Course Review

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Financial Management

- **Capital Budgeting**: the process of planning and managing a firm's long-term investments.
  - Discounted cash flow method
  - Estimate the required return for projects

- **Capital Structure**: the mixture of long-term debt and equity maintained by a firm.

- **Working Capital Management**: the management of a firm's short-term assets and liabilities.

- Primary goal: maximize the shareholder wealth or current stock price.

Forms of Business Organization

- Sole Proprietorship
- Partnership
- Corporation
  - Private VS. Public Company
  - Separation of ownership and management

- Pros and Cons
  - Creation and regulation, lifespan, limited or unlimited liability, transfer of ownership, tax, agency problem

Agency Problem

- Agency Costs
  - Direct VS. Indirect Agency Costs

- Potential solutions:
  - Compensation plans
  - Monitoring (e.g., lenders, analysts, and investors)
  - Threat of firing and takeover

Financial Markets

- Primary Market
  - Initial Public Offering (IPO)
- Secondary Market
  - Dealer Market: e.g., over-the-counter (OTC) market, where bonds are primary traded
  - Auction Market: e.g., limit order book (LOB) market, where stocks are primary traded

- Money Market: debt securities of less than one year
- Capital Market: equity and long-term debt claims

PV and FV

- Draw a timeline
- The interest rate, the periodic payment, and the time period should match.
  - time value of money, capital budgeting, bond and stock valuation
- Single Cash Flow: $FV_t = PV(1+r)^t$
- Multiple Cash Flows (unequal payments)
  - Treat each of them as a single cash flow

PV and FV

- Multiple Cash Flows (equal payments of C):
  - **Ordinary Annuity**: equal payments for a set number of periods, the first cash flow occurs one period from now.
    - $Annuity\ PV = C \times \left[\frac{1}{r} - \frac{1}{r(1+r)^t}\right]$
    - $Annuity\ FV = C \times \left[\frac{(1+r)^t}{r} - \frac{1}{r}\right]$
  - **Annuity Due**: the first cash flow occurs immediately.
    - $Annuity\ Due\ PV = Annuity\ PV \times (1 + r)$
    - $Annuity\ Due\ FV = Annuity\ FV \times (1 + r)$
  - **Perpetuity**: equal payments that are paid forever.
    - $Perpetuity\ PV = \frac{C}{r}$

Bond vs. Stock

Bond

- Creditors/Lenders
- Cash flows: par value (face value) and coupons
- Interest payment is a predetermined obligation and tax deductible.

Stock

- Stockholders/Owners
- Cash flows: market price and dividends
- Dividend payment is not required and not tax deductible.

