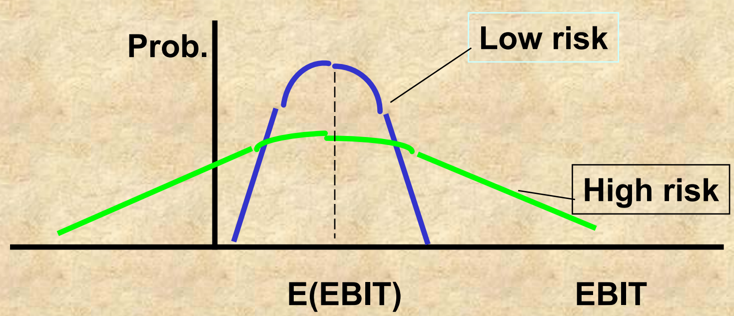
CHAPTER 13
Capital Structure and Leverage

- **Business and financial risk**
- **Optimal capital structure**
- **Operating Leverage**
- **Capital structure theory**

What's business risk?

- **Uncertainty about future operating income (EBIT), i.e. how well can we predict operating income?**



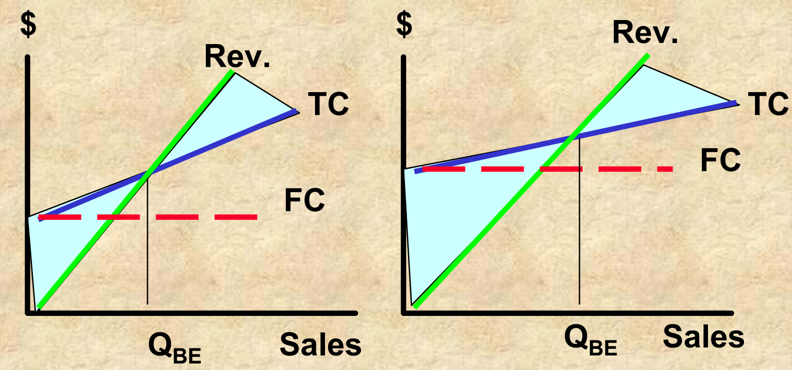
Some factors that affect business risk:

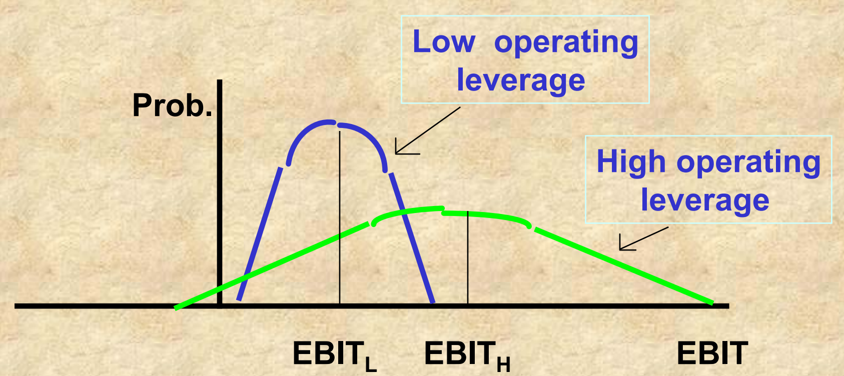
- Uncertainty about demand (unit sales).
- Uncertainty about output prices.
- Uncertainty about input prices.
- Product, types of other liability.
- Degree of operating leverage (DOL).

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

- Operating leverage is the use of fixed costs rather than variable costs.
- If most costs are fixed, hence do not decline when demand falls, then the firm has a high DOL.

More operating leverage leads to more business risk, for then a small sales decline causes a big profit decline.





Typical situation: Can use operating leverage to get higher E(EBIT), but risk increases.

What is financial leverage? Financial risk?

- Financial leverage is the use of debt and preferred stock.
- Financial risk is the additional risk placed on common stockholders as a result of financial leverage.

Business Risk vs. Financial Risk

- Business risk depends on business factors such as competition, product liability, and operating leverage.
- Financial risk depends only on the types of securities issued: More debt, more financial risk. Concentrates business risk on the stockholders.

