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Unlocking Treasures Of Knowledge

Financial management (MGT511)

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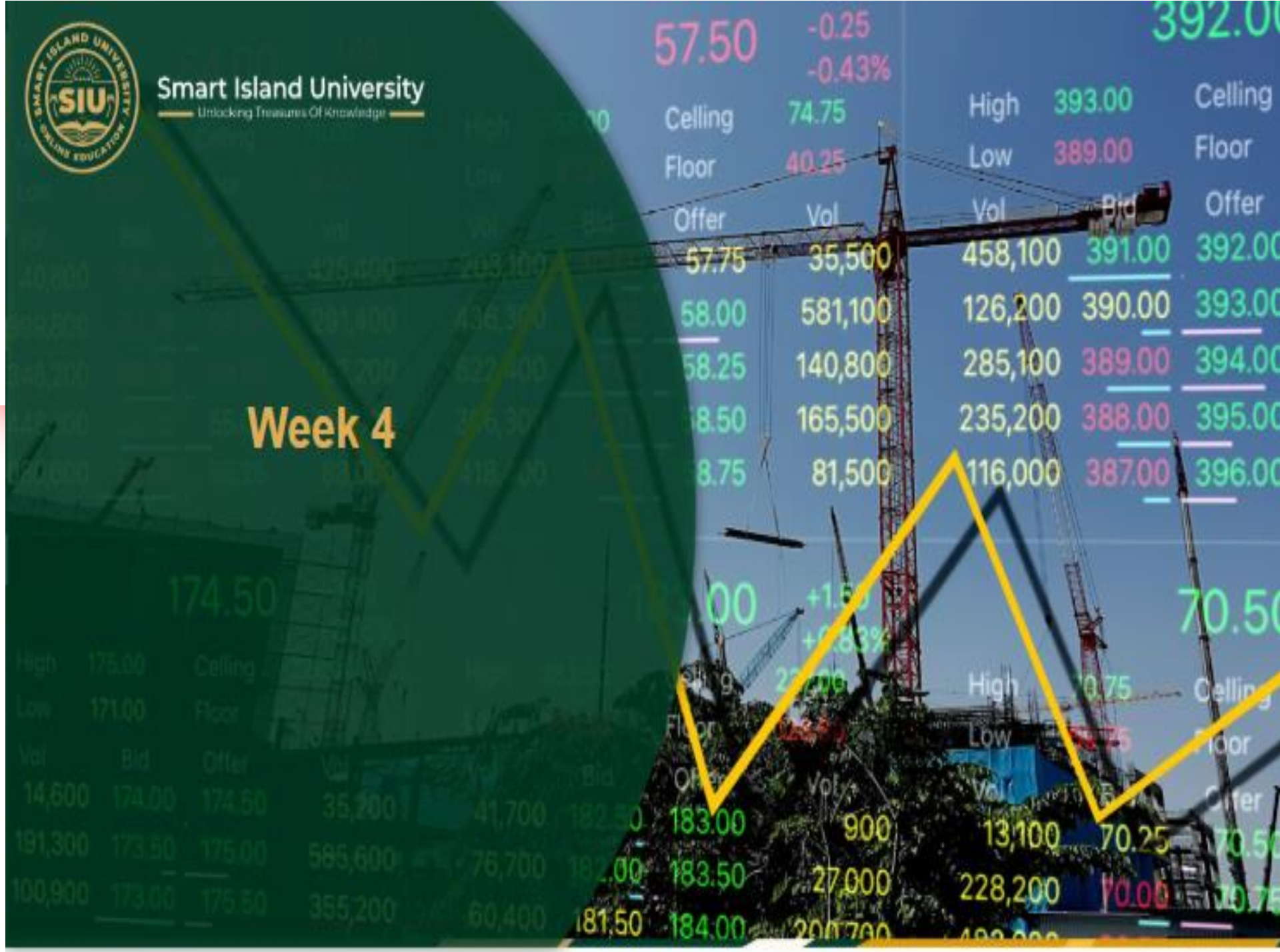
Unlocking Treasures Of Knowledge