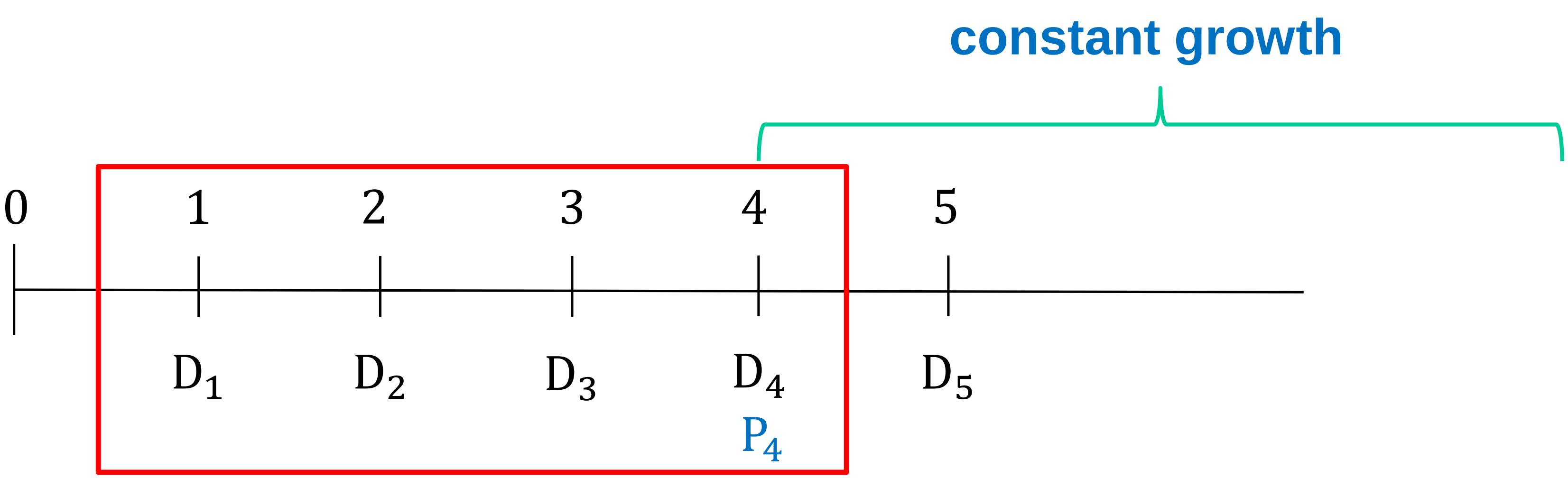
Bond Valuation

$$Bond\ value = C \times \left\{ \underbrace{\frac{1 - [1/(1+r)^t]}{r}}_{\text{PV of the coupons}} \right\} + \underbrace{\frac{F}{(1+r)^t}}_{\text{PV of the face value}}$$

- Par value bond: Coupon Rate = YTM
- Discount bond: Coupon Rate < YTM
- Premium bond: Coupon Rate > YTM

Stock Valuation

- Dividend Growth Model
  - **Constant Dividend**: $P_0 = \frac{D}{R}$
  - **Constant Dividend Growth**: $P_0 = \frac{D_1}{R-g} = \frac{D_0 \times (1+g)}{R-g}$
  - **Two-Stage Growth**
    - A special case of supernormal growth



Return

- **Effective Annual Rate**: $EAR = \left[1 + \left(\frac{Quoted\ rate}{m}\right)\right]^m - 1$
- **Annual Percentage Rate**: quoted rate, stated rate
  - APR = Period rate × Number of periods per year

- Bond return
  - **Capital gains yield** = $(P_{t+1} - P_t)/P_t$
  - **Total percentage return**
    - If sell before maturity: Coupon income/initial investment + Capital gains yield
    - If hold to maturity: Yield-to-maturity (YTM)
- Stock return
  - **Dividend yield** = D_{t+1}/P_t
  - **Capital gains yield** = $(P_{t+1} - P_t)/P_t$
  - **Total percentage return** = Dividend yield + Capital gains yield

Return and Risk: Single Asset

- Use the *historical* data:
  - **Arithmetic Average Return**: $\frac{R_1+R_2+\cdots+R_T}{T}$
  - **Geometric Average Return**:
  $$[(1+R_1)\times(1+R_2)\times\cdots\times(1+R_T)]^{1/T}-1$$
  - **Variance**:
  $$Var(R)=\sigma^2=\frac{1}{T-1}[(R_1-\bar{R})^2+\cdots+(R_T-\bar{R})^2]$$
  - **Standard Deviation**: $SD(R)=\sigma=\sqrt{Var(R)}$

Return and Risk: Single Asset

- Use future possible returns and the probability of each possibility:
  - **Expected Return**: $E(R) = \sum_{s=1}^{S} p_s R_s$
  - **Variance**: $Var(R) = \sigma^2 = \sum_{s=1}^{S} p_s [R_s - E(R)]^2$
  - **Standard Deviation**: $SD(R) = \sigma = \sqrt{\sigma^2}$

- Variance/standard deviation measures total risk.
- Total risk includes systematic (non-diversifiable) risk and unsystematic (diversifiable) risk.

