UNIVERSITY OF Southampton

# Corporate Finance

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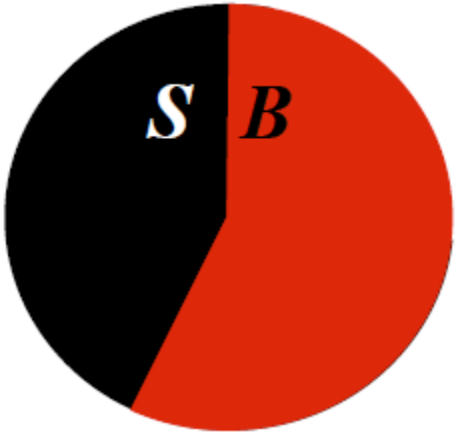
# The Capital Structure Decision

# Maximizing Firm value vs. Maximizing Shareholder Interests




If the goal of the firm's management is to make the firm as valuable as possible, then the firm should pick up the debt-equity ratio that makes the pie as big as possible.

Capital Structure decision deals with the right-hand side of the balance sheet (company's financing decisions).

Company can choose among many different capital structure possibilities (fixed-rate or floating-rate debt, off-balance-sheet debt, e,g, operating lease).

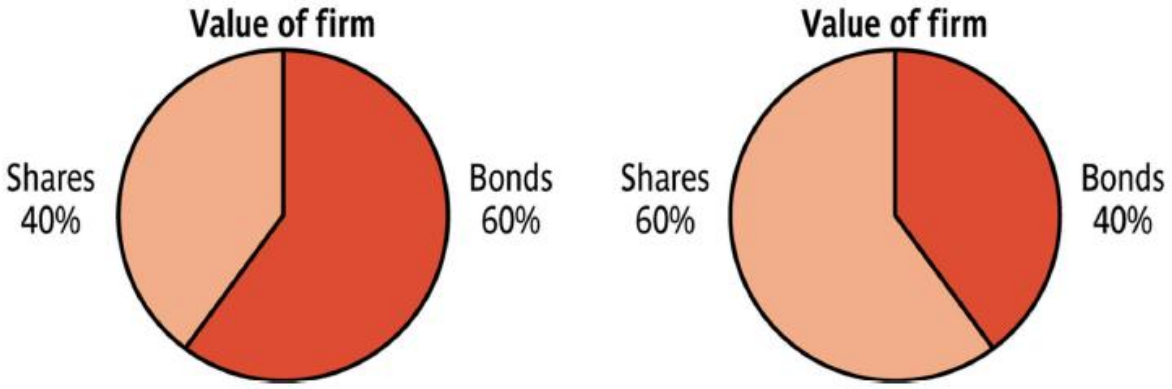
Most important decision: how much external capital is needed

Modigliani and Miller: The market value of any firm is independent of its capital structure (proposition 1).

If operating cash flows are constant and there are no taxes, a company's value is not affected by the amount of debt it carries (capital structure decision is irrelevant).

However, world with no taxes, financial distress costs, asymmetric information and other transaction costs.

# Capital Structure and the Pie




The value of a firm is defined to be the sum of the value of the firm's debt and the firm's equity.

$$V = B + S$$

Their key assumption is that investment and financing decisions and independent decisions.

In reality , when a company carries debt, it incurs interest charges that are tax deductible. As a result they pay less tax to the government.

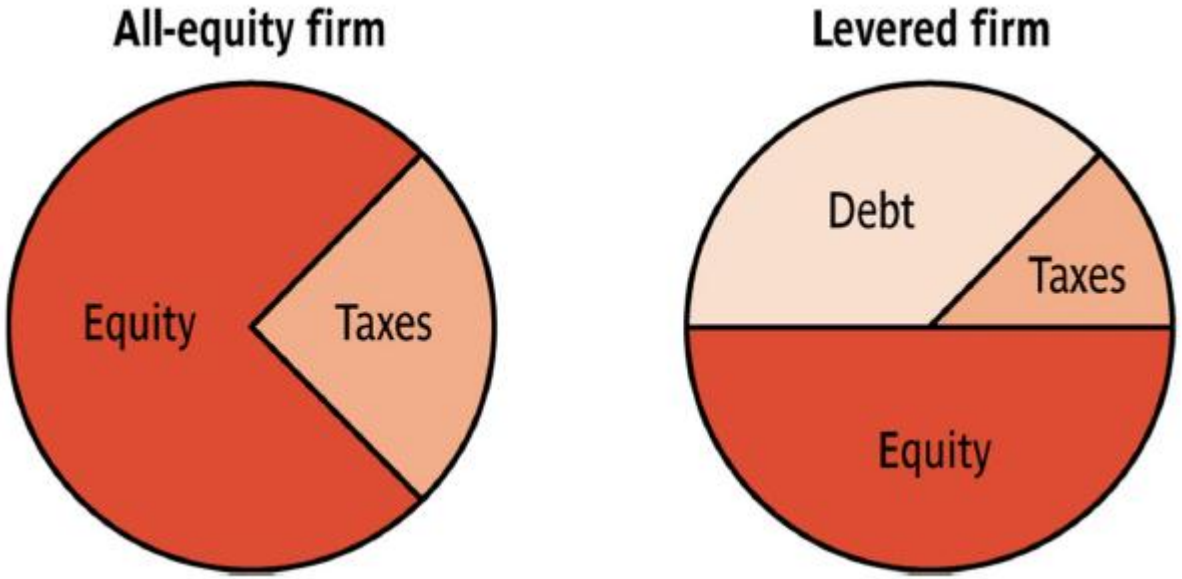
In a world with taxes, companies can be viewed as a partnership between shareholders and government.

