



SPROTT
SCHOOL OF BUSINESS

BUSI 2505F - Business Finance

Tuesday, February 14, 2012

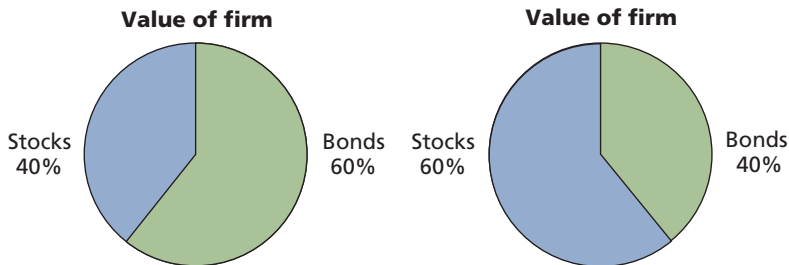
§16.4-16.9 leverage and capital structure (cont.)

- **group assignment #1** - due next class (tue feb 28, **on or before 18:00**)
- **MIDTERM** - tue feb 28, in-class 304SA
 - 18:05 - 20:05 (2 hours)
 - chapters 2, 10, 11, 14, and 15
 - formula sheet provided
 - chapter 15 suggested exercises will be posted on webct (coming soon)
 - sample midterm (2505_w11_midterm.pdf) posted on webct in "Quizzes / Midterm / Final" folder
- **QUIZ 3** - tue mar 6, chapter 16, suggested exercises will be posted on webct during winter break

- §16.1 - The Capital Structure Question [last week]
- §16.2 - The Effect of Financial Leverage [last week]
- §16.3 - Capital Structure and the Cost of Equity Capital [review]
- §16.4 - M&M Propositions I and II with Corporate Taxes
- §16.5 - Bankruptcy Costs
- §16.6 - Optimal Capital Structure
- §16.7 - The Pie Again
- §16.8 - Observed Capital Structures
- §16.9 - Long-Term Financing Under Financial Distress and Bankruptcy

- Modigliani and Miller Theory of Capital Structure
 - **Proposition I** - firm value
 - **Proposition II** - WACC
- The value of the firm is determined by the cash flows to the firm and the risk of the assets
- Changing firm value
 - Change the risk of the cash flows
 - Change the cash flows

16.3 [review]: pie model (figure 16.2, p.487)



M&M Proposition I - size of the pie does not depend on how it is sliced

$$\underbrace{V_U = \frac{EBIT}{R_U}}_{\text{value of unlevered firm}} = \underbrace{V_L}_{\text{value of levered firm}} = \underbrace{E_L}_{\text{market value of equity}} + \underbrace{D_L}_{\text{market value of debt}}$$

- **Case I - Assumptions**
 - No corporate or personal taxes
 - No bankruptcy costs
- **Case II - Assumptions**
 - Corporate taxes, but no personal taxes
 - No bankruptcy costs
- **Case III - Assumptions**
 - Corporate taxes, but no personal taxes
 - Bankruptcy costs

- Proposition I
 - The value of the firm is NOT affected by changes in the capital structure
 - The cash flows of the firm do not change, therefore value doesn't change
- Proposition II
 - The WACC of the firm is NOT affected by capital structure
- Doesn't matter how we divide our cash flows between our stockholders and bondholders, the cash flow of the firm doesn't change
- Since the cash flows don't change, and we haven't changed the risk of existing cash flows, the value of the firm won't change

16.3 [review]: case i - equations

assumption no taxes \Rightarrow term $(1 - T_C)$ is not included in the WACC

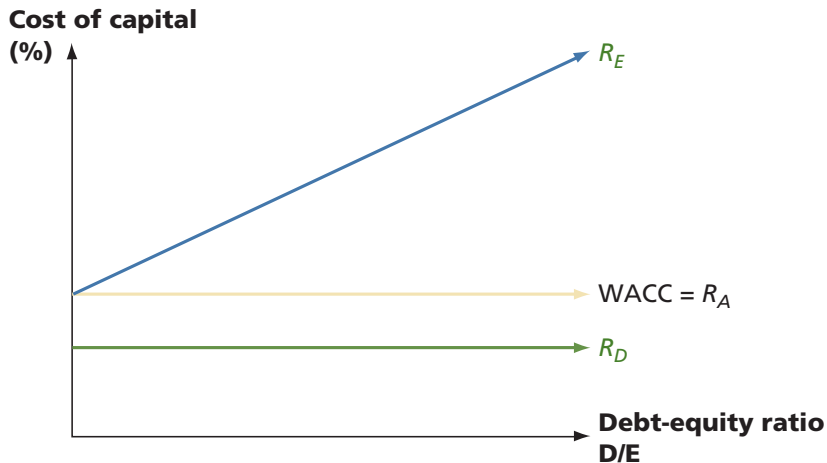
$$WACC = R_A = \left(\frac{E}{V}\right) R_E + \left(\frac{D}{V}\right) R_D$$

