

SUMA K4020 Cost Benefit Analysis

Instructor: Satyajit Bose

Course Overview

Cost-Benefit Analysis (CBA) is a policy assessment method that quantifies the value of policy consequences (usually called impacts) in monetary terms to all members of society. The purpose of a CBA is to help effective social decision making through efficient allocation of society's resources when markets fail. When markets fail and resources are used inefficiently, CBA can be used to clarify which of the potential alternative programs, policies or projects (including the status quo) is the most efficient.

The course introduces practitioners of environmental science and sustainability management to the techniques of preparing a CBA, including microeconomic foundations, valuation methods, discounting, the impact of uncertainty and optionality, and distributional consequences. The course provides a basic introduction to revealed preference, contingent valuation and benefits transfer method of valuing environmental impacts. The use and interpretation of CBA in specific cases is critically evaluated, with a detailed examination of alternative approaches. Worked examples and case studies are integral to each topic.

This course is both for those who want to perform CBA and those who want to know how to understand and interpret it: in other words, the various clients of CBA. Students are assumed to have had no previous exposure to economics. Students who have had an undergraduate course in intermediate microeconomics or taken Economics of Sustainability

Management will be adequately prepared to excel in the course. Those who have not had such preparation will need to work hard to absorb the theoretical concepts along with the applications. However, it is not uncommon for students with little economics preparation to excel in a course on CBA. In the absence of any economics preparation, it is useful to have some mathematical fluency. If you are concerned about your level of mathematics preparation, you are strongly encouraged to attend the Math Camp provided before the start of the Fall semester or to watch the lectures online.

Learning Objectives

By the end of the course, you will be able to:

- Demonstrate an understanding of theoretical concepts that are foundational to CBA, including: consumer surplus, producer surplus, discounting and present value, uncertainty and expected value theory, option value, revealed preference, contingent valuation and shadow pricing.
- Demonstrate an understanding of quantitative techniques/skills necessary to compute consumer and producer surplus, present values, expected values, option values and shadow prices and perform supplementary analyses such as distributional impact assessments or Monte Carlo analyses.
- Conceive, plan and implement a CBA.
- Articulate why a particular CBA may be faulty or inappropriate for a specific policy choice. Interpret any economic argument employing the logic of costs and benefits.
- Describe alternative techniques of decision-making which complement a CBA.
- Develop proficiency in the language of cost-benefit analysis, including the ability to structure a clear, concise and persuasive argument both verbally and in writing.

Required Text

Boardman, A.E., D.H. Greenberg, A.R. Vining & D.L. Weimer. Cost-Benefit Analysis: Concepts and Practice. 4th edition.

A selection of additional readings will be required and posted to the course website. These include academic articles and public filings such as reports and environmental disclosures prepared by government agencies and businesses.

Assignments

Problem Sets: Three or four times during the course, you will complete problem sets in small groups. The problem sets will consist of quantitative exercises and essays interpreting quantitative information. Each problem set will be graded on a categorical scale from check- to check+. A check will be equivalent to 85 out of 100. Problem sets will account for 15% of the final grade. Absent extenuating circumstances, problem sets will be graded by the TA and returned to students approximately one week after they are due.

Attendance and Participation: For participation, students will be required to:

1. Contribute to class discussions. Contributing means enhancing the quality of the class experience for yourself and others. It involves making relevant, useful and non-obvious comments, or posing pertinent questions, in clear and succinct language;
2. Be prepared to give 2-3 minute answers to impromptu questions regarding the readings in the live events; and
3. Provide at least three carefully considered and substantive (2-3 paragraphs) posts in the discussion board.

The attendance and participation grade will comprise a weighted index of numeric grades that

combine performance under each of the three tasks above and actual attendance at live events. Participation will account for 20% of the final grade.

Midterm: Halfway through the course, you will take a midterm consisting of short quantitative exercises, computation of accounting ratios and essays interpreting accounting data. The midterm exam will be graded on a numeric scale from 1 to 100 and account for 25% of the final grade.

