

FN 201 : Lecture Note 9

Capital Structure Decision

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Topics in Lecture Note

- Overview and preview of capital structure effects
- Business versus financial risk and the impact of debt on returns
- Capital structure theory
- Example: Choosing the optimal structure

Overview and preview of capital structure effects

Goal of the Firm ?

- Maximize shareholder Wealth
- Maximize Profits
- Maximize ROIC
- Maximize Firm Value
- Minimize WACC

$$V = \sum_{t=1}^{\infty} \frac{FCF_t}{(1 + WACC)^t}$$

The impact of capital structure on value depends upon the effect of debt on:

=> WACC and FCF

Basic notation:

- V = value of firm
- FCF = free cash flow
- WACC = weighted average cost of capital

Goal of the Firm ?

- Maximize shareholder Wealth
 - Maximize Profits
 - Maximize ROIC
- Maximize Firm Value
 - Minimize WACC

$$V = \sum_{t=1}^{\infty} \frac{FCF_t}{(1 + WACC)^t}$$

- Lowering risk
- Increasing CFs
- Maximize Op. Profits
- Growth Business
- Reduce Taxes

The Effect of Additional Debt on WACC

- Debt holders have a **prior claim on cash flows** relative to stockholders.
 - = **Cost of stock, R_E , goes up.**
- Debt **increases risk of bankruptcy**
 - = Causes **pre-tax cost of debt, R_D** , to increase
- Adding debt increase percent of firm financed with **low-cost debt** (w_d) and decreases percent financed with **high-cost equity** (w_s)
 - = **Net effect on WACC is uncertain**

The Effect of Additional Debt on FCF

- Debt Reduces the Taxes a Company Pays
- Additional debt **increases the probability of bankruptcy**:
 - **Direct costs** = Legal fees, “fire” sales, etc.
 - **Indirect costs** = Lost customers
- Additional debt can affect **the behavior of managers**:
 - **Reductions in agency costs**
 - **Increases in agency costs**: too risk-averse

Business versus financial risk
and the impact of debt on returns

Business Risk: Uncertainty in EBIT, NOPAT, and ROIC

- Uncertainty about **demand** (unit sales)
- Uncertainty about **output prices**
- Uncertainty about **input costs**
- Product and other types of liability
- Degree of operating leverage (DOL)

What is operating leverage, and how does it affect a firm's business risk?

- Operating leverage

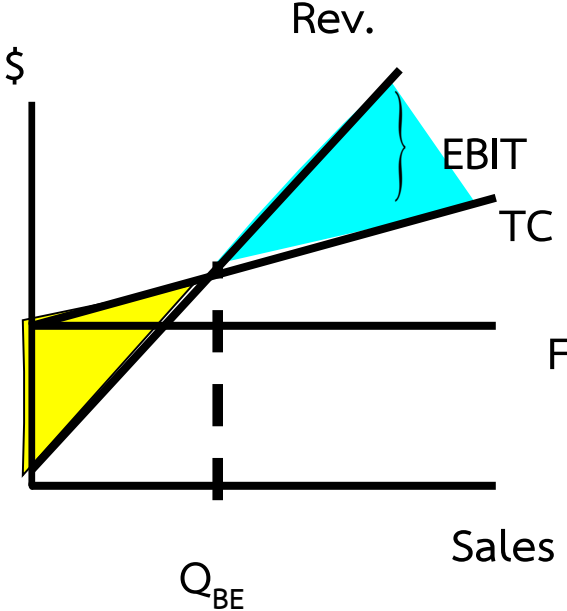
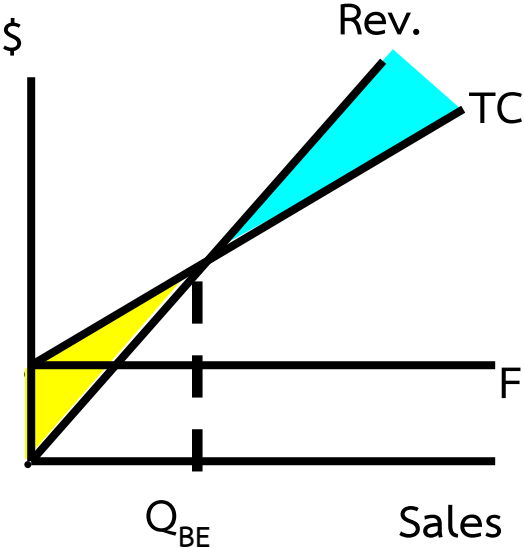
= the change in EBIT caused by a change in quantity sold

