Chapter 12 – Making Sure Managers Maximize NPV

This chapter is a practical discussion of how we can make sure managers are following the NPV rule (accept positive NPV projects and reject negative NPV projects). We will discuss:

1) Evaluation of projects after acceptance (post-audits)
2) Problems with the capital budgeting process and how to correct these problems
3) Measuring project performance using accounting income
4) Measuring project performance using economic income

This chapter focuses on the performance of a project after it has been accepted. It would seem that the performance of rejected projects couldn’t be evaluated. However, it is possible to evaluate the performance of a rejected project. For instance, perhaps a competitor accepted the project that your company rejected.

Evaluation of the project after acceptance

Why do we look at a project after acceptance?

1) Fix any unanticipated problems, avoid costly delays, and limit the ability to of managers to divert project funds (without authorization) to other uses.

2) Determine the accuracy of forecasts (to help in making more accurate forecasts for future projects).

3) These two can be done with a post-audit. Post-audits are performed shortly after the project starts.
   - Were the estimates of initial investment accurate?
   - Are the first-year cash flow estimates accurate?

Overall profitability of the project is probably not evaluated since post-audits are typically conducted prior to the project's completion.

Need to consider the affect of the economy of project cash flows.

4) Some projects are difficult to evaluate separately because they are interwoven with other projects.

   Example: Advertisements for a new product is done in three forms (TV, radio, and newspaper). What was the incremental impact of the newspaper advertisement on product sales?

Problems with project analysis performed by project managers

1) Biased economic forecasts done at the project manager level can cause bad project selection decisions. Rather than having each project manager put together an independent economic forecast, it is probably better to have a company economic forecast that can be applied to all projects. (Also, rather than one economist’s forecast, a consensus forecast of a team of economists can further reduce biases.)

2) Bad (non-economic based) forecasts of future cash flows for projects can also cause bad project selection decisions
   - For example, an overly optimistic (or pessimistic) manager makes biased forecasts of future cash flows

3) Agency problems [i.e., conflicts of interests between decision-makers (agents) and firm owners] can cause sub-optimal investment decisions. Describe how the following examples can result in the acceptance of a bad project (or rejection of a good project)
• Project acceptance allows the project manager to over consume perks
• Project acceptance increases the size of manager’s division (think about the manager’s compensation)
• Manager is overly concerned with short-term profitability of his (her) division
• Project manager has an incentive to invest in projects that require his (her) specialized skills
• Project manager needlessly wants to avoid risk when deciding which projects to select
• The project manager may not expend the effort needed to make the project successful

4) Many of these problems can also apply to senior management as well

How to correct these problems

1) Increased monitoring. However, you need to compare the benefits with the costs of monitoring.

Benefits of monitoring
• Reduced agency costs (or correct for optimistic / pessimistic forecasts)

Costs and problems of monitoring
• Monitoring costs money and takes time
• Senior management can’t review projects they don’t know about
• Micro management by senior management
• Too many constraints (or too much time spent on monitoring) can result in the firm being prevented from undertaking positive NPV projects
• Diminishing returns - Need to review projects that are most likely to contain errors in assumptions or analysis that would hurt the firm

Example: You are a senior level manager in charge of reviewing projects prior to acceptance / rejection. A junior analyst has computed the NPV of two projects

NPV (Project A) = $10
NPV (Project B) = -$10

Assume that you know that the junior analyst is pessimistic in making forecasts and calculating NPVs. If you have only the time to review one project, which would you review?

• Who monitors senior management?

