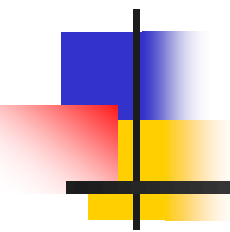


Capital Structure (Chapter 17)



Key Concepts and Skills



- *Define the costs associated with bankruptcy*
- *Understand the theories that address the level of debt a firm carries*
 - *Tradeoff; Signaling; Agency Cost; Pecking Order*
- *Know factors and global practices concerning capital structure*



Two Fundamental Questions

- Q1 - Does capital structure (or financing decision), i.e., the mix of debt and equity, affect the total value of the firm?
 - Recall: $V = B + S$ (Firm Value Identity; Pie)
 - Maximization of long-term firm value and hence shareholder interests (i.e., value)
 - Optimal capital structure is one that maximizes long-term firm value!
- ***Q2 - If it does, then what factors affect the optimal mix of debt and equity?***



Capital Structure

- Examine capital structure under strict simplifying assumptions (Chapter 16)
 - Foundation of Modern Corporate Finance
- ***Add back market imperfections such as bankruptcy costs and agency problems, in an attempt to explain the capital structure observed in practice (Chapter 17)***

Market Imperfections and Capital Structure

(Chapter 17; Barclay & Smith JACF 2005)

- Bankruptcy and Financial Distress Costs
- Agency Costs
- Free Cash Flow Reduction
- Information Asymmetry
- More Taxes – Personal
- Other Considerations



§

Modigliani and Miller Proposition I:

$$V_L = V_U + \text{PV of interest tax shield } (T_c * B; \text{ perpetual debt}) - \text{PV of bankruptcy (financial distress) costs} - \text{PV of agency costs} + \text{PV of free cash flow reduction}$$

→ The optimal capital structure is determined by a trade-off between benefits and costs of debt financing.



17.1&2 Bankruptcy Costs

- Bankruptcy risk versus Bankruptcy costs
 - It is NOT the risk, but the costs associated with bankruptcy that lower firm value
 - Stockholders, not (rational) bondholders, bear bankruptcy costs
- Direct Costs of Bankruptcy
 - Legal and administrative costs
- Indirect Costs of Bankruptcy
 - Impaired ability to conduct business (e.g., lost sales)



Bankruptcy Costs – Example

Plato & Co. estimates its cash flow as \$200 for its final year in business if the economy booms. If the economy is normal, the estimated cash flow is \$60 for the year. There is a 55% chance of an economic boom and a 45% chance of a normal economy. The firm has a principal and interest payment of \$75 on previously incurred debt that is due at the end of the year. The current interest rate is 9%.

What is the current value of the firm if you ignore bankruptcy costs?

What is the value of the firm if you consider the bankruptcy costs of \$12?

Bankruptcy Costs – Example

	Cash flows ignoring costs	
	Boom	Normal
Cash flow	\$200	\$60
Payment to bondholders	\$75	\$60
Payment to stockholders	\$125	\$0

$$\begin{aligned} S &= \frac{.55 \times \$125 + .45 \times \$0}{1.09} \\ &= \frac{\$68.75 + \$0}{1.09} \\ &= \$63.07 \end{aligned}$$

$$\begin{aligned} B &= \frac{.55 \times \$75 + .45 \times \$60}{1.09} \\ &= \frac{\$41.25 + \$27.00}{1.09} \\ &= \$62.61 \end{aligned}$$

$$V = S + B = \$63.07 + \$62.61 = \$125.68$$

Bankruptcy Costs – Example

	<u>Cash flows with costs</u>	
	Boom	Normal
Cash flow	\$200	\$60
Payment to bondholders	\$75	\$48
Payment to stockholders	\$125	\$0

$$\begin{aligned} S &= \frac{.55 \times \$125 + .45 \times \$0}{1.09} \\ &= \frac{\$68.75 + \$0}{1.09} \\ &= \$63.07 \end{aligned}$$

$$\begin{aligned} B &= \frac{.55 \times \$75 + .45 \times \$48}{1.09} \\ &= \frac{\$41.25 + \$21.60}{1.09} \\ &= \$57.66 \end{aligned}$$