Next graphs shows the value of an all-equity company and a leveraged company.

There are three claims on the company's profits: shareholders (stock), debtholders (for instance bonds) ,and government taxes.

Leverage can increase firm value because interest on debt is tax deductible (also called tax shields)

# Corporate Taxes



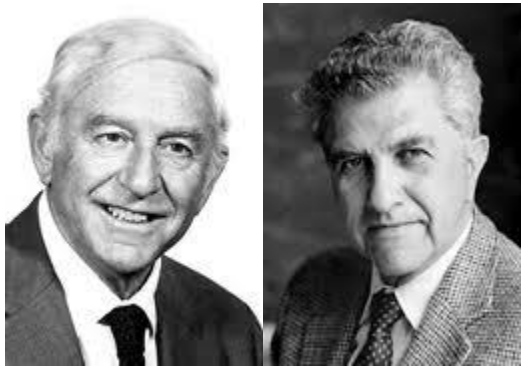

The levered firm pays less in taxes than does the all-equity firm.

Thus the sum of the debt plus the equity of the levered firm is greater than the equity of the unlevered firm

# Modigliani and Miller (MM) Proposition I (No Taxes)

The value of the levered firm is the same as the value of the unlevered firm

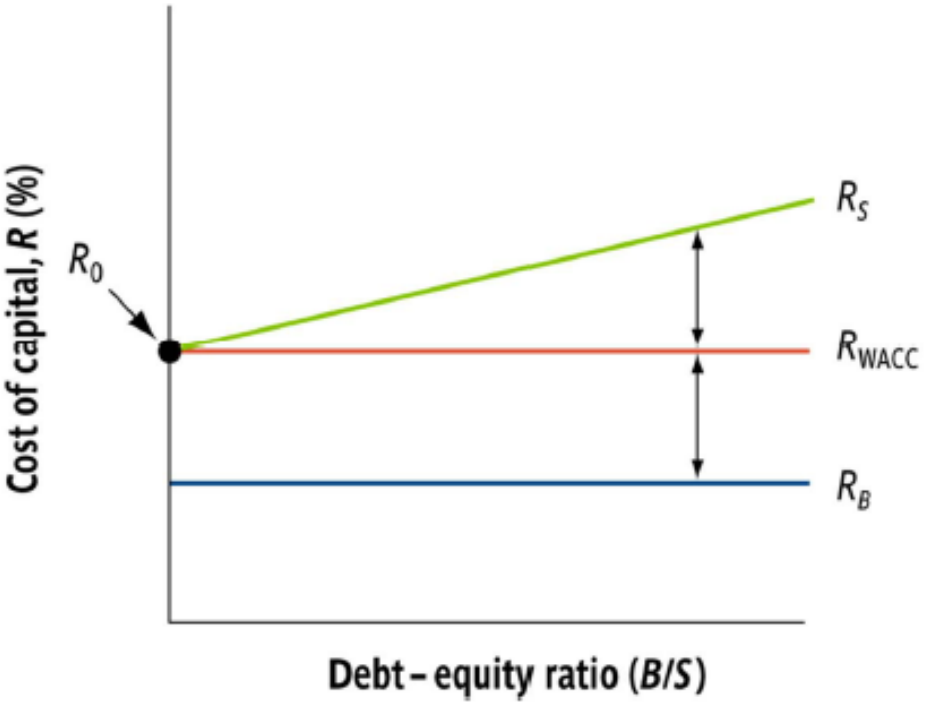
Because stockholders' welfare is directly related to the firm's value, the changes in capital structure cannot affect the stockholders' welfare



MM Proposition I: Key Assumptions

- Individuals can borrow as cheaply as corporations. Is this realistic?
- No taxes
- No transaction Costs

# MM Proposition I (No Taxes)




$$R_S = R_0 + (R_0 - R_B)B/S$$

$R_S$ is the cost of equity.
$R_B$ is the cost of debt.
$R_0$ is the cost of capital for an all-equity firm.
$R_{WACC}$ is a firm's weighted average cost of capital. In a world with no taxes, $R_{WACC}$ for a levered firm is equal to $R_0$.
$R_0$ is a single point whereas $R_S$, $R_B$ and $R_{WACC}$ are all entire lines.

The cost of equity capital, $R_S$, is positively related to the firm's debt–equity ratio. The firm's weighted average cost of capital, $R_{WACC}$, is invariant to the firm's debt–equity ratio.

# Valuing the Tax Savings from Debt

$$Interest = R_b \times B$$

$R_b$: Interest rate

$B$: Amount Borrowed

## Reduction in Corporate Taxes

$$t_C \times R_b \times B$$

$t_C$: Corporate tax rate

$R_b \times B$: Interest Paid

## Assuming Cash Flows are Perpetual, Present Value of Tax Shields

$$\frac{t_C R_b B}{R_b} = t_C B$$

# MM Proposition I with Corporate Taxes

The value of an unlevered firm

$$V_U = \frac{EBIT \times (1 - t_C)}{R_0}$$

## MM Proposition I with Corporate Taxes

$$V_L = \frac{EBIT \times (1 - t_C)}{R_0} + \frac{t_C R_B B}{R_B} = V_U + t_C B$$

# Taxes and Cash Flow

## Example

ABC Company has a corporate tax rate, $\tau_C$, of 35% and expected earnings before interest and taxes (EBIT) of £1 million each year. Its entire earnings after taxes are paid out as dividends

The firm is considering two alternative capital structures.