Week 4



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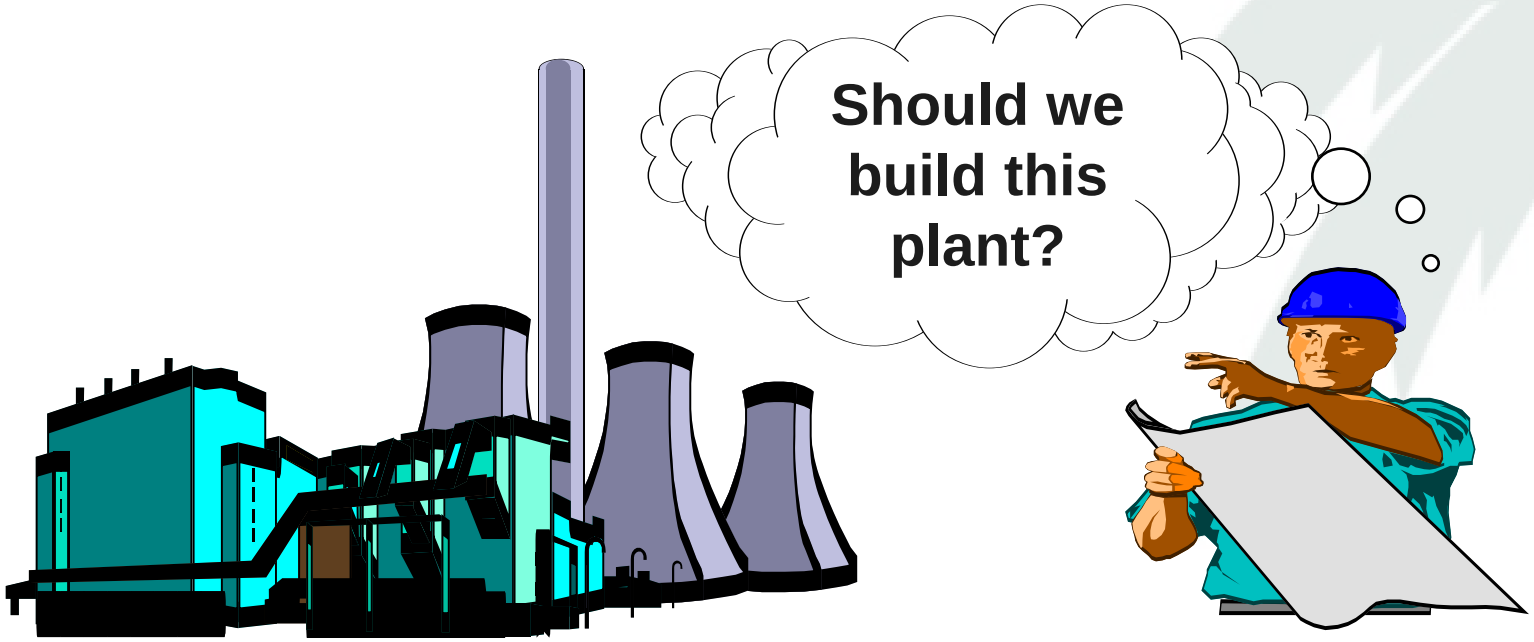
The Basics of Capital Budgeting



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What is capital budgeting?

- Analysis of potential additions to fixed assets.
- Long-term decisions; involve large expenditures.
- Very important to firm's future.

Steps to capital budgeting

1. Estimate CFs (inflows & outflows).
2. Assess riskiness of CFs.
3. Determine the appropriate cost of capital.
4. Find NPV and/or IRR.
5. Accept if NPV > 0 and/or IRR > WACC.

What is the difference between independent and mutually exclusive projects?

- Independent projects – if the cash flows of one are unaffected by the acceptance of the other.
- Mutually exclusive projects – if the cash flows of one can be adversely impacted by the acceptance of the other.

What is the difference between normal and nonnormal cash flow streams?

- Normal cash flow stream – Cost (negative CF) followed by a series of positive cash inflows. One change of signs.
- Nonnormal cash flow stream – Two or more changes of signs. Most common: Cost (negative CF), then string of positive CFs, then cost to close project. Nuclear power plant, strip mine, etc.

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What is the payback period?

- The number of years required to recover a project's cost, or "How long does it take to get our money back?"
- Calculated by adding project's cash inflows to its cost until the cumulative cash flow for the project turns positive.