Return and Risk: Portfolio

- **Portfolio Expected Return**
  - $E(R_P) = w_1 \times E(R_1) + w_2 \times E(R_2) + \cdots + w_n \times E(R_n)$

- **Portfolio Variance**:
  - $Var(R_P) = \sigma_P^2 = \sum_{s=1}^{S} p_s[R_{Ps} - E(R_P)]^2$
  - $Var(R_P) = \sigma_P^2 = w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2\sigma_{1,2}$
    - $Cov(R_1, R_2) = \sigma_{1,2} = \sigma_1\sigma_2\rho_{1,2} \rightarrow$ *diversification*

- **Portfolio Standard Deviation**: $SD(R_P) = \sigma_P = \sqrt{Var(R_P)}$

Systematic Risk

- **Covariance**:
  - $\sigma_{i,M} = \frac{1}{T-1}\sum_{t=1}^{T}(R_{it} - \bar{R}_i)(R_{Mt} - \bar{R}_M)$
  - $\sigma_{i,M} = \sum_{s=1}^{S} p_s\,[R_{is} - E(R_i)][R_{Ms} - E(R_M)]$

- Systematic Risk (**Beta**):
  - Single asset: $\beta_i = \frac{\sigma_{i,M}}{\sigma_M^2} = \frac{\rho_{i,M}\sigma_i\sigma_M}{\sigma_M^2} = \frac{\sigma_i}{\sigma_M}\rho_{i,M}$
  - Portfolio: $\beta_P = \sum_{i=1}^{n} w_i\beta_i$

Reward-to-risk Ratios

- Reward-to-risk ratio for investment in market portfolio:

$$\frac{E(R_M) - R_f}{\beta_M} = E(R_M) - R_f = market\ risk\ premium$$

- Reward-to-risk ratios of any assets should be equal

$$\frac{E(R_\mathrm{i}) - R_f}{\beta_\mathrm{i}} = \frac{E(R_\mathrm{M}) - R_f}{\beta_\mathrm{M}} = E(R_M) - R_f$$

- Rearrange, we get

$$E(R_i) = R_f + \left[E(R_M) - R_f\right] \times \beta_i$$

Capital Asset Pricing Model

- ***CAPM***: $E(R_i) = R_f + \left[E(R_M) - R_f\right] \times \beta_i$
  - Risk-free asset: $\beta = 0$
  - Market portfolio: $\beta = 1$
  - SML Slope = reward-to-risk ratio = market risk premium
  - On SML: fairly priced
  - Above SML: underpriced
  - Below SML: overpriced

Capital Budgeting Decision Criteria

1. **NPV**: accept if NPV > 0
   - $NPV = \sum_{i=1}^{t} \frac{CF_i}{(1+r)^i} - CF_0$ where *r* is the required return

2. **IRR**: accept if the IRR is greater than the required return
   - $\sum_{i=1}^{t} \frac{CF_i}{(1+IRR)^i} - CF_0 = 0$

For 1 and 2, we need to estimate the required return for the project of its risk level:

- 100% equity financed firms:

$$R_E = R_f + \left[E(R_M) - R_f\right] \times \beta_i$$

- equity and debt financed firms:

$$WACC = \frac{E}{V} \times R_E + \frac{D}{V} \times R_D$$ (in a world of no corporate taxes)

3. **Payback Period**: accept if the payback period is less than some pre-specified limit.

Exam

- Final Exam
  - December 2 (Thursday), Regular Lecture Hours. Sino LT2

- The final exam is a closed-book exam. You can bring one (financial or scientific) calculator as well as one A4-size sheet of paper (with any notes/formulas you wish to write/print/photocopy on the front and back).

Follow Your Passion

- My term as your professor has come to an end, but our friendship will not, because friendship is a good thing, and maybe the best thing in the world, and no good thing ever dies

- Our ways will come across again

- Follow your passion!