$$R_E = \underbrace{R_A}_{\text{cost of the firm's business risk, ie. required return on the firm's assets}} + \underbrace{(R_A - R_D) \left(\frac{D}{E}\right)}_{\text{cost of the firm's financial risk, ie. additional return required by stockholders to compensate for the risk of leverage}}$$

cost of the firm's business risk, ie. required return on the firm's assets

cost of the firm's financial risk, ie. additional return required by stockholders to compensate for the risk of leverage

16.3 [review]: cost of equity and wacc (m&m without taxes) (fig 16.3, p.488)



$$R_E = R_A + (R_A - R_D)(D/E), \text{ by M\&M Proposition II}$$

A firm has a debt-equity ratio of .40, a WACC of 16%, and a yield-to-maturity on its debt of 13%. Ignoring taxes, what is the cost of equity?

answer: 17.2%

- Interest is tax deductible
- Therefore, when a firm adds debt, it reduces taxes, all else equal
- The reduction in taxes increases the cash flow of the firm
- How should an increase in cash flows affect the value of the firm?

16.4: case ii - example 1

	Unlevered Firm	Levered Firm
EBIT	5,000	5,000
Interest	0	500
Taxable Income	5,000	4,500
Taxes (34%)	1,700	1,530
Net Income	3,300	2,970
CFFA	3,300	3,470

16.4: case ii - example 1 (cont.)

- Assume the company has \$6,250 8% coupon debt and faces a 34% tax rate
- Annual interest tax shield
 - Tax rate times interest payment
 - \$6,250 in 8% debt = \$500 in interest expense
 - Annual tax shield = $(.34)(\$500) = \170
- Present value of annual interest tax shield
 - Assume perpetual debt for simplicity
 - $PV = \$170 / .08 = \$2,125$
 - $PV = D(R_D)(T_C) / R_D = D \cdot T_C = (\$6,250)(.34) = \$2,125$
- Increase in cash flow is exactly equal to the interest tax shield

Your firm has a \$250,000 bond issue outstanding. These bonds have a 7% coupon, pay interest semiannually, and have a current market price equal to 103% of face value. What is the amount of the annual interest tax shield given a tax rate of 35%?

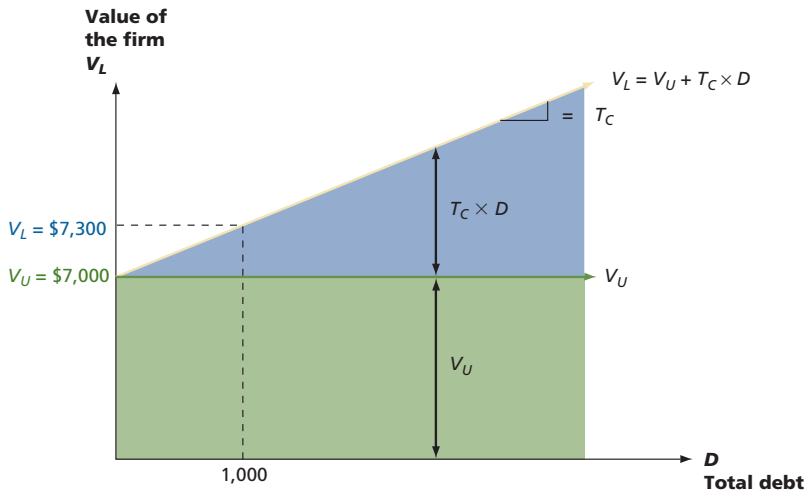
answer: \$6,125

16.4: case ii - proposition i

- The value of the firm increases by the present value of the annual interest tax shield
 - Value of a levered firm = value of an unlevered firm + PV of interest tax shield
 - Value of equity = Value of the firm - Value of debt
- Assuming perpetual cash flows
 - $V_U = EBIT(1 - T)/R_U$
 - $V_L = V_U + D \cdot T_C$
- R_U is the cost of capital for an unlevered firm = R_A for an unlevered firm
- V_U is PV of the expected future cash flow from assets for an unlevered firm

- EBIT = \$25 million; Tax rate = 35%;
Debt = \$75 million; Cost of debt = 9%;
Unlevered cost of capital = 12%
- $V_U = (25M)(1 - .35)/.12 = 135.42M$
- $V_L = 135.42M + (75M)(.35) = 161.67M$
- $E = 161.67M - 75M = 86.67M$

16.4: m&m proposition i with taxes (figure 16.4, p.492)



The value of the firm increases as total debt increases because of the interest tax shield. This is the basis of M&M Proposition I with taxes.