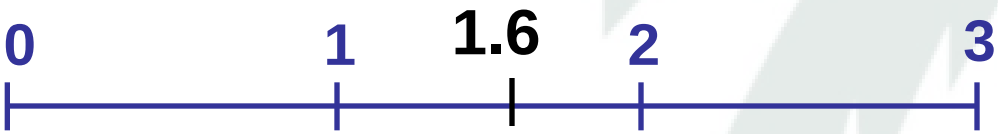
Calculating payback

Project L

	0	1	2	2.4	3
CF_t	-100	10	60	100	80
Cumulative	-100	-90	-30	0	50

$$\text{Payback}_L = 2 + 30 / 80 = 2.375 \text{ years}$$

Project S



	0	1	1.6	2	3
CF_t	-100	70	100	50	20
Cumulative	-100	-30	0	20	40

$$\text{Payback}_S = 1 + 30 / 50 = 1.6 \text{ years}$$

Strengths and weaknesses of payback

- Strengths
  - Provides an indication of a project's risk and liquidity.
  - Easy to calculate and understand.
- Weaknesses
  - Ignores the time value of money.
  - Ignores CFs occurring after the payback period.

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Discounted payback period

- Uses discounted cash flows rather than raw CFs.

CF_t	-100	10	60	80
PV of CF_t	-100	9.09	49.59	60.11
Cumulative	-100	-90.91	-41.32	18.79

$$\text{Disc Payback}_L = 2 + \frac{41.32}{60.11} = 2.7 \text{ years}$$

Net Present Value (NPV)

- Sum of the PVs of all cash inflows and outflows of a project:

$$NPV = \sum_{t=0}^{n} \frac{CF_t}{(1+k)^t}$$

What is Project L's NPV?

Year	CF_t	PV of CF_t
0	-100	-$100
1	10	9.09
2	60	49.59
3	80	60.11
	NPV_L =	$18.79

NPV_S = $19.98

Solving for NPV: Financial calculator solution

- Enter CFs into the calculator's CFLO register.
  - $CF_0 = -100$
  - $CF_1 = 10$
  - $CF_2 = 60$
  - $CF_3 = 80$
- Enter I/YR = 10, press NPV button to get $NPV_L = \$18.78$.

Rationale for the NPV method

NPV = PV of inflows – Cost

= Net gain in wealth

- If projects are independent, accept if the project NPV > 0.
- If projects are mutually exclusive, accept projects with the highest positive NPV, those that add the most value.
- In this example, would accept S if mutually exclusive ($NPV_S > NPV_L$), and would accept both if independent.

Internal Rate of Return (IRR)

- IRR is the discount rate that forces PV of inflows equal to cost, and the NPV = 0:

$$0 = \sum_{t=0}^{n} \frac{CF_t}{(1 + IRR)^t}$$

- Solving for IRR with a financial calculator:
  - Enter CFs in CFLO register.
  - Press IRR; IRR_L = 18.13% and IRR_S = 23.56%.

How is a project's IRR similar to a bond's YTM?

- They are the same thing.
- Think of a bond as a project. The YTM on the bond would be the IRR of the "bond" project.
- EXAMPLE: Suppose a 10-year bond with a 9% annual coupon sells for $1,134.20.
  - Solve for IRR = YTM = 7.08%, the annual return for this project/bond.

Rationale for the IRR method

- If IRR > WACC, the project's rate of return is greater than its costs. There is some return left over to boost stockholders' returns.

IRR Acceptance Criteria

- If IRR > k, accept project.
- If IRR < k, reject project.

- If projects are independent, accept both projects, as both IRR > k = 10%.
- If projects are mutually exclusive, accept S, because $IRR_S > IRR_L$.

NPV Profiles

- A graphical representation of project NPVs at various different costs of capital.