- The **higher the proportion of fixed costs** relative to **variable costs**,

=> the greater the operating leverage

Higher operating leverage leads to more business risk:

=



Operating Breakeven or Breakeven Quantity (Q_{BE})

- Operating breakeven = Q_{BE}

- $Q_{BE} =$

Q = quantity sold

P = price per unit

F = fixed cost

V = variable cost

TC = total cost, and

Example: Shapland Inc. has fixed operating costs of \$500,000 and variable costs of \$50 per unit. If it sells the product for \$75 per unit, what is the break-even quantity?

Business Risk versus Financial Risk

- **Business risk:**
 - Uncertainty in future **EBIT, NOPAT, and ROIC.**
 - Depends on business factors such as competition, operating leverage, etc.
- **Financial risk:**
 - Additional business risk concentrated on **common stockholders** when financial leverage is used.
 - Depends on **the amount of debt financing.**

Recall that:

1. NOPAD
2. ROIC
3. ROE

Consider Two Hypothetical Firms Identical Except for Debt

	<u>Firm U</u>	<u>Firm L</u>
Capital	\$20,000	\$20,000
Debt	\$0	\$10,000 (12% rate)
Equity	\$20,000	\$10,000
Tax rate	40%	40%
EBIT	\$3,000	\$3,000
NOPAT	\$1,800	\$1,800
ROIC	9%	9%

Impact of Leverage on Returns

	<u>Firm U</u>	<u>Firm L</u>
EBIT	\$3,000	\$3,000
Interest	<u>0</u>	<u>1,200</u>
EBT	\$3,000	\$1,800
Taxes (40%)	<u>1,200</u>	<u>720</u>
NI	<u>\$1,800</u>	<u>\$1,080</u>
ROIC = NOPAT/Capital	9.0%	9.0%
ROE = NI/Equity	9.0%	10.8%

Why does leveraging increase return?

- More cash goes to investors of Firm L.
 - Total dollars paid to investors:
 - U:
 - L:
 - Taxes paid:
 - U:
 - L:
- In Firm L, fewer dollars are tied up in equity.

Impact of Leverage on Returns if EBIT Falls

= Leverage magnifies risk and return!

	<u>Firm U</u>	<u>Firm L</u>
EBIT	\$2,000	\$2,000
Interest	<u>0</u>	<u>1,200</u>
EBT	\$2,000	\$800
Taxes (40%)	<u>800</u>	<u>320</u>
NI	<u>\$1,200</u>	<u>\$480</u>
ROIC	6.0%	6.0%
ROE	6.0%	4.8%

Impact of Leverage on Returns if EBIT Increases

= Leverage magnifies risk and return!

	<u>Firm U</u>	<u>Firm L</u>
EBIT	\$4,000	\$4,000
Interest	<u>0</u>	<u>1,200</u>
EBT	\$4,000	\$2,800
Taxes (40%)	<u>1,600</u>	<u>1,120</u>
NI	<u>\$2,400</u>	<u>\$1,680</u>
ROIC	12.0%	12.0%
ROE	12.0%	16.8%

