Discounted Cash Flow: Decision Criteria

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Last Time
Discounted Cash Flow (DCF)

• Forecasting free cash flows

This Time

Discounted Cash Flow (DCF)

- Decision Criteria

Decision Criteria

What do we do with cash flows?

1. Compute the NPV (assume discount rate of 12%)

1. Compute the NPV

$$NPV = \frac{-\$376.8}{(1+0.12)^0} + \frac{-\$133.6}{(1+0.12)^1} + \frac{\$111.6}{(1+0.12)^2} + \frac{\$505.7}{(1+0.12)^3} + \frac{\$542.1}{(1+0.12)^4} + \frac{\$725.5}{(1+0.12)^5}$$

$$= \$708.42$$

1. Compute the NPV

Firm value (i.e., debt plus equity) increases by $708.42 million, in expectation, if the project is undertaken → undertake the project

Lesson: The NPV Rule says accept all projects with positive NPV, reject all projects with negative NPV

2. Compute internal rate of return

The internal rate of return (IRR) of a project is the one discount rate such that the net present value of the project's free cash flows equals zero.

2. Compute internal rate of return

$$NPV = \frac{-\$376.8}{(1+IRR)^0} + \frac{-\$133.6}{(1+IRR)^1} + \frac{\$111.6}{(1+IRR)^2} + \frac{\$505.7}{(1+IRR)^3} + \frac{\$542.1}{(1+IRR)^4} + \frac{\$725.5}{(1+IRR)^5}$$

$$\Rightarrow \quad IRR = 43.7\%$$

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Typically need to solve numerically (e.g., *IRR* function in Excel), or trial and error.
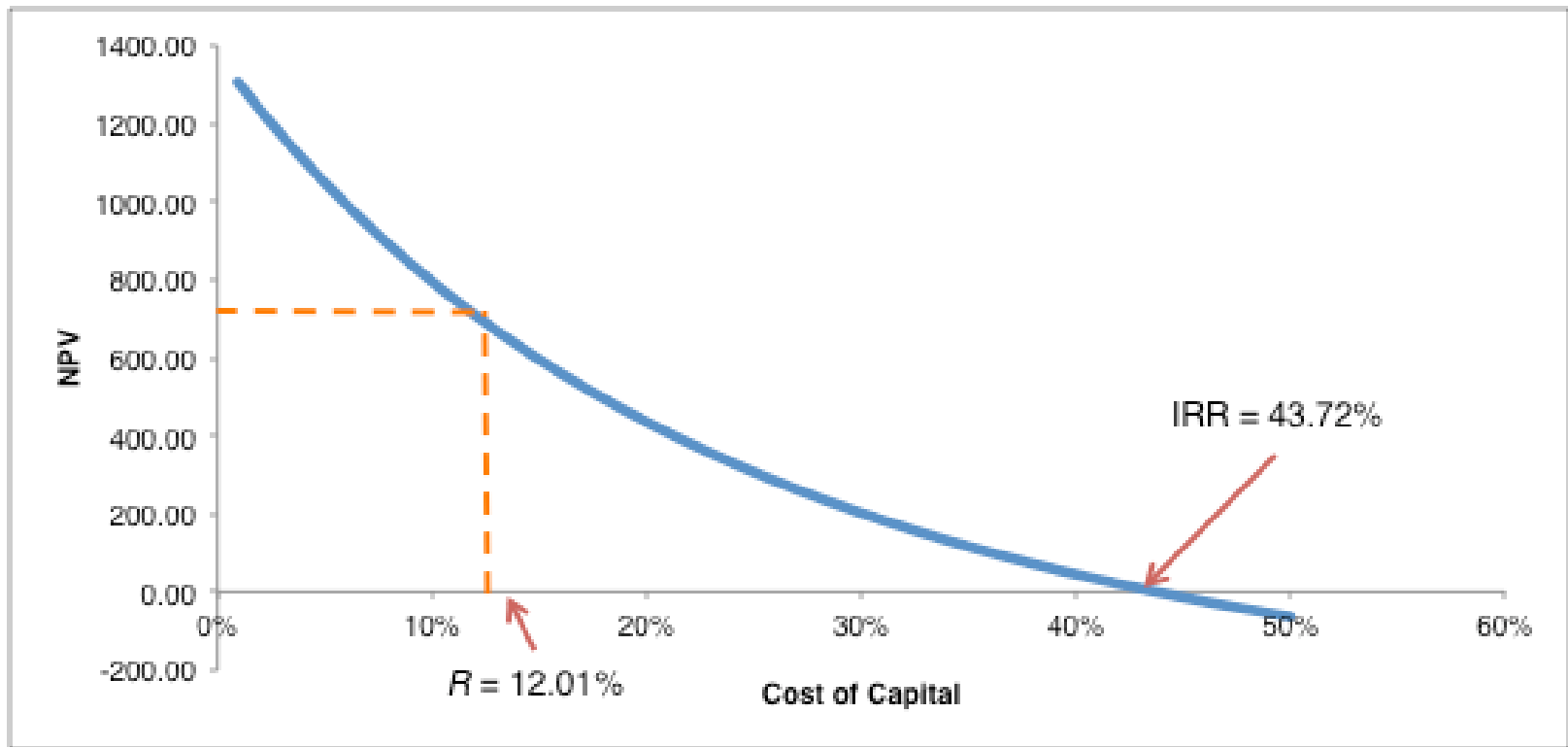
2. Compute internal rate of return

The promised return on investing in the project is 43.7% > 12% (hurdle rate) → undertake the project

Lesson: The IRR Rule says accept all projects whose $IRR > R$, reject all projects whose $IRR < R$

Lesson: The IRR Rule is informative but has several shortcomings that we explore in Topic 4 (Return on Investment)

NPV vs. IRR

3. Compute payback period

The payback period, *pp*, of a project is the duration until the the cumulative free cash flows turn positive.

3. Compute payback period

Alternative Decision Criteria	Year					
	0	1	2	3	4	5
Free Cash Flows	-376.8	-133.6	111.6	505.7	542.1	725.5
Cumulative Free Cash Flows	-376.8	-510.4	-398.8	106.9	649.0	1,374.5
Payback Period	3					

3. Compute payback period

It takes 3 years to recover your investment. Good? Bad? Compare to some threshold payback period, *pp**

Lesson: The Payback Period Rule says accept all projects with $pp < pp^*$, reject all projects whose $pp > pp^*$

Lesson: The Payback Period Rule has several shortcomings…

Lesson: The Payback Period Rule has several shortcomings

#1: Ignores time value of money and risk of cash flows

3a. Compute discounted payback period

The discounted payback period, *dpp*, of a project is the duration until the the cumulative discounted free cash flows turn positive.

3a. Compute discounted payback period

Alternative Decision Criteria	Year					
	0	1	2	3	4	5
Discounted Free Cash Flows	-376.8	-119.3	88.9	359.8	344.4	411.4
Cumulative Discounted Free Cash Flows	-376.8	-496.1	-407.1	-47.3	297.0	708.4
Discounted Payback Period	4.0					

Lesson: The Discounted Payback Period Rule has several shortcomings

#1: Ignores cash flows after cutoff leading to myopic decision making

Lesson: The Discounted Payback Period Rule has several shortcomings

#2: Does not tell us value implications of our decision

Lesson: The Discounted Payback Period Rule has several shortcomings

#3: Does not help in choosing among projects with similar payback periods

Summary

Lessons

- Several decision criteria
  - NPV unambiguously the best but
  - Others are informative. Understand their shortcomings and use judiciously

Coming up next

- Discounted Cash Flow (DCF)
  - Sensitivity analysis