Term Project: A position paper, accompanying cost-benefit analysis spreadsheet and an oral presentation arguing for a specific decision regarding a narrow aspect of sustainability for a business or a country will be prepared in groups assigned by the instructor based on stated topic preference. You will choose from a list of topics distributed in the second week of class, prepare your report throughout the semester, and present it to your peers during the last few weeks of the course. The position paper, accompanying spreadsheet and oral presentation will be graded on a letter grade scale from F to A+ and will constitute 30% of the final grade.

Evaluation and Grading

Your final course grade will be computed using a weighted index of numeric grades that combine performance under problem sets, attendance and participation, midterm exam, analyst report, CBA spreadsheet and oral presentation. The weighted index will be scaled into a letter grade scale from F to A+ based on an expectation that a class representative of the population of Columbia masters students will receive a median grade of B+ or A-.

Course Policies

Attendance

Regular attendance in online sessions is required. Students are expected to have done the readings for each session prior to the live session.

Participation

We expect your contributions to enhance the quality of the class experience for yourself and others. This involves making relevant, useful and non-obvious comments, or posing pertinent questions, in clear and succinct language. Come prepared to answer impromptu questions about the readings and course assignments. Participation in practice problem forums and tutorial sessions are optional, but strongly recommended for those striving to fully understand core concepts.

Late work

All assignments must be submitted on the published due dates. In the absence of well-documented extenuating circumstances, I will deduct 10 points from the assignment grade score for each day that you are late in submission.

School Policies

Academic Integrity

All work is expected to be original either from team effort or individual design; cheating and plagiarism will not be tolerated. Columbia University expects that its students will act with honesty and propriety at all times and will respect the rights of others. It is fundamental University policy that academic dishonesty in any guise or personal conduct of any sort that disrupts the life of the University or denigrates or endangers members of the University community is unacceptable and will be dealt with severely. It is essential to the academic integrity and vitality of this community that individuals do their own work and properly acknowledge the circumstances, ideas, sources and assistance upon which that work is based.

Academic honesty in class assignments and exams is expected of all students at all times. SCE holds each member of its community responsible for understanding and abiding by the SCE Academic Integrity and Community Standards at: <http://ce.columbia.edu/node/217>. You are required to read these standards within the first few days of class. Ignorance of the School's policy concerning academic dishonesty shall not be a defense in any disciplinary proceedings.

Accessibility

Columbia is committed to providing equal access to qualified students with documented disabilities. A student's disability status and reasonable accommodations are individually determined based upon disability documentation and related information gathered through the intake process. For more information regarding this service, please visit the University's Health Services website: <http://health.columbia.edu/services/ods/support>

Session 1

Topic:

Introduction

Required Readings:

- **Boardman et al. :**
- Boardman, A.E., D.H. Greenberg, A.R. Vining & D.L. Weimer. Chapters 1-2 in *Cost-Benefit Analysis: Concepts and Practice*. 4th edition.
- **Arrow, Cropper et al. :**
- Arrow, K.J., M.L. Cropper, et al. "[Is There a Role for Benefit-Cost Analysis in Environmental, Health, and Safety Regulation.](#)" *Science*. 272(April 12, 1996): 221-222
- **Goulder & Stavins :**
-  Goulder, L.H. & R.N. Stavins. "[An Eye on the Future.](#)" *Nature* 419:673-674. Oct 2002.

Lectures:

-  Introduction

Session 2

Topic:

Microeconomic Foundations

Required Readings:

- **Boardman et al. :** Boardman, A.E., D.H. Greenberg, A.R. Vining & D.L. Weimer. Chapter 3 in *Cost-Benefit Analysis: Concepts and Practice*. 4th edition.
- **Kolstad :** Kolstad, C.D. Chapter 7 in *Environmental Economics*. 2nd edition. (see file below)

Lectures:

- Microeconomic Foundations

Session 3

Topic:

Environmental Valuation

Required Readings:

- **Boardman et al.** : Boardman, A.E., D.H. Greenberg, A.R. Vining & D.L. Weimer. Chapters 4-5 in *Cost-Benefit Analysis: Concepts and Practice*. 4th edition.
- **McFadden** : Daniel McFadden. "Why is Natural Resource Damage Assessment So Hard?" Hibbard Lecture. (See file below)
- **V. Kerry Smith** : V. Kerry Smith: "Can we measure the economic value of environmental amenities?" ([Southern Economic Journal](#) 56:865-78. 1990.)

