

# FN 201 : Lecture Note 9

## Capital Structure Decision

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# Topics in Chapter

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

# Goal of the Firm is

- Maximize Firm Value
- Minimize WACC
  - Thru:
    - Lowering risk
    - Increasing CFs
    - Maximize Op. Profits
    - Growth Business
    - Reduce Taxes

# Factors Affecting Capital Structure

- Business Risk
- Debt's tax deductibility
- Ability to raise capital under adverse terms
- Managerial decisions:
  - Conservative vs. Aggressive
  - Minimize WACC
  - Thru:
    - Lowering risk
    - Increasing CFs
    - Maximize Op. Profits
    - Growth Business
    - Reduce Taxes

# Basic Definitions

- $V$  = value of firm
- FCF = free cash flow
- WACC = weighted average cost of capital
- $R_E$  and  $R_D$  are costs of stock and debt
- $w_E$  and  $w_D$  are percentages of the firm that are financed with stock and debt.

How can capital structure affect value?

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

$$WACC = w_D (1-T) R_D + w_E R_E$$

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

=> WACC and FCF

# The Effect of Additional Debt on WACC

- Debt holders have a **prior claim on cash flows** relative to stockholders.
  - Debt holders' "**fixed**" claim increases risk of stockholders' "residual" claim.
  - **Cost of stock,  $R_E$ , goes up.**
- Firm can deduct interest expenses.
  - Reduces the **taxes paid**
  - Reduces **after-tax cost of debt**

## The Effect of Additional Debt on WACC (Cont.)

- 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 = uncertain.

(Continued...)

# The Effect of Additional Debt on FCF

- Additional debt **increases the probability of bankruptcy.**
  - **Direct costs:**
    - = Legal fees, “fire” sales, etc.
  - **Indirect costs:**
    - = **Lost customers**, reduction in productivity of managers and line workers, reduction in credit (i.e., accounts payable) offered by suppliers
    - = **NOPAT goes down due to lost customers and drop in productivity**
    - = Investment in capital goes up due to **increase in net operating working capital** (accounts payable goes down as suppliers tighten credit).

(Continued...)

# The Effect of Additional Debt on FCF

- Additional debt can affect **the behavior of managers**.
  - **Reductions in agency costs:** debt “pre-commits,” or “bonds,” free cash flow for use in making interest payments. Thus, managers are **less likely to waste FCF on perquisites or non-value adding acquisitions**.
  - **Increases in agency costs:** debt can make managers **too risk-averse**, causing “**underinvestment**” in **risky** but positive NPV projects.

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

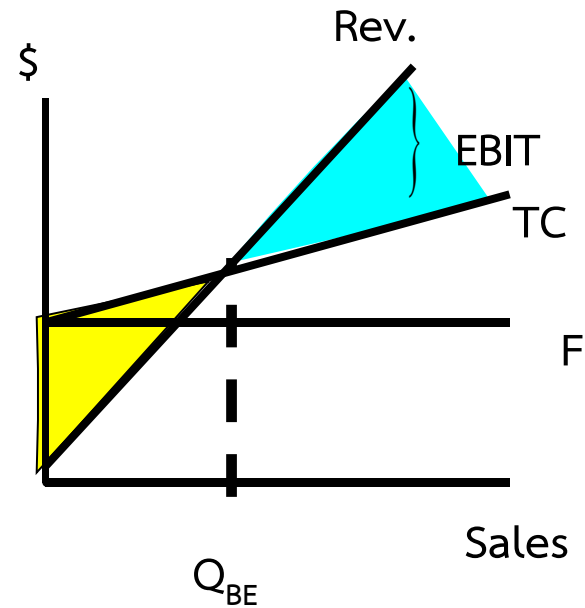
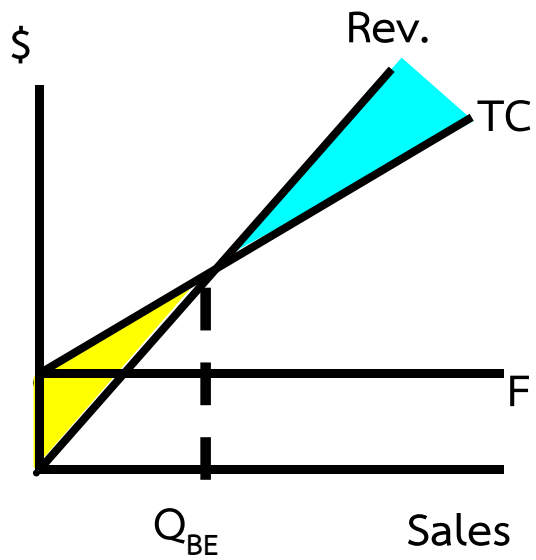
  - = the change in EBIT caused by a change in quantity sold

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

  - => the greater the operating leverage

(More...)