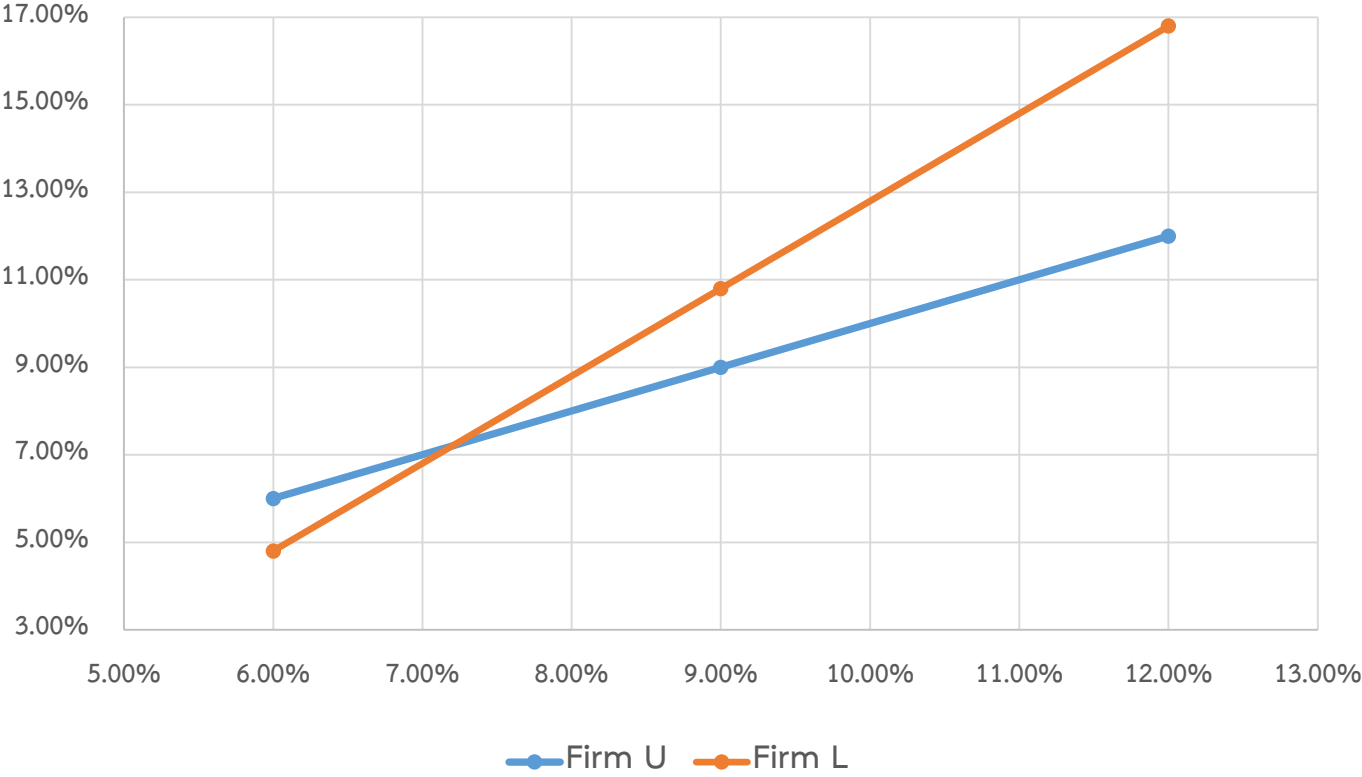
Leverage magnifies risk and return!

- Financial risk is from an uncertainty in **EBIT** and thus **NOPAT**

1. NOPAD = $\text{EBIT} (1 - T)$
2. ROIC = $\text{NOPAD} / \text{Capital}$
3. ROE = $\text{NI} / \text{Equity}$

Key Performance Measures	<u>Worst</u>		<u>Expected</u>		<u>Best</u>	
	<u>U</u>	<u>L</u>	<u>U</u>	<u>L</u>	<u>U</u>	<u>L</u>
EBIT	\$2,000	\$2,000	\$3,000	\$3,000	\$4,000	\$4,000
NOPAT (tax = 40%)	\$1,200	\$1,200	\$1,800	\$1,800	1,600	1,600
ROIC	6.0%	6.0%	9.0%	9.0%	12.0%	12.0%
ROE	6.0%	4.8%	9.0%	10.8%	12.0%	16.8%

Financial Leverage



Capital structure theory

Capital Structure Theory

- MM theory
 - Zero taxes
 - Corporate taxes
 - Corporate and personal taxes
- Trade-off theory
- Signaling theory
- Pecking order
- Debt financing as a managerial constraint
- Windows of opportunity

