# Capital Structure

# Sources of Financing: "Capital Structure"

- One of the key questions of corporate finance is Financing:
  - How should a firm finance its operations?
  - How should we finance the investment projects we choose to undertake?
    - Is a firm's value dependent on its financing?
    - If so, how?
- Definition: How a firm's operations are financed is referred to as its **capital structure.**
- **Capital structure decision**: Describing a firm's capital structure is finding the right financing mix between the financing choices: Equity vs. Debt.

- **Objective: Maximize the Value of the Firm**

# Equity financing

- Private firm: founders and others contribute money
- Publicly-traded firm: shareholders contribute money in the initial public offering (IPO). Subsequently, more funds can be raised in a seasoned equity offering.
- Retained earnings: shareholders money gets "plowed back in."

# Debt financing

- Bank loans
- Corporate bonds

# What do we mean by optimal capital structure?

- A firm's capital structure is given by its debt to equity ratio.

- **Choosing an optimal capital structure**:

  Is there an "optimal" capital structure, i.e., an optimal mix between debt and equity?

- *The optimal capital structure that **maximizes the value of the firm** is also the one that **minimizes the cost of capital**.*

- Find the debt/equity ratio, D/E, that maximizes Value of the firm.

$$Value = \sum_{i=1}^{t} \frac{Cashflow_i}{(1+r)^i}$$

# Why is Capital Structure Important?

1. Leverage: Higher financial leverage means higher returns to stockholders, but higher risk due to interest payments.

2. Cost of Capital: Each source of financing has a different cost. Capital structure affects the cost of capital.

3. The Optimal Capital Structure is the one that minimizes the firm's cost of capital and maximizes firm value.

# Financing Policy

- Real investment policies imply funding needs.
- But what is the best source of funds?
    - Internal funds (i.e., cash)?
    - Debt (i.e., borrowing)?
    - Equity (i.e., issuing stock)?
- Moreover, the policy depends on different kinds of sources
    - internal funds (e.g., cash reserves vs. cutting dividends)
    - debt (e.g., Banks vs. Bonds)
    - equity (e.g., VC vs. IPO)

# Factors determine the capital structure

- Major factors that might affect target capital structure:
1. Trade-off between risk and return of financing instruments
    - Equity
    - Debt
2. Taxes
3. Costs of financial distress
4. Management incentives
5. Information problems.
6. Conflicts of interest (agency)
7. Strategic (business strategy)
- More generally: capital structure is more than just "debt to equity ratio"

- For most of this lecture, we consider factor 1-3 and assume:
  1. Financial market is perfect.
  2. A firm's investment decisions have been made.
     - They are independent of its financing decisions.
  3. Investments are financed by debt and equity.
     - No other financial instruments are used.

- Levered vs unlevered:
  - A company that has no debt is called an unlevered firm; a company that has debt in its capital structure is a levered firm.

# Theories on capital structure

- There are many theories that can capture everything that drives thousands of corporations' debt vs. equity choices.

    1. Benchmark: MM irrelevance Theory

    2. Theory 1: Static Trade-Off Theory

    3. Theory 2: Pecking Order Theory

# Modigliani-Miller (MM) Theorem

- **The no-tax case**

**A. Proposition I:** The value of the firm levered is equal to the value of the firm unlevered

- In frictionless markets, financial policy is irrelevant. Changes in capital structure do not affect firm value.
- The firm's value is determined by its real assets, not by the securities it issues. Thus capital structure is irrelevant as long as the firm's investment decisions are taken as given.

- Implications of Proposition I:
  1. A firm's capital structure is irrelevant.
  2. A firm's weighted average cost of capital (WACC) is the same no matter what mixture of debt and equity is used to finance the firm.

- The values of two firms ( levered vs unlevered) in the same risk class must be equal, independent of how they are financed:

  $V_L = V_U$.

- There is no "optimal" capital structure.

- Financing does not matter.

- MM provides a benchmark:
  - It tells us what does not matter.
  - It may tell us what does matter.