An example: Illustrating effects of financial leverage

- Two firms with the same operating leverage, business risk, and probability distribution of EBIT.
- Only differ with respect to their use of debt (capital structure).

Firm U	Firm L
No debt	$10,000 of 12% debt
$20,000 in assets	$20,000 in assets
40% tax rate	40% tax rate

Firm U: Unleveraged

	Economy		
	Bad	Avg.	Good
Prob.	0.25	0.50	0.25
EBIT	$2,000	$3,000	$4,000
Interest	0	0	0
EBT	$2,000	$3,000	$4,000
Taxes (40%)	800	1,200	1,600
NI	$1,200	$1,800	$2,400

Firm L: Leveraged

	Economy		
	Bad	Avg.	Good
Prob.*	0.25	0.50	0.25
EBIT*	$2,000	$3,000	$4,000
Interest	1,200	1,200	1,200
EBT	$ 800	$1,800	$2,800
Taxes (40%)	320	720	1,120
NI	$ 480	$1,080	$1,680

*Same as for Firm U.

Ratio comparison between leveraged and unleveraged firms

FIRM U	Bad	Avg	Good
BEP	10.0%	15.0%	20.0%
ROE	6.0%	9.0%	12.0%
TIE	∞	∞	∞

FIRM L	Bad	Avg	Good
BEP	10.0%	15.0%	20.0%
ROE	4.8%	10.8%	16.8%
TIE	1.67x	2.50x	3.30x

Risk and return for leveraged and unleveraged firms

Expected Values:

	Firm U	Firm L
E(BEP)	15.0%	15.0%
E(ROE)	9.0%	10.8%
E(TIE)	∞	2.5x

Risk Measures:

	Firm U	Firm L
σ_{ROE}	2.12%	4.24%
CV_{ROE}	0.24	0.39

The effect of leverage on profitability and debt coverage

- For leverage to raise expected ROE, must have BEP > k_d.
- Why? If k_d > BEP, then the interest expense will be higher than the operating income produced by debt-financed assets, so leverage will depress income.
- As debt increases, TIE decreases because EBIT is unaffected by debt, and interest expense increases (Int Exp = k_dD).

Conclusions

- Basic earning power (BEP) is unaffected by financial leverage.
- L has higher expected ROE because BEP > k_d.
- L has much wider ROE (and EPS) swings because of fixed interest charges. Its higher expected return is accompanied by higher risk.

Optimal Capital Structure

- That capital structure (mix of debt, preferred, and common equity) at which P_0 is maximized. Trades off higher E(ROE) and EPS against higher risk. The tax-related benefits of leverage are exactly offset by the debt's risk-related costs.
- The target capital structure is the mix of debt, preferred stock, and common equity with which the firm intends to raise capital.

Finding Optimal Capital Structure

- The firm's optimal capital structure can be determined two ways:
  - Minimizes WACC.
  - Maximizes stock price.
- Both methods yield the same results.

Other factors to consider when establishing the firm's target capital structure

1. Industry average debt ratio
2. TIE ratios under different scenarios
3. Lender/rating agency attitudes
4. Reserve borrowing capacity
5. Effects of financing on control
6. Asset structure
7. Expected tax rate

How would these factors affect the target capital structure?

1. Sales stability?
2. High operating leverage?
3. Increase in the corporate tax rate?
4. Increase in the personal tax rate?
5. Increase in bankruptcy costs?
6. Management spending lots of money on lavish perks?

Table for calculating WACC and determining the minimum WACC

Amount borrowed	D/A ratio	E/A ratio	k_s	k_d (1 – T)	WACC
$ 0	0.00%	100.00%	12.00%	0.00%	12.00%
250	12.50	87.50	12.51	4.80	11.55
500	25.00	75.00	13.20	5.40	11.25
750	37.50	62.50	14.16	6.90	11.44
1,000	50.00	50.00	15.60	8.40	12.00

* Amount borrowed expressed in terms of thousands of dollars

Table for determining the stock price maximizing capital structure

Amount Borrowed	DPS	k_s	P_0
$ 0	$3.00	12.00%	$25.00
250,000	3.26	12.51	26.03
500,000	3.55	13.20	26.89
750,000	3.77	14.16	26.59
1,000,000	3.90	15.60	25.00

Why do the bond rating and cost of debt depend upon the amount borrowed?