k	NPV_L	NPV_S
0	$50	$40
5	33	29
10	19	20
15	7	12
20	(4)	5

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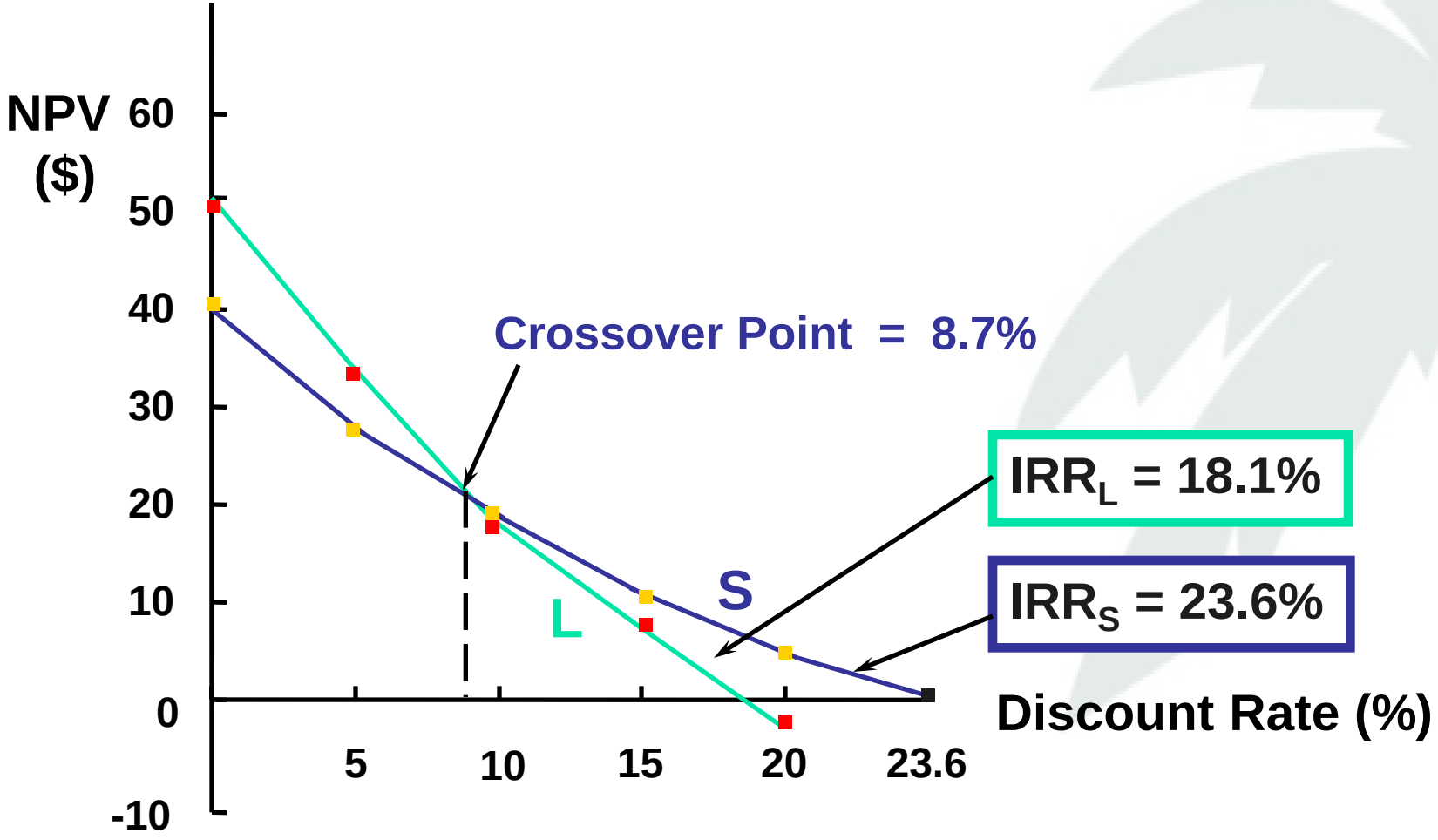
Drawing NPV profiles



Comparing the NPV and IRR methods

- If projects are independent, the two methods always lead to the same accept/reject decisions.
- If projects are mutually exclusive …
  - If k > crossover point, the two methods lead to the same decision and there is no conflict.
  - If k < crossover point, the two methods lead to different accept/reject decisions.

Finding the crossover point

1. Find cash flow differences between the projects for each year.
2. Enter these differences in CFLO register, then press IRR. Crossover rate = 8.68%, rounded to 8.7%.
3. Can subtract S from L or vice versa, but better to have first CF negative.
4. If profiles don't cross, one project dominates the other.

Reasons why NPV profiles cross

- Size (scale) differences – the smaller project frees up funds at t = 0 for investment. The higher the opportunity cost, the more valuable these funds, so high k favors small projects.
- Timing differences – the project with faster payback provides more CF in early years for reinvestment. If k is high, early CF especially good, $NPV_S > NPV_L$.

Reinvestment rate assumptions

- NPV method assumes CFs are reinvested at k, the opportunity cost of capital.
- IRR method assumes CFs are reinvested at IRR.
- Assuming CFs are reinvested at the opportunity cost of capital is more realistic, so NPV method is the best. NPV method should be used to choose between mutually exclusive projects.
- Perhaps a hybrid of the IRR that assumes cost of capital reinvestment is needed.

Since managers prefer the IRR to the NPV method, is there a better IRR measure?

- Yes, MIRR is the discount rate that causes the PV of a project's terminal value (TV) to equal the PV of costs. TV is found by compounding inflows at WACC.
- MIRR assumes cash flows are reinvested at the WACC.