## B. Proposition II:

- Implications of Proposition II:

    1. The cost of equity rises as the firm increases its use of debt financing.

    2. The risk of the equity depends on two things: the riskiness of the firm's operations (business risk) and the degree of financial leverage (financial risk).

$$WACC \equiv \left[ r_D * \frac{Debt}{Debt + Equity} + r_E * \frac{Equity}{Debt + Equity} \right]$$

$$If\ WACC = required\ rate\ of\ return = r_A,$$
$$the\ above\ equation\ can\ be\ written\ as$$

$$r_E = r_A + (r_A - r_D)(D/E)$$

- **Assumptions:**
  - Market efficiency and no asymmetric information
  - No taxes
  - No transaction or bankruptcy costs
  - Individual and corporations borrow at same rate

- MM's "Irrelevance" Theorem: Financing decisions do not matter!

- Do real-world managers follow MM by treating capital structure decisions with indifference?

- Unfortunately, virtually all companies in certain industries, such as banking, choose high debt-equity ratios.

- Conversely, companies in other industries, such as pharmaceuticals, chose low debt-equity ratios.

- In fact, almost any industry has a debt-equity ratio to which companies in that industry tend to adhere.

- Thus companies do not appear to be selecting there degree of leverage in a random manner.

# Companies and industries vary in their capital structures

| Industry | Debt Ratio* (%) |
|---|---|
| Electric and Gas | 43.2 |
| Food Production | 22.9 |
| Paper and Plastic | 30.4 |
| Equipment | 19.1 |
| Retailers | 21.7 |
| Chemicals | 17.3 |
| Computer Software | 3.5 |
| | |
| Average over all industries | 21.5 |

# Capital Structure and Corporate Taxes

- Managers pay great attention to the tax implications of their financial decisions.
- Financial transactions are taxed (e.g. taxes on capital gains, dividends, etc.)
- Different financial transactions are taxed differently:
  - Interest payments are considered a business expense, and <u>tax exempt</u> for the firm.
  - Dividends and retained earnings are <u>taxed</u>.
  - In Indian system, capital gain tax is less than dividend tax.

- Why interest expenses is tax deductible?
  - It is an incentive, subsidy to encourage entrepreneurs, employers etc.
- Other things equal, the firm's financing decision might aim at minimizing its tax burden.

# Debt Tax Shield

- The MM Proposition changes once taxes are taken into account.
  At the corporate level:
    - Interest payments are tax deductible
    - Dividends and retained earnings are not.

- When interest payments on debt are tax-deductible, the PV of the government's claim on pre-tax income can be reduced by issuing debt.
- Claim: **Issuing debt saves taxes and increases a firm's value.**

Consider the following:

I.   Two firms, U and L, with identical, pre-tax, perpetual, expected annual cash flow of X.

II.  Firm U is 100% equity financed and has a required rate of return denoted by $r_A$.

III. Firm L maintains a debt level D and pays perpetual expected interest rate $r_D$ on the debt.

IV.  The corporate tax is $\tau_c$.

The expected after-tax cash flows of the two firms are

- **Firm U:**

$CF_U = (1-\tau_c)\, X$

**Firm L:**

- Interest payment = return on debt x amount borrowed = $r_D D$

    Tax paid = $(X - r_D D) \times \tau_c$, Hence, after-tax cash flows

    $CF_L = (1 - \tau_c)(X - r_D D) + r_D D = (1 - \tau_c) X + \tau_c(r_D D)$

- The cash flows of Firm U and L differ by the "tax shield" created by the tax-deductibility of interest expenses.

- The present value of each of these firms is (considering perpetuity in nature):

$$V_u = \frac{(1 - \tau_c)X}{r_A}$$

$$V_L = \frac{(1 - \tau_c)X}{r_A} + \frac{\tau_c(r_D D)}{r_D} = V_u + \tau_c D$$

where, PV(tax shield)= $\tau_c D$

$$\text{Hence,} \qquad V_L = V_u + \tau_c D$$

Value of Levered firm= Value of Unlevered firm + Gain from leverage

Note:
- The risk of the first part of the cash flow of Firm L is identical to that of Firm U, thus the same discount rate, $r_A$, applies.
- The discount rate for the cash flows to the debt holders is the same as the required rate of return on debt, $r_D$.

