Principles of Corporate Finance

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CHAPTER 8

Net Present Value and Other Investment Criteria

"There are three kinds of people; the ones that can count and the ones that can't ."

Net Present Value

Net Present Value - Present value of cash flows minus initial investments.

Opportunity Cost of Capital - Expected rate of return given up by investing in a project

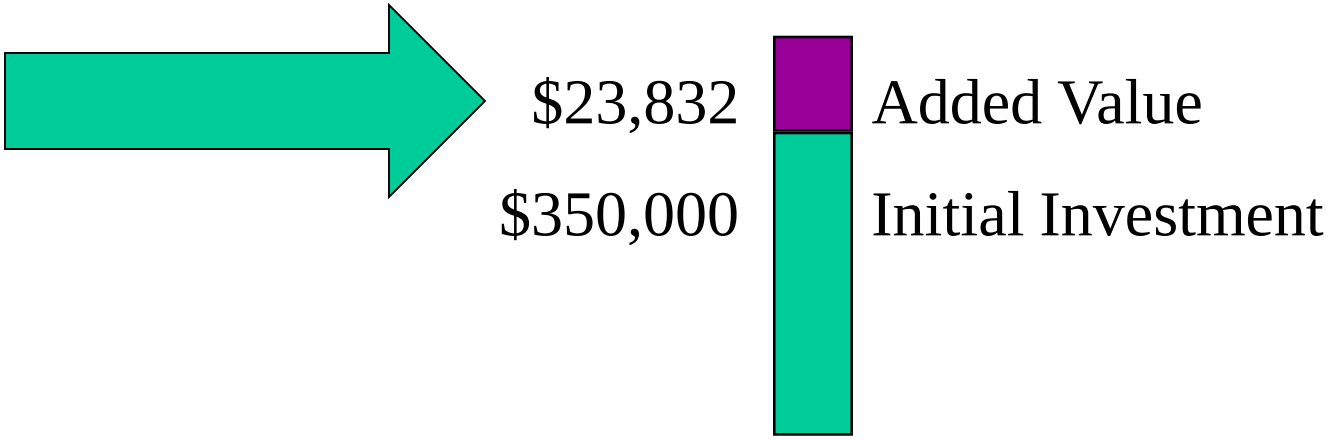
Net Present Value

Example

Suppose we can invest $350,000 today and receive $400,000 in one year. What is our increase in value given a 7% expected return?

$$\text{Profit} = -350{,}000 + \frac{400{,}000}{1.07} = \$23{,}832$$

This is NPV



Net Present Value

NPV = PV - required investment

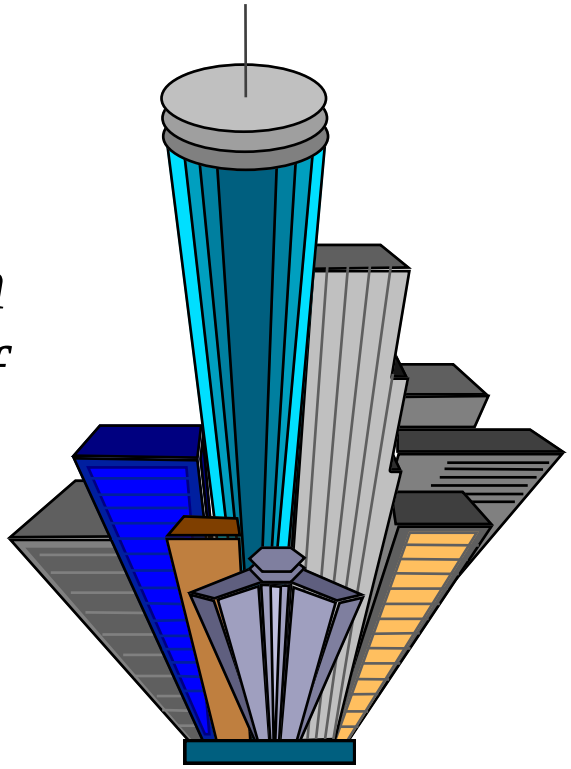
$$NPV = C_0 + \frac{C^t}{(1+r)^t}$$

$$NPV = C_0 + \frac{C_1}{(1+r)^1} + \frac{C_2}{(1+r)^2} + \ldots + \frac{C_t}{(1+r)^t}$$