Higher operating leverage leads to more business risk:  
small sales decline causes a larger EBIT decline.



(More...)

# 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 and preferred stock financing.**

## 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 Falls

= Leverage magnifies risk and return!

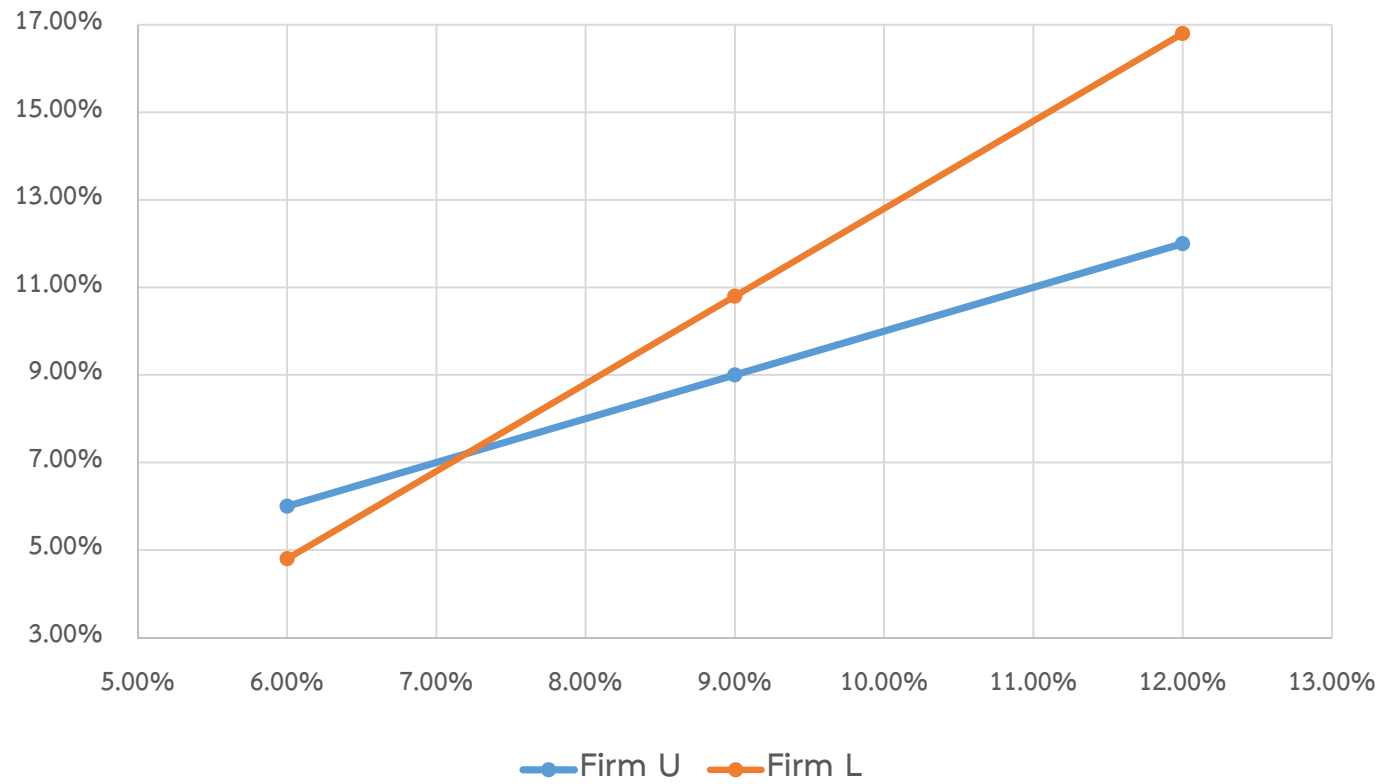
	<u>Firm U</u>	<u>Firm L</u>
EBIT	\$4,000	\$4,000
Interest	<u>0</u>	<u>1,200</u>
EBT	\$4,000	\$2,800
Taxes (40%)	<u>1,600</u>	<u>1,120</u>
NI	<u>\$2,400</u>	<u>\$1,680</u>
ROIC	12.0%	12.0%
ROE	12.0%	16.8%

