90747 – K5: COST-BENEFIT ANALYSIS

Course Information for May Semester 2017

Introduction

This course introduces the public policy analytical tool known as Cost-Benefit Analysis (CBA). CBA is not financial analysis. Financial analysis is concerned with how to evaluate a project over its lifespan and measures the adequacy of current and future cash flows and revenues to cover the cost of building, operating, and maintaining the project. While financial analysis is an important part of policy analysis or project management, the economic merit of the policy or project as measured by CBA is generally not affected by how the project is financed.

CBA attempts to capture all benefits and costs accruing to society from the policy, project or course of action, regardless of which particular party realizes the benefits or costs, or the form these benefits and costs take. It reveals the most economically efficient investment alternative, i.e., the one that maximizes the net benefits to the public from an allocation of resources. However, CBA requires that the analyst address a number of complications:

- Society’s ultimate goal of maximizing social welfare is not necessarily equivalent to maximizing the difference of benefits and costs;
- It is not clear which groups ought to be included in the cost-benefit analysis;
- Some impacts may be difficult to express in dollar terms;
- Some groups may be more affected by a project than others;
- The precision of the data used, and the purpose to which the study is put, depend strongly on whether the study is done before, during or at the end of a project’s life;
- Benefits and costs of a demonstration project may not “scale up”;
- Projects may be subject to political pressures that affect outcomes.

Researchers have explored these objections to traditional CBA in great detail, and we will examine these objections. We will also identify situations in which a rigorous CBA of a potentially controversial policy initiative, such as the decision to build a publicly-funded highway, or pursue an environmental protection regulation, may be irrelevant to the policy choice actually made.

There will be a tension in the course between the “textbook” notion of CBA that relies on technical assumptions to apply microeconomic methods, and real-world concerns about CBA, policy analysis and politics that may limit the utility of any given analysis. Examining this tension will help you better understand the promise and limits of quantitative analysis for policy design.
Course Goals:

The fundamental goal of this course is to explain and illustrate how to perform a CBA. Achieving this goal is in a sense a “necessary condition” for a passing grade in the course. Boardman et al. (pp. 7 – 17) nicely summarize the key steps of this analysis as:

1. Specify the set of alternative projects;
2. Decide whose benefits and costs count;
3. Catalogue the impacts and select measurement indicators (units);
4. Predict the impacts quantitatively over the life of the project;
5. Monetize (attach dollar values to) all impacts;
6. Discount benefits and costs to obtain present values;
7. Compute the net present value (NPV) of each alternative;
8. Perform sensitivity analysis;
9. Make a recommendation based on NPV and sensitivity analysis.

As mentioned earlier, the wide variety of real-world complications makes completion of these steps a nontrivial exercise. There are situations in which (a) information is so imperfect that a rigorous CBA cannot be done; (b) despite a large volume of data, the economic analysis necessary to monetize impacts with the smallest amount of error is beyond the expertise of the analysts; (c) a meaningful CBA may be, unfortunately, irrelevant to, compromised by, or opposed by, the political process that it is supposed to inform. The notion of a CBA as the process of producing a persuasive “glossy report” is inadequate to understanding the CBA and its role in organizational decision-making.

So, one may identify a number of course meta-goals as:

- Determine when a CBA may be performed in a meaningful way;
- Perform the analysis as completely as possible, given relevant modeling assumptions or approximations;
- Identify limitations in modeling assumptions, data or political concerns that may compromise the validity of the study;
- Communicate the results of the CBA to stakeholders in such a way as to facilitate political or administrative processes.

