Week 11

The COST OF CAPITAL

Economic and management principles

Review of the Last Two Lectures

- We defined the concept of future and present value.
- We explained the process of compounding and discounting.
- We learned how to deal with different interest rates.
- Time value analysis has many applications, including planning for retirement, valuing stocks and bonds, setting up loan payment schedules, and making corporate decisions regarding investing in new plant and equipment.

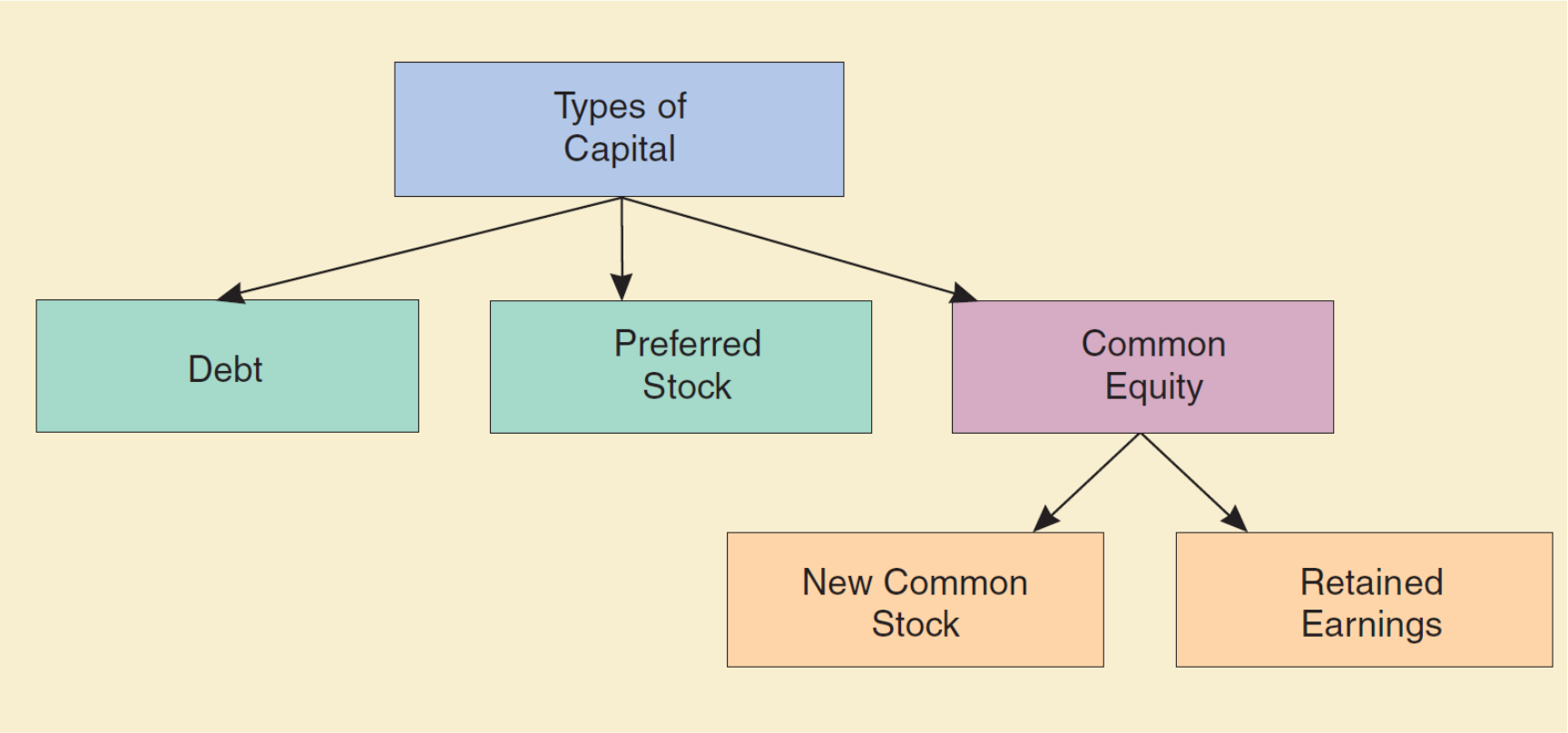
The Cost of Capital

- Today, we talk about cost of capital and its different components
- Our final aim is to be able to evaluate the profitability of investment decisions.
- Every investment requires some level of capital that has to be used.
- The sources of this capital are different and they are associated with different costs.
- We will define the weighted average of these different costs and we will discuss what factors influence them.

The Need for Capital

- Firms need capital to finance increase of assets necessary for their operations.
- The items on the right side of a firm's balance sheet - various types of debt, preferred stock, and common equity - are called capital components.
- Any increase in total assets must be financed by an increase in one or more of these capital components.
- The cost of each component is called the component cost of that particular type of capital.
- Firms take a long-run view, and the cost of capital is calculated as a weighted average, or composite, of the various types of funds used over time, regardless of the specific financing used to fund projects in a given year.

