

DECISION MAKING AND SCENARIOS

MODULE 1.4 – Why Is Net Present Value Appropriate for Evaluating Projects?

Other Evaluation Techniques

Professor Robert Holthausen
Professor Richard Lambert



Wharton
UNIVERSITY of PENNSYLVANIA

ONLINE

Other Evaluation Techniques - IRR

- Definition:
Discount rate that makes the NPV of the project exactly zero.

$$\text{NPV} = 0 = -C_0 + C_1/(1 + \text{IRR}) + C_2/(1 + \text{IRR})^2 + \dots + C_n/(1 + \text{IRR})^n$$

where C_n represents the cash flow in period n

- Solve for the discount rate that makes the NPV exactly zero and that is the IRR

Other Evaluation Techniques - IRR

- An investment of \$200 million today will yield \$120 million in 1 year and \$144 million in 2 years. Should we accept the project?

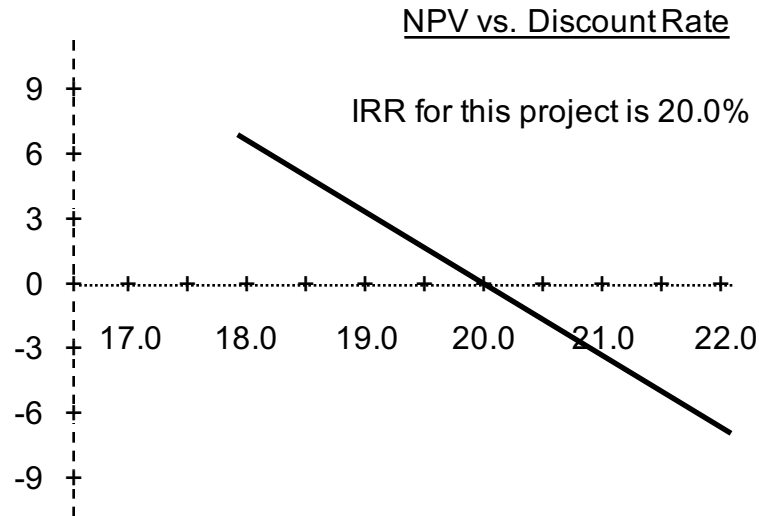
$$0 = -200 + 120/(1 + \text{IRR}) + 144/(1 + \text{IRR})^2$$

IRR = 20% ← If our cost of capital is below 20%, the project has a positive NPV. If it is above 20%, the project has a negative NPV.

Other Evaluation Techniques - IRR

$$0 = -200 + 120/(1 + \text{IRR}) + 144/(1 + \text{IRR})^2$$

$$\text{IRR} = 20\%$$



IRR Criterion - Pitfalls

- IRR is often an appropriate technique for evaluating projects
- However, the IRR can lead you to select the wrong project in certain circumstances, such as mutually exclusive projects (can do one project but not the other because they are two solutions to the same thing or you are capital constrained) and variation in the cost of capital over the life of the project
- IRR sometimes fails to provide a definitive answer as to whether a project is worth taking
- Simple rule – If the IRR criterion does not provide a definitive answer regarding whether a project is good or not, OR if the NPV criterion and the IRR criterion do not agree on the appropriate project to select, use the NPV criterion

Other Evaluation Techniques - Payback

- **Definition:**

How many years will it take for us to recover the initial outlay?

(Payback is the number of years until the cumulative non-discounted after tax cash flows are equal to 0)

Other Techniques - Payback Pitfalls

- Gives equal weight to all cash flows before the payback by ignoring the opportunity cost of capital.
- Ignores cash flows after the payback
- No correct decision criteria. e.g., is three years too long?
- *Tends* to make firms accept too many projects which are short-lived and reject too many long-lived projects.

Other Evaluation Techniques - Payback Pitfalls

| Project | Initial Investment | <u>Annual Cash flows</u> | | | Net Income for 3 years |
|---------|-----------------------|--------------------------|------|------|---------------------------|
| | | 1 | 2 | 3 | |
| A | -2000 | 0 | 0 | 4500 | 2500 |
| B | -2000 | 2000 | 2000 | 100 | 2100 |

What is the payback?

The payback for project A is in year 3

The payback for project B is year 1

But of course, project B is not necessarily to be preferred over Project A. It depends on the discount rate as we saw. Firms which adopt “rules of thumb” based on how quickly payback must occur, often wind up focusing on projects with very short lives and eliminating projects with big cash flows in later years.

Other Evaluation Techniques - Return on Investment (ROI)

- Definition:

Companies sometimes calculate return on investment, return on assets, or return on invested capital. Most typically, this is some **accounting** measure of profitability divided by an accounting measure of investment.

The accounting profit measure is sometimes before tax and sometimes after tax, and is usually not a measure of cash flows.

Other Techniques - ROI Pitfalls

- Firms usually have some specified minimum required ROI before a project is accepted. Of course, the expected ROI usually varies from year to year and there is no correct procedure for aggregating varying ROI from year to year into a single ROI estimate for the project to compare against a cost of capital.

Firms using ROI typically reject projects which are unprofitable in their early years.

Other Evaluation Techniques - ROI Pitfalls

| Project | Initial Investment | <u>Annual Cash flows</u> | | | Net Income for 3 years |
|---------|-----------------------|--------------------------|------|------|---------------------------|
| | | 1 | 2 | 3 | |
| A | -2000 | 0 | 0 | 4500 | 2500 |
| B | -2000 | 2000 | 2000 | 100 | 2100 |

What is the ROI based on the cash flows (not accounting profits)?

The ROI for Project A is 0%, 0% and 225% for Years 1 to 3

The ROI for Project B is 100%, 100% and 5% for Years 1 to 3

How do you aggregate those different ROIs? And despite the early ROI from Project B, it is not necessarily to be preferred over Project A. It depends on the discount rate as we saw. Firms which adopt “rules of thumb” based on ROI often reject projects that do not have a good ROI in the early years of the project.





ONLINE