Lectures:

- Environmental Valuation

Session 4

Topic:

Discounting

Required Readings:

- **Boardman et al.** : Boardman, A.E., D.H. Greenberg, A.R. Vining & D.L. Weimer. Chapters 6 & 10 in *Cost-Benefit Analysis: Concepts and Practice*. 4th edition.

Lectures:

- Discounting

Session 5

Topic:

Uncertainty

Required Readings:

- **Boardman et al.** : Boardman, A.E., D.H. Greenberg, A.R. Vining & D.L. Weimer. Chapter 7 in *Cost-Benefit Analysis: Concepts and Practice*. 4th edition.

Recommended Readings:

- **Recommended** : 1. Kolstad Ch 18 2. Lee S. Friedman. Chapter 7 in *Microeconomics of Public Policy Analysis*

Lectures:

- Uncertainty
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Session 6

Topic:

Optionality

Required Readings:

- **Boardman et al.** : Boardman, A.E., D.H. Greenberg, A.R. Vining & D.L. Weimer. Chapter 8 in *Cost-Benefit Analysis: Concepts and Practice*. 4th edition.

Recommended Readings:

- **Recommended** : Copeland & Antikarov. Chapter 1 in *Real Options: A Practitioner's Guide*

Lectures:

- Optionality
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Session 7

Topic:

In-Class Midterm Examination

Assignments Due:

Practice Midterm

Session 8

Topic:

Valuation Methods: Demand Curves and Revealed Preference

Required Readings:

- **Boardman et al.** : Boardman, A.E., D.H. Greenberg, A.R. Vining & D.L. Weimer. Chapters 13-14 in *Cost-Benefit Analysis: Concepts and Practice*. 4th edition.

Lectures:

- Revealed Preference
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Session 9

Topic:

Valuation Methods: Surveys and Experiments

Required Readings:

- **Boardman et al.** : Boardman, A.E., D.H. Greenberg, A.R. Vining & D.L. Weimer. Chapters 12 & 15 in *Cost-Benefit Analysis: Concepts and Practice*. 4th edition.
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Session 11

Topic:

Valuation Methods: Benefits Transfer

Required Readings:

- **Boardman et al.** : Boardman, A.E., D.H. Greenberg, A.R. Vining & D.L. Weimer. Chapters 16-17 in *Cost-Benefit Analysis: Concepts and Practice*. 4th edition.
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Session 12

Topic:

Critiques and Assessment of CBA

Required Readings:

- **Boardman et al.** : Boardman, A.E., D.H. Greenberg, A.R. Vining & D.L. Weimer. Chapters 18-20 in *Cost-Benefit Analysis: Concepts and Practice*. 4th edition.
 - **Kelman** : Kelman, S. "Cost-Benefit Analysis: An Ethical Critique (with Replies)." in *Economics of the Environment: Selected Readings*. Fourth Edition. R.N. Stavins, ed. (2000). Ch 15. (See file below)
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Session 13

Topic:

Student Presentations

Class Plan:

Should New York City install green infrastructure technologies to manage stormwater before it enters the City's combined sewer system?

Should the federal government and New York and New Jersey re-start the canceled Hudson River Tunnel Project?

Assignments Due:

Term Project

Session 14

Topic:

Student Presentations

Class Plan:

- Should the U.S. government subsidize the use of biodiesel from soybean oil?
 - Are there any health benefits to consuming organic food?
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Session 15

Topic:

Student Presentations

Class Plan:

- Should the NYC Taxi and Limousine Commission require yellow cabs to switch to plug-in electric vehicle models?
 - Should New York state lift the ban on hydrofracking?
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