Net Present Value

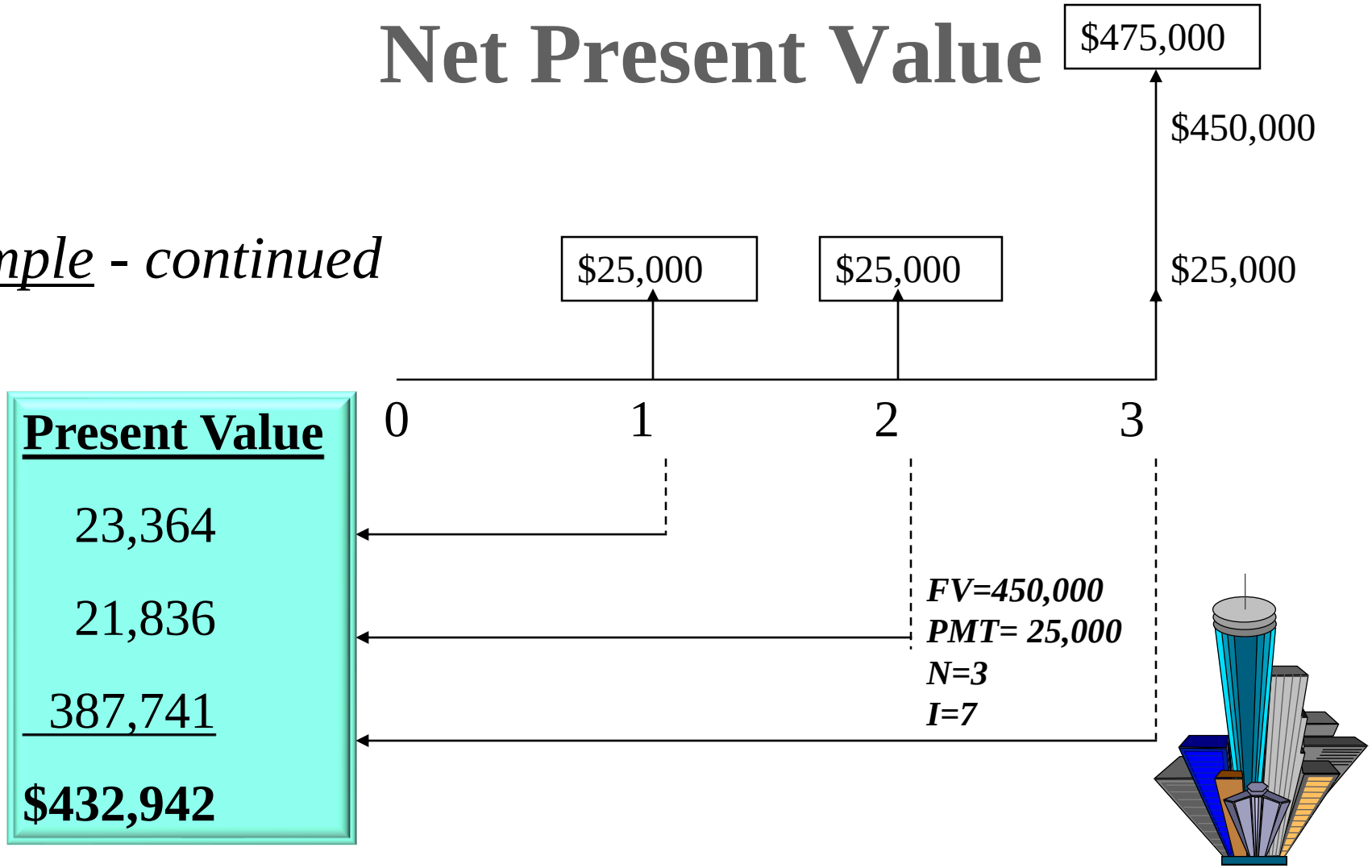
Example

You have the opportunity to purchase an office building. You have a tenant lined up that will generate $25,000 per year in cash flows for three years. At the end of three years you anticipate selling the building for $450,000. How much would you be willing to pay for the building?



Net Present Value

Example - *continued*



Net Present Value

<u>Example</u> - continued

If the building is being offered for sale at a price of $375,000, would you buy the building and what is the added value generated by your purchase and management of the building?