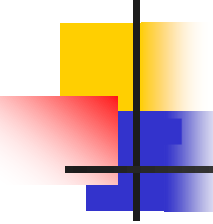
$$V = S + B = \$63.07 + \$57.66 = \$119.73$$



Asset Characteristics and Bankruptcy costs

- Expected Bankruptcy Costs = $f(\text{bankruptcy costs; bankruptcy risk})$
- Firms with mostly liquid and tangible assets have lower bankruptcy **costs** than firms with a large fraction of illiquid and intangible assets.
- Firms with stable and predictable operating income have lower bankruptcy **risk** than firms with uncertain or volatile operating income.

17.2 Agency Problems of Debt



Conflicts between stockholders and bondholders
(Jensen and Meckling, 1976)

- Assume no conflict between management and stockholders
- With agency conflicts, investment strategies that maximize firm value may no longer maximize the value of stockholders.
- Examples of agency conflicts:
 - Risk incentive problem (Strategy 1)
 - Underinvestment (Strategy 2)
 - Claim Dilution (Strategy 3)



17.2&3 Dealing with Agency Costs of Debt

- (Rational) Bondholders may require higher returns to compensate for the risk of wealth loss due to agency conflicts;
- Protective covenants in bond contracts may allow firm to issue bonds at lower interest rates.
 - Positive covenants (i.e., what to do)
 - Negative covenants (i.e., what NOT to do)
- Debt Consolidation
 - Contracting costs fall with a smaller number of parties



Selfish Strategy 1: Take Risks (Asset Substitution; NO Debt)

<u>The Gamble</u>	<u>Probability</u>	<u>Payoff</u>
Win Big	10%	\$1,000
Lose Big	90%	\$0

Cost of investment is \$200 (all the firm's cash)

Required return is 50%

Expected CF from the Gamble = $\$1000 \times 0.10$
+ $\$0 = \100

$$NPV = -\$200 + \frac{\$100}{(1.50)}$$

$$NPV = -\$133$$



Selfish Strategy 1: Take Risks (Asset Substitution; \$300 Debt)

- Expected CF from the Gamble
 - To Bondholders = $\$300 \times 0.10 + \$0 = \$30$
 - To Stockholders = $(\$1000 - \$300) \times 0.10 + \$0 = \70
- PV of Bonds Without the Gamble = \$200
- PV of Stocks Without the Gamble = \$0
- PV of Bonds With the Gamble: $\$20 = \frac{\$30}{(1.50)}$
- PV of Stocks With the Gamble: $\$47 = \frac{\$70}{(1.50)}$

Selfish Strategy 2: (Underinvestment)

- Consider a government-sponsored project that guarantees \$350 in one period.
- Cost of investment is \$300 (the firm only has \$200 now), so the stockholders will have to supply an additional \$100 to finance the project.

$$NPV = -\$300 + \frac{\$350}{(1.10)}$$

- Required return is 10%.

$$NPV = \$18.18$$

- Should we accept or reject?

Selfish Strategy 2: (Underinvestment)

Expected CF from the government sponsored project:

To Bondholder = \$300

To Stockholder = (\$350 – \$300) = \$50

PV of Bonds Without the Project = \$200

PV of Stocks Without the Project = \$0

PV of Bonds With the Project: $\$272.73 = \frac{\$300}{(1.10)}$

PV of Stocks With the Project: $-\$54.55 = \frac{\$50}{(1.10)} - \$100$

Selfish Strategy 3: Milking the Property



- Liquidating dividends
 - Suppose our firm paid out a \$200 dividend to the shareholders. This leaves the firm insolvent, with nothing for the bondholders, but plenty for the former shareholders.
 - Such tactics often violate bond indentures.
- Increase perquisites to shareholders and/or management

