runway at Mascot (Sydney) Airport
13. The North Queensland Spaceport
14. Sydney's Inner West Redevelopment Project
15. The Sydney Water Board's treatment projects
16. Turning the rivers inland.
17. The domestic fibre-optic network
18. The Eastern Creek raceway fiasco
19. The Sydney–Melbourne "Tilt" Train
20. The Fast Freight Train/National Rail Freight System
21. The Bass Strait Electricity Link/National Electricity Grid
22. Private power stations (building or selling).

23. The Very Fast Train (still!)
24. A proposal to make the wearing of seat belts/cycle helmet voluntary.
25. Examination of the risk/benefits of (hypothetical?) proposals for improving road safety, or air safety, or the safety of new drugs.
26. Examination of “lumpy” business projects, which might be large in relation to the company, to the local area, or to both. (Evaluation of such projects may benefit from some of the techniques presented.)
27. Analysis of the revealed implicit social valuation of human life in 1996 Australia.
28. Analysis of the revealed implicit risk tolerance of the Australian public
29. Examination of a (hypothetical) policy to require adventures (mountaineers, wilderness venturers, sea-faring wind-surfers, white-water canoeists, etc.) to take insurance out against necessity for government search-and-rescue teams to save them.
30. Use of CBA techniques to aid an actual decision, and an evaluation of the procedure. (From your previous work experience, perhaps.)
31. The similarities and differences between public- and private-sector project evaluation.
32. The risks and returns from increasing the allowable blood alcohol content from 0.05% to 0.08%.
33. The Rasmussen report on nuclear safety, risks, and uncertainty.
34. Bond University, or other private universities.
35. The development at Darling Harbour.
36. Sydney freeways.
37. Standardisation of the Melbourne–Adelaide railway.
38. Education vouchers.
39. Privatisation of QANTAS, of the NSW Electricity System.
40. An assessment of the social costs of the AIDS epidemic.
41. The large bank you are working for is considering financing a consortium to undertake some large-scale project which might be the second-stage of the North West Shelf natural-gas development, tourist development, a large new shopping mall, hyper-market or whatever. Use your imagination or your contacts to choose and evaluate the viability of such a project. Evaluate the project from both a “financial” and an “economic” viewpoint and contrast the differences.
42. Approach a company with which either you or Faculty have contacts that is undertaking a new project. Provide an independent evaluation of the project but drawing on information provided by the company where appropriate.
43. The Sydney Harbour Bridge Tollroad.
44. AGSM’s Australian Open Learning Program.
45. The government’s proposed reforms to Medicare.
46. Performance evaluation of public enterprises.
47. Some aspect of the micro-economic reform program.
48. Some aspect of environmental policy or the greenhouse effect.
49. Private toll roads or electronic road pricing.
50. Or anything else you may think of — which may be in your home country, not here.

I have some papers from previous years. Please see me to borrow them, and to discuss perhaps using them to write a new analysis of your own.



Author	Title	
Abbott	BHP Mini Steel Mill	2
Adams	Harris-Daishowa woodchip project	1
Alston	Australian Technology Park	1
Arasu	CBA of the MBA	2
Bain	Kingsford Smith Airport and the Third Runway	1
Baldwin	Heroin Policy Alternatives for Aust	2
Blewitt	Proposed Toll Methodology for the Sydney Harbour Tunnel	1
Blundell	Social cost of viral hepatitis in Australia	1
Brindley	The NSW Rugby League Draft	1
Bryant	Adelaide's Grand Prix	1
Carr	Economic Impact of AIDS in Aust	2
Coe	The Social Cost to Australia of AIDS	2
Conde	Site Selection for a Second Sydney Airport: A CBA	1
Dennon	Bar-Code Scanning at the Supermarket	1
Digwood	The Sydney Monorail: A CBA	2
Drimer	Australia's plastic money	1
Duck	The M5 East motorway	1
Godden	Partnerships for Development or Partnerships for Disaster?	1
Gorman	An EIA into a Proposed new Light Rail Link—S.E. Sector	2
Harrington	A heliport for Sydney's CBD	1
Horstman	CBA of Runway Expansion based on Efficient Pricing	1
Hutchinson	The Evaluation of Health Maintenance Organisations	1
Jackson	CBA of Woronora River Bridge	1
Jayaratne	The Argyle Diamond Mine Project (ADM): A CBA	1
Johnson	Oil Drilling on the Great Barrier Reef	1
Lee	A Proposed Congestion Tolling System for the Sydney Harbour Bridge	2
Licari	A CBA of the Spit Bridge	1
Luk	Jabiluka Uranium Mine	1
Mehling	CBA of Diaper (Nappy) Usage	1
Michael	A Fast Railway between Sydney, Canberra & Melbourne	1
Mitchell	A CBA of Woolplan	1
O'Donnell	A CBA of the Proposed 1992 Olympic Games in Brisbane	2
Oke	Decisions without Market Prices: The Proposed Oxley National Park	2
Paul	The VFT	1
Peter	Domestic Waste Disposal & Recycling	1
Purves	A CBA of Memtech's Membio project	1
Roberts	Bond Corp.'s Skytower project	1
Ross	Going on (student) exchange	1
Ryan	The F2 Freeway	1
Sewell	The Pavilion, Manly: A CBA	2
Shanahan	AGSM vs. UBC: a CBA of the MBA Degree	1
Smyth	Medical Manpower: The Report of the Committee of Officials (May 1980)	1
Tang	Privatisation of AAirlines & Deregulation of Domestic Aviation	2
Tanner	Access to Ski Resorts in Kosciusko National Park	2
Weeks	Going abroad for an MBA	1
Yan	Evaluation of Random Breath Testing in NSW	2
Ying	The Shanghai's Pudong New Area in China	1