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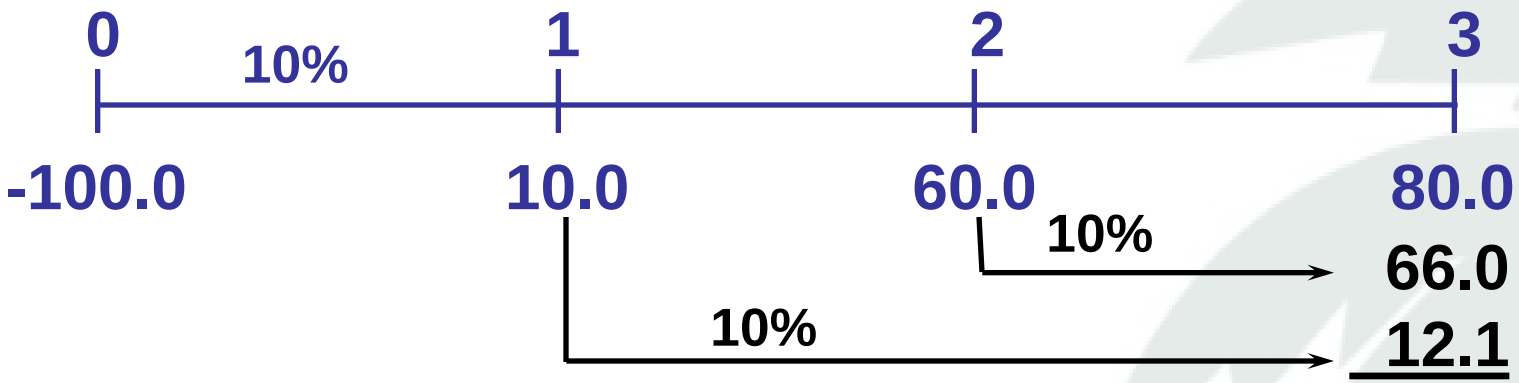
Calculating MIRR



-100.0

PV outflows

$100 = $158.1 / (1 + MIRR$_L$)^3

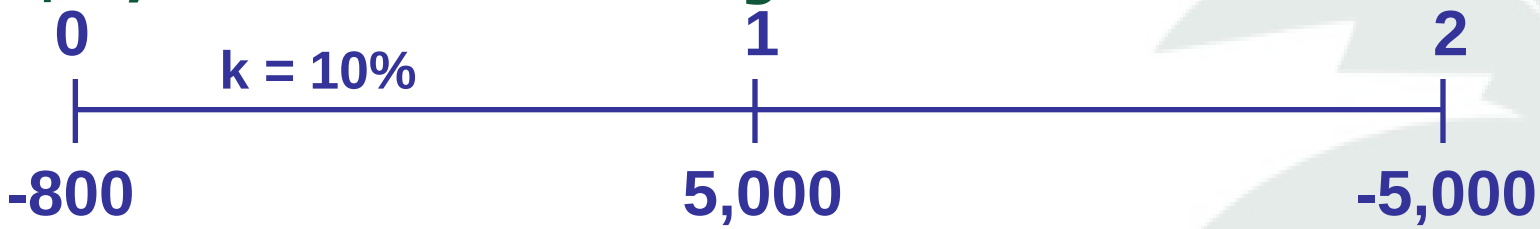
TV inflows

MIRR$_L$ = 16.5%

Why use MIRR versus IRR?