**Example.** The interest the company pays that is fixed committed is a tax-deductible expense. The tax deductibility of interest increases the total income that can be paid out to bondholders and stockholders.

| | Income statement of Unlevered firm | Income statement of Levered firm |
|---|---|---|
| Earnings before Interest and taxes | $1,000 | $1,000 |
| Interest paid to bondholders (D) | $0 | $80 |
| Pre-tax Income | $1,000 | $920M |
| Corporate tax at $\tau_c$ = 0.35 | $350 | $322 |
| Net Income to stockholders | $650 | $598 |
| Total income to both bondholders and shareholders | $0+$650=$650 | $80+$598=$678 |
| Interest tax shield ($\tau_c$ D) | $0 | $28 |

# Modigliani-Miller Proposition with tax case

**Modigliani-Miller Proposition I with Taxes**

- The values of two firms in the same risk class will differ by the present value of their tax shield.

  $V_L$ = $V_U$ +PV (debt tax-shield)= $V_u + \tau_c D$.

**Modigliani-Miller Proposition II with Taxes**

- The WACC declines as the debt-equity ratio grows

$$WACC \equiv \left[ r_D(1 - \tau_c) * \frac{D}{D + E} + r_E * \frac{E}{D + E} \right], where\ D = debt, E = equity$$

Or, $WACC = \left[ r_D * \frac{D}{D+E} + r_E * \frac{E}{D+E} \right] - \left[ r_D \tau_c * \frac{D}{D+E} \right]$ = Pretax WACC- Reduction due to Interest Tax Shield

- The traditional approach to capital structure advocates that there is a right combination of equity and debt in the capital structure, at which the market value of a firm is maximum.

- As per this approach, debt should exist in the capital structure only up to a specific point, beyond which, any increase in leverage would result in the reduction in value of the firm.

- This is because, increase in debt=> increase in interest=>increase in risk=>increase in required rate of returns=>increase in cost of capital

- When post-tax debt=post-tax equity we get an optimal capital structure.
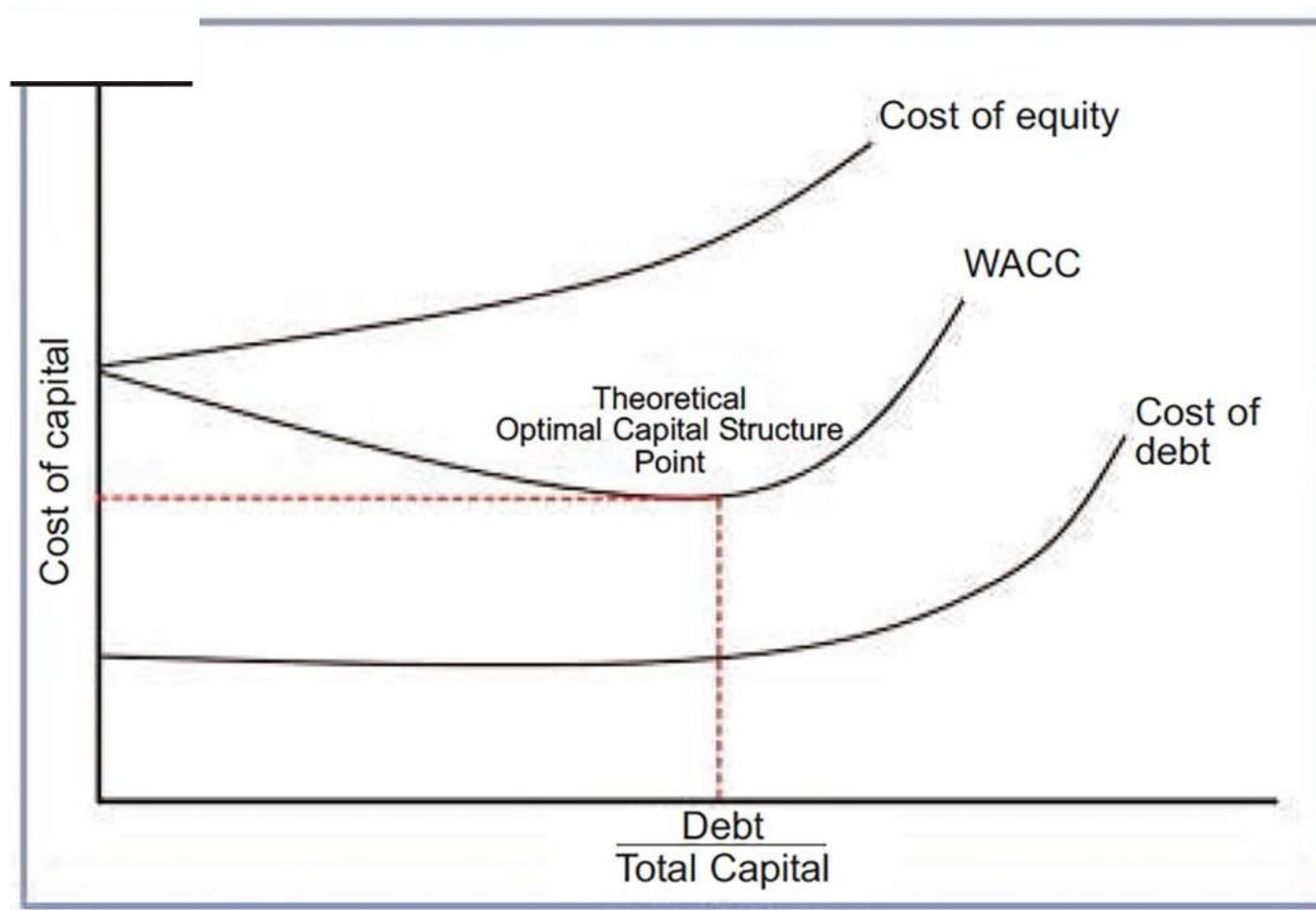
# Implication of MM-I with Corporate Taxes