Primary responsibility - the board of directors
Other possibilities – stockholders, lenders

2) Changing incentives

• The amount of incentives should depend on how much firm value is influenced by managers’ efforts
Two examples:

A) Firm value is primarily influenced by factors beyond the manager’s control (e.g., a power plant)

B) Firm value is primarily influenced by factors in manager’s control (e.g., internet company)

• The magnitude of gains and losses for large corporations require stockholders and management to share risk
• Incentives are often linked to stock performance

Problems

A) Too much concern with the ‘within firm’ risk of the project

B) Large fluctuations in the firm’s stock value could be caused by changes in the overall stock market and / or firm specific changes in stock value

C) Abnormal stock price increases may occur too early (the problem with hiring a hot-shot manager)

Measuring performance

1) Accounting return on investment = Accounting net income / Investment. Compare this fraction to the opportunity cost of capital

2) Economic Valued Added (EVA©) =
   Net (accounting) operating profit after taxes – (opportunity cost of capital) (investment).

   See: http://www.sternstewart.com/index2.shtml for more information

3) Disadvantages of both methods

   They use accounting income as a starting point, and

   They use current profits from a project instead of the present value of future expected cash flows from the project.

Measuring the profitability of the firm’s assets using economic income versus accounting income


Economic income = cash flow minus economic depreciation.

   Cash flow computation is described in Chapter 6.

   Economic depreciation reflects the decrease in the present value of the asset over time.

Example – Accounting (book) depreciation

1) $1000 initial investment in a factory
2) Factory has a useful life of 3 years and a zero salvage value
3) Expected factory accounting revenue (and expected cash flows): Year 1 = $300, Year 2 = $300, Year 3 = $700
4) Accounting depreciation method = Straight-line depreciation.
5) No other expenses other than depreciation. Ignore income taxes.
Expected accounting income per year:

- Year 1: $300 - $333 = -$33
- Year 2: $300 - $333 = -$33
- Year 3: $700 - $334 = $366

Expected accounting return on investment (ROI) per year:

- Year 1: -$33 / $1000 = -3.3%
- Year 2: -$33 / $667 = -4.95%
- Year 3: $366 / $334 = 109.58%

Performance Evaluation using Accounting Figures. Assume that you are the project manager and (under your management) you are able to exactly meet expectations. How will the firm's senior management view your performance using accounting ROI as a measure?

Performance evaluation at the end of year 1:
Performance evaluation at the end of year 2:
Performance evaluation at the end of year 3:

Example - Economic depreciation (using a 10% cost of capital):

1) PV(t = 0): $1046.5815

2) What is the PV of the project at years 1, 2, and 3?
   - PV (t = 1):
   - PV (t = 2):
   - PV (t = 3):

3) Economic depreciation equals the change in PV by year.

   Since we are calculating these figures at time zero, we are really calculating ‘expected’ economic depreciation. Ideally, you would recalculate the present value (from the previous step) each year in order to calculate the previous year’s ‘actual’ economic depreciation.

   Expected economic depreciation (year 1):
   Expected economic depreciation (year 2):
   Expected economic depreciation (year 3):
   Total expected economic depreciation is $1046.58 (PV of project).

4) Expected economic income per year (factory cash flow minus economic depreciation)

   Year 1:
   Year 2:
   Year 3:

5) Expected economic return on investment (ROI):

   Year 1:
   Year 2:
   Year 3:
Performance evaluation using economic income figures. Assume that you are the project manager and (under your management) you are able to exactly meet expectations. How will the firm's officers view your performance using economic ROI as a measure?

Performance evaluation at the end of year 1:
Performance evaluation at the end of year 2:
Performance evaluation at the end of year 3:

Lessons:

1) Accounting depreciation distorts the year-by-year ROI. Managers compensated based on accounting ROI may be reluctant to take projects similar to the example given above.

2) If actual cash flows equal expected cash flows, then economic income results in a constant ROI equal to the cost of capital.

Side note: What would actual accounting and economic ROI look like if you exceeded expectations. For example, assume that actual cash flows are:

Year 1) $300
Year 2) $300
Year 3) $725

What is the actual accounting ROI for years 1, 2, and 3?
What is the actual economic ROI for years 1, 2, and 3?

How to correct the accounting/economic depreciation problem:

1) Adjust accounting depreciation to reflect economic depreciation.