Modigliani-Miller (MM) Theory: Zero Taxes

	<u>Firm U</u>	<u>Firm L</u>
EBIT	\$3,000	\$3,000
Interest	<u>0</u>	<u>1,200</u>
NI	<u>\$3,000</u>	<u>\$1,800</u>
CF to shareholder	\$3,000	\$1,800
CF to debtholder	<u>0</u>	<u>\$1,200</u>
Total CF	<u>\$3,000</u>	<u>\$3,000</u>

MM Results: Zero Taxes

- MM assume:
 - (1) No transactions costs;
 - (2) No restrictions or costs to short sales;
 - (3) Individuals can borrow at the same rate as corporations.
- MM prove that **if the total CF to investors of Firm U and Firm L are equal**, then arbitrage is possible unless the total values of Firm U and Firm L are equal:
$$V_L = V_U$$
- Because FCF and values of firms L and U are equal, **their WACCs are equal**.
- Therefore, capital structure is irrelevant.

MM Theory: Corporate Taxes

- Corporate tax laws **allow interest to be deducted**, which reduces taxes paid by levered firms.
- Therefore, more **CF goes to investors and less to taxes** when leverage is used.
- In other words, **the debt “shields” some of the firm’s CF from taxes.**

MM Result: Corporate Taxes

- *MM show that* the total CF to Firm L's investors is equal to the total CF to Firm U's investor plus an additional amount due to interest deductibility:

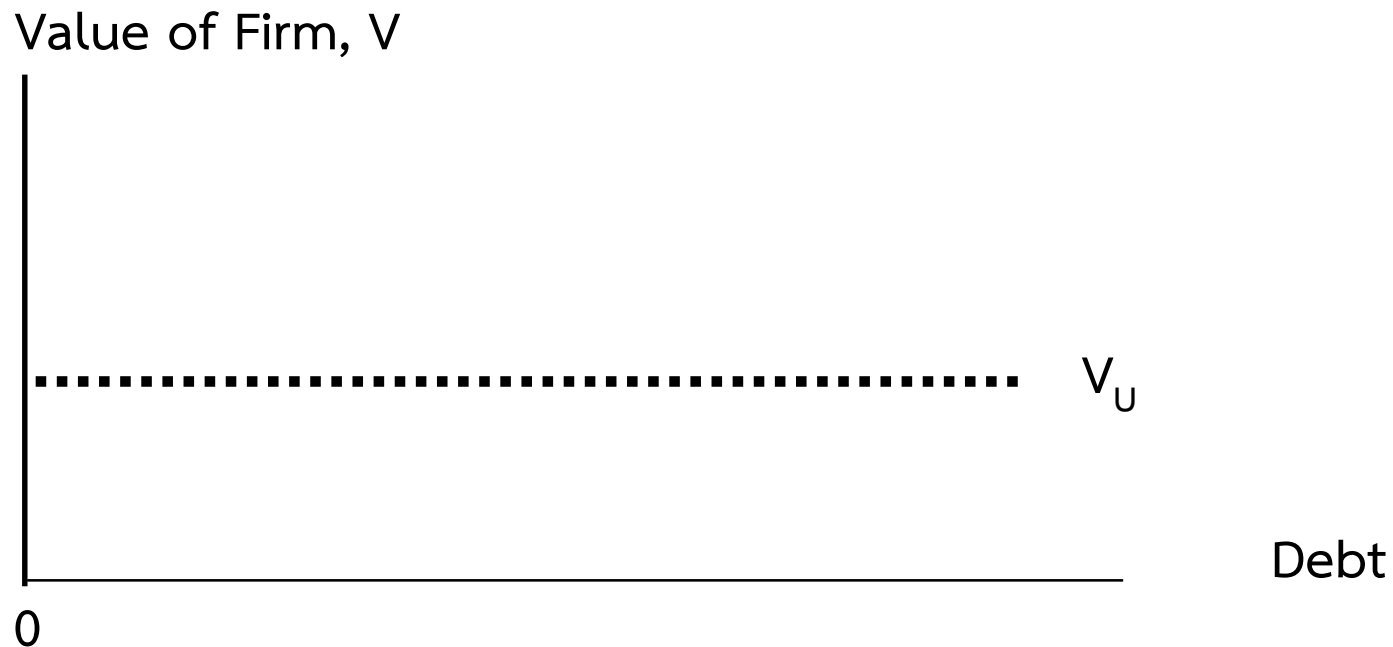
- What is value of these cash flows?