Firms use various types of capital - divided as debt and equity



Debt and Equity

- Debt is typically raised by issuing bonds or borrowing money from a financial institution such as a bank.
- Some companies also finance with preferred stock.
- The third type of capital, common equity, is provided by the company's common stockholders, and it is raised in two ways:

    1. by issuing new common stock

    2. by retaining earnings (that is, by not paying out all of their earnings as dividends).

- Equity raised by selling newly issued stock is called external equity, while retained earnings are called internal equity.

Optimal Capital Structure

- Each firm has an optimal capital structure, defined as the mix of debt, preferred, and common equity that causes its stock price to be maximized.
- Therefore, a value-maximizing firm will estimate its optimal capital structure, use it as a target, and then raise new capital in a manner designed to keep the actual capital structure on target over time.
- In this lecture, we assume that the firm has identified its optimal capital structure, that it uses this optimum as the target, and that it finances so as to remain on target.
- The target proportions of debt, preferred stock, and common equity, along with the costs of those components, are used to calculate the firm's weighted average cost of capital, **WACC**.

Cost of Debt

- The cost of debt is the interest rate minus tax savings
- The after-tax cost of debt, $r_d(1 - T)$, is used to calculate the weighted average cost of capital, and it is the interest rate on debt, r_d, less the tax savings that result because interest is deductible:

After-tax cost of debt = Interest rate - Tax savings

$$= r_d - r_d T$$

$$= r_d (1 - T)$$

- We use the after-tax cost of debt in calculating the WACC because we are interested in maximizing the value of the firm's stock, and the stock price depends on after tax cash flows.

Cost of Debt

- The cost of preferred stock is the preferred dividend yield
- The component cost of preferred stock used to calculate the weighted average cost of capital, r_d, is the preferred dividend, D_p, divided by the current price of the preferred stock, P_p

Cost of preferred stock = $r_p = D_p / P_p$

- No tax adjustments are made when calculating rp because preferred dividends, unlike interest on debt, are not deductible.
- Therefore, no tax savings are associated with the use of preferred stock.

Cost of Equity

- The costs of debt and preferred stock are based on the returns investors require on these securities.
- Similarly, the cost of common equity is based on the rate of return investors require on the company's common stock.
- Remember that new common equity is raised in two ways:

  1. by issuing new common stock

  2. by retaining earnings (that is, by not paying out all of their earnings as dividends).

Cost of Equity

- Equity raised by issuing stock has a somewhat higher cost than equity raised as retained earnings due to the flotation costs involved with new stock issues.
- Therefore, once they get beyond the startup stage, firms normally obtain all of their new equity by retaining earnings.
- We use the symbol r_s to designate the cost of retained earnings and r_e to designate the cost of new stock, or external equity.

Cost of Equity

- The cost of equity is evaluated based on the opportunity cost principle
- While it is true that no direct costs are associated with capital raised as retained earnings, this capital still has a cost.
- The reasoning here involves the opportunity cost principle.
- If management decides to retain earnings, there is an opportunity cost involved - stockholders could have received the earnings as dividends and invested this money in other stocks, in bonds, in real estate, or in anything else.
- Thus, the firm needs to earn on its retained earnings at least as much as the stockholders themselves could earn on alternative investments of comparable risk.

Cost of Equity

- The question is how to establish how much investors could earn on alternative investments.
- Whereas debt and preferred stocks are contractual obligations whose costs are clearly stated on the contracts themselves, stocks have no comparable stated cost rate.
- That makes it difficult to measure r_s.
- There are some methods that allow us to estimate what value of r_s stockholders should expect.

Cost of Equity

- The most widely used approach to the cost of common equity is CAPM.
- Capital Asset Pricing Model (CAPM) follows these steps:

  1. Estimate the risk-free rate, r_{RF} (usually 10-year Treasury bond rate or a short-term Treasury bill rate).

  2. Estimate the stock's beta coefficient, β, and use it as an index of the stock's risk.

  3. Estimate the expected market risk premium (the difference between the return that investors require to hold an average stock (r_{RF}) and the risk-free rate).