Under Plan I, ABC would have no debt in its capital structure
Under Plan II, the company would have £4 million of debt, B. The cost of debt, $R_B$ is 10%.

What is the total cash flow to shareholders and bondholders under each scenario?

# Taxes and Cash Flow

## Example

| | Plan I (€) | Plan II (€) |
|---|---|---|
| Earnings before interest and corporate taxes (EBIT) | 1,000,000 | 1,000,000 |
| Interest ($R_B B$) | 0 | 400,000 |
| Earnings before taxes (EBT) = (EBIT – $R_B B$) | 1,000,000 | 600,000 |
| Taxes ($t_C = 0.35$) | 350,000 | 210,000 |
| Earnings after corporate taxes (EAT) = [(EBIT – $R_B B$) × (1 – $t_C$)] | 650,000 | 390,000 |
| Total cash flow to both shareholders and bondholders [EBIT × (1 – $t_C$) + $t_C R_B B$] | 650,000 | 790,000 |

## How can a company change its capital structure relatively quickly?

Leveraged recapitalization: debt-financed share buyback program

This implies an increase in debt and a reduction in equity. As a result of the debt increase, the tax shield is higher and so is the firm value.

Example

A company has a 25% tax rate and 200 shares outstanding that are valued at $25 each.
The total market of equity is $5,000. Originally company has no debt: thus the value of the company is $5,000 as well.
Company announces an issue of $2,000 in debt that will be used to buy back shares.
Assuming the $2,000 debt funding is permanent, the present value of interest tax shield is $500 ($2{,}000 \times 25\%\ tax\ rate$)
Thus the market value of the company is equal to $5,500

After the buyback program is announced, the share price exceeds the prior share price by the per share amount of the PVTS.
Therefore, the share price goes up to $27.50.

At that price, the $2,000 of debt will allow the repurchase of 72.72 shares.

| | Before: 100% equity financed | After buyback announcement, but before actual buyback | After buyback |
|---|---|---|---|
| Number of shares | 200 | 200 | 127.2727 |
| Price per share | $25 | $27.50 | $27.50 |
| Market Value of Equity | $5,000 | $5,500 | $3,500 |
| Debt | $0 | $0 | $2,000 |
| Value of Company | $5,000 | $5,500 | $5,500 |
| Debt/market value of equity | 0 | 0 | 57% |

## Additional benefits of debt

Reduces the agency costs of free cash flows (free cash flow hypothesis, Michael Jensen)

Forces managers to further optimize the company's resources, committing them to operate more efficiently

Indeed, this benefit of debt underlies the majority of leveraged buyouts (LBOs) used in private equity sector.

By leveraging the company shareholders obtain two benefits:

- Their own equity investment is reduced
- There are strong incentives for managers to perform well and deliver on the debt's scheduled payments

## How much to borrow?

There are however costs associated with debt that will explore next

## Cost of debt goes up with leverage

Cost of debt is not constant (as assumed in Modigliani and Miller proposition 1).

$$r_{debt} = r_f + spread$$

Key ratios for global companies

| | Operating Margin | EBIT/Interest Expense | Debt/EBITDA | Debt/Equity (%) |
|---|---|---|---|---|
| Aaa | 20.3 | 21.6 | 1.0 | 24.7 |
| Aa | 13.1 | 9.6 | 1.7 | 35.4 |
| A | 11.2 | 6.9 | 2.2 | 43.5 |
| Baa | 10.9 | 4.2 | 2.9 | 47.0 |
| Ba | 11.1 | 3.0 | 3.3 | 51.1 |
| B | 8.0 | 1.4 | 5.1 | 72.3 |
| C | 2.7 | 0.4 | 7.6 | 98.1 |

# Credit Spreads for different ratings

| Investment Grade | |
|---|---|
| AAA | 0.21% |
| AA | 0.34% |
| A+ | 0.48% |
| A | 0.56% |
| A- | 0.88% |
| BBB+ | 0.94% |
| BBB | 1.13% |
| BBB- | 1.70% |

| Junk Bonds | |
|---|---|
| BB+ | 2.18% |
| BB | 2.41% |
| BB- | 2.64% |
| B+ | 3.14% |
| B | 3.41% |
| B- | 4.08% |

Bloomberg, January, 2014

## Cost of equity goes up with leverage

Under normal conditions, equity holders of leveraged companies have higher expected returns than holders of unleveraged companies, however , they also incur in higher risks

Debt and Risk (three scenarios)

Current Capital Structure
NO DEBT

| | Current |
|---|---|
| Assets | €8,000 |
| Debt | €0 |
| Equity (market and book) | €8,000 |
| Interest rate | 10% |
| Market value/share | €20 |
| Shares outstanding | 400 |

| | Recession | Expected | Expansion |
|---|---|---|---|
| Return on assets (ROA) | 5% | 15% | 25% |
| Earnings | €400 | €1,200 | €2,000 |
| Return on equity (ROE) = Earnings/Equity | 5% | 15% | 25% |
| Earnings per share (EPS) | €1.00 | €3.00 | €5.00 |