An unlevered firm has aftertax net income = \$125,000. The unlevered cost of capital is 13% and the corporate tax rate is 34%. What is the value of this firm?

answer: \$961,538

A firm with no debt has 200,000 shares outstanding valued at \$20 each. Its cost of equity is 12%. The firm is considering adding \$1 million in debt to its capital structure. The coupon rate would be 8% and the bonds would sell for par value. The firm's tax rate is 34%. How much will the firm be worth after adding the debt?

answer: \$4,340,000

16.4: value of a levered firm - example 2

An unlevered firm has an EBIT = \$250,000, aftertax net income = \$165,000, and a cost of capital of 12%. A levered firm with the same assets and operations has \$1.25 million in face value debt paying an 8% annual coupon; the debt sells for par value in the marketplace. What is the value of the levered firm? The tax rate is 34%.

answer: \$1,800,000

Trudy's Pizza is an unlevered firm with an after-tax net income of \$47,000. The unlevered cost of capital is 7.5% and the tax rate is 35%. What is the value of this firm?

answer: \$626,667

Martha's Grapevines, Inc. has an EBIT of \$46,000, no debt, a 34% tax rate, and a 15% cost of capital. What will the value of the firm be if Martha's Grapevines issues \$75,000 in debt?

answer: \$227,900

16.4: case ii - proposition ii

- The WACC decreases as D/E increases because of the government subsidy on interest payments

$$WACC = (E/V)R_E + (D/V)(R_D)(1 - T_C)$$

$$R_E = R_U + (R_U - R_D)(D/E)(1 - T_C)$$

- continuing earlier example...

$$R_E = .12 + (.12 - .09)(75/86.67)(1 - .35) = 13.69\%$$

$$\begin{aligned} WACC &= \left(\frac{86.67}{161.67} \right) (.1369) + \left(\frac{75}{161.67} \right) (.09)(1 - .35) \\ &= 10.05\% \end{aligned}$$

16.4: case ii - proposition ii - example

- Suppose that the firm changes its capital structure so that the debt-to-equity ratio becomes one, ie. 50% equity and 50% debt
- What will happen to the cost of equity under the new capital structure?

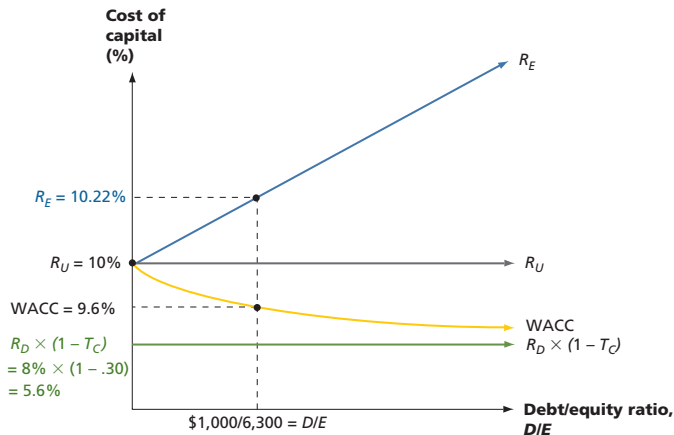
$$R_E = .12 + (.12 - .09)(1)(1 - .35) = 13.95\%$$

- What will happen to the weighted average cost of capital?

$$WACC = .5(.1395) + .5(.09)(1 - .35) = 9.9\%$$

- The amount of leverage in the firm increased, the cost of equity increased, but the overall cost of capital decreased.

16.4: cost of equity and wacc (m&m with taxes) (figure 16.5, p.494)



M&M Proposition I with taxes implies that WACC decreases as the firm relies more heavily on debt financing: $WACC = (E/V)R_E + (D/V)R_D(1 - T_C)$

M&M Proposition II with taxes implies that cost of equity rises as the firm relies more heavily on debt financing: $R_E = R_U + (R_U - R_D)(D/E)(1 - T_C)$

A firm has debt of \$18,000, equity of \$42,000, a cost of debt of 7.5%, a cost of equity of 11.6%, and a tax rate of 34%. What is the firm's weighted average cost of capital?

answer: 9.61%

A firm is worth \$1,400, has a 35% tax rate, total debt of \$600, an unlevered return of 15%, and a cost of debt of 9%. What is the cost of equity?