Net Present Value

Example - continued

If the building is being offered for sale at a price of $375,000, would you buy the building and what is the added value generated by your purchase and management of the building?

$$NPV = -375{,}000 + \frac{25{,}000}{(1.07)^1} + \frac{25{,}000}{(1.07)^2} + \frac{475{,}000}{(1.07)^3}$$

$$NPV = \$57{,}942$$

Net Present Value

Net Present Value Rule

Managers increase shareholders' wealth by accepting all projects that are worth more than they cost.

Therefore, they should accept all projects with a positive net present value.

For mutually exclusive projects, pick the project with the highest positive NPV.

Net Present Value

Calculating the NPV can be a laborious task. Fortunately, financial calculators can perform this function easily.

HP-10B		HP-12C		BAII Plus
-375,000	CFj	-375,000	g CF0	CF
25,000	CFj	25,000	g CFj	2nd {CLR Work}
25,000	CFj	25,000	g CFj	-375,000 ENTER ↓
475,000	CFj	475,000	g CFj	25,000 ENTER ↓↓
7	i	7	i	25,000 ENTER ↓↓
NPV		f NPV		475,000 ENTER ↓
				CPT NPV 7 ENTER ↓
				CPT

All produce
NPV=57,941.95

Other Investment Criteria

Internal Rate of Return (IRR) - Discount rate at which NPV = 0.

Rate of Return Rule - Invest in any project offering a rate of return that is higher than the opportunity cost of capital.

Internal Rate of Return

Example

You can purchase a building for $375,000. The investment will generate $25,000 in cash flows (i.e. rent) during the first three years. At the end of three years you will sell the building for $450,000. What is the IRR on this investment?

$$0 = -375{,}000 + \frac{25{,}000}{(1+IRR)^1} + \frac{25{,}000}{(1+IRR)^2} + \frac{475{,}000}{(1+IRR)^3}$$