No debt: ROA equals ROE in all scenarios

Proposed Capital Structure
Debt = 4,000

| | Proposed |
|---|---|
| Assets | €8,000 |
| Debt | €4,000 |
| Equity (market and book) | €4,000 |
| Interest rate | 10% |
| Market value/share | €20 |
| Shares outstanding | 200 |

| | Recession | Expected | Expansion |
|---|---|---|---|
| Return on assets (ROA) | 5% | 15% | 25% |
| Earnings before interest (EBI) | €400 | €1,200 | €2,000 |
| Interest | −400 | −400 | −400 |
| Earnings after interest | €0 | €800 | €1,600 |
| Return on equity (ROE) | | | |
| = Earnings after interest/Equity | 0 | 20% | 40% |
| Earnings per share (EPS) | 0 | €4.00 | €8.00 |

Leveraged shareholders have better returns in good times and worse returns in bad times.

Leveraged company is riskier for its equity holders.
The cost of equity of a leverage company must be higher than that of an unleveraged company

## Proposition II

Leverage increases the risk and return to stockholders

$$R_S = R_0 + (B/S_L) \times (R_0 - R_B)$$

$R_S$ is the return on (levered) equity (cost of equity)
$R_0$ is the return on (unlevered) equity (cost of capital)
$B$ is the value of debt
$S_L$ is the value of levered equity
$R_B$ is the interest rate (cost of debt)

Because levered equity has greater risk, it should have a greater expected return as compensation.

# MM Propositions with Taxes

## Summary

### Assumptions

- Corporations are taxed at the rate $t_C$, on earnings after interest
- No transaction costs
- Individuals and corporations borrow at same rate

### Proposition I

- $V_L = V_U + t_C B$ (for a firm with perpetual debt)

- Because corporations can deduct interest payments, corporate leverage lowers tax payments

# MM Propositions with Taxes

## Summary (Cont.)

### Proposition II

$$R_S = R_0 + \frac{B}{S}(1 - t_C)(R_0 - R_B)$$

- The cost of equity rises with leverage because the risk to equity rises with leverage
- Value is positively related to leverage.

# Review: Modigliani and Miller (MM) Proposition I Assumptions

Individuals and corporations borrow at same rate

No tax (for MM Proposition without tax)

No transaction costs

No costs of financial distress

# Description of Financial Distress Costs

## Direct Costs

Legal and Administrative Costs

## Indirect Costs

Impaired ability to conduct business (e.g., lost sales)

## Agency costs

Incentive to take large risks
Incentive toward underinvestment
Milking the property

# Can costs of debt be reduced?

## Protective covenants

Incorporated as part of the loan document (or indenture) between stockholders and bondholders

A negative covenant limits or prohibits actions that the company may take

A positive covenant specifies an action that the company agrees to take or a condition the company must bear by

## Debt consolidation

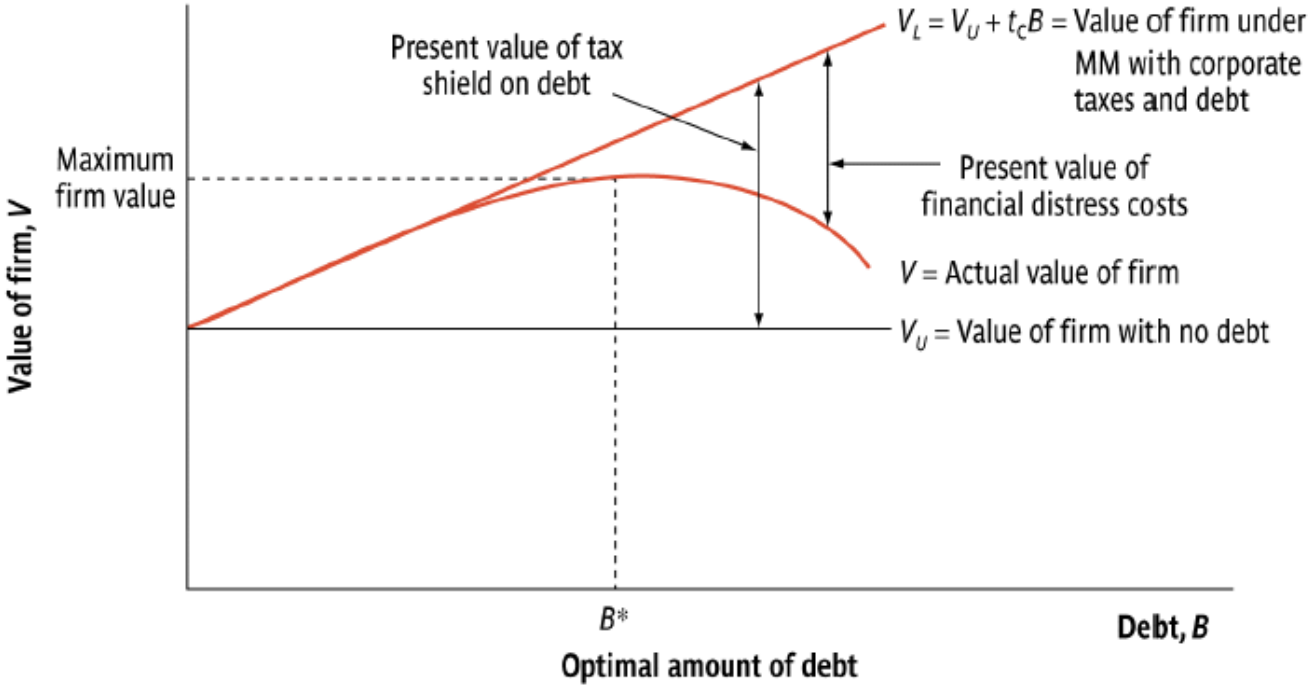
If we minimize the number of parties, contracting costs fall.