- As the firm borrows more money, the firm increases its financial risk causing the firm's bond rating to decrease, and its cost of debt to increase.

What effect does increasing debt have on the cost of equity for the firm?

- If the level of debt increases, the riskiness of the firm increases.
- We have already observed the increase in the cost of debt.
- However, the riskiness of the firm's equity also increases, resulting in a higher k_s.

The Hamada Equation

- Because the increased use of debt causes both the costs of debt and equity to increase, we need to estimate the new cost of equity.
- The Hamada equation attempts to quantify the increased cost of equity due to financial leverage.
- Uses the unlevered beta of a firm, which represents the business risk of a firm as if it had no debt.

The Hamada Equation

$$\beta_L = \beta_U[1 + (1 - T)(D/E)]$$

- Suppose, the risk-free rate is 5%, and the market risk premium is 7%. The unlevered beta of the firm is 1.0. Total assets are $2,000,000 and the debt equals $250,000. The tax rate is 40%.

25

Calculating levered betas and costs of equity

$\beta_L = 1.0\ [1 + (0.6)(\$250/\$1{,}750)]$

$\beta_L = 1.0857$

Leveraged:

$k_s = k_{RF} + (k_M - k_{RF})\ \beta_L$

$k_s = 5.0\% + (7.0\%)\ 1.0857$

$k_s = 12.6\%$

Unleveraged:

$k_s = 5.0\% + (7.0\%)\ 1.0 = 12\%$

26

Who are Modigliani and Miller(MM)?

- They published theoretical papers which changed the way people thought about financial leverage.
- They won Nobel prizes in economics because of this work.

What assumptions underlie the Independence Hypothesis?

- No brokerage/transaction costs.
- No taxes.
- No bankruptcy costs.
- Investors have the same information about the firm’s future as management.
- Investors borrow at the same rate as corporations.
- EBIT is not affected by the use of debt.

- Without corporate taxes, the Independence Hypothesis says:

Firm value is not affected by the level of debt in the firm.

THEORY: Main contribution is that it shows the items that can cause debt to affect firm value.

What if interest is tax deductible? (Corporate Taxes)

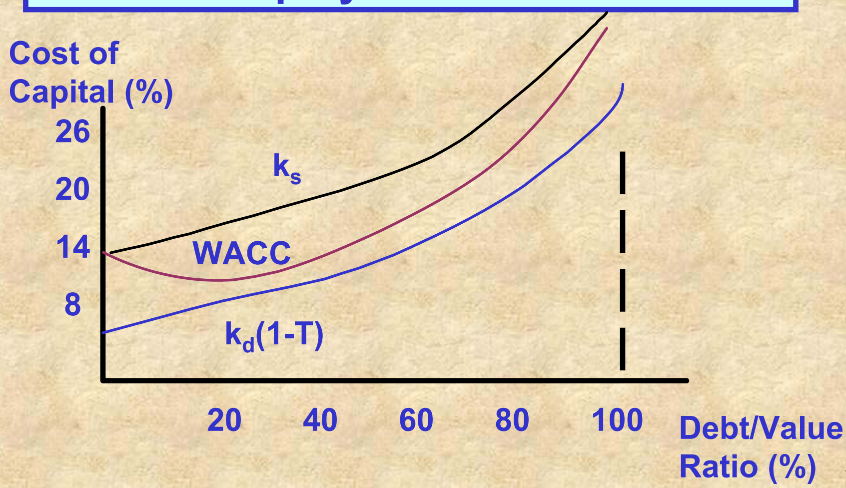
- Even if the costs of debt and equity were the same before taxes, with interest deductibility the cost of debt would be less than the cost of equity after taxes.
- Replacing higher cost equity with lower cost debt would result in a lower WACC and higher firm value.

What if interest is tax deductible and there are bankruptcy costs?

- The tax advantage for debt still has the same effect as before.
- However, the existence of bankruptcy costs causes ALL investors to recognize that increased debt means more risk.
- More risk means more expected return.

