## 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**



## 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  $\rightarrow$  undertake the project

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

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.

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

$$\Rightarrow IRR = 43.7\%$$

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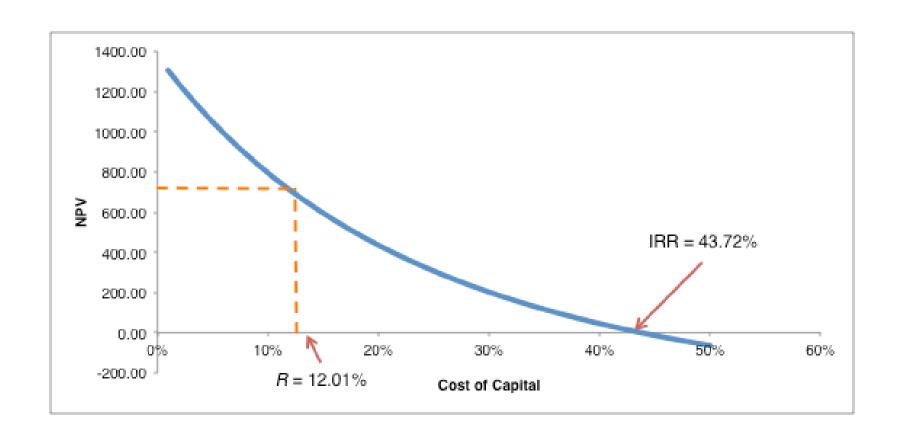
Typically need to solve numerically (e.g., *IRR* function in Excel), or trial and error.

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
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



#### 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