- The tax effect is likely to be substantial.

  **Example.** A firm has a constant safe cash flow of 100M. Compare its value with 100% debt to that with no debt.

$$\frac{V(with\ debt)}{V(all\ equity)} = 1 + \frac{\tau_c D}{V(all\ equity)}$$

Thus, with corporate tax rate $\tau_c$ = 35%.
  - for D = 20%, firm value increases by about 7%.
  - for D = 50%, it increases by about 17.5%.

- To increase a firm's value, the firm should use as much debt as possible: the optimal capital structure is 100% debt! The issues are:

  1. It is hard to believe that 100% debt is optimal.
  2. Most firms seem to avoid having a large amount of debt.
     » "What are the costs associated with debt?"
     » These costs should be substantial to offset the tax gains.
     3. Personal taxes.

- **Main Conclusions**:
  1. In absence of taxes, a firm's value is independent of it's capital structure.
     - Financing decisions are irrelevant.
  2. In the presence of taxes, when interest-expenses on debt are tax deductible, a firm's value increases with it's debt/equity ratio.
     - It is better to have more debt financing.
  3. When there are costs of financial distress, there is an optimal Capital Structure.

# Optimal Capital Structure

- Since taxes favour debt for most firms, should all firms be 100% debt financed? Why don't all firms lever up and save on corporate taxes?

- The tax benefit makes debt financing attractive. However, high debt level increases the chance of financial distress.

- Financial Distress – is a circumstance in which a firm cannot fulfil its debt obligations to the creditors, which in return leads to either restructuring or bankruptcy.

**Costs of Financial Distress**

- In a <u>perfect world</u>, financial distress is costless:
  - no frictions
  - no asymmetric information among different parties
  - no incentive problems
  - perfect contracts

- In an <u>imperfect world</u>, financial distress is costly:
  a) Direct Costs of Financial Distress:
     - Administrative expenses
     - Disruption of operations
     - Loss of customer confidence . . .
  b) Indirect Costs of Financial Distress:
     - Conflicts between different stakeholders
     - Negative perception by financial markets
     - Weakened position against competitors
     - Costs incurred to mitigate the above . . .

- It is important to distinguish between:
  - ❑ Bankruptcy
    - Liquidity (can't pay $r_D$)
    - Insolvency (D > PV(Free Cash Flow))
    - A division of the cash flows

  - ❑ Business failure (Free Cash Flow < 0)

- Financial distress is something that happens to companies as a consequence of operating decisions or external forces while bankruptcy is something that companies choose to do to protect their assets from creditors.

# Static Trade-Off Theory

- The trade-off theory of capital structure involves decision about the trade-off between the tax benefits of debt and the costs of financial distress.

- Debt financing has one important advantage
  - Debt increases firm value by reducing corporate tax bill.
  - This is because interest payments are tax deductible.


- However, debt puts pressure on the firm because interest and principal payments are obligations. If these obligations are not met, the firm may risk some sort of financial distress.