IRR = 12.56%

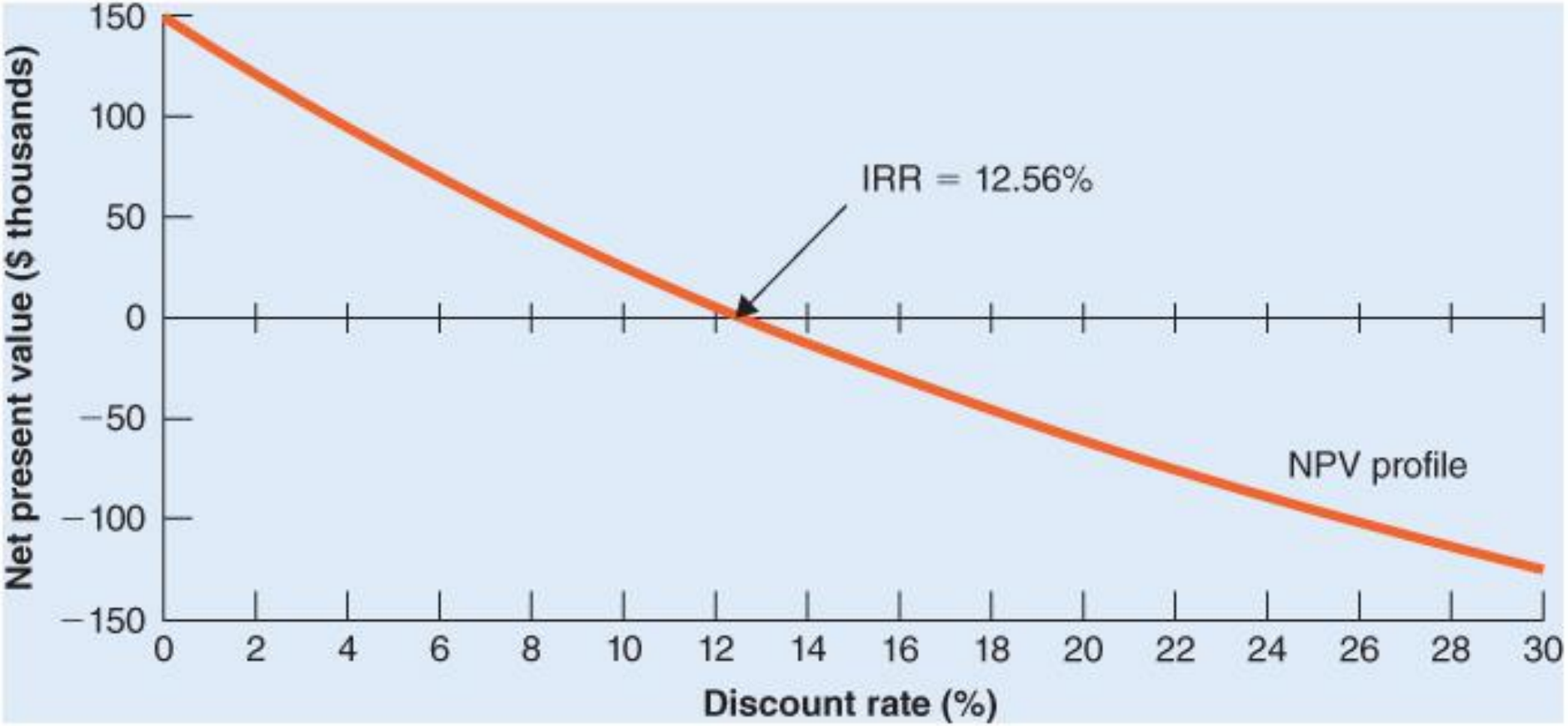
Internal Rate of Return

Calculating the IRR can be a laborious task. Fortunately, financial calculators can perform this function easily.

HP-10B		HP-12C		BAII Plus	
-375,000	CFj	-375,000	g CF0	CF	
25,000	CFj	25,000	g CFj	2nd	{CLR Work}
25,000	CFj	25,000	g CFj	-375,000	ENTER↓
475,000	CFj	475,000	g CFj	25,000	ENTER↓↓
	{IRR/YR}		f IRR	25,000	ENTER↓↓
				475,000	ENTER↓
					IRR CPT

