Objective of lecture.

To understand the following points

1-MARR-Minimum Attractive rate of return.

2-WC- WACC = Weighted Average Cost of Capital

Solved examples

MARR = Minimum Attractive Rate of Return

1. MARR

Is the return "speed" of capital investment. In simple analogy, if the velocity of vehicle A is 100 km/hour and vehicle B is 50 km/hour for the same distance of 100 km then you can expect that vehicle A will finish first compare to B

In practical use in day life, if you have "interest" of borrowing money from your cousin say 10% per year for selling coffee cafe, then in logic you must have provide of > than 10% per year [say 11% minimum] otherwise close this business !

2. WACC

Mixed money
↳ Bank
→ Personal Fund

WACC is the cost of money from "mix money lenders". Say you want to open coffee cafe and you borrow money from "your cousin" AND "the bank" with some interest rate then for MARR establishment of your business then you should calculate WACC.

REMEMBER, WACC should be used if you have "mix" between "equity lenders = your cousin" and "debt = the bank". If not, just use the interest either from "your cousin" or "the bank" as the base measurement [the case called "full equite" or "full bank"]

https://www.investopedia.com/terms/w/wacc.asp

What Is Weighted Average Cost of Capital (WACC)?

The weighted average cost of capital (WACC) is a calculation of a firm's cost of capital in which each category of capital is proportionately weighted. All sources of capital, including common stock, preferred stock, bonds, and any other long-term debt, are included in a WACC calculation.

A firm's WACC increases as the beta and rate of return on equity increase because an increase in WACC denotes a decrease in valuation and an increase in risk.

BASICS of Engineering Economy → LELAND BLANK

13.5 CAPITAL FUNDS AND THE COST OF CAPITAL

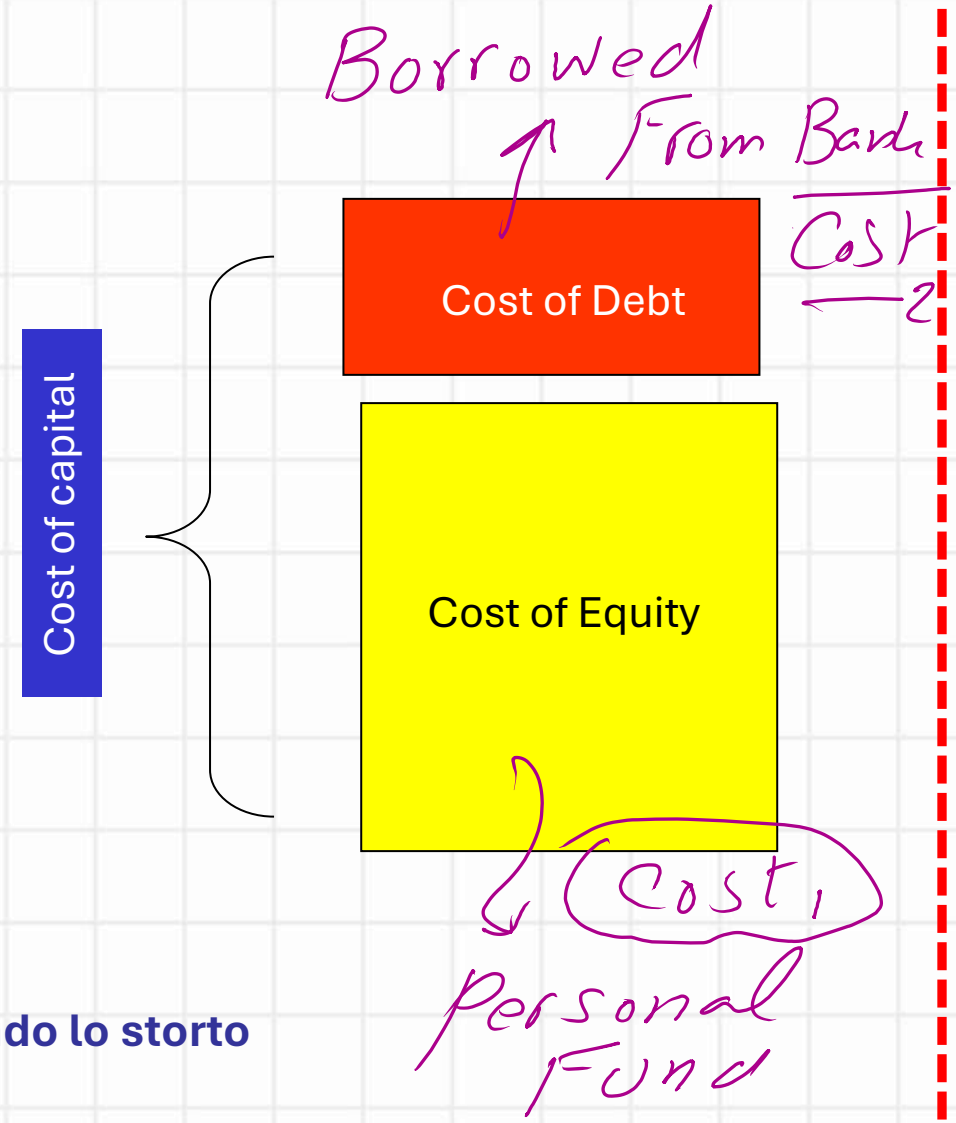
The funds that finance engineering projects are called *capital*, and the interest rate paid on these funds is called the *cost of capital*. The specific MARR used in an economic analysis is established such that MARR exceeds the cost of capital, as discussed initially in Section 1.3 of this text. To understand how a MARR is set, it is necessary to know the two types of capital.