answer: 17.93%

Your firm has a pre-tax cost of debt of 8% and an unlevered cost of capital of 12.5%. Your tax rate is 35% and your cost of equity is 14.34%. What is your debt-equity ratio?

answer: .63

16.5: case iii - with bankruptcy costs

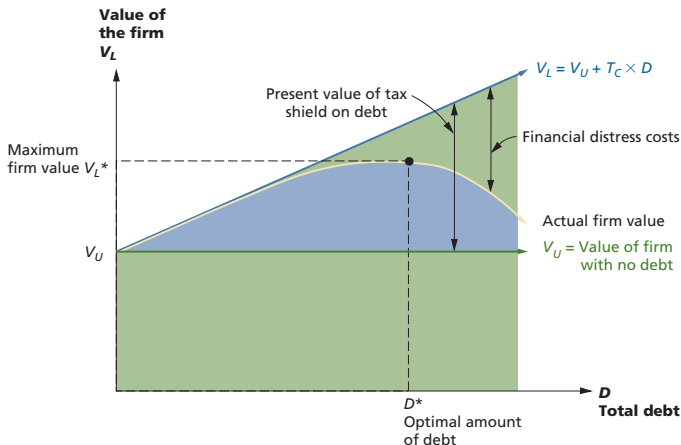
- Now we add bankruptcy costs
- As the D/E ratio increases, the probability of bankruptcy increases
- This increased probability will increase the expected bankruptcy costs
- At some point, the additional value of the interest tax shield will be offset by the expected bankruptcy cost
- At this point, the value of the firm will start to decrease and the WACC will start to increase as more debt is added

- Direct costs
 - Legal and administrative costs
 - Ultimately cause bondholders to incur additional losses
 - Disincentive to debt financing
- Financial distress
 - Significant problems in meeting debt obligations
 - Most firms that experience financial distress do not ultimately file for bankruptcy

- Indirect bankruptcy costs
 - Larger than direct costs, but more difficult to measure and estimate
 - Stockholders wish to avoid a formal bankruptcy filing
 - Bondholders want to keep existing assets intact so they can at least receive that money
 - Assets lose value as management spends time worrying about avoiding bankruptcy instead of running the business
 - Also have lost sales, interrupted operations and loss of valuable employees

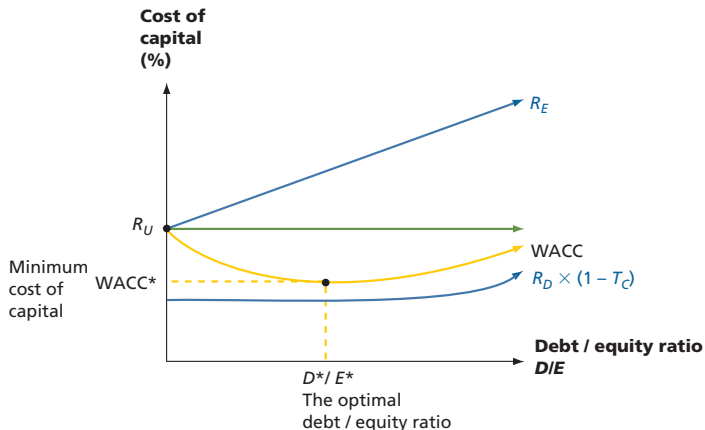
- So what is the optimal capital structure?
- A firm borrows up to the point where the tax benefit from an extra dollar in debt is exactly equal to the cost that comes from the increased probability of financial distress
- This is the point where the firm's WACC is minimized

16.6: static theory and firm value (figure 16.6, p.497)



According to the static theory, the gain from the tax shield on debt is offset by financial distress costs. An optimal capital structure exists that just balances the additional gain from leverage against the added financial distress cost.

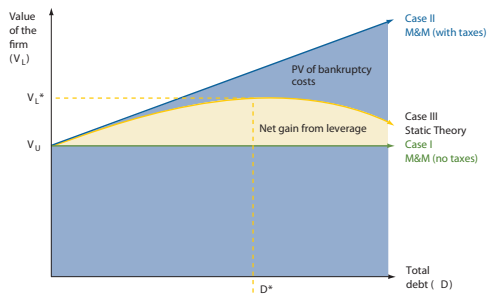
16.6: static theory and cost of capital (figure 16.7, p.498)



According to the static theory, the WACC falls initially because of the tax advantage of debt. Beyond the point D^*/E^* , it rises because of financial distress costs.