  4. Substitute the preceding values into the CAPM equation to estimate the required rate of return on the stock in question:

$$r_s = r_{RF} + \beta (r_M - r_{RF})$$

Cost of Equity

- Even if CAPM is used the most often, it has some issues – it is quite hard to estimate the values of β and r_M.
- That is why we use alternative options, e.g. the Discounted Cash Flow (DCF) approach.
- Both the price and the expected rate of return on a share of common stock depend, ultimately, on the stock's expected cash flows.
- For companies that are expected to go on indefinitely, the cash flows are the dividends and so the price should reflect the NPV of the dividends' stream:

$$P_0 = \sum_{t=1}^{+\infty} \frac{D_t}{(1+r_s)^t} \quad .$$

Cost of Equity

- If we assume that dividends grow at the rate of g ($D_t = (1 + g) \cdot D_t - 1$), we can express

$$P_0 = D_1 / r_s - g$$

- This gives us

$$r_s = D_1 / (P_0 + g)$$

- Thus, investors expect to receive a dividend yield, $D_1 = P_0$, plus a capital gain, g.
- It is easy to determine the dividend yield, but it is difficult to establish the proper growth rate - g must be estimated in some other manner.

Cost of Equity

- One method for estimating g involves first forecasting the firm's average future dividend payout ratio and its complement, the retention rate, and then multiplying the retention rate by the company's average expected future rate of return on equity **(ROE)**:

$$\mathbf{g = (Retention\ rate) \cdot (ROE) = (1 - Payout\ rate) \cdot (ROE)}$$

- This formula expresses the idea that the company growth is proportional to reinvested retained earnings.

Cost of Equity

- The third option is to simply add risk premium to bond yield
- In situations where reliable inputs for neither the CAPM nor the DCF approaches are available, analysts often use a more subjective procedure to estimate the cost of equity.
- This procedure relies on the simple reasoning that stocks are riskier than bonds:

$$r_s = \text{Bond yield} + \text{Risk premium}$$

- Both surveys of portfolio managers and empirical studies suggest that the risk premium on a firm's stock over its own bonds generally ranges from 3 to 5 percentage points.
- Based on this evidence, the analysts simply add a judgmental risk premium of 3 to 5 percent to the interest rate on the firm's own long-term debt to estimate its cost of equity.

Weighted Average Cost of Capital

- The overall cost of capital is the weighted average of different components' cost
- As we said, each firm has to identify its optimal capital structure, and use this optimum as the target.
- The target proportions of debt (w_d), preferred stock (w_p), and common equity (w_s), along with the costs of those components, are used to calculate the firm's weighted average cost of capital, WACC:
  - $\mathbf{WACC = w_d r_d(1 - T) + w_p r_p + w_s r_s}$
- The WACC is the cost of investor-supplied capital used to finance new projects.

Weighted Average Cost of Capital

- The cost of capital is affected by a number of factors that a firm cannot influence
- The two most important factors that are beyond a firms direct control are interest rates and tax rates.
- If interest rates in the economy rise, the cost of debt increases because firms will have to pay bondholders more when they borrow.
- Also, we can see from CAPM that higher interest rates increase the costs of common and preferred equity.
- The increase of tax rate induces higher savings on the cost of debt.
- Lower tax rates makes stock more attractive and reduce the relative cost of equity.

Weighted Average Cost of Capital

- The cost of capital is affected also by factors that a firm can influence
- A firm can directly affect its cost of capital in three primary ways:
    1. by changing its capital structure,
    2. by changing its dividend payout,
    3. by altering its capital budgeting decision rules to accept projects with more or less risk than in the past.
- Regarding capital structure, we have assumed that firms have given target capital structures, and we used those target weights to calculate their WACCs.

Weighted Average Cost of Capital

- However, if a firm changes its target capital structure, then the weights used to calculate the WACC will change.
- Because the after-tax cost of debt is lower than the cost of equity, an increase in the target debt ratio will tend to lower the WACC, and vice versa if the debt ratio is lowered.
- However, an increase in the use of debt will increase the riskiness of both the debt and the equity, and these increases in component costs might offset the effects of the change in the weights and leave the WACC unchanged or even higher.

Weighted Average Cost of Capital

- Dividend policy affects the amount of retained earnings available to the firm, and thus the possible need to sell new stock and thus incur flotation costs.
- This suggests that the higher the dividend payout ratio, the smaller the addition to retained earnings and thus the higher the cost of equity and therefore the WACC.
- However, investors may want the firm to pay out more dividends, and thus a reduction in the payout ratio might lead to an increase in the required rate of return on equity.
- The cost of capital also depend on the riskiness of the investment project.