Value of $CF_U =$

MM show that the value of $r_d DT =$

- If $T=40\%$, then every dollar of debt adds 40 cents of extra value to firm.

MM relationship between value and debt when corporate taxes are considered.



Under MM with corporate taxes, the firm's value increases continuously as more and more debt is used.

Miller's Theory: Corporate and Personal Taxes

- Personal taxes lessen the advantage of corporate debt:
 - **Corporate taxes favor debt financing** since corporations can deduct interest expenses.
 - **Personal taxes favor equity financing**, since no gain is reported until stock is sold, and long-term gains are taxed at a lower rate.

Miller's Model with Corporate and Personal Taxes

$$V_L = V_U + \left[1 - \frac{(1 - T_c)(1 - T_E)}{(1 - T_D)} \right] D$$

T_c = corporate tax rate.

T_d = personal tax rate on debt income.

T_E = personal tax rate on stock income.

$T_c = 40\%$, $T_d = 30\%$, and $T_s = 12\%$.

$$\begin{aligned}V_L &= V_U + \left(1 - \frac{(1 - 0.40)(1 - 0.12)}{(1 - 0.30)} \right) D \\ &= V_U + (1 - 0.75)D \\ &= V_U + 0.25D.\end{aligned}$$

Conclusions with Personal Taxes

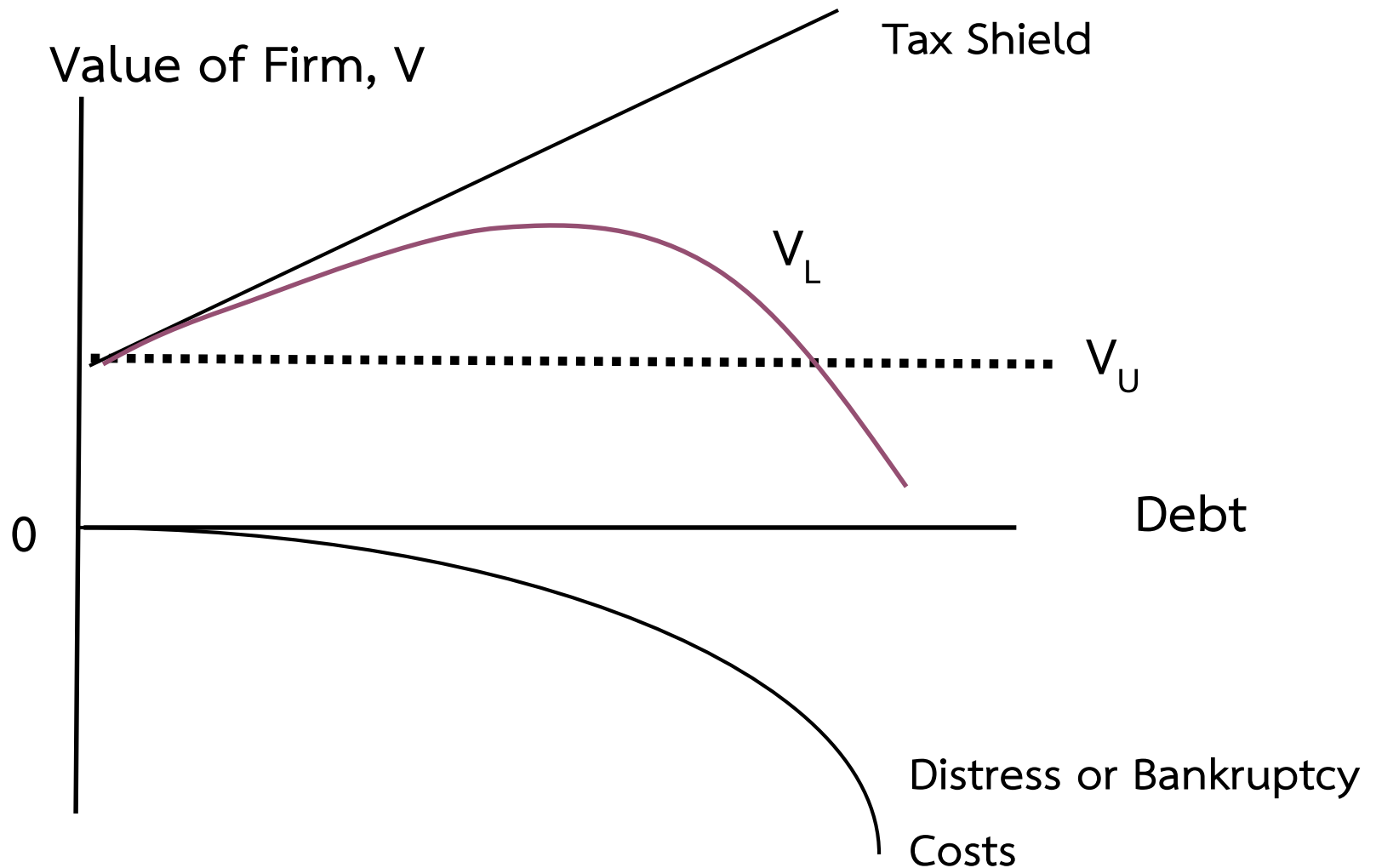
- Use of debt financing remains advantageous, but benefits are less than under only corporate taxes.
- Firms should still use 100% debt.