2) Compare year-by-year accounting ROI with accounting ROIs from similar successful projects.

3) Change manager compensation package.

4) In the long run (when the firm has a mixture of old and new projects), accounting return on investment will be closer to economic return on investment. (But see Table 12.9 showing that the two measures can still be different.)

Chapter 12 Review Questions

1. Understand why a project should be evaluated after acceptance. When is a “post-audit” performed? What is the purpose of a post audit?

2. Understand the management problems as they relate to the capital budgeting process. How can monitoring and changing incentives address these problems? What are the limitations, costs, and problems of monitoring and changing incentives?

3. How is accounting ROI different that EVA©?

4. What is economic depreciation? Understand how to calculate return-on-investment (ROI) using both accounting and economic depreciation. What are the advantages of using economic depreciation instead of using an accounting depreciation method such as the straight-line or the sum-of-the-years-digits or tax depreciation methods? In particular, what is the problem with using accounting depreciation in performance evaluation for a manager?

5. What are the various ways a corporation can adapt accounting depreciation to correctly evaluate the performance of a manager?
Chapter 12 Practice Questions

1. Assume that a project requires an initial investment of $5000 and is expected to produce cash flows (and net income) of $2100 per year for three years. This net income figure is before any depreciation deduction. Ignore income taxes.

A. What is the expected economic depreciation per year if the discount rate is 10%? $1577.76, $1735.54, $1909.09.
B. What is the expected economic ROI per year? 10% for each of the three years.
C. What is the expected accounting ROI if straight-line depreciation is used? 8.667%, 13%, 26%.
D. What is the actual economic ROI in year 3 if cash flows exceed expectations in year 3? More than 10%.

2. Assume a divisional manager's compensation contract is designed as follows: $50,000 per year base salary plus a bonus equal to 5% of the difference between the actual cash flows for the division and the division's projected cash flows. Since the base salary is relatively low, the manager expects most of her / his yearly salary from the bonus. If this manager is responsible for reviewing and approving new projects for the division, it is likely that:

A. The manager will have an incentive to overestimate project cash flows.
B. The manager will have an incentive to underestimate project cash flows. (Correct Answer)

3. Four junior analysts have the responsibility to calculate NPV for four different projects. Unfortunately (and as discussed in class), the person calculating the project NPV may let their biases enter into their calculations. Assume the following:

Biased NPV calculated for Project A = $5. This junior analyst tends to overestimate project NPV.
Biased NPV calculated for Project B = -$5. This junior analyst tends to overestimate project NPV.
Biased NPV calculated for Project C = $5. This junior analyst tends to underestimate project NPV.
Biased NPV calculated for Project D = -$5. This junior analyst tends to underestimate project NPV.

A senior analyst has enough time to evaluate and check the assumptions and NPV calculations for only two projects. Taking into account the junior analysts’ biased NPV calculations and their known tendency to overestimate (or underestimate) NPV, which two projects should the senior analyst review? Projects A and D

4. As described in class, the accounting return on investment for a project is calculated by dividing the year's net income for the project by:

A. The book value of the project at the beginning of the year. (Correct Answer)
B. The book value of the project at the end of the year.

5. A three-year project requires an initial investment of $2000. It will produce expected cash flows of $1500 at time one, $1200 at time two, and $500 at time three. The opportunity cost of capital is 10%.

A. What is the NPV of the project? $731.03
B. What is the economic depreciation for the second year? $1049.59
C. If actual cash flows are less than expected cash flows for the third year, what will the economic return on investment be for the third year? Less than 10%

6. ABC Corporation will invest in a two-year project. Expected cash flows are listed below:

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<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
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<tr>
<td></td>
<td>-$190,000</td>
<td>$88,000</td>
<td>$145,200</td>
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Using a 10% discount rate, the PV of the project’s future expected cash flows is $200,000. Therefore, the NPV for the project is $10,000. Using the expected cash flows, what is the economic depreciation for the first year? $68,000