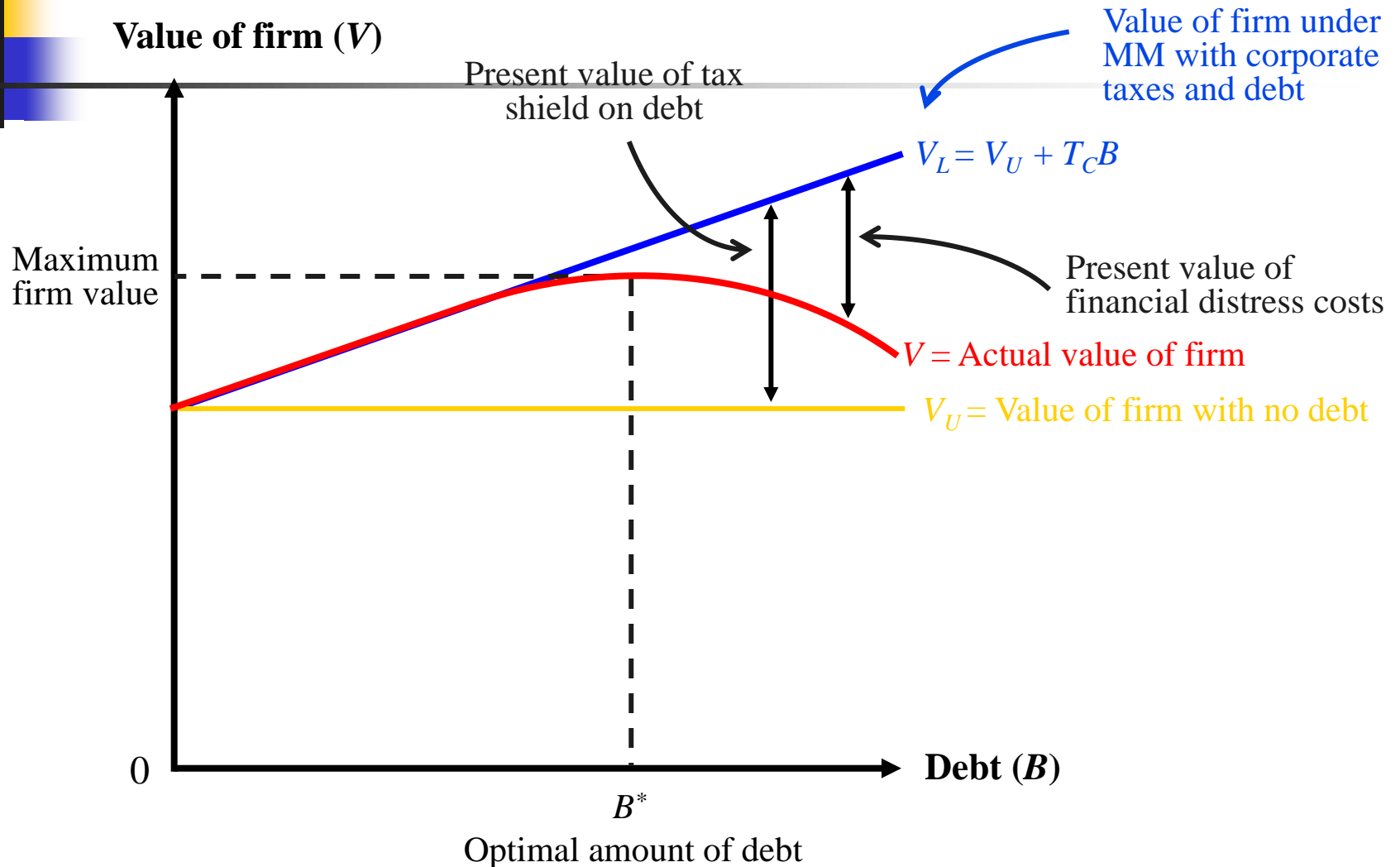


17.4 Tying It All Together

- Static Tradeoff Model

- There is a trade-off between the tax advantage of debt (Chapter 16) and the costs of financial distress.
- It is difficult to express this with a precise and rigorous formula.
- Revise M&M value diagrams to incorporate the effects of agency and bankruptcy costs.