Note: However, Miller argued that in equilibrium, the tax rates of marginal investors **would adjust until there was no advantage to debt.**

Trade-off Theory

- MM theory ignores bankruptcy (financial distress) costs, which increase as more leverage is used.
 - ✓ At low leverage levels, tax benefits outweigh bankruptcy costs.
 - ✓ At high levels, bankruptcy costs outweigh tax benefits.
- An optimal capital structure exists that balances these costs and benefits.

Tax Shield vs. Cost of Financial Distress



Signaling Theory - Information

- MM assumed that **investors and managers have the same information.**
- But, **managers often have better information.** Thus, they would:
 - ✓ A firm with **very positive prospect** should **NOT sell stock** and instead to raise required new capital by other means
 - ✓ A firm with **very negative prospect** should **sell stock**, brining new investor to share losses!
- Investors understand this, so view **new stock sales as a negative signal.**
- Implications for managers?

Pecking Order Theory

- Firms **use internally generated funds first**, because there are no flotation costs or negative signals.
- If more funds are needed, **firms then issue debt because it has lower flotation costs than equity** and not negative signals.
- If more funds are needed, firms then issue **equity**.

Implications for Managers

- **Take advantage of tax benefits** by issuing debt, especially if the firm has:
 - High tax rate, stable sales, and low operating leverage
- **Avoid financial distress costs** by maintaining excess borrowing capacity, especially if the firm has:
 - Volatile sales, high operating leverage, many potential investment opportunities
 - Special purpose assets (instead of general purpose assets that make good collateral)
- If manager has asymmetric information regarding firm's future prospects, then **avoid issuing equity** if actual prospects are better than the market perceives.

Choosing the Optimal Capital Structure: Example

Example:

$$b = 1.0 \quad R_F = 6\% \quad R_M = 6\%$$

$$T = 40\% \quad \text{Debt} = 0$$

Expected FCF = \$30 million (expects zero growth)

Solution

Cost of equity using CAPM:

Currently has no debt: $w_d = 0\%$.

Current Value of Operations

V_{op}

Other Data for Valuation Analysis

- Company has no ST investments.
- Company has no preferred stock.
- 10 mil shares outstanding

Current Valuation Analysis

V_{op}	\$250
<u>+ ST Inv.</u>	<u>0</u>
V_{Total}	\$250
<u>- Debt</u>	<u>0</u>
S	\$250
<u>÷ n</u>	<u>10</u>
P	\$25.00
<hr/>	

Investment bankers provided estimates of R_D for different capital structures.

w_d	0%	20%	30%	40%	50%
r_d	0.0%	8.0%	8.5%	10.0%	12.0%

If company recapitalizes, it will use proceeds from debt issuance to repurchase stock.