Pre-requisites

Successfully completed the following courses:

- 90-710 Applied Economic Analysis I,
- 90-711 Empirical Methods for Public Policy and Management,
- 90-724 Financial Analysis
### Course Schedule and Topics (subject to change if necessary)

<table>
<thead>
<tr>
<th>Lec</th>
<th>Date</th>
<th>Time</th>
<th>Lectures</th>
<th>Chap</th>
<th>Due</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>23 May</td>
<td>1500 – 1600</td>
<td>Introduction to CBA and Concepts</td>
<td>1,2</td>
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<tr>
<td></td>
<td></td>
<td>1600 – 1620</td>
<td>Briefing</td>
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<td>2</td>
<td>25 May</td>
<td>1500 – 1620</td>
<td>Valuing benefits &amp; costs</td>
<td>3,4,5</td>
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<td></td>
<td></td>
<td>1600 – 1620</td>
<td>Project meeting 1</td>
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<td>3</td>
<td>30 May</td>
<td>1500 – 1540</td>
<td>Existence value</td>
<td>9</td>
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<td></td>
<td></td>
<td>1540 – 1620</td>
<td>Discounting &amp; sensitivity analysis</td>
<td>6, 7</td>
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<td>4</td>
<td>01 June</td>
<td>1500 – 1600</td>
<td>SDR &amp; Predicting &amp; monetizing impacts</td>
<td>10, 11</td>
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<td></td>
<td></td>
<td>1600 – 1620</td>
<td>Project meeting 2</td>
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<td>5</td>
<td>06 Jun</td>
<td>1500 – 1540</td>
<td>Valuing impact: Observed behavior</td>
<td>12</td>
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<td></td>
<td></td>
<td>1540 – 1620</td>
<td>Valuing impact: direct methods</td>
<td>13</td>
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<tr>
<td>6</td>
<td>08 Jun</td>
<td>1500 – 1600</td>
<td>Indirect methods</td>
<td>14</td>
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<td></td>
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<td>1600 – 1620</td>
<td>Project meeting 3</td>
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<td>7</td>
<td>13 Jun</td>
<td>1500 – 1600</td>
<td>Contingent valuation</td>
<td>15</td>
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<td></td>
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<td>1600 – 1620</td>
<td>Project meeting 4</td>
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<td>8</td>
<td>15 Jun</td>
<td>1500 – 1600</td>
<td>Shadow prices</td>
<td>16</td>
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<td></td>
<td></td>
<td>1600 – 1620</td>
<td>Project meeting 5</td>
<td></td>
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<td>9</td>
<td>20 Jun</td>
<td>1500 – 1600</td>
<td>Accuracy of CBA</td>
<td>20</td>
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<td></td>
<td></td>
<td>1600 – 1620</td>
<td>Project meeting 6</td>
<td></td>
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<tr>
<td>10</td>
<td>22 Jun</td>
<td>1500 – 1620</td>
<td>CEA and Revision</td>
<td>18</td>
<td>A1</td>
</tr>
<tr>
<td>W6</td>
<td>29 Jun</td>
<td>1500 – 1700</td>
<td>Final Examination</td>
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<td>A2</td>
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</tbody>
</table>

- A1: Assignment 1
- A2: Team Project
Course Instructor and Contact Details

Mail to: Dr. T. K. Lim, Ph.D., FCMA
Professor of Finance and Policy
Carnegie Mellon University
H. John Heinz III College
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E-mail: tklim@andrew.cmu.edu

Course delivery day: Tuesday and Thursday 3.00PM to 4.20PM
Consultation time: Tuesday and Thursday 1.30PM to 2.30PM
Other days by appointment via e-mail confirmation.

Teaching Assistant

None

Review session: on request basis

Core Textbook:


Core Readings:


Other Readings:

Pricing the Priceless: Cost-Benefit Analysis of Environmental Protection, Frank Ackerman and Lisa Heinzerling, 2002, Georgetown University

Memorandum For Heads of Executive Departments and Establishments, October 1992, Office of Management and Budget, Circular No.A-94

Benefit-Cost Analysis and Crime Prevention, Australian Institute of Criminology, 2000
Financial Calculator:

You are allowed to bring a financial calculator for examination purpose. The recommended brand is Sharp EL-738

Lecture Notes & Attendance:

Weekly notes are available during the class and also available in power point files on request basis. Other reading materials may be distributed during the class sessions.