Tax Effects and Financial Distress



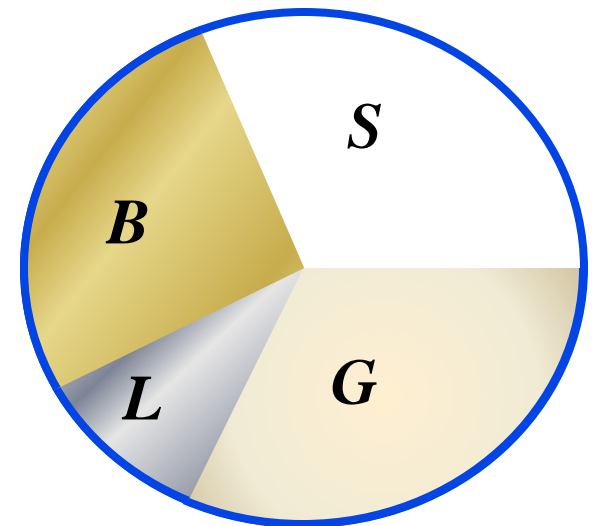
The Pie Model Revisited

- Taxes and bankruptcy costs can be viewed as just another claim on the cash flows of the firm.

■ Let G and L stand for payments to the government and bankruptcy lawyers, respectively.

- $V_T = S + B + G + L$

- *The essence of the M&M intuition is that V_T depends on the cash flow of the firm; capital structure just slices the pie.*



- Cash Flow = Payments to stockholders (S) + Payments to creditors (B) + Payments to the government (G) + Payments to bankruptcy courts and lawyers (L)



The Pie Model Revisited

- Marketed claims – claims against cash flow that can be bought and sold (bonds, stock)
VM = value of marketed claims
- Nonmarketed claims – claims against cash flow that cannot be bought and sold (taxes, legal costs)
VN = value of nonmarketed claims
- $VT = \text{value of all claims} = VM + VN = S + B + G + L$
- Given the firm's cash flows, the optimal capital structure is the one that maximizes VM or minimizes VN.



The Pie Model Revisited

Sun Importers has a current EBIT of \$147,000. The firm has one debt issue outstanding with a market value of \$650,000 and a cost of 9%. Assume there are no taxes. Also assume the required return on equity is equal to the required return on debt. The growth rate of the firm is 4% annually in perpetuity.

What is the value of the equity?

What is the total marketable value of the firm?

The Pie Model Revisited

$$\text{EBIT}_{\text{Next Year}} = \$147,000(1.04) = \$152,880$$

$$\text{Cash flow to bondholders} = .09(\$650,000) = \$ 58,500$$

$$\text{Cash flow to shareholders} = \$152,880 - \$58,500 = \$ 94,380$$

$$V_s = \frac{\$94,380}{.09 - .04} = \$1,887,600$$

$$\begin{aligned} V_M &= V_B + V_s \\ &= \$650,000 + \$1,887,600 \\ &= \$2,537,600 \end{aligned}$$



The Pie Model Revisited

The Wheat Mill has an all-equity value of \$23.6 million. However, the firm is levered as it has \$7.9 million of debt outstanding which is currently selling at par. There are 450,000 shares of stock outstanding with a market price of \$38.50 a share. The tax rate is 35%.

What is the value of the nonmarketable claims?

The Pie Model Revisited

$$\begin{aligned}V_L &= V_U + t_c B \\&= \$23,600,000 + .35(\$7,900,000) \\&= \$26,365,000\end{aligned}$$

$$\begin{aligned}V_M &= B + S \\&= \$7,900,000 + 450,000(\$38.50) \\&= \$25,225,000\end{aligned}$$

$$\begin{aligned}V_T &= V_M + V_N \\\$26,365,000 &= \$25,225,000 + V_N \\V_N &= \$1,140,000\end{aligned}$$



17.6 Agency Costs of Equity

While managers may have motive to partake in perquisites, they need the opportunity to do so. Free cash flow provides this opportunity.

