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Financial Management

Capital Structure

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Capital Structure

This lecture will explore the determinants of the mix
of debt and equity the firm uses to finance its operations.

- We will first explore the situations under which capital
  structure is irrelevant to a firms operations.

Examining these situations will allow us to explore how the
following factors influence the mix of debt and equity a firm
uses to finance its operations.

- TAXES
- RISK
- FINANCIAL SLACK
- ASSET CHARACTERISTICS
- COSTS OF FINANCIAL DISTRESS.

The Capital Structure Question

MODIGLIANI – MILLER (MM):
IRRELEVANCE OF CAPITAL STRUCTURE

A. Firm Value and Capital Structure:

- Modigliani-Miller (MM) Proposition I: The value of the firm is independent of the capital structure of the firm UNDER certain assumptions.
  - 1st Arbitrage Proof in Finance:
  - Concept of Homemade Leverage.

Assumptions of MM:

COMPLETE AND PERFECT CAPITAL MARKETS

Capital Structure Does Not Matter IF:

- No Taxes - Assumption Relaxed.
- No Bankruptcy Costs
- No Costs of Enforcing Debt Contracts or issuing securities.
- Investment Opportunities are Given
- Homogeneous Expectations about the Investment Opportunities of Firms

MM Proposition II:

The cost of equity capital for a levered firm =

- The constant overall cost of capital + a risk premium.

$$r_e = r_a + (1 - t_c)(r_a - r_d)\frac{D}{E}$$

• Where the risk premium due to debt = the spread between the overall cost of capital and the cost of debt multiplied by the firm's debt equity ratio.

and: r_e = required rate of return for equity.

r_d = required rate of return for debt.

r_a (or ρ) = required rate of return of a company with

100% equity (the same as the asset required rate of return).

& t_C is the corporate tax rate.

The CAPM and MM Proposition II

- Both address equity risk & are actually equivalent. MM II has the advantage of showing directly how equity risk depends on capital structure.

How can we see this?

- Remember the following:

(1) $r_e = r_f + \beta_e(r_m - r_f)$ CAPM for equity

(2) $r_a = r_f + \beta_a(r_m - r_f)$ CAPM for firm with NO debt

(3) $\beta_e = \beta_a * (1 + D/E*(1-t))$ (equation to releverage Betas)

Substitute equation 3 into eq. 1 and then substitute eq. 2 into this new expression, rearrange and you will get the MM proposition II for a firm with RISKLESS debt.

Note equation 3 does not hold for risky debt. For a firm with risky debt, MM II is more useful than the equation to releverage a firm's Beta. All you need is observed YTM on risky debt.

MM Value of the Firm

The Value of the Firm (Leveraged/With Debt)

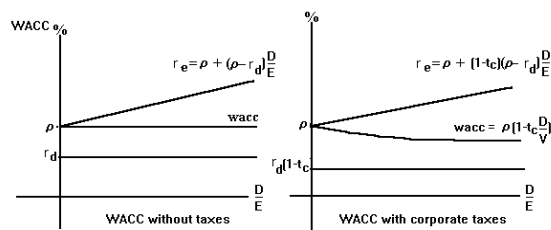= The value of the unlevered firm + the present value of the tax shield.

$$V_L = V_U + \quad tD$$

(Yearly tax shield = t_c*Interest rate*Debt/expected return)

==> Optimal Capital Structure: 100% financed with debt.

GRAPHICALLY:

Maximizing the value of the firm == Minimizing WACC

WACC %

$r_e = \rho + (\rho - r_d)\frac{D}{E}$

ρ wacc

r_d

$\frac{D}{E}$

WACC without taxes

%

$r_e = \rho + (1-t_c)(\rho - r_d)\frac{D}{E}$

ρ

$r_d(1-t_c$

wacc $= \rho(1-t_c\frac{D}{V})$

$\frac{D}{E}$

WACC with corporate taxes

Note I have written r_a as ρ (they are the same thing) in the above graph

More Taxes:

- The tax dis-advantage of debt to personal investors mitigates some of this advantage of debt.
- Miller (1977) Journal of Finance, pp. 261-275, shows that the gain to leverage, G_L can be expressed as:

$$G_L = \left[1 - \frac{(1-t_c)(1-t_{PS})}{1-t_{PB}}\right]D_L$$

- G_L = Gain to leverage,

- t_c = corporate tax rate,

- t_{PS} = personal tax rate on stock capital gains,

- t_{PB} = personal tax rate on interest income.