As this is an advanced-level fast pace mini-course, attendance is strongly recommended. Supplementary examination will ONLY be granted to absentees if (a) prior consent from instructor is obtained for critical non-work-related reasons; or (b) produce medical certificate as evidence of medical emergency. Note that it is prohibited to take pictures, video record, or audio tape during class without the explicit written consent from the instructor.

Course Assessment

There are three major assessment components for this course, which include one written assignment, one team project, and one final examination.

The original assignment reports and exam answer books will be kept by the instructor. After obtaining your marks for each assessment or the final grade, you may come to discuss with the instructor or request a formal second assessment of the result via e-mail to instructor. However, the new and final result may vary depends on the outcome of the second formal assessment.

Please be informed that any late submission of your works will be subjected to a penalty of five marks per day, unless you have obtained prior approval from the instructor.

The assigned marks for the assessment components are listed below:

<table>
<thead>
<tr>
<th>Assessment components</th>
<th>Total Marks</th>
<th>Assignment Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Written report</td>
<td>15 marks</td>
<td>22-June</td>
</tr>
<tr>
<td>b) Team Project</td>
<td>30 marks</td>
<td>29-June</td>
</tr>
<tr>
<td>c) Final Exam</td>
<td>55 marks</td>
<td>29-June</td>
</tr>
<tr>
<td>Total score:</td>
<td>100 marks</td>
<td></td>
</tr>
</tbody>
</table>

The details of the written assignment and team-project will be discussed during the first lecture.

An overview of the grading scale and score range as well as guideline on grading is shown below:
Table for Grading Scale and Score Range:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
<th>Points</th>
<th>Score Range (in percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>Exceptional</td>
<td>4.33</td>
<td>97 to 100.00</td>
</tr>
<tr>
<td>A</td>
<td>Excellent</td>
<td>4.00</td>
<td>93 to 96.99</td>
</tr>
<tr>
<td>A-</td>
<td>Very Good</td>
<td>3.67</td>
<td>90 to 92.99</td>
</tr>
<tr>
<td>B+</td>
<td>Good</td>
<td>3.33</td>
<td>86 to 89.99</td>
</tr>
<tr>
<td>B</td>
<td>Acceptable</td>
<td>3.00</td>
<td>80 to 85.99</td>
</tr>
<tr>
<td>B-</td>
<td>Fair</td>
<td>2.67</td>
<td>76 to 79.99</td>
</tr>
<tr>
<td>C+</td>
<td>Poor</td>
<td>2.33</td>
<td>70 to 75.99</td>
</tr>
<tr>
<td>C</td>
<td>Very Poor</td>
<td>2.00</td>
<td>66 to 69.99</td>
</tr>
<tr>
<td>C-</td>
<td>Minimal Passing</td>
<td>1.67</td>
<td>60 to 65.99</td>
</tr>
<tr>
<td>R</td>
<td>Failing</td>
<td>0.00</td>
<td>0 to 59.99</td>
</tr>
</tbody>
</table>

Guideline for Grading

The following descriptive statements are guidelines used to grade your assessment components:

- **Grade A+** (Exceptional) Extraordinary piece of work for a graduate student. Work at this level is distinctively outstanding, ultra high level of critical thinking, innovative ideas, crystal clear yet precise explanations with solid justifications and references, very sophisticated methodologies with professional level of writing and communication skills. Work is extraordinary; attain the highest academic and professional quality.

- **Grade A** (Excellent) Excellent work of a graduate student. Work at this level is unusually thorough, very high-level of critical thinking, innovative, superior explanations/justifications, sophisticated methodologies, well written and superb presentation. Work is of outstanding, professional quality.

- **Grade A-** (Very Good) Strong work for a graduate student. Work at this level shows high-level of critical thinking, some signs of creativity, is thorough and well-reasoned, good presentation, indicates strong understanding of appropriate methodological or analytical approaches, and meet the professional standard.