Hamada's Formula:

The Cost of Equity at Different Levels of Debt

= MM theory implies that **beta changes with leverage**.

b_U is the beta of a firm when it has no debt (the unlevered beta)

The Cost of Equity for $w_d = 20\%$

- Use Hamada's equation to find beta:

$$b = b_U [1 + (1 - T)(w_d/w_s)]$$

=

=

- Use CAPM to find the cost of equity:

$$r_s = r_{RF} + b_L (RPM)$$

=

- Calculate for new WACC:

$$WACC = w_d (1-T) r_d + w_{ce} r_s$$

=

=

Beta, r_s , and WACC

w_d	0%	20%	30%	40%	50%
r_d	0.0%	8.0%	8.5%	10.0%	12.0%
w_s	100%	80%	70%	60%	50%
b	1.000	1.150	1.257	1.400	1.600
r_s	12.00%	12.90%	13.54%	14.40%	15.60%
WACC	12.00%	11.28%	11.01%	11.04%	11.40%

Corporate Value for $w_d = 20\%$

- $V_{op} = [FCF(1+g)]/(WACC - g)$

=

- Debt = $D_{New} = w_d V_{op}$

=

- Equity = $S = w_s V_{op}$

=

Value of Operations, Debt, and Equity

w_d	0%	20%	30%	40%	50%
r_d	0.0%	8.0%	8.5%	10.0%	12.0%
w_s	100%	80%	70%	60%	50%
b	1.000	1.150	1.257	1.400	1.600
r_s	12.00%	12.90%	13.54%	14.40%	15.60%
WACC	12.00%	11.28%	11.01%	11.04%	11.40%
V_{op}	\$250.00	\$265.96	\$272.48	\$271.74	\$263.16
D	\$0.00	\$53.19	\$81.74	\$108.70	\$131.58
S	\$250.00	\$212.77	\$190.74	\$163.04	\$131.58

Example 1:

Elliott Athletics is trying to determine its optimal capital structure, which now consists of only debt and common equity. The firm does not currently use preferred stock in its capital structure, and it does not plan to do so in the future. To estimate how much its debt would cost at different debt levels, the company's treasury staff has consulted with investment bankers and, on the basis of those discussions, has created the following table:

Market Debt- to-Value Ratio (w_d)	Market Equity- to-Value Ratio (w_s)	Market Debt- to-Equity Ratio (D/S)	Bond Rating	Before-Tax Cost of Debt (r_d)
0.0	1.0	0.00	A	7.0%
0.2	0.8	0.25	BBB	8.0
0.4	0.6	0.67	BB	10.0
0.6	0.4	1.50	C	12.0
0.8	0.2	4.00	D	15.0

Elliott uses the CAPM to estimate its cost of common equity, r_s . The company estimates that the risk-free rate is 5%; the market risk premium is 6%, and the company's tax rate is 40%. Elliott estimates that if it had no debt, its "unlevered" beta, b_U , would be 1.2. Based on this information, what is the firm's optimal capital structure, and what would be the weighted average cost of capital at the optimal capital structure?

Example 2:

Beckman Engineering and Associates (BEA) is considering a change in its capital structure. BEA currently has \$20 million in debt carrying a rate of 8%, and its stock price is \$40 per share with 2 million shares outstanding. BEA is a zero-growth firm and pays out all of its earnings as dividends. The firm's EBIT is \$14.933 million, and it faces a 40% federal-plus-state tax rate. The market risk premium is 4%, and the risk-free rate is 6%. BEA is considering increasing its debt level to a capital structure

with 40% debt, based on market values, and repurchasing shares with the extra money that it borrows. BEA will have to retire the old debt in order to issue new debt, and the rate on the new debt will be 9%. BEA has a beta of 1.0.

- What is BEA's unlevered beta? Use market value D/S when unlevering.
- What are BEA's new beta and cost of equity if it has 40% debt?
- What are BEA's WACC and total value of the firm with 40% debt?

Question?