# Protective covenants Example

| Positive | Negative |
| --- | --- |
| Maintain working capital at a minimum level | Limitations on the amount of dividends a company may pay |
| Provide periodic financial statements to the lender | Cannot pledge any of its assets to other lenders |
| | Cannot merge with another firm |
| | Cannot sell or lease major assets without approval by the lender |
| | Cannot issue additional long-term debt |

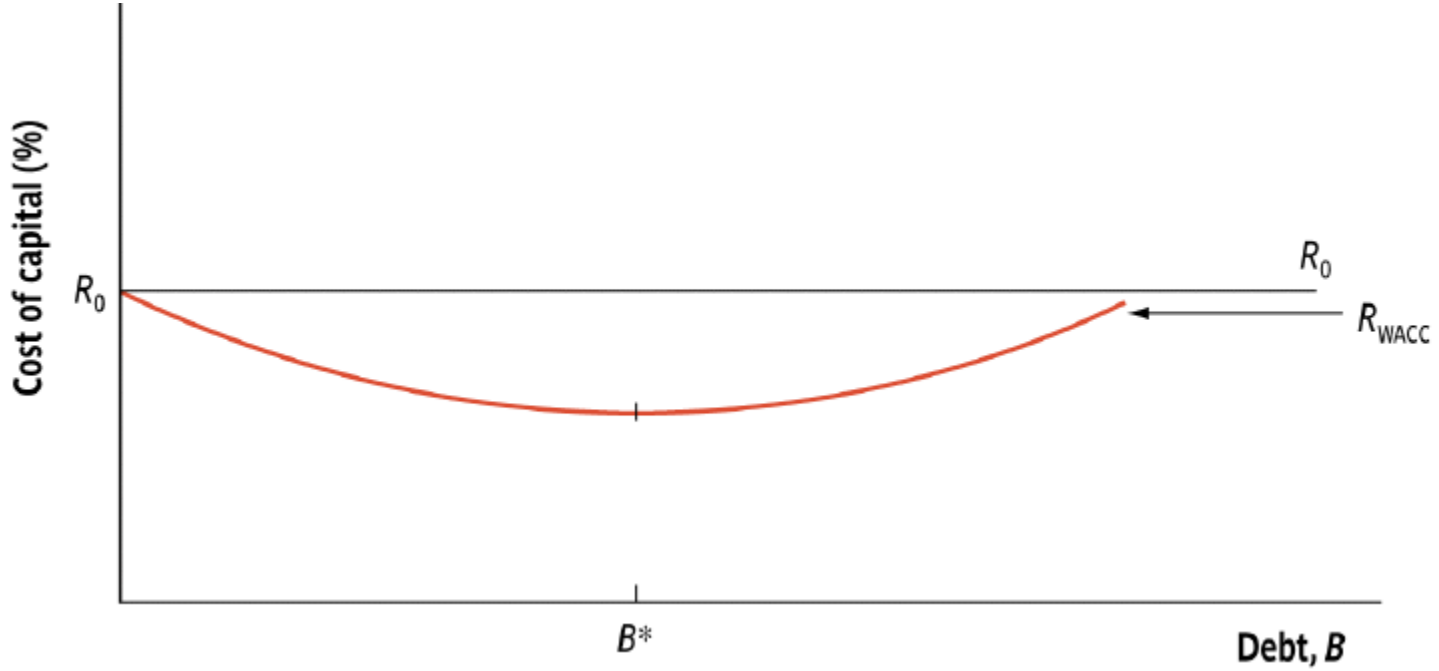
# Tax effects and Financial Distress

There is a trade-off between the tax advantage of debt and the costs of financial distress




The tax shield increases the value of the levered firm.
Financial distress costs lower the value of the levered firm
Two offsetting factors produce an optimal amount of dent at $B^*$