- The *free cash flow hypothesis* says that an increase in dividends should benefit the stockholders by reducing the ability of managers to pursue wasteful activities.
- The *free cash flow hypothesis* also argues that an increase in debt obligations will reduce the ability of managers to pursue wasteful activities more effectively than dividend increases because debt obligations are legally binding.
- Debt for equity swaps positively impact firm valuation!!

17.6 Agency Costs of Equity

You currently own 100% of your firm which is valued at \$1.4 million. You are planning on doubling the size of the firm next year but are trying to determine whether you should issue debt or equity to raise the additional \$1.4 million of capital that is needed. You have determined that the expanded firm will generate an annual cash flow of \$530,000 if you devote 70% of your energy to the firm. On the other hand, if you devote 100% of your energy to the firm, the firm's cash flows would increase to \$900,000. The interest rate on the debt is 10%. There are no taxes.

Should you issue debt or equity to fund the expansion?

Should you devote 70% or 100% of your energy to the firm?

17.6 Agency Costs of Equity

Debt Issue				
	Cash Flow	Interest	Cash Flow To Equity	Cash Flow To You
70% effort	\$530,000	\$140,000	\$390,000	\$390,000
100% effort	\$900,000	\$140,000	\$760,000	\$760,000

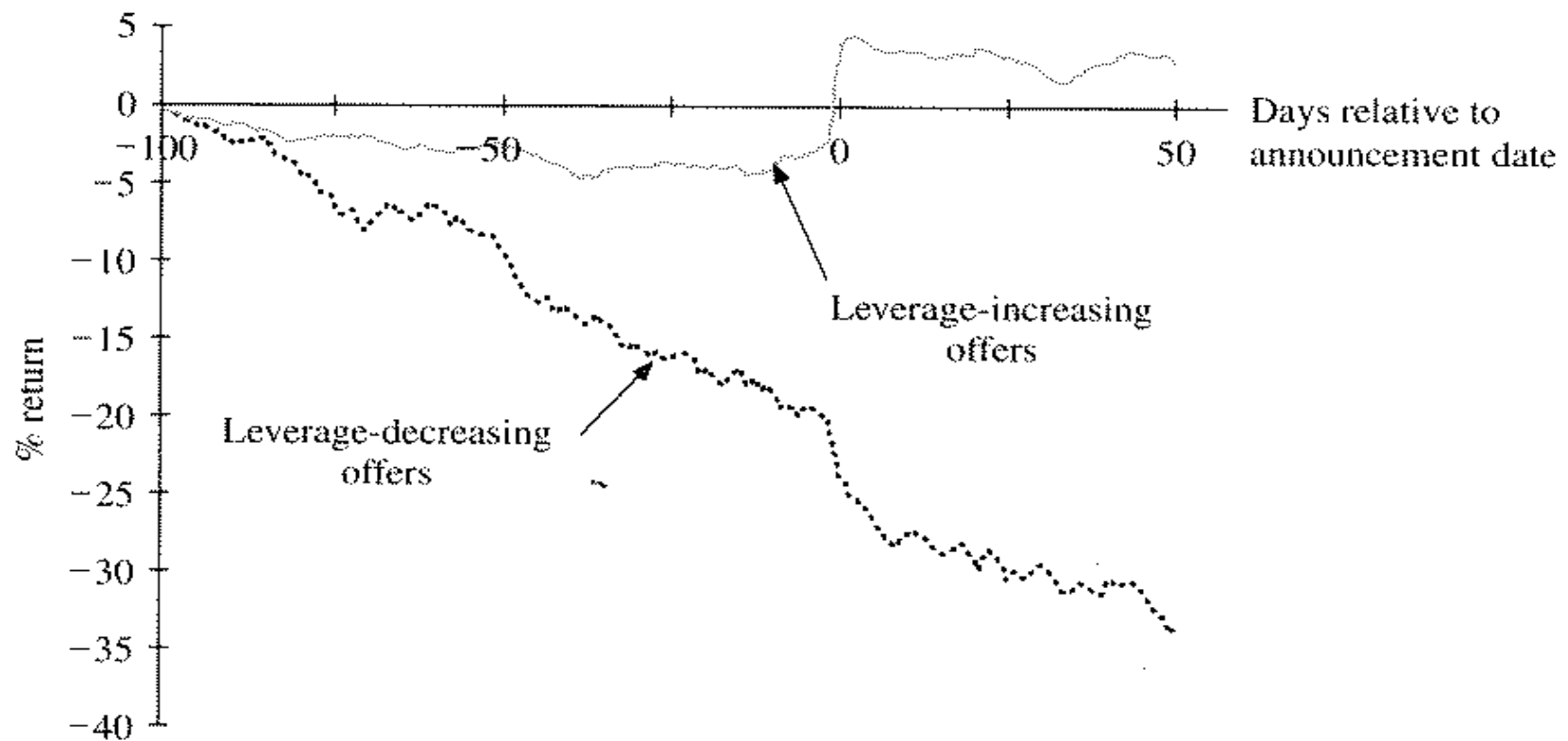
Equity Issue				
	Cash Flow	Interest	Cash Flow To Equity	Cash Flow To You
70% effort	\$ 530,000	\$0	\$ 530,000	\$265,000
100% effort	\$900,000	\$0	\$900,000	\$450,000