- D_L = Debt of leveraged firm.

Intuition: Corporations have to pay higher interest on debt

because individuals have a tax-disadvantage relative to capital gains.

Other Factors Influencing Debt:

(VIOLATING ASSUMPTIONS OF MM)

BANKRUPTCY COSTS:

- Including bankruptcy costs gives an interior optimum.

$$V_L = V_U + tD - B$$

- where B = PV OF THE COSTS OF FINANCIAL DISTRESS.

Do This: Try out your intuition. What would the previous graphs look like if you include bankruptcy costs?

- Including the cost of enforcing debt contracts also shifts the debt optimum to the left, with the shift affected by how the enforcement costs vary with the amount of the debt.

AGENCY COSTS

__(Investment Opportunities are not fixed.)__

• Managers may have incentives to decrease risk.

• Stockholders may have incentives to increase risk.

DIFFERENTIAL INFORMATION

• Investors have diff. information than management or insiders about the firm's prospects and investments

• Capital structure may tell or "signal" something about firm's prospects.

II. Practical Matters:

• PRACTICAL MATTERS

How much debt is right for your company?

• FACTORS TO CONSIDER.
   1. TAXES
   2. RISK
   3. FINANCIAL SLACK / ASSET TYPE
   4. COSTS OF FINANCIAL DISTRESS.

Factors to consider:

1. TAXES:

- Debt is Tax Deductible: Increase in Debt reduces the income tax paid IF the company is in a tax-paying position.

- However, the company has to MAKE money.

- OTHER potential tax shields do exist - such as accelerated write-offs of plant and equipment.

- Remember the equation presented earlier from Miller which shows that the tax advantage is less as corporations have to "gross up" the interest paid on bonds to compensate personal investors for a tax advantage.

2. RISK

- Two types of risk: Financial and Operating

A. FINANCIAL: Directly controlled by managers. This can be noted in the formula for unleveraging and levering Betas. The following example shows how the risk increases for the firm as it increases debt.

B. OPERATING OR ASSET RISK: Can be controlled by managers through their choice of scale or size of fixed assets.

2A.) FINANCIAL RISK:

A. The Impact of Financial Leverage
• EXAMPLE: A proposed change in financial

	Current	Proposed
Assets	$5,000,000	$5,000,000
Debt	$0	$2,500,000
Equity	$5,000,000	$2,500,000
Debt/Equity ratio	0	1
Share price*	$10	$10
Shares outstanding	500,000	250,000
Interest rate	na	10%

Scenario analysis :

• Current capital structure: No debt

	Recession	Expected	Expansion
EBIT	$300,000	$650,000	$1,000,000
Interest	0	0	0
Net income	$300,000	$650,000	$1,000,000
ROE	6%	13%	20%
EPS	$0.60	$1.30	$2.00

Proposed : D/E = 1; interest rate = 10%

	Recession	Expected	Expansion
EBIT	$300,000	$650,000	$1,000,000
Interest	250,000	250,000	250,000
Net income	$50,000	$400,000	$750,000
ROE	2%	16%	30%
EPS	$0.20	$1.60	$3.00

CONCLUSIONS
1. *The effect of financial leverage depends upon EBIT.*
2. *When EBIT are high, financial leverage raises EPS and ROE.*
3. *The variability of EPS and ROE is increased with financial leverage.*

Example using MM II

Part 1 (Use the previous numbers):
- Assume a company previous cash flows for ever: with 1/3 chance of each state.
- The company's discount rate is 13% with no debt.
- What is the value of the company?