# Integration of Tax Effects and Financial Distress Costs

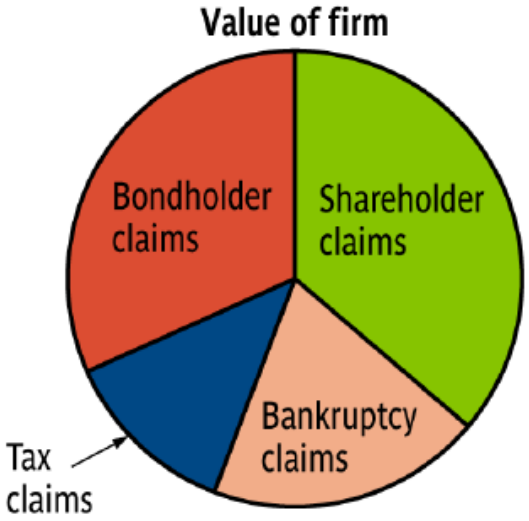


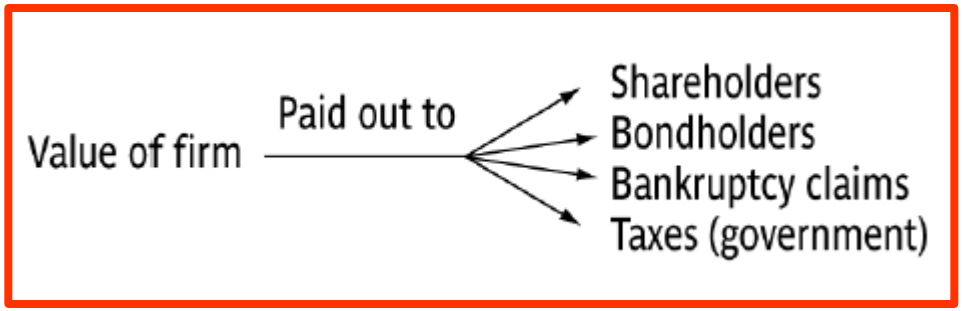

$R_{WACC}$ falls initially because of the tax advantage of debt

Beyond point $B^*$ , it begins to rise because of financial distress costs

Bankruptcy costs increase faster than the tax shield beyond $B^*$, implying a reduction in firm value further leverage.

# The Pie Model Revisited




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

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

# Signalling

The firm's capital structure is optimized where the marginal subsidy to debt equals the marginal cost.

Investor's 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 cost in the long run.

# The Pecking-Order Theory

The theory provides the following two rules for the real world

Rule 1
Use internal financing first

Rule 2
Issue debt next, new equity last

The Pecking-order theory is at odds the trade-off theory:

- There is no target D/E ratio
- Profitable firms use less debt
- Companies like financial slack

# How Firms establish Capital Structure

Most non-financial corporations have low debt-asset ratios

There are differences in capital structure across industries

A number of firms use no debt

Most corporations employ target debt-equity ratios

# Factors in Target 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

# What managers consider important in deciding on how much debt to carry...

A survey of Chief Financial Officers of large U.S. companies provided the following ranking (from most important to least important) for the factors that they considered important in the financing decisions

| Factor | Ranking (0-5) |
|---|---|
| Maintain financial flexibility | 4.55 |
| Ensure long-term survival | 4.55 |
| Maintain Predictable Source of Funds | 4.05 |
| Maximize Stock Price | 3.99 |
| Maintain financial independence | 3.88 |
| Maintain high debt rating | 3.56 |
| Maintain comparability with peer group | 2.47 |

# Preference rankings long-term finance: Results of a Survey

| Ranking | Source | Score |
|---|---|---|
| 1 | Retained Earnings | 5.61 |
| 2 | Straight Debt | 4.88 |
| 3 | Convertible Debt | 3.02 |
| 4 | External Common Equity | 2.42 |
| 5 | Straight Preferred Stock | 2.22 |
| 6 | Convertible Preferred | 1.72 |

# Levered and Unlevered Beta

In a perfect world… we would estimate the beta of a firm by doing the following:

1) Start with the beta of the business that the firm is in

2) Adjust the business beta for the operating leverage of the firm to arrive at the unlevered beta for the firm.

3) Use the financial leverage of the firm to estimate the equity beta for the firm

$$Levered\ Beta = Unlevered\ Beta\left(1 + (1 - tax\ rate)(Debt/Equity)\right)$$

Within any business:

Firms with lower fixed costs (as a percentage of total costs) should have lower unlevered betas.

If you can compute: fixed and variable costs for each firm in a sector, you can break down the unlevered beta into business and operating leverage components.

$$Unlevered\ Beta = Pure\ Business\ Beta \times \left(1 + (Fixed\ Costs/Variable\ Costs)\right)$$

The biggest problem with doing this is informational.
It is difficult to get information on fixed and variable costs for individual firms.

In practice, we tend to assume that the operating leverage of firms within a business are similar and use the same unlevered beta for every firm.

# Adjusting for financial leverage

## Conventional approach

If we assume that debt carries no market risk (has a beta of zero), the beta of equity alone can be written as a function of the unlevered beta and the debt-equity ratio

$$\beta_U = \frac{\beta_L}{\left[1 + (1 - \tau_C) \times \frac{D}{E}\right]}$$

Where:

$\beta_L$ is the firm's beta with leverage.

$\beta_U$ is the firm's beta without leverage

$\tau_C$ is the corporate tax rate.

$D/E$ is the company's debt/equity ratio.

Metric that compares the risk of an unlevered company to the risk of the market.

The unlevered beta is the beta of a company without any debt.

*Unlevering* a beta removes the financial effects from leverage.

The formula to calculate a company's unlevered beta is:

## Debt Adjusted Approach

If beta carries market risk and you can estimate the beta of debt, you can estimate the levered beta as follows:

$$\beta_L = \beta_U(1 + (1 - \tau_C)\, D/E) - \beta_{Debt}(1 - \tau_C)(D/E)$$

While the latter is more realistic, estimating betas for debt can be difficult to do.