17.5 Signaling

- The firm's capital structure is optimized where the marginal subsidy to debt equals the marginal cost.
- Investors view debt as a signal of firm value.
 - Firms with low anticipated profits will take on a low level of debt.
 - Firms with high anticipated profits will take on a high level of debt.
- A manager that takes on more debt than is optimal in order to fool investors will pay the price in the long run.
 - Signaling costs could take the form of bankruptcy (financial distress) costs!

17.5 Signaling



Exchange offers change the debt–equity ratios of firms. The graph shows that stock prices increase for firms whose exchange offers increase leverage. Conversely, stock prices decrease for firms whose offers decrease leverage.

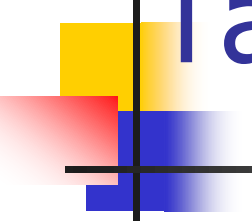
17.7 The Pecking Order Hypothesis (Myers 1984)

- Managers are better informed than investors. Investors might see external equity issuance as bad news about the company suggesting overvaluation of the stock, thus investors will react to this issuance negatively, increasing the issuance cost of external equity.
- Firms therefore prioritize their sources of financing according to the law of least effort, or of least resistance: prefer internal financing when available, and debt is preferred over equity if external financing is required. In addition, less risky security is preferred over higher risk security.
 - **The hierarchy of financing sources: internal funds > safe debt > risky debt > quasi-equity > equity!**

The Pecking Order Hypothesis (Myers 1984)

- Disagreement with the Tradeoff theory:
 - There is NO target D/E ratio.
 - Profitable firms use less debt.
 - Can rely on internal funding
 - Companies like financial slack/flexibility.
 - Help avoid seeking external capital
- Market Timing Consideration
 - A firm will issue a type of external capital when the associated capital market condition is favorable. For instance, it will issue stocks when the stock market is hot under which stocks are more likely overvalued.

17.8 Corporate and Personal Taxes (Miller, 1977)



- Added personal taxes to the M&M model to explain observed capital structures.
- Miller claimed that personal tax on interest income offset tax deductibility of interest at the corporation level.