- **Grade B+** (Good) Competent and sound work for a graduate student; well reasoned and thorough, good presentation, reasonable level of critical thinking, methodologically sound, but not especially creative or insightful or technically sophisticated. This is the graduate student grade that indicates the student has accomplished the objectives of the course, with acceptable professional standard.

- **Grade B** (Acceptable) Proficient work for a graduate student. Moderately thorough, some level of critical thinking, well reasoned, demonstrating competency in the key course objectives but showing some indications that understanding of some key issues is less than complete. Methodologically or analytical approaches used are adequate but student has shown one or more weaknesses or limitations.
• **Grade B- (Fair)** Basic work for a graduate student. Meets the basic expectations for a graduate student in the course; low level of critical thinking, understanding of salient issues is somewhat incomplete, methodological or analytical work performed in the course is basic, although adequate.

• **Grade C+ (Poor)** Inadequate work for a graduate student; barely meets the basic expectations for a graduate student in the course. Work is inadequately developed or flawed by some errors and misunderstanding of important issues. Methodological or analytical work performed is deficient and barely demonstrates the knowledge or technical competence expected of graduate students.

• **Grade C (Very Poor)** Weak work for a graduate student; hardly meet the basic expectations for a graduate student in the course. Work is very poorly developed or flawed by numerous errors and lack of understanding of important issues. Methodological or analytical work performed is very weak and fails to demonstrate the knowledge or technical competence expected of graduate students.

• **Grade C- (Minimal Passing)** Very weak work for a graduate student; hardly meet the minimal expectations for a graduate student in the course. Work is carelessly developed or full of errors and missing the important issues. Methodological or analytical work performed is mostly wrong and fails to demonstrate the knowledge or technical competence expected of graduate students.

• **Grade R (Fail)** Work fails to meet even minimal expectations for course credit for a graduate student. Performance has been consistently weak in methodology and understanding, with serious limits in many areas. Weaknesses or limits are pervasive.

**Academic Integrity**

The Heinz College takes very seriously its mission to produce graduates who are committed to ethical behavior in all phases of their professional lives. In this regard, the College views any cheating and plagiarism as serious offences. You are required to review thoroughly the material on academic integrity presented in master’s program handbooks (http://www.heinz.cmu.edu/resources/handbooks/msppm.html) and elsewhere, and to monitor your own actions carefully to prevent even the appearance of violations of academic integrity guidelines. Any violations of academic integrity in this class will have the following consequences: (a) zero mark for assignments; and (b) in more serious offences, failing the class.

You are, however, allowed to form small study groups to collaborate on assignments and case studies. Group collaboration is defined as “group discussions or brain-storming on the issues of an assignment or a case, followed by submission of independent work”. It is wrong for you to submit an assignment in which one or more answers represent the work of other classmates.
90747-K5 Cost-Benefit Analysis
May 2017
Assessment Components

There are 3 core assessments as shown below:

1. Individually Written Report: 15 marks. Submit hardcopy on 22-Jun-17 @3.00pm
   - Review of Article: “CBA of Financial Regulation: Case Studies and Implications”
   - Format:
     a. Summary of paper – 3 marks. Length: 2 pages – use your own words. Quotation from article is not allowed. Adhere to the length limit.
     c. References: Must quote all references. 1 page.

2. Team Project: 30 marks: Submit team report on 29-Jun-2017 @ 3.00pm
   Conduct a CBA on a Public Project of Adelaide City Council.
   - Format:
     a. Description of project – 1 mark. Length limit: 1 page
     b. Nine-steps of CBA – 18 marks: length limit: 9 pages
     c. Evaluation and recommendation – 5 marks. Length: 2 pages
     d. References – 1 page.
     e. Appendix – Excel tables
     f. Peer confidential evaluation – 6 marks.

3. Final Examination: 55 marks. Exam date: 29-Jun-2017 @ 3.00pm
   - Closed-book exam – 120 minutes duration
   - Three qualitative questions & Three quantitative problems
   - No computer, mobile phone or other electronic devices. However, you can use a financial calculator.