# Evidence on Capital Structure

More profitable firms tend to use less leverage

High-growth firms borrow less than mature firms do

Stock market generally views leverage-increasing events positively

Tax deductibility of interest gives firms an incentive to use debt

# Recommended Reading

Debt and Taxes: Evidence from Bank-financed Small and Medium-sized Firms
http://ssrn.com/abstract=672104 or http://dx.doi.org/10.2139/ssrn.672104

Financing of SME's: And Asset Side Story
http://ssrn.com/abstract=1098347 or http://dx.doi.org/10.2139/ssrn.1098347

Taxes and Corporate Debt Policy: Evidence for Unlisted Firms of Sixteen European Countries
http://ssrn.com/abstract=1098370 or http://dx.doi.org/10.2139/ssrn.1098370

# The Weighted Average Cost of Capital

- The weighted average cost of capital (WACC or $k_0$) is the benchmark required rate of return used by a firm to evaluate its investment opportunities
  - The discount rate used to evaluate projects of similar risk to the firm

- It takes into account how a firm finances its investments
  - How much debt versus equity does the firm employ?

- The WACC depends on…
  - Qualitative factors
  - The market values of the alternative sources of funds
  - The market costs associated with these sources of funds

# Estimating the WACC

- The main steps involved in the estimation of the WACC are…
  - Identify the financing components
  - Estimate the current (or market) values of the financing components
  - Estimate the cost of each financing component
  - Estimate the WACC

- We will consider each step for typical financing components

# Identify the Financing Components

- Debt
  - Identify all externally supplied debt items
  - Do not include creditors and accruals as these costs are already included in net cash flows
- Ordinary shares
  - Obtain number of issued shares from the balance sheet
  - Do not include reserves and retained earnings
- Preference shares
  - Obtain number of issued shares from the balance sheet

# Valuing the Financing Components

- Use market values and not book values
- Value coupon paying debt using the following pricing relation (see Lecture 3)

$$P_0 = \frac{C_1}{(1+k_d)} + \frac{C_2}{(1+k_d)^2} + \ldots + \frac{C_n}{(1+k_d)^n} + \frac{F_n}{(1+k_d)^n}$$

$$P_0 = \sum_{t=1}^{n} \frac{C_t}{(1+k_d)^t} + \frac{F_n}{(1+k_d)^n}$$

where $P_0$ = Market price of the debt security

$C_t$ = Periodic interest payment on debt in period $t$

$k_d$ = Required rate of return on debt

# Valuing Long Term Debt

Example: BLD Ltd has 10,000 bonds outstanding and each bond has a face value of $1,000 with two years remaining to maturity. The bonds pay coupons (or interest) at a rate of 10% p.a. every six months. If the market interest rate appropriate for the bond is 15% p.a., what is the current price of each bond? What is the total market value of debt in BLD Ltd's capital structure?

# Valuing Long Term Debt

- Coupon (or interest) payments are made every six months
- Number of payments, n = 4, semi-annual payments
- Annual interest payments = 0.10(1000) = $100.00
  - So, semi-annual interest payments = $50.00
- Repayment of principal at the end of year 2 = $1000.00
- Required return on debt, $k_d$ = 15% p.a.
- So, semi-annual required return on debt, $k_d$ = 7.5%

# Valuing Long Term Debt

The price of the bond is…

$$P_0 = \frac{50}{(1.075)^1} + \frac{50}{(1.075)^2} + \frac{50}{(1.075)^3} + \frac{1050}{(1.075)^4}$$

$P_0$ = \$916.27

- So, total value of debt = 10000(916.27) = \$9,162,700

- Note: As the coupon rate is lower than the market rate, the price is less than the face value, that is, the bond is selling at a discount to face value
  - If the coupon rate is greater than the market rate, the price would be at a premium to face value

# Valuing Ordinary Shares

- Example: ABC Ltd has 300,000 shares on issue which each have a par value of $1.00. If the shares are currently trading at $3.50 each what is the total market value of ABC's ordinary shares?

- There are 300,000 shares on issue with a market value of $3.50 per share

- Market value of equity = 300000 × 3.50 = $1,050,000
    - The par (or book) value of shares is not relevant here

# Valuing Preference Shares

- Preference shares pay a fixed dividend at regular intervals
- If the shares are non-redeemable, then the cash flows represent a perpetuity and the market value can be computed as…

- $P_0 = D_p/k_p$

Where

$P_0$ = The current market price
$D_p$ = Value of the periodic dividend
$k_p$ = Required return on preference shares

# Valuing Preference Shares

• Example: Assume the preference shares of XYZ Ltd pay a dividend of $0.40 p.a. and the cost of preference shares is 10% p.a. What is the price of the preference shares? If XYZ Ltd has 500,000 preference shares outstanding, what is the market value of these shares?

•The cash flows from the preference shares are…

- $D_p$ = $0.40 per share
- So, $P_0$ = 0.40/0.10 = $4.00
- Market value of shares = 500000 × 4.00 = $2,000,000

# Estimating the Costs of Capital

- The costs of a firm's financing instruments can be obtained as follows…
  - Use observable market rates - may need to be estimated
  - Use effective annual rates
  - For the cost of debt use the market yield

- Focus here is on the costs of debt, ordinary shares and preference shares
  - Note: We ignore the complications of flotation costs and franking credits associated with dividends (sections 15.5.3 and 15.5.5 of the text)

# Cost of Debt

- Example: The bonds of ABD Ltd have a face value of $1,000 with one year remaining to maturity. The bonds pay coupons at the rate of 10 percent p.a. If the current market price of the bonds is $1,018.50, what is the firm's cost of debt?

