

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

$$\begin{aligned} NPV &= \frac{-\$376.8}{(1+0.12)^0} + \frac{-\$133.6}{(1+0.12)^1} + \frac{\$111.6}{(1+0.12)^2} + \frac{\$505.7}{(1+0.12)^3} + \frac{\$542.1}{(1+0.12)^4} + \frac{\$725.5}{(1+0.12)^5} \\ &= \$708.42 \end{aligned}$$

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

$$NPV = \frac{-\$376.8}{(1+IRR)^0} + \frac{-\$133.6}{(1+IRR)^1} + \frac{\$111.6}{(1+IRR)^2} + \frac{\$505.7}{(1+IRR)^3} + \frac{\$542.1}{(1+IRR)^4} + \frac{\$725.5}{(1+IRR)^5}$$
$$\Rightarrow IRR = 43.7\%$$

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Typically need to solve numerically (e.g., *IRR* function in Excel), or trial and error.

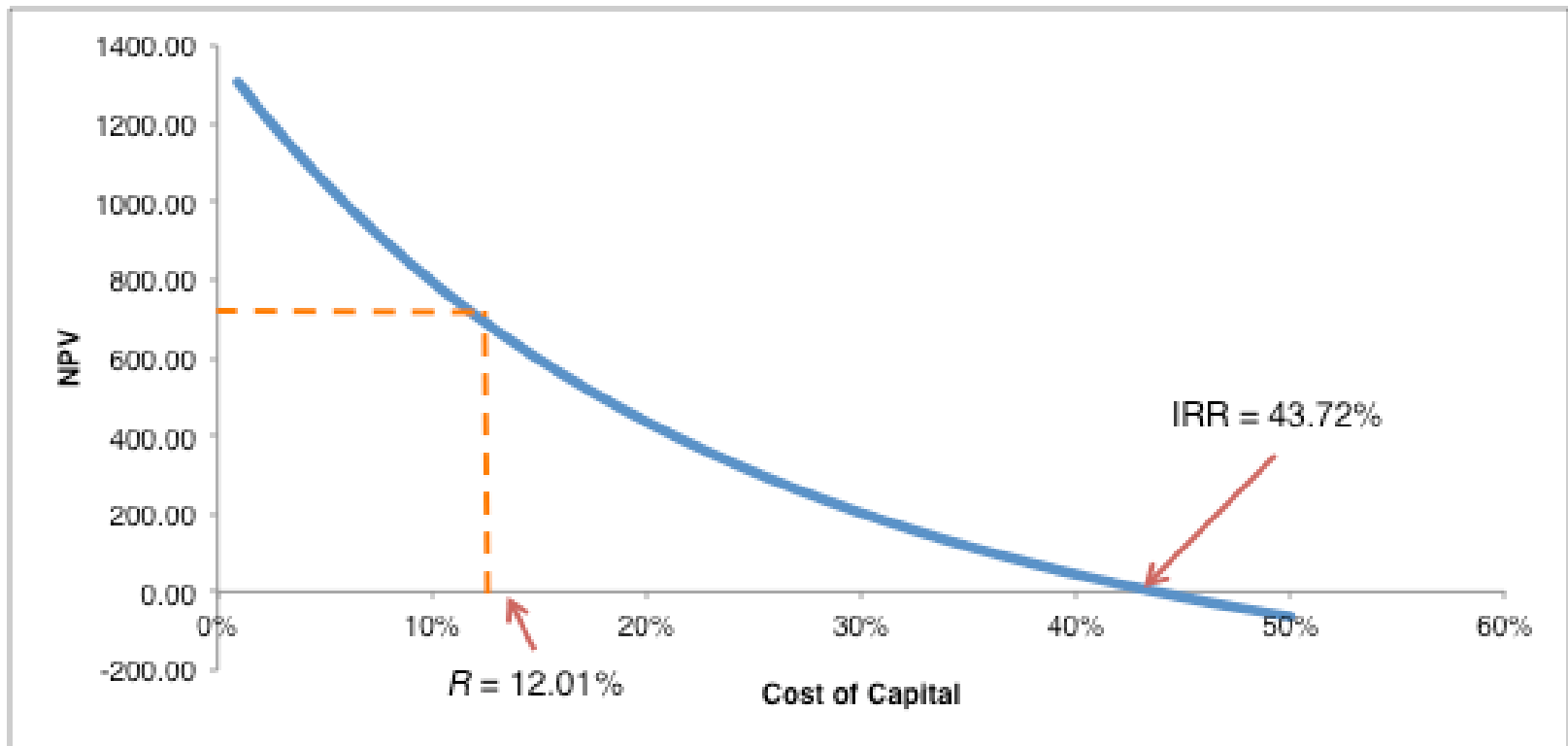
2. Compute internal rate of return

The promised return on investing in the project is $43.7\% > 12\%$ (hurdle rate) \rightarrow 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

Free Cash Flows

Cumulative Free Cash Flows

Payback Period

Year					
0	1	2	3	4	5
-376.8	-133.6	111.6	505.7	542.1	725.5
-376.8	-510.4	-398.8	106.9	649.0	1,374.5
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

Discounted Free Cash Flows

Cumulative Discounted Free Cash Flows

Discounted Payback Period

Year					
0	1	2	3	4	5
-376.8	-119.3	88.9	359.8	344.4	411.4
-376.8	-496.1	-407.1	-47.3	297.0	708.4
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