Part 2:
- Assume the company issues debt that has a discount rate of 10%, that is worth 50% of the value of the company found in Part 1.
- What is the new discount rate for equity? (Hint Use MMII)
- What is the new value of equity? (Find expected cash flow to equity)
- What is the new TOTAL value of the company? Add D+E
- What is the WACC? Total value using WACC as discount rate?

Example continued

Part 3:

- How would the above answers to Part 2 change if the corporate tax rate was 34%? (Hint use MMII with taxes & figure out new discount rate. Combine to find new WACC if using total cash flows to the firm.
- An ALTERNATIVE method: Find new cashflows to equity and use equity discount rate..) Both methods give the same answer!!

Homemade Leverage

- Homemade leverage - investors can create or adjust leverage how they see fit.

Example: Homemade leverage

- Suppose the firm in the previous example does not change its

capital structure & the investor wants High Debt.

- An investor can replicate the returns of the proposed borrowing on personal account by making his or her own D/E ratio equal 1 for the investment.

- That is, suppose an investor buys a total of 100 shares,
- 50 shares with their own money and
- 50 shares by borrowing $500 at 10% interest.

	Recession	Expected	Expansion
EPS of unlevered firm	$0.60	$1.30	$2.00
Earnings for 100 shares	$60.00	$130.00	$200.00
Less interest on $500 at 10%	50.00	50.00	50.00
Net earnings	$10.00	$80.00	$150.00
Return on investment			
(net earnings/$500)	2%	16%	30%

•Individual investors can also "unleverage" the firm's borrowing by lending to the firm.

•Thus, investors can do or undo any pattern of financing for themselves

B.   Operating Risk:

- Degree of operating leverage (DOL) - The degree to which a percentage change in Q (quantity) affects operating cash flow.
- Percentage change in OCF = DOL x percentage change in Q
    - DOL = 1 + FC/OCF

- Selection of high risk projects: RISK may increase with debt ratio ==> "go for broke since you will get nothing otherwise"   (limited liability)

- A project can have a positive NPV for one group of claimants, while it is a negative NPV project in aggregate. Example: Hunt Brothers

3. FINANCIAL SLACK:

- Financial Slack can be defined as the amount of funds a firm has available to invest without visiting the external financial markets after paying interest and before paying dividends + Depreciation.

- The following factors influence whether firms should have more equity (financial slack) or more Debt in their capital structures.

    – Firms Track Record of Picking Good Investments.

    – The likelihood of good investments and opportunities arising (growth industry?)

Likelihood of + NPV Investments?

1. Firms Track Record: PROBLEM OF LEMONS

- Firms may be willing to take risks and negative NPV projects because they are investing "other peoples money".

2. Is Financing Available When Good Investments Arise?

- Small growing firms may have problems raising financing when they have positive NPV projects.
- The problem arises in convincing investors that their projects have merit out of a pool of potential investments.

3. Costs of Financial Slack

Too much free cash flow may result in uneconomic expansion

- Serious examples include the incentives of executives to build "empires". A possible example: ATT's takeover of NCR.

- McConnell and Muscarella, Journal of Financial Economics, 1985, OIL EXPLORATION.

- Debt can be a mechanism that "ties the manager's hands".

Example

The Tale of EQUITY vs. DEBT (EXAMPLE OF Increased Effort.)

  Consider Two individuals both working the corner grocer store.

  Neither has enough money to open and operate the store.

- They must finance the store by raising money.
- Kelly Nesbitt finances the store with EQUITY.
    - Sells 90% of the business to an investor for 90,000
- Tom Garvey finances his store with DEBT - keeps 100% of the ownership,
    - Finances 90% of the company with debt.
    - Gets 90,000 in DEBT.
- By JUNE it becomes apparent that both stores have made 90,000. The profit opportunity during the summer is 10,000. It is very tough work and it takes 2,500 to get owner to forego the beach. Who works, and who goes to the beach?

Solution:

- Tom knows that he will get all $10,000 of the PROFIT so he stays and works
- Kelly realizes that she will only get $1,000 of the $10,000 so GOES to the BEACH.

==>Debt can produce higher efficiency and less waste

(A reduction of Agency Costs.)