Debt capital—These are funds borrowed from sources outside the corporation and its owners/stockholders. Debt financing includes loans, notes, mortgages, and bonds. The debt must be repaid at some stated interest rate using a specific time schedule, for example, over 15 years at 10% per year simple interest based on the declining loan balance. A corporation indicates outstanding debt financing in the liability section of its balance sheet. (See Appendix B, Table B.1.)

Equity capital—These are retained earnings previously kept within the corporation for future capital investment, and owners' funds obtained from stock sales (public corporations) or individual owner's funds (private corporations). Equity funds are indicated in the net worth section of the balance sheet. (Again, see Table B.1.)

Cost of Capital

- ✓ Cost of Equity (i_e) – Opportunity cost associated with using shareholders' capital.
- ✓ Cost of Debt (i_d) – Cost associated with borrowing capital from creditors.
- ✓ Cost of Capital (k) – Weighted average of i_e and i_d



Equity

In engineering economics, equity refers to the owners' stake or net worth in a business, which is the difference between the total assets and total liabilities. It represents the value of the assets that would be left over for the owners if all liabilities were paid off

WACC (No Tax) Weighing Average Cost of Capital

If 1/3 of the capital of a firm is borrowed at 6% and the remainder of its capital is equity earning 12%, then the alleged minimum rate of return is

$$\frac{1}{3} \times 6\% + \frac{2}{3} \times 12\% = 10\%$$

Cost Equity

2/3 of the capital ⇒ Equity ⇒ 12%.

1/3 of capital From Bank 6%.

Capital

Bank debit

Equity Personal money or partnership.

Cost of Debit

Cost of Equity

MARR Should be ≥ 10%.

WACC (No Tax) Weighing Average Cost of Capital

If 1/3 of the capital of a firm is borrowed at 6% and the remainder of its capital is equity, earning 12%, then the alleged minimum rate of return is

$$\frac{1}{3} \times 6\% + \frac{2}{3} \times 12\% = 10\%$$

$E = 1 \Rightarrow R_E = 12\%$

$D = 2 \Rightarrow R_D = 6\%$

$D \quad R_D \quad E \quad R_E$

$\frac{E}{V} R_E + \frac{D}{V} R_D$

Capital

Bank

Equity

Personal money or partnership

Cost of debt

Cost of Equity

The cost of debt is the effective interest rate a company pays on its borrowed funds.

$V = E + D$

$V = 1 + 2 = 3$

MARR Should be $\geq 10\%$

WACC without $= \frac{E}{V} R_e + \frac{D}{V} R_D$ without Tax

$$WACC = \frac{E}{V} \times Re + \frac{D}{V} \times Rd \times (1 - Tc)$$

WACC-Weighing Average Cost of Capital

with Tax

Where:

- Re = cost of equity
- Rd = cost of debt
- E = market value of the firm's equity
- D = market value of the firm's debt
- V = E + D
- E/V = percentage of financing that is equity
- D/V = percentage of financing that is debt
- Tc = corporate tax rate

$V = E + D$ → Debt from Bank

↓ Equity

Re: Cost of Equity

R_D: Cost of debt

Case of Tax

- Equity = $8,000
- Debt = $2,000
- Re = 12.5%
- Rd = 6%
- Tax rate = 30%

Capital = 8000 → From Equity (E)
+ 2000 → From Bank (D)

Equity Cost 12.5% Re

Debt Cost R_D = 6% → 70%

Tax 30%

To find WACC, enter the values into the equation and solve:

$$WACC = \left[\left(\frac{8,000}{8,000+2,000} \times 0.125\right)\right] + \left[\left(\frac{2,000}{8,000+2,000} * 0.06 * (1 - 0.3)\right)\right]$$

WACC = 0.1 + .0084 = 0.1084 or 10.84%; the WACC for this firm then is **10.84%.**

$$WACC = \frac{8000}{(8000+2000)}\left(\frac{12.50}{100}\right) + \frac{2000}{10,000}\left(\frac{6}{100}\right)\left(1 - \frac{30}{100}\right)$$

$$= 10.84\%$$