A firm has the following information

Current Data

- D/E ratio = 10%
- Long-term treasury (risk free)= 6%
- Tax rate = 35%
- EBIT = $1,500
- Interest Expense = $200
- Equity Beta (Levered) = 1.079
- Cost of Equity, rE = 13%

Coverage	Cost of Debt
6-9	7.00%
4-6	7.50%
3-4	8.00%

New Information: The firm wishes to alter its capital structure to a D/E ratio of 20%. What is the impact on WACC? Should they do it?

Step 1: uncover hidden info using current Data:

$MRP = \frac{r_E - r_f}{\beta} = \frac{13-6}{1.079} = \boxed{6.49\%}$ ← Will need later for CAPM!

market Risk Premium

$\text{coverage} = \frac{EBIT}{\text{Interest}} = \frac{EBIT}{\text{Debt} \times r_D}$ Thus $\text{Debt} = \frac{\text{Interest}}{r_D}$

$\boxed{7.5} = \frac{\$1500}{\$200}$

Look up in table → $r_D = 7\%$

$\text{Debt} = \frac{\$200}{.07}$

$\text{Debt} = \boxed{\$2857.142}$

$\text{Current } D/E = .10 = \frac{\text{Debt}}{\text{Equity}} = \frac{2857.14}{\text{Equity}}$

so, $\text{Equity} = \frac{\text{Debt}}{D/E \text{ ratio}} = \frac{2857.14}{.10}$

$\text{Equity} = \boxed{28571.42}$

Here comes the magic trick: Magic formula!

$\text{Coverage ratio} = \frac{EBIT}{\text{Debt} \times r_D}$

so, $\$\text{Debt} = \frac{EBIT}{\text{Coverage} \times r}$, now Divided everything by Equity

$\frac{\text{Debt}}{\text{Equity}} = \frac{\left(\frac{EBIT}{\text{Coverage} \times r}\right)}{\text{Equity}}$ → $D/E = \frac{EBIT}{\text{Coverage} \times r_D \times \text{Equity}}$

magic formula!

$\text{Unlevered Beta} = \frac{\beta_L}{[D/E_{\text{current}} \times (1-TAX)+1]}$

$1.0131 = \frac{1.079}{[.10 \times (1-.35)+1]}$

Step 2: Relever the beta and get new r_E:

$\beta_L = \beta_u \times [D/E_{\text{new}} (1-Tax)+1] \rightarrow 1.0131 \times [.20 \times (1-.35)+1] = 1.145$

use CAPM to get r_E:

$r_E = \underbrace{(r_M - rf)}_{\text{Market Risk Premium}} \times \beta + rf \rightarrow (6.49\%) \times 1.145 + 6 = 13.43\%$

Step 3

Now we deal with the Coverage table:

$D/E = \frac{EBIT}{\text{Coverage} \cdot r_D \times E}$ ← Magic Formula!

given

r_D	Low	High	D/E
.07	6	to 9	$\frac{1500}{6 \times .07 \times 28571.43} = .13$ to $.08$ ← $\frac{1500}{9 \times .07 \times 28571.43}$
.075	4	to 6	$\frac{1500}{4 \times .075 \times 28571.43} = .18$ to $.12$ $\frac{1500}{6 \times .075 \times 28571.43}$
.08	3	to 4	$\frac{1500}{3 \times .08 \times 28571.43} = .22$ to $.12$

← These are the D/E Ratios. Since we are going to D/E = .20 our cost of debt, r_D is going to be 8%

FINAL STEP: Compute WACC Before & After!

$D/E_{\text{old}} = .10$ $\quad w_D = \frac{D/E}{D/E+1} = \frac{.10}{1.10} = .091$ thus $w_E = 1 - .091 = .909$

$WACC_{\text{old}} = w_D^{\text{old}} \times r_D^{\text{old}} \times (1-T) + w_E \times r_E^{\text{old}}$

$= .091 \times 7\% \times (1-.35) + .909 \times 13$

$WACC_{\text{old}} = 12.23\%$

$D/E_{\text{new}} = .20$ $\quad w_D = \frac{.2}{1.2} = .167$, thus $w_E = .833$

$WACC_{\text{new}} = w_D^{\text{new}} \times r_D^{\text{new}} \times (1-T) + w_E^{\text{new}} \times r_E^{\text{new}}$

$= .167 \times 8 \times (1-.35) + .833 \times 13.43$

$WACC_{\text{new}} = 12.06\%$

Conclusion: Since WACC decreased, the firm should increase the D/E ratio

How much Debt $?

$D/E = 0.2 = \frac{2857.14 + X}{28571.4}$ Extra Debt — solve!

X Addition Debt = 2857.14! So firm should Add debt equal to their current amount, effectively Doubling total debt to

2857.14 + 2857.14 → $5714.28, new total Debt.