- Financial distress occurs when promises to creditors are broken or honored with difficulty. Sometimes financial distress leads to bankruptcy.
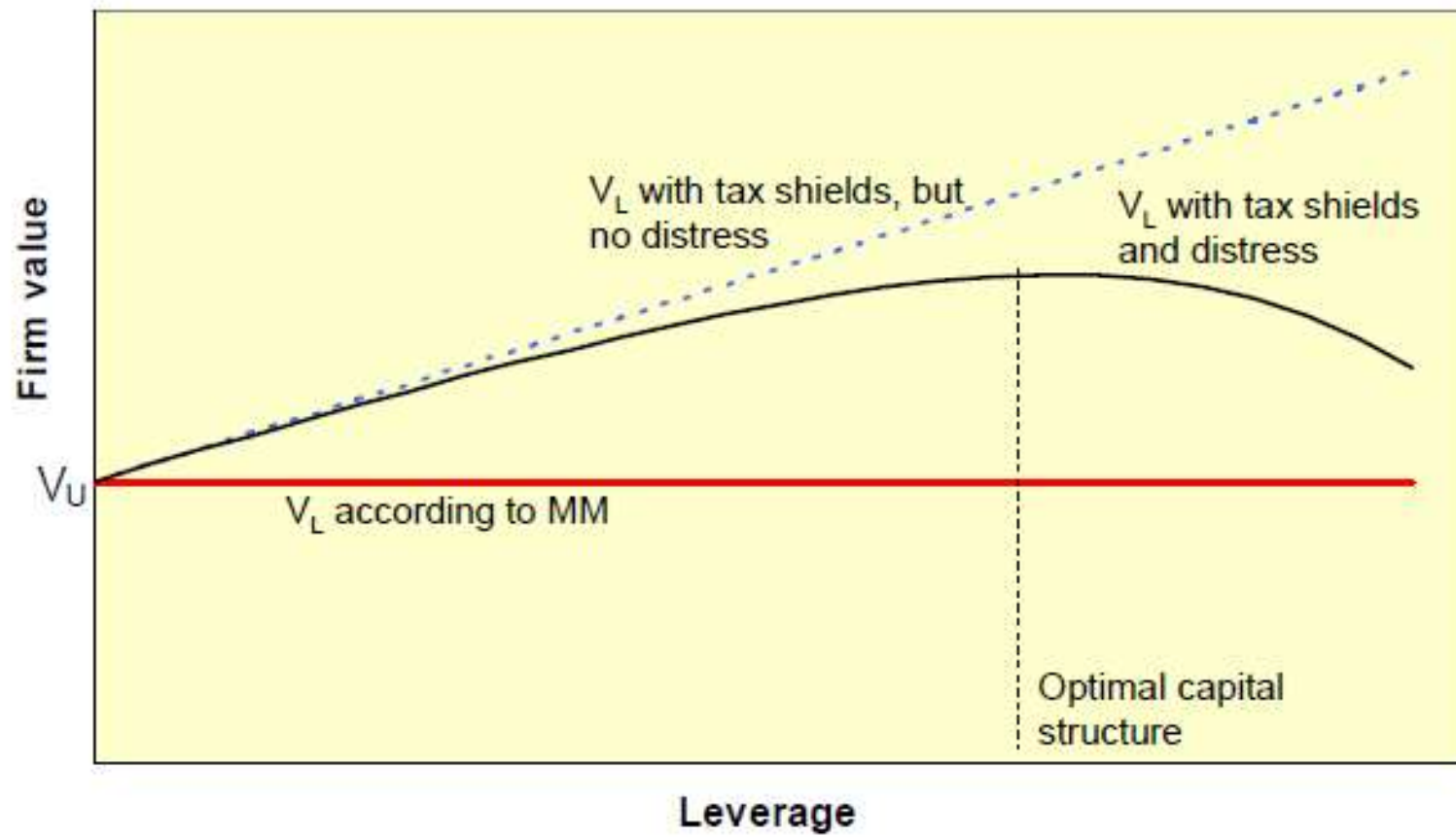
- The optimal target capital structure is determined by balancing interest tax shields and the costs of financial distress.

- Because financial distress costs cannot be expressed in a precise way, no formula has yet been developed to determine a firm's optimal debt level exactly.

- It does not give a precise target but rather a range, an order of magnitude.

- The manager should choose the debt ratio that maximizes firm value.