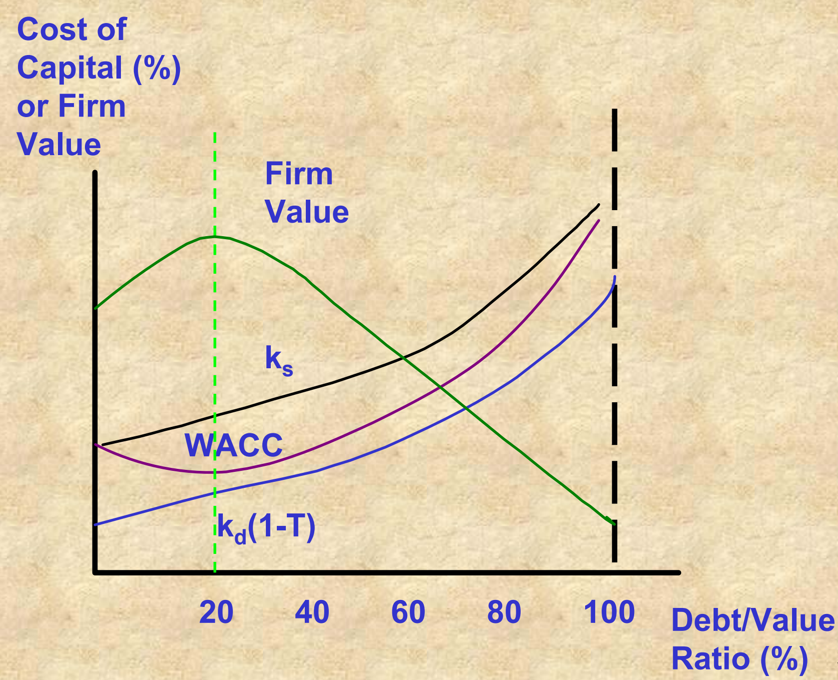
- The cost of equity and debt will increase as the level of debt used increases.
- Initially this increase will likely be small so that the benefit of debt exceeds its cost.
- Eventually costs will exceed benefits.
- This is the Trade-off Theory.

Relationship between capital costs and leverage when corporate taxes and bankruptcy risk are considered.



Implications of Tradeoff Theory

- The firm's value is the discounted value of future CFs.
- The appropriate discount rate is WACC.
- The firm's value will be maximized when the WACC is at its lowest.
- The optimal capital structure will be where the WACC is at its lowest which results in firm value at its highest.



Information asymmetry (Signaling)

- It is difficult to accept that investors know as much about the firm's future prospects as managers.
- If this is not true, we say information asymmetry exists.

- Managers cannot simply tell investors what they know because investors may not believe them
- With information asymmetry present, the old saying “action speaks louder than words” becomes paramount.
- Investors know watch managers actions for clues.

Logically, when would managers use debt instead of equity financing?

- Debt has a set payment amount. If it is not met, the firm can be forced into bankruptcy.
- Equity only promises residual payments (if there are profits, they belong to shareholders).

- Generally, this means managers are more likely to use debt when they view the future as favorable. In such a situation they see no reason to "fear" fixed payment amounts.
- They are more likely to choose equity when prospects are more uncertain.

Signaling Theory

- Financing choices provide a "signal" to investors.
- Debt financing - "good news"
- Equity financing - "bad news"
- This may lead managers to maintain "reserve borrowing capacity."

Agency costs

- In many corporations, the managers of the firm own relative small portions of the company.
- Thus, they may have incentives to operate in a manner which is not most beneficial to shareholders.

- Some have argued that this incentive is greater if the managers have access to large amounts of unrestricted CFs (free CF).
- Since debt imposes fixed payments that must be met, its use may help alleviate agency costs.

OVERALL

- Which of the theories are most correct?
- Clearly, the original M&M theorem is not what we face in the "real world."
- (Of course, the importance of it is that it identifies the factors that may cause capital structure to matter.)

- More than likely all of the factors come into play, thus real world capital structure policy is actually a composite of all of the theories.
- Further, other factors may also be important. (e.g., managerial attitudes toward risk)