- We could repeat this example with the desire to buy jet planes or to buy other companies.
- For example: A fancy office costs $50,000 but adds only $25,000 TO corporate profits. Tom DOESN'T BUY.
- Kelly GETS $25,000 of benefits - only costs her $5,000
- of her money. Kelly installs the fancy office.

4. COSTS OF FINANCIAL DISTRESS

4.1 Types of bankruptcy costs: Direct costs and Indirect Costs.

A. DIRECT COSTS OF BANKRUPTCY:

LAWYERS AND ACCOUNTINGS:

- Cost of dividing up the pie - enforcement costs.
- Jerold Warner, Journal of Financial Economics, 1977 has shown these to be small for bankrupt railroads. Enron? World Com?

ON TAXES: Loss of PV of Tax Credits.

B. Indirect Costs of Bankruptcy:

On Sales and customers: Future Service and reliability.
- Large costs of switching suppliers
- Lost up-front relationship specific costs.

On Firm Opportunities: Higher Supplier Charges / trade credit
- Cutback in R&D, advertising.

On Operating Costs: Higher Labor Costs / Higher costs of investing in long term relationship.

On Flexibility: Debt restrictions and covenants.

Expected(Costs) = Prob. of bankruptcy * Cost of Bankruptcy

Maksimovic and Phillips (Journal of Finance, 1988) shows that indirect costs are related to economic distress not bankruptcy. This is true for firms that enter bankruptcy. Many avoid bankruptcy – restructure their debt quickly.

Forms of Increased Leverage:

High Yield Securities
- BOND RATINGS: MOODYS and S&Ps

Investment grade bonds: BONDS RATED Baa or greater by MOODYS or BBB by S&P's.

High Yield Bonds: Bonds rated lower than investment grade.
- Why do some borrowers have to pay a higher interest rate than others?
- Risk Premiums, Promised vs. Effective Yield
  - Promised Yield: Yield that is calculated assuming NO default risk.
  - Effective Yield: Yield that takes into account the bonds EXPECTED PAYMENT.

Exercise: Pricing the Risk of Default

EXAMPLE:
- risk free bonds have a 9% coupon, $1,000 par (face) value,
- 1 year till maturity.
- Assume that default is not correlated with systematic market risk. ==> β of the Bonds = 0.

Suppose the company has a 20% chance of default - bondholders receive NOTHING in the event of default. They receive full payment + interest otherwise.

What is the EFFECTIVE YIELD, What is the PROMISED YIELD?

SOLUTION

OUTCOME	PAYOFF	PROBABILITY
Full Payment	$1000	.8
No Payment	$0	.2

- Expected Value of the Payment = .8 ($1090) + .2 ($0) = $872

NOW note investors require only 9%:

because of the assumption of no correlation with systematic risk.
- PV of the NOTES = $872 / 1.09 = $800
- An investor who bought the notes would receive a promised yield of:
- PROMISED YIELD: 1090 / 800 - 1 = 36.3%
- EFFECTIVE YIELD: still 9%.

- PART 2: What if default were related to the market - default was more likely to occur in a recession. Therefore investors will require an additional RISK PREMIUM.

Suppose that the premium required is 2% . (From a Beta of .25)

- $R_d = R_{f+} \beta (E(r_m) - R_f)$, Assume the market risk premium is 8%.

==> $R_d = 9\% + .25(8\%) = 11\%$

- The notes will sell for WHAT PRICE?

- 872/ 1.11 = 785.59

- The notes will thus have a PROMISED yield of $1090 / 785.59 = 38.8\%$, & of an Effective Yield of ????.

Conclusions

Optimal Capital Structure involves "trading off" costs and benefits.

Advantages to Debt:
- Reduction of taxes through tax shield
- Reduces managerial discretion when firm has few positive investment opportunities.

Disadvantages of Debt:
- Bankruptcy costs may be significant and may affect operation of business.

Advantages of Equity:
- Increased managerial discretion when firm has more positive investment opportunities and outside investors have poor ability to choose good firms.