- The theoretical optimum is reached when the present value of tax savings due to further borrowing is just offset by increases in the present value of costs of distress.

# Factors determining the target debt-equity ratios

- Debt-equity ratios vary across industries.
- <u>Factors determining the target debt-equity ratios</u>:
  - Taxes
    - High taxable income rely more on debt
    - Highly profitable firms likely to have larger target ratios
  - Types of assets
    - Firms with intangible assets have low debt
    - Firms with primarily tangible assets have higher debt
  - Uncertainty of operating income
    - Firms with high uncertainty of operating income rely mostly on equity
    - Firms in regulated industries generally has low volatility use a great deal of debt
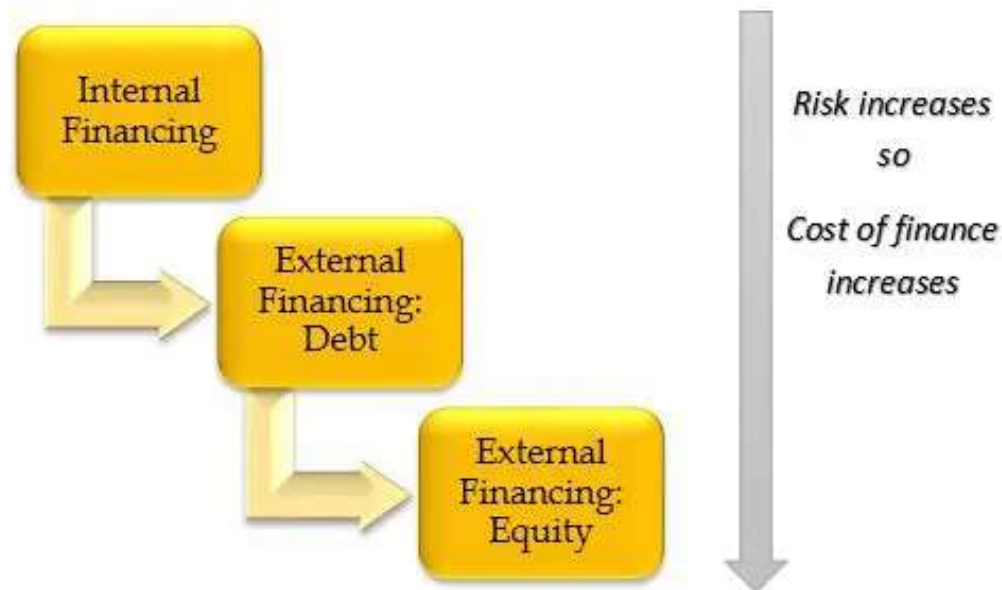
# Pecking Order Theory

- The pecking-order theory starts with asymmetric information — indicating that managers know more about their companies' prospects, risks, and values than do outside investors.

- Asymmetric information affects the choice between internal and external financing and between new issues of debt and equity securities.

- To compensate for information asymmetry, external users demand a higher return to counter the risk that they are taking.

- Mangers try to reduce this information asymmetry.

- Information asymmetry between firm and market makes:
  - External finance more costly than internal funds
  - Debt less costly than equity (because less info-sensitive)

- Managers follow a <u>hierarchy (pecking order)</u> when considering sources of financing:
  - Preferably use retained earnings
  - Then borrow from debt market (unless already highly leveraged)
  - As a last resort, issue equity

- In this theory, there is no well-defined target debt–equity mix, because there are two kinds of equity, internal and external, one at the top of the pecking order and one at the bottom.

**Hierarchy for Pecking Order Theory**

Internal Financing

External Financing: Debt

External Financing: Equity

Risk increases
so
Cost of finance increases

- The pecking order explains why the most profitable firms generally borrow less—not because they have low target debt ratios but because they don't need outside money.

- Less profitable firms issue debt because they do not have internal funds sufficient for their capital investment programs and because debt financing is first on the pecking order of external financing.

- With no information asymmetries, managers are indifferent between internal and external financing.

- Why is safe debt better than equity?
  - Its value is independent of the information
  - Managers and the market give it the same value
  - Safe debt is fairly priced, hence no under-pricing
- An equity issue by an undervalued firm entails a loss of value for its current shareholders:
- When equity is undervalued, managers prefer internal financing to issuing equity to outside investors.

# Summary

1. In absence of taxes and information/incentive problems, a firm's value is independent of its capital structure and financing decisions are irrelevant.