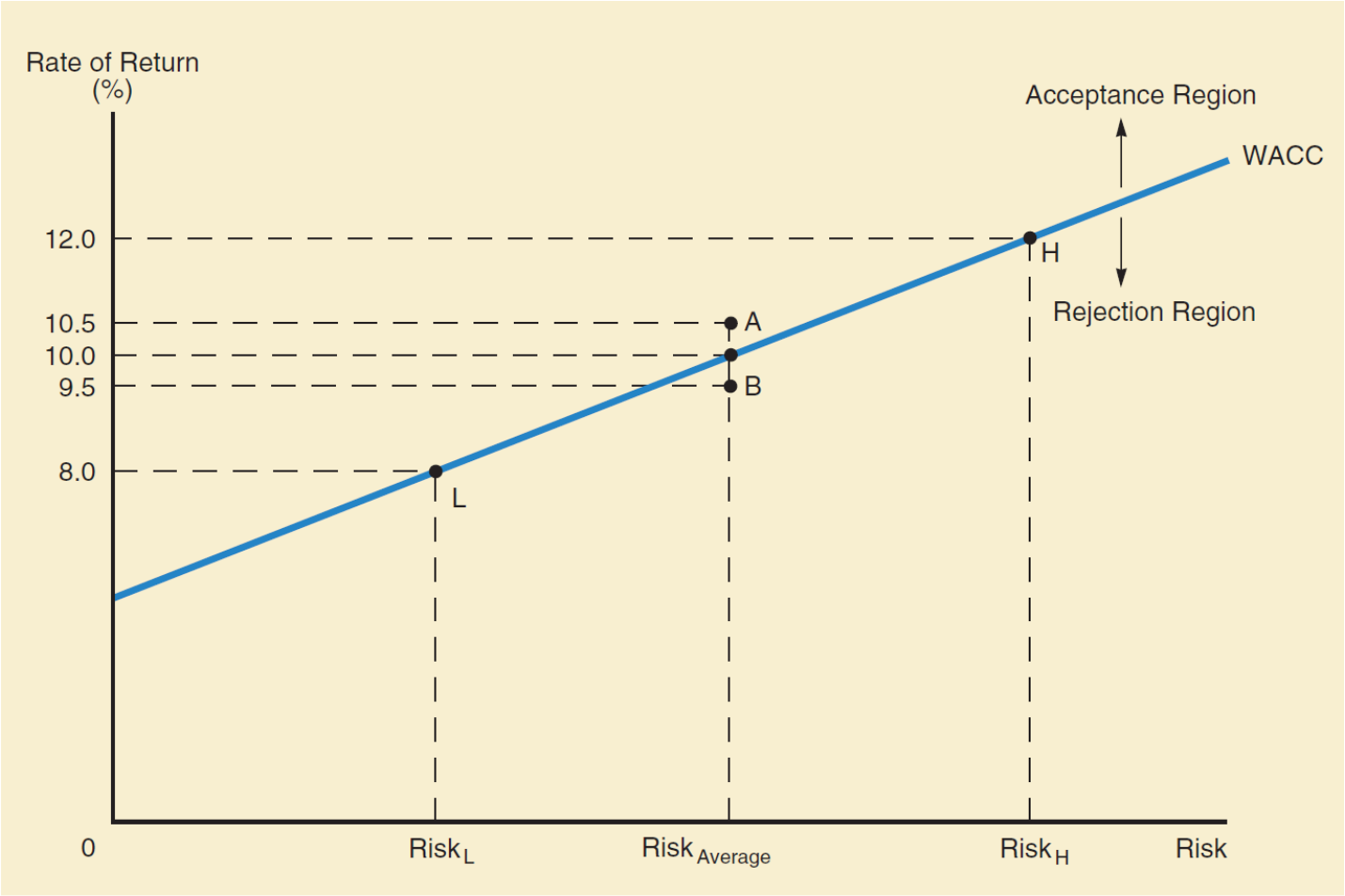
Risk – Return Ratio

- When we estimate the cost of capital, we use as the starting point the required rates of return on the firms outstanding stock and bonds.
- Those cost rates reflect the riskiness of the firms existing assets.
- Therefore, we have been implicitly assuming that new capital will be invested in the same types of assets and with the same degrees of risk as the existing assets.
- This assumption is generally correct, as most firms do invest in assets similar to those they currently operate.
- However, if the firm decides to invest in an entirely new and risky line of business, then its component costs of debt and equity, and thus the WACC, will increase.

Risk – Return Ratio

- The required rate of return depends on the riskiness of the project
- As we will see in the next lecture, the cost of capital is a key element in the investment decisions.
- Projects should be accepted if and only if their estimated returns exceed their costs of capital.
- If two projects have the same risk, the one that has higher rate of return should be accepted.
- If the projects are associated with different risk, investors require higher returns on riskier investments.
- Consequently, companies that are raising capital to take on risky projects will have higher costs of capital than companies that are investing in safer projects.

Risk – Return Ratio



Summary

- In this lecture, we explained why value of money differs in time
- We should know what types of capital firms can use to finance investment projects.
- We should understand how the cost of capital components is derived.
- We should remember the weighted average cost of capital is.
- We should be able to apply risk – return ratio.

- In the next lecture, we will talk about investment decisions.