Formula for calculating gains from leverage (Miller, 1977)

- T_C = tax rate on corporate profits;
- T_S = personal tax rate on investment income from stock;
- T_B = personal tax rate on investment income from debt;
 - $T_S < < < T_B$
- G_L = gains from using leverage;
- B = market value of a firm's outstanding debt



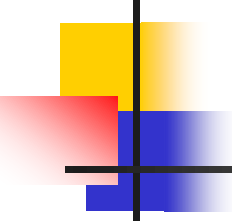
Personal Taxes

- Dividends face double taxation (firm and shareholder), which suggests a stockholder receives the net amount:
 - $(1-T_C) \times (1-T_S)$
- Interest payments are only taxed at the individual level since they are tax deductible by the corporation, so the bondholder receives:
 - $(1-T_B)$



Personal Taxes

- If $T_S = T_B$, then the firm should be financed primarily by debt (avoiding double taxation on equity income).
 - NO offset from personal taxation; $V_L = V_U + T_c * B > V_U$
- The firm is indifferent between debt and equity when: $(1 - T_C) \times (1 - T_S) = (1 - T_B)$
 - Perfect offset from personal taxation; $V_L = V_U$
- The firm should be primarily all-equity financed when: $(1 - T_C) \times (1 - T_S) > (1 - T_B)$
 - Excessive offset from personal taxation; $V_L < V_U$



Formula for calculating gains due to leverage (G_L)

- $\{1 - [(1-T_C)(1-T_S)]/(1-T_B)\} * B = G_L$
 - Note: $G_L > 0$ for the case of no offset
 $G_L = 0$ for the case of perfect offset
 $G_L < 0$ for the case of excessive offset
- $V_L = V_U + \{1 - [(1-T_C)(1-T_S)]/(1-T_B)\} * B$
- $V_L = V_U + G_L$

17.9 How Firms Establish Capital Structure



- Most corporations have low Debt-Asset ratios.
- Changes in financial leverage affect firm value.
 - Stock price increases with leverage and vice-versa; this is consistent with M&M with taxes (and the Free Cash Flow hypothesis).
 - Another interpretation is that firms signal good news when they lever up.
- There are differences in capital structure across industries.
- There is evidence that firms behave as if they had a target range of Debt-Equity ratio.

Factors in Target B/S (D/E) Ratio



Taxes

- Since interest is tax deductible, highly profitable firms should use more debt (i.e., greater tax benefit).
- Types of Assets
 - The costs of financial distress depend on the types of assets the firm has.
- Uncertainty of Operating Income
 - Even without debt, firms with uncertain operating income have a high probability of experiencing financial distress.
- Pecking Order and Financial Slack
 - Firms prefer issuing debt to issuing equity when internal financing is insufficient.



Capital Structure in Practice

- Survey of CFOs by Graham and Harvey (JFE 2001; **JACF 2002**)
- Tradeoff Theory of Capital Structure
 - Relevant Question – Do firms have target debt ratios? (ref: Figure 4)
- 10% no target debt ratio or range
- 34% flexible target
- 37% somewhat tight target or range
- 19% strict target debt ratio



Rebalancing Capital Structure after Equity Price Changes

- Large firms, investment grade firms, firms with low levels of managerial ownership and regulated firms are more likely to have a specific target debt ratio.
- Changes in the market value of a firm's common stock will change the debt ratio. Question from survey – do managers rebalance their capital structure after equity price changes to maintain a target debt ratio.
- Findings suggest that they do not. Transactions costs may be one reason for this lack of rebalancing.



Debt Policy Factors

- Approximately 45% of the responding CFOs indicated that the interest tax savings are an important or very important factor in capital structure decisions, especially for large, regulated and dividend-paying firms.
- Personal tax rates are not important in capital structure decision, responding CFOs indicated.
- Financial distress and bankruptcy costs are not an important consideration. But credit rating is a very important factor. CFOs quite concerned about earnings and cash flow volatility.
- Moderate support found for theory that firms trade off costs and benefits of using debt to find an optimal debt ratio.



Additional Findings of the Survey

- Manager desire for financial flexibility is the most important consideration in capital structure decisions.
- Managers are reluctant to issue common stock when they believe it is undervalued.
 - Consistent with Pecking Order theory.
- Firms issue new stock after stock price has increased. Most important in firms suffering from informational asymmetry.
 - Consistent with Pecking Order theory.
- Few managers indicate they use capital structure to signal their quality or future prospects.