# Leverage magnifies risk and return!

- Financial risk is from an uncertainty in **EBIT** and thus **NOPAT**
  1. NOPAD
  2. ROIC
  3. ROE

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%
<b>ROE</b>	<b>6.0%</b>	<b>4.8%</b>	<b>9.0%</b>	<b>10.8%</b>	<b>12.0%</b>	<b>16.8%</b>

# 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

# 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.

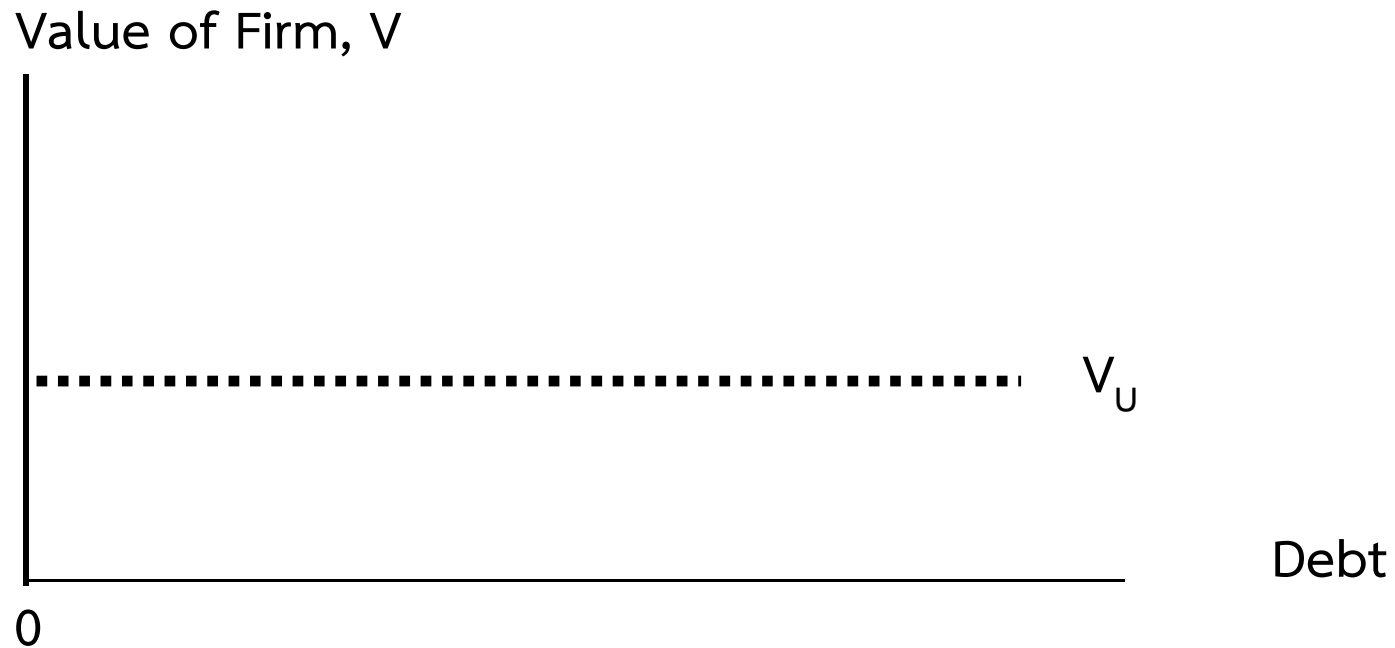
# MM Theory: Corporate Taxes

- 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  $CF_U = V_U$
  - MM show that the value of  $r_d DT = TD$
- 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.