- The annual interest (coupon) paid on the debt is…
  - 1000 × 0.10 = $100

- So, 1018.50 = (1000 + 100)/(1 + kd)
- $k_d$ = (1100/1018.50) – 1 = 8.0%

# Cost of Ordinary Shares

It is common to use CAPM to estimate the cost of equity capital, where the cost of equity is…

$$k_e = r_f + [E(r_m) - r_f]\beta_e$$

where $E(r_m) - r_f$ = Expected market risk premium

$r_f$ = Risk free rate

$\beta_e$ = Equity beta

- Note that the equity beta is the estimate of the firm's relative "risk" compared to movements in the market portfolio
  - The market risk premium is typically estimated using historical market data
  - The riskfree rate is typically based on the long term government bond rate

# Cost of Ordinary Shares

Example: Assume that the risk free rate is 6 percent, the expected market risk premium is 8 percent and the equity beta of XYW Ltd's equity is 1.2. What is the firm's cost of equity capital?

Using the CAPM, we have…

- $k_e = r_f + [E(r_m) - r_f]\beta_e$
- $k_e = 0.06 + 0.08 \times 1.2 = 15.6\%$

Note: Can also use the dividend discount models covered in Lecture 4 (but not commonly used by managers…)

- $P_0 = D_1/(k_e - g)$
- So, $k_e = D_1/P_0 + g$

# Cost of Preference Shares

- Recall that, $P_0 = D_p/k_p$

- Thus, $k_p = D_p/P_0$

- Example: The preference shares of DBB Ltd pay a dividend of $0.50 p.a. If the preference shares are currently selling for $4.00 per share, what is the cost of these shares to the firm?

- The cost of preference shares is given as…

$$k_p = D_p/P_0$$

So, $k_p = 0.50/4.00 = 12.5\%$

# Weighted Average Cost of Capital

The weighted average cost of capital (ko) uses the cost of each component of the firm's capital structure and weights these according to their relative market values

Assuming that only debt and equity are used, we have…

$$k_o = k_d(D/V) + k_e(E/V)$$

where $k_d$ = Cost of debt

$k_e$ = Cost of equity

$D$ = Market value of debt

$E$ = Market value of equity

$V = D + E$

# Weighted Average Cost of Capital

Assuming that preference shares are used as well as debt and equity…

$$k_o = k_d(D/V) + k_e(E/V) + k_p(P/V)$$

where $P$ = Market value of preference shares

$k_p$ = Cost of preference shares

$V = D + E + P$

- Be careful of rounding errors in initial calculations
- Be careful to work in consistent terms
  - Calculations in percentages versus decimals
- Check your answers with some common sense logic…

❖ $k_e > k_p > k_d > k_d(1 - t_c)$ (Why?)

# Taxes and the WACC

- Under the classical tax system…
  - Interest on debt is tax deductible
  - Dividends have no tax effect for the firm

- The after-tax cost of debt, $k'_d = (1 - t_c)\, k_d$
  where $t_c$ *corporate tax rate*

- The cost of equity (*ke) is unaffected*

- The after-tax WACC is defined as…

$$k_o = k_d(1 - t_c)(D/V) + k_e(E/V) \qquad and$$
$$k_o = k_d(1 - t_c)(D/V) + k_e(E/V) + k_p(P/V)$$

# Calculating and Using the WACC

Example: You are given the following information for BCA Ltd. Note that book values are obtained from the firm's balance sheet while market values are based on market data.

The firm's marginal tax rate is 30%. Estimate the firm's before-tax and after-tax weighted average costs of capital

| | Book values | Market values | Market costs |
|---|---|---|---|
| Bonds | $30,000,000 | $50,000,000 | 8.0% |
| Preference shares | $10,000,000 | $20,000,000 | 10.0% |
| Ordinary shares | $60,000,000 | $80,000,000 | 14.0% |
| Total | $100,000,000 | $150,000,000 | |

# Calculating and Using the WACC

- Before-tax weighted average cost of capital
  - WACC weights are based on market values so book values are not relevant

$$k_o = k_d(D/V) + k_e(E/V) + k_p(P/V)$$
$$V = D + E + P$$

| | Market values | Weights | Market costs | Weights×Costs |
|---|---|---|---|---|
| Bonds | $50,000,000 | 0.333 | 8.0% | 2.67% |
| Preference shares | $20,000,000 | 0.133 | 10.0% | 1.33% |
| Ordinary shares | $80,000,000 | 0.533 | 14.0% | 7.47% |
| Total | $150,000,000 | 1.000 | | 11.47% |

Note: Weight in bonds, D/V = 50/150 = 0.333, and so on

- Before-tax cost of capital = 11.47%

# Calculating and Using the WACC

The after-tax cost of capital requires the after tax **cost of debt**

$$k'_d = k_d(1 - t_c)$$
$$k'_d = 0.08(1 - 0.30) = 5.6\%$$

| | Market values | Weights | After tax market costs | Weights×Costs |
|---|---|---|---|---|
| Bonds | $50,000,000 | 0.333 | 5.6% | 1.87% |
| Preference shares | $20,000,000 | 0.133 | 10.0% | 1.33% |
| Ordinary shares | $80,000,000 | 0.533 | 14.0% | 7.47% |
| Total | $150,000,000 | 1.000 | | 10.67% |

- Note: Weight in bonds, D/V = 50/150 = 0.333, and so on
  - After-tax cost of capital = 10.67%