2. In the presence of corporate taxes, with interest expenses being tax deductible, a firm's value increases with its debt/equity ratio.

3. Personal taxes favours equity over debt.

4. When there are costs to financial distress, there may exist an optimal capital structure with a mixture of debt and equity.

5. Information/incentive problems can be important factors in determining capital structure.

# What is "leverage?"

- Leverage is a technique involving borrowing funds to buy an investment assets as opposed to equity or cash, estimating that future profits will be more than the cost of borrowing.

- Leverage is also the term used to describe the amount of debt a firm uses to finance assets.

- Leverage arises from the existence of fixed costs.

- Operating Leverage
  - Arises from the firm's fixed operating costs.
  - The risk in the business cash flows is affected by operating leverage.
  - The percentage change in profits for each 1% change in sales.
  - Related to the business's fixed costs as opposed to variable operating costs.
  - A firm with relatively high fixed operating costs will experience more variable operating income if sales change.

- Financial leverage
  - Arises from the firm's fixed financing costs such as interest on debt.
  - Usually measured by the ratio of long-term debt to total long-term capital.
  - It affects the equity cost of capital
  - Can also affect the debt cost of capital, if debt is big enough to make financial distress an important possibility.

# Business Risk

- Business risk is the variability or uncertainty of a firm's operating income (EBIT).

- Business risk is affected by:
  - Sales volume variability
  - Competition
  - Cost variability
  - Product diversification
  - Product demand
  - Operating Leverage

# Financial Risk

- The variability or uncertainty of a firm's earnings per share (EPS) and the increased probability of insolvency that arises when a firm uses financial leverage.

# Effect of Corporate Financial Leverage

- Leverage increases risk
- Risk is proportional to beta
- So leverage must affect beta

# Weighted Average Cost of Capital

- A company's cost of capital is the average cost of the various capital components (or securities) employed by it.

- It is the average rate of return required by the investors who provide capital to the company.

- It is used for evaluating investment projects, for determining the capital structure, for setting the rates that regulated company like utility services can charge to their customers and so on.

- A company's cost of capital is the weighted average cost of various sources of finance used by it, e.g., equity, debt etc.

  WACC= Proportion of equity  X Cost of equity + Proportion of debt  X cost of debt

- **Cost of debt calculation:**

Cost of debt $(r_D)$= average interest cost of debt x (1 – tax rate)= $r_d(1 - \tau)$

Because interest on debt is tax deductible we multiply it by the corporate tax rate.

- **Cost of equity calculation:**

This is a much more theoretical number and takes into account beta (risk) and prevailing interest rates.
 We use capital Asset Pricing Model (CAPM) to estimate cost of capital.

Cost of equity = risk-free interest rate + beta (market rate – risk-free rate)

$$r_e = r_f + \beta \, (r_m - r_f)$$
where, $r_f$ = risk free rate; $r_m$ = market return;
$\beta$ = riskiness of the project cash flows

- Beta ($\beta$) measures the volatility of the company's stock compared to the market. The higher the beta, the riskier the stock is, according to investors.
- What if beta is unknown?
  - Find comparable company and use its beta.
  - Find comparable historical project and use its cashflows to estimate beta.
  - Use intuition and empirical judgment to guesstimate beta.

- **WACC: Weighted Average Cost of Capital**

$$WACC \equiv \left[ r_D * \frac{Debt}{Debt + Equity} + r_E * \frac{Equity}{Debt + Equity} \right]$$

$$WACC = r_d(1 - \tau)\frac{D}{V} + r_e\frac{E}{V}$$

$r_d$ = cost of debt capital

$r_e$ = cost ofequity capital

$\tau$ = corporate tax rate

V = Debt (D) + Equity (E)

# WACC calculation

| | |
|---|---|
| Total Debt | $10M |
| Total Equity | $20M |
| Total Capital | $30M |
| Cost of Equity<br>    Beta<br>    Risk free rate<br>    Expected market return | <br>2.15<br>2.50%<br>6.00% |
| Cost of equity | 15.40% |
| Cost of Debt<br>    Interest rate<br>    Tax rate | <br>6.50%<br>32.00% |
| Cost of debt after tax | 4.42% |
| Equity weight % | 66.67% |
| Debt weight % | 33.33% |
| WACC | 11.74% |