$T_s$  = 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

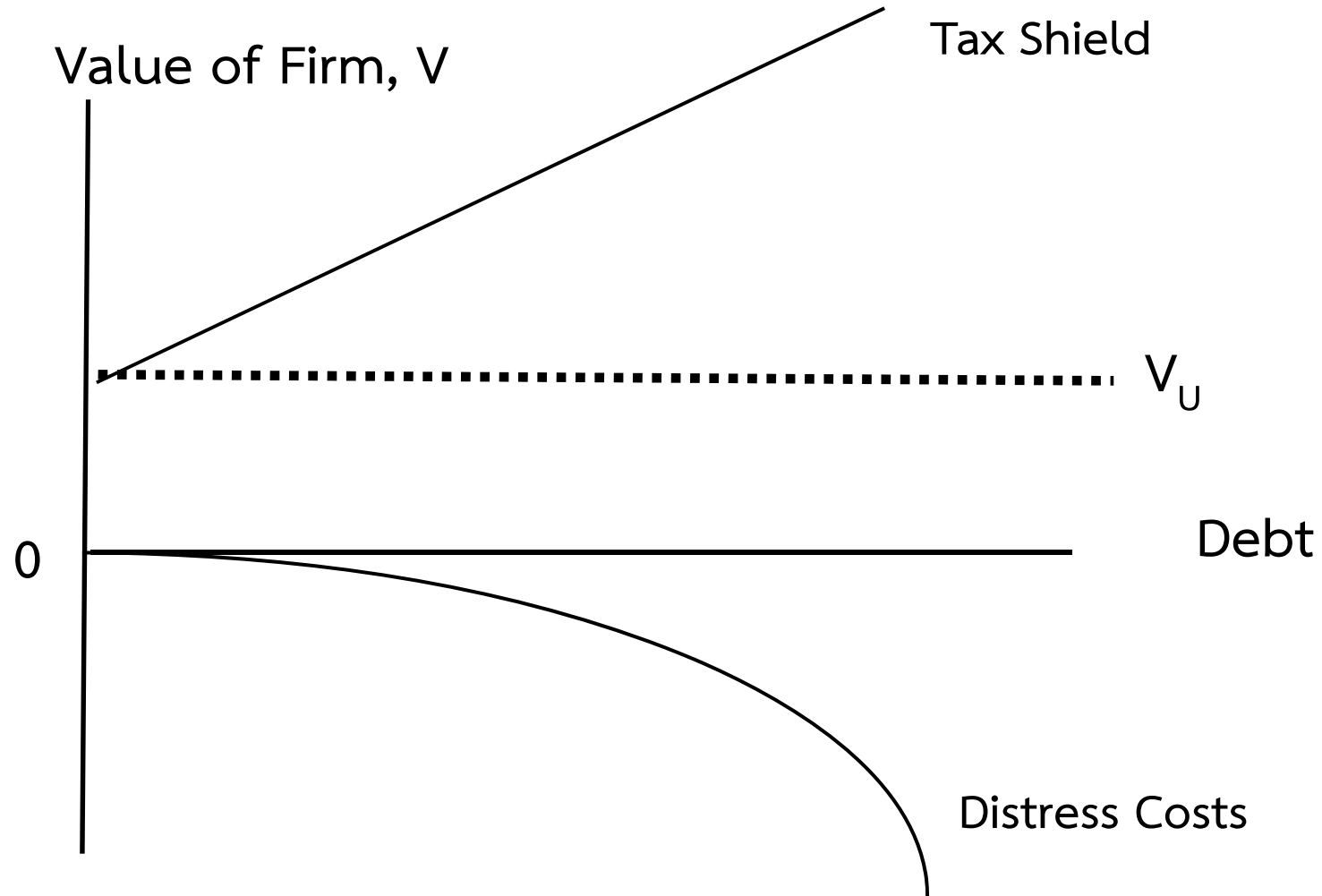
- Use of debt financing remains advantageous, but benefits are less than under only corporate taxes.
- Firms should still use 100% debt.

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

# Other Data for Valuation Analysis

- Company has no ST investments.
- Company has no preferred stock.
- 100,000 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

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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:

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

=

- Calculate for new WACC:

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

# 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>b</b>	1.000	1.150	1.257	1.400	1.600
$r_s$	12.00%	12.90%	13.54%	14.40%	15.60%
<b>WACC</b>	12.00%	11.28%	11.01%	11.04%	11.40%

## Corporate Value for $w_d = 20\%$

- $V_{op} = [FCF(1+g)]/(WACC - g)$   
 $= [\$30(1+0)]/(0.1128 - 0)$   
 $= \$265.96$  million.
- Debt =  $D_{New} = w_d V_{op}$   
 $= 0.20(265.96) = \$53.19$  million.
- Equity =  $S = w_s V_{op}$   
 $= 0.80(265.96) = \$212.77$  million.

# 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

Question?