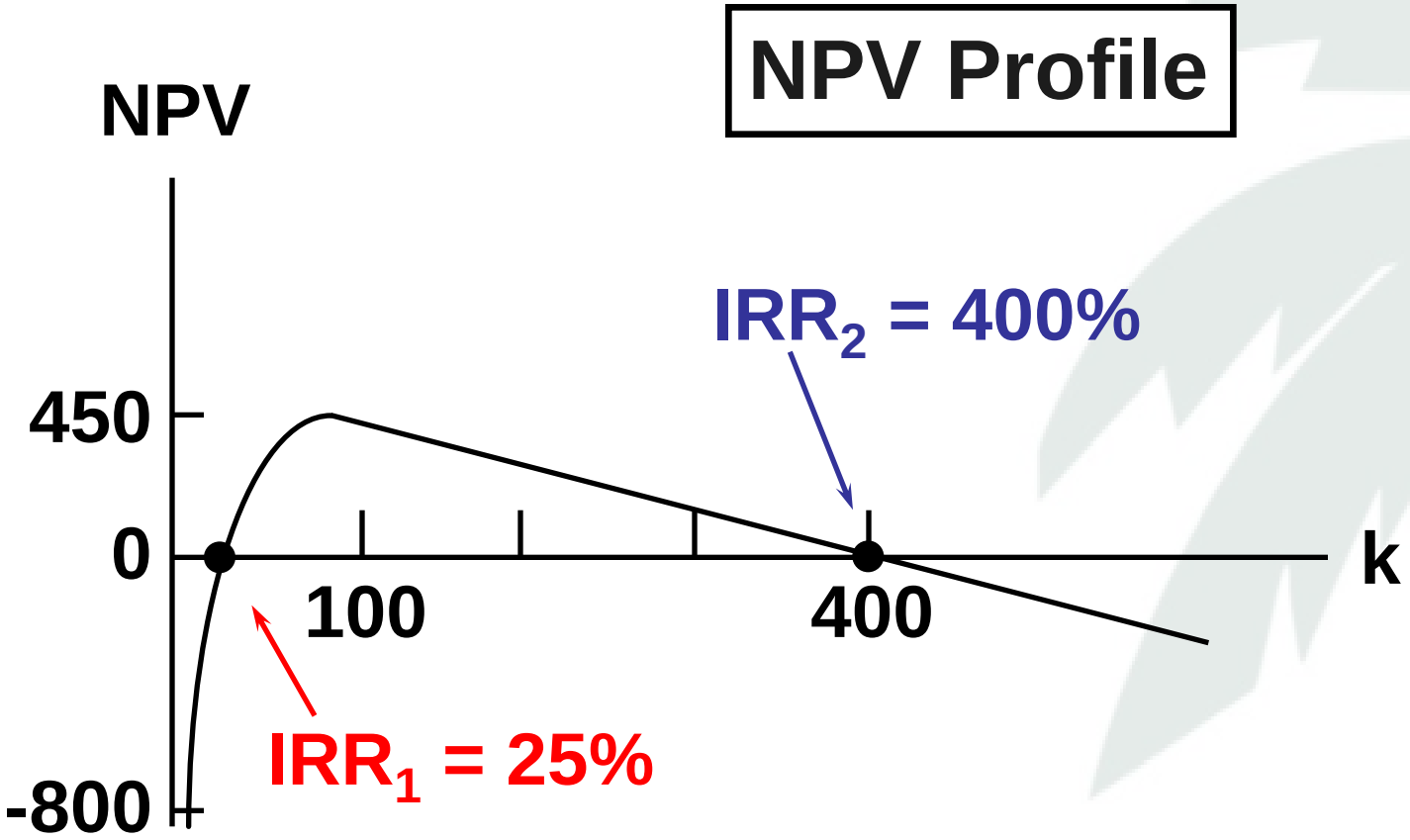
- MIRR correctly assumes reinvestment at opportunity cost = WACC. MIRR also avoids the problem of multiple IRRs.
- Managers like rate of return comparisons, and MIRR is better for this than IRR.

Project P has cash flows (in 000s): CF_0 = -$800, CF_1 = $5,000, and CF_2 = -$5,000. Find Project P's NPV and IRR.



- Enter CFs into calculator CFLO register.
- Enter I/YR = 10.
- NPV = -$386.78.
- IRR = ERROR Why?

Multiple IRRs



Why are there multiple IRRs?

- At very low discount rates, the PV of CF_2 is large & negative, so NPV < 0.
- At very high discount rates, the PV of both CF_1 and CF_2 are low, so CF_0 dominates and again NPV < 0.
- In between, the discount rate hits CF_2 harder than CF_1, so NPV > 0.
- Result: 2 IRRs.

Solving the multiple IRR problem

- Using a calculator
  - Enter CFs as before.
  - Store a "guess" for the IRR (try 10%)

    10 ■ STO

    ■ IRR = 25% (the lower IRR)
  - Now guess a larger IRR (try 200%)

    200 ■ STO

    ■ IRR = 400% (the higher IRR)
  - When there are nonnormal CFs and more than one IRR, use the MIRR.

When to use the MIRR instead of the IRR? Accept Project P?

- When there are nonnormal CFs and more than one IRR, use MIRR.
  - PV of outflows @ 10% = -$4,932.2314.
  - TV of inflows @ 10% = $5,500.
  - MIRR = 5.6%.
- Do not accept Project P.
  - NPV = -$386.78 < 0.
  - MIRR = 5.6% < k = 10%.