All produce IRR=12.56

Internal Rate of Return



Internal Rate of Return

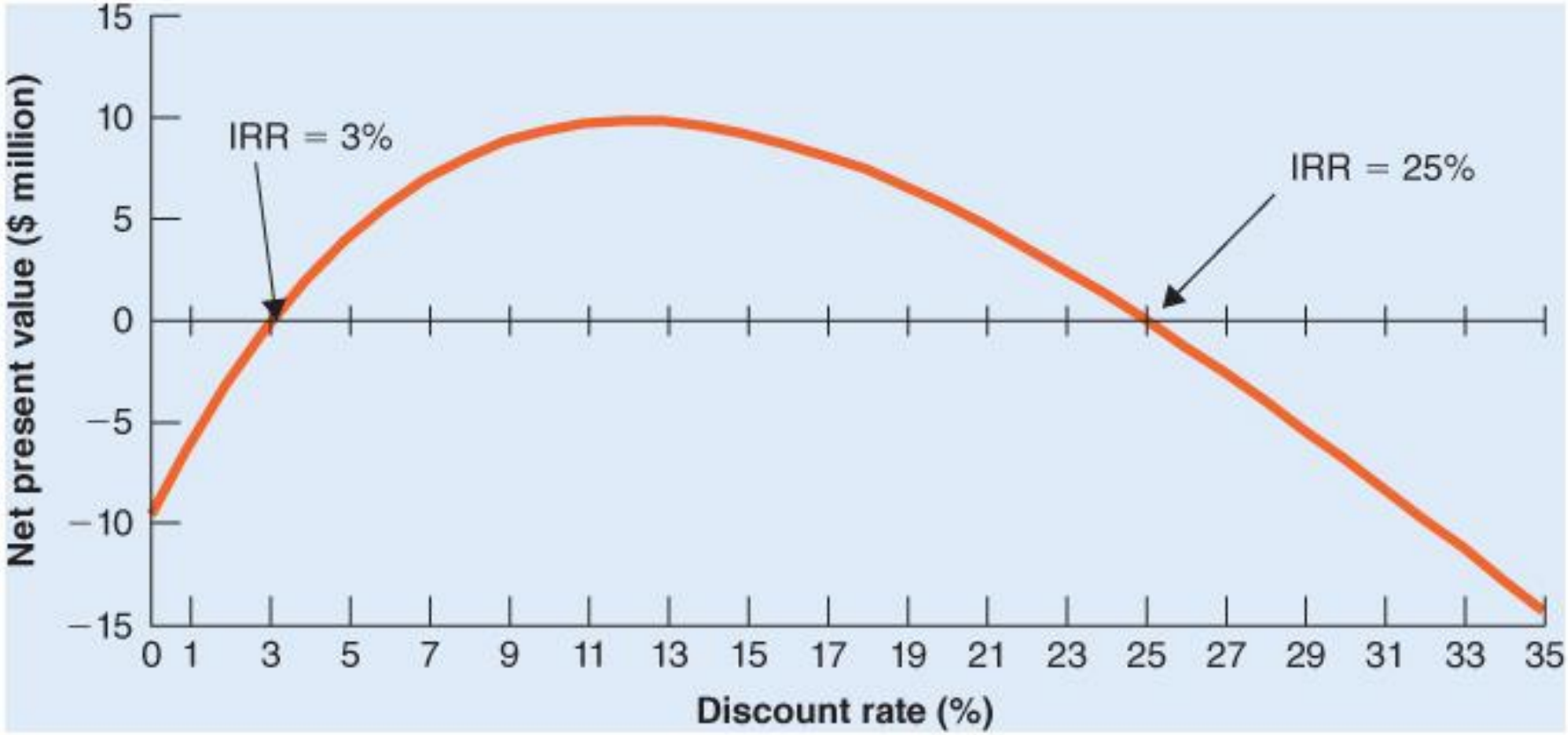
Example

You have two proposals to choice between. The initial proposal has a cash flow that is different than the revised proposal. Using IRR, which do you prefer?

Project	C_0	C_1	C_2	C_3	IRR	NPV@7%
Initial Proposal	-350	400			14.29%	$ 23,832
Revised Proposal	-375	25	25	475	12.56%	$ 57,942

Internal Rate of Return

IRR = 3% and 25%



Payback Method

Payback Period - Time until cash flows recover the initial investment of the project.

The *payback rule* specifies that a project be accepted if its payback period is less than the specified cutoff period. The following example will demonstrate the absurdity of this statement.

Payback Method

The three project below are available.The company accepts all projects with a 2 year or less payback period. Show how this will impact our investment decision.

Cash Flows

Proj.	C_0	C_1	C_2	C_3	Payback	NPV @10%
A	-2000	+500	+1000	+10000	2+	+6,794
B	-2000	+1000	+1000	0	2	- 264
C	-2000	0	+2000	0	2	- 347

Capital Rationing

Capital Rationing - Limit set on the amount of funds available for investment.

- **Soft Rationing** - Limits on available funds imposed by management.
- **Hard Rationing** - Limits on available funds imposed by the unavailability of funds in the capital market.

Profitability Index

Project	PV	Investment	NPV	Profitability Index
L	4	3	1	1/3 = .33
M	6	5	1	1/5 = .20
N	10	7	3	3/7 = .43
O	8	6	2	2/6 = .33
P	5	4	1	1/4 = .25

Investment Timing

Example:

You may purchase a computer anytime within the next five years. While the computer will save your company money, the cost of computers continues to decline. If your cost of capital is 10% and given the data listed below, when should you purchase the computer?

Year	Cost	PV Savings	NPV at Purchase		NPV Today
0	50	70	20		20.0
1	45	70	25		22.7
2	40	70	30		24.8
3	36	70	34	**Date to purchase**	**25.5**
4	33	70	37		25.3
5	31	70	39		24.2

Equivalent Annual Annuity (Cost)

Equivalent Annual Annuity (Cost) - The payment per period with the same present value as the cash flows.

- Calculate the NPV of both projects.
- Use NPV as your present value and find the appropriate annuity payment.

Equivalent Annual Annuity (Cost)

Given the following costs of operating two machines and a 6% cost of capital, select the lower cost machine using equivalent annual cost method.

	Year					Annuity
Mach.	0	1	2	3	PV@6%	Payment
D	-15	-4	-4	-4	-25.69	***-9.61***
E	-10	-6	-6		-21.00	-11.45

Replacement Chain Method

0	1	2	3	4	5	6
-15	-4	-4	-4			
			-15	-4	-4	-4
-15	-4	-4	-19	-4	-4	-4

NPV @6%= $-47.26

Select Project A

0	1	2	3	4	5	6
-10	-6	-6				
		-10	-6	-6		
				-10	-6	-6
-10	-6	-16	-6	-16	-6	-6

NPV @6%= $-56.30