- **Case I** - no taxes or bankruptcy costs
 - No optimal capital structure
- **Case II** - corporate taxes but no bankruptcy costs
 - Optimal capital structure is 100% debt
 - Each additional dollar of debt increases the cash flow of the firm
- **Case III** - corporate taxes and bankruptcy costs
 - Optimal capital structure is part debt and part equity
 - Occurs where the benefit from an additional dollar of debt is just offset by the increase in expected bankruptcy costs

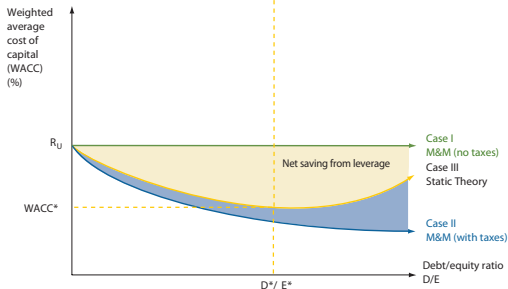
16.6: summary of 3 cases (figure 16.8, p.499)



- **Case I** - With no taxes or bankruptcy costs, the value of the firm and its weighted average cost of capital are not affected by capital structure

- **Case II** - With corporate taxes and no bankruptcy costs, the value of the firm increases and the weighted average cost of capital decreases as the amount of debt goes up

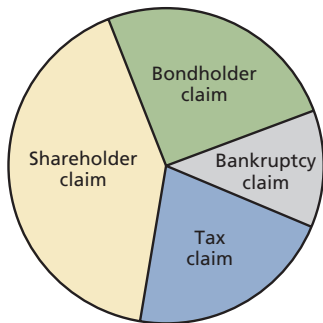
- **Case III** - With corporate taxes and bankruptcy costs, the value of the firm V_L^* reaches a maximum at D^* , the optimal amount of borrowing. At the same time, the weighted average cost of capital, $WACC^*$, is minimized at D^*/E^*



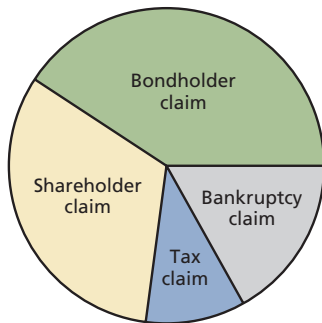
- The tax benefit is only important if the firm has a large tax liability
- Risk of financial distress
 - The greater the risk of financial distress, the less debt will be optimal for the firm
 - The cost of financial distress varies across firms and industries. As a manager you need to understand the cost for your industry

16.6: extended pie model (figure 16.9, p.501)

Lower financial leverage



Higher financial leverage



In the extended pie model, the value of all the claims against the firm's cash flows is not affected by capital structure, but the relative value of claims changes as the amount of debt financing is increased.

- Value of the firm = marketed claims + non-marketed claims
 - Marketed claims are the claims of stockholders and bondholders
 - Non-marketed claims are the claims of the government and other potential stakeholders
- The overall value of the firm is unaffected by changes in capital structure
- The division of value between marketed claims and non-marketed claims may be impacted by capital structure decisions

- Capital structure does differ by industry
- Seems to be a connection between different industry's operating characteristics and capital structure
- Firms and lenders look at the industry's debt/equity ratio as a guide

16.8: debt/equity ratios (table 16.7, p.502)

Industry	Ratio
All industries	0.916
Non-financial	0.989
Agriculture, forestry, fishing and hunting	1.296
Oil and gas extraction and support activities	0.967
Mining (except oil and gas)	0.454
Utilities	0.905
Construction	2.006
Manufacturing	0.618
Wholesale trade	0.855
Retail trade	1.072
Transportation and warehousing	1.454
Information and cultural industries	1.238
Real estate and rental and leasing	2.061
Professional, scientific and technical services	0.846
Administrative and support, waste management and remediation services	1.427
Educational, healthcare and social assistance services	0.930
Arts, entertainment and recreation	2.393
Accommodation and food services	3.592
Repair, maintenance and personal services	0.838
Insurance carriers and related activities	0.177

Source: "Book value debt/equity ratios for selected industries in Canada 2005," adapted from the Statistics Canada publication "Quarterly financial statistics for enterprises," Catalogue 61-008, Fourth Quarter, 2005, vol. 16, no. 4, April 2006.

- **Business failure** - business has terminated with a loss to creditors
- **Legal bankruptcy** - petition federal court for bankruptcy
- **Technical insolvency** - firm is unable to meet debt obligations
- **Accounting insolvency** - book value of equity is negative

- Liquidation
 - Covered under the Bankruptcy and Insolvency Act (1992)
 - Firm is terminated as a going concern
 - Trustee takes over assets, sells them and distributes the proceeds
- Reorganization
 - Keep firm as growing concern
 - Involves issuing new securities to replace old securities
- Depends on whether the company is worth more dead or alive