FINA 2203: Fundamentals of Business Finance

Comprehensive Exam Summary

Lecture Notes Summary

Fall 2025

Contents

1 Chapter 6: Bonds

1.1 Bond Terminology

Key Definitions

- **Bond**: A security sold by governments and corporations to raise money from investors today in exchange for promised future payments
- **Face Value (Par Value)**: The notional amount used to compute interest payments; typically repaid at maturity
- **Coupon Rate**: The annual interest rate stated on the bond, expressed as APR
- **Maturity Date**: The final repayment date of the bond
- **Term**: Time remaining until the repayment date

1.2 Coupon Payment Formula

$$\boxed{CPN = \frac{\text{Coupon Rate} \times \text{Face Value}}{\text{Number of Coupon Payments per Year}}} \tag{1}$$

Example: A bond with 6% coupon rate, \$1000 face value, semiannual payments:

$$CPN = \frac{0.06 \times 1000}{2} = \$30 \text{ per period}$$

1.3 Zero-Coupon Bonds

1.3.1 Characteristics

- Only two cash flows: purchase price today and face value at maturity
- Always trades at a **discount** to face value
- Treasury bills are zero-coupon bonds with maturity up to one year

1.3.2 Yield to Maturity of Zero-Coupon Bond

$$\boxed{YTM_n = \left(\frac{\text{Face Value}}{\text{Price}}\right)^{1/n} - 1} \tag{2}$$

1.3.3 Price of Zero-Coupon Bond

$$\boxed{P = \frac{\text{Face Value}}{(1 + YTM_n)^n}} \tag{3}$$

Example: 5-year zero-coupon bond, \$100 face value, YTM = 5%:

$$P = \frac{100}{(1.05)^5} = \$78.35$$

1.4 Coupon Bonds

1.4.1 Coupon Bond Pricing Formula

$$\boxed{P = CPN \times \frac{1}{y}\left[1 - \frac{1}{(1+y)^N}\right] + \frac{FV}{(1+y)^N}} \tag{4}$$

Where:

- P = Current price of the bond
- CPN = Coupon payment per period
- y = Yield to maturity per period
- N = Number of periods until maturity
- FV = Face value

Important Note

For semiannual coupon bonds:

- Divide annual coupon rate by 2 to get periodic coupon rate
- Divide annual YTM by 2 to get periodic yield
- Multiply years to maturity by 2 to get number of periods

1.5 Bond Price and YTM Relationship

When...	Bond trades...	Condition
Coupon Rate > YTM	At a Premium (above par)	Price > Face Value
Coupon Rate = YTM	At Par	Price = Face Value
Coupon Rate < YTM	At a Discount (below par)	Price < Face Value

1.6 Interest Rate Risk

Key Relationships

1. **Inverse Relationship**: Bond prices and interest rates move in opposite directions
2. **Longer Maturity ⇒ Higher Interest Rate Risk**
3. **Lower Coupon Rate ⇒ Higher Interest Rate Risk**

1.7 Corporate Bonds and Credit Risk

1.7.1 Credit Spread

$$\boxed{\text{Credit Spread} = \text{Corporate Bond Yield} - \text{Treasury Yield}} \tag{5}$$

1.7.2 Bond Ratings

Category	Ratings
Investment Grade	AAA, AA, A, BBB
Speculative (Junk/High-Yield)	BB, B, CCC, CC, C, D

2 Chapter 7: Stock Valuation

2.1 Stock Basics

Types of Stock

- **Common Stock**: Voting rights, residual claim on assets, dividends not guaranteed
- **Preferred Stock**: Priority over common stock for dividends and liquidation, usually fixed dividends, limited or no voting rights

2.2 One-Year Investor: Stock Returns

2.2.1 Stock Price (One-Year Holding)

$$\boxed{P_0 = \frac{Div_1 + P_1}{1 + r_E}} \tag{6}$$

2.2.2 Total Return Components

$$\boxed{r_E = \underbrace{\frac{Div_1}{P_0}}_{\text{Dividend Yield}} + \underbrace{\frac{P_1 - P_0}{P_0}}_{\text{Capital Gain Rate}}} \tag{7}$$

2.3 Dividend-Discount Model (DDM)

2.3.1 General Form

$$\boxed{P_0 = \frac{Div_1}{(1 + r_E)} + \frac{Div_2}{(1 + r_E)^2} + \cdots + \frac{Div_N}{(1 + r_E)^N} + \frac{P_N}{(1 + r_E)^N}} \tag{8}$$

2.3.2 Infinite Horizon (No Terminal Price)

$$P_0 = \sum_{t=1}^{\infty} \frac{Div_t}{(1 + r_E)^t} \tag{9}$$

2.4 Constant Dividend Growth Model (Gordon Growth Model)

$$\boxed{P_0 = \frac{Div_1}{r_E - g}} \tag{10}$$

Where:

- Div_1 = Expected dividend next year
- r_E = Equity cost of capital (required return)
- g = Constant dividend growth rate (must be $< r_E$)

2.4.1 Rearranging for Cost of Equity

$$\boxed{r_E = \frac{Div_1}{P_0} + g} \tag{11}$$

2.5 Dividend Growth Rate

$$\boxed{g = \text{Retention Rate} \times \text{Return on New Investment}} \tag{12}$$

Where:

- Retention Rate = 1− Dividend Payout Rate
- Dividend Payout Rate = $\dfrac{Div}{EPS}$

2.5.1 Dividend Calculation

$$Div_1 = EPS_1 \times \text{Dividend Payout Rate} \tag{13}$$

2.6 Two-Stage Growth Model

For a firm with high growth initially, then constant growth:

$$\boxed{P_0 = \sum_{t=1}^{N} \frac{Div_t}{(1+r_E)^t} + \frac{1}{(1+r_E)^N} \times \frac{Div_{N+1}}{r_E - g}} \tag{14}$$

Where g is the long-run constant growth rate after year N.

2.7 Total Payout Model

Used when firms repurchase shares:

$$\boxed{P_0 = \frac{PV(\text{Future Total Dividends and Repurchases})}{\text{Shares Outstanding}}} \tag{15}$$

$$\text{Equity Value} = \frac{\text{Total Payout}_1}{r_E - g} \tag{16}$$

Then: $P_0 = \dfrac{\text{Equity Value}}{\text{Shares Outstanding}}$

3 Chapter 9: Fundamentals of Capital Budgeting

3.1 Key Concepts

Important Distinctions

- **Operating Expenses**: Expenses directly incurred, deducted immediately
- **Capital Expenditures**: Large purchases depreciated over time
- **Incremental Cash Flows**: Only cash flows that change as a result of the project

3.2 Incremental Earnings

3.2.1 EBIT Calculation

$$\boxed{EBIT = \text{Incremental Revenue} - \text{Incremental Costs} - \text{Depreciation}} \tag{17}$$

3.2.2 Income Tax

$$\boxed{\text{Income Tax} = EBIT \times \text{Marginal Tax Rate}} \tag{18}$$

3.2.3 Incremental Earnings (Unlevered Net Income)

$$\boxed{\text{Incremental Earnings} = (Revenue - Costs - Depreciation) \times (1 - T_c)} \tag{19}$$

3.3 Free Cash Flow

3.3.1 From Earnings to Free Cash Flow

$$\boxed{\text{FCF} = \text{Unlevered Net Income} + \text{Depreciation} - \text{CapEx} - \Delta NWC} \tag{20}$$

3.3.2 Direct Calculation

$$\boxed{\text{FCF} = (Revenue - Costs) \times (1 - T_c) + T_c \times Depreciation - CapEx - \Delta NWC} \tag{21}$$

Depreciation Tax Shield

$$\text{Depreciation Tax Shield} = T_c \times \text{Depreciation} \tag{22}$$

This represents the tax savings from depreciation expense.

3.4 Net Working Capital

$$\boxed{NWC = \text{Current Assets} - \text{Current Liabilities}} \tag{23}$$

$$NWC = \text{Cash} + \text{Inventory} + \text{Receivables} - \text{Payables} \tag{24}$$

$$\boxed{\Delta NWC_t = NWC_t - NWC_{t-1}} \tag{25}$$

Note: An *increase* in NWC is a cash *outflow* (reduces FCF)

3.5 Depreciation Methods

3.5.1 Straight-Line Depreciation

$$\boxed{\text{Annual Depreciation} = \frac{\text{Purchase Price}}{\text{Depreciable Life}}} \tag{26}$$

3.5.2 MACRS Depreciation (5-Year Property)

Year	1	2	3	4	5	6
Rate	20.00%	32.00%	19.20%	11.52%	11.52%	5.76%

3.6 Asset Sales and Salvage Value

3.6.1 Book Value

$$\boxed{\text{Book Value} = \text{Purchase Price} - \text{Accumulated Depreciation}} \tag{27}$$

3.6.2 Capital Gain or Loss

$$\boxed{\text{Capital Gain} = \text{Sale Price} - \text{Book Value}} \tag{28}$$

3.6.3 After-Tax Cash Flow from Asset Sale

$$\boxed{\text{After-Tax CF} = \text{Sale Price} - T_c \times (\text{Sale Price} - \text{Book Value})} \tag{29}$$

Or equivalently:

$$\text{After-Tax CF} = \text{Sale Price} - T_c \times \text{Capital Gain} \tag{30}$$

3.7 NPV Calculation

$$\boxed{NPV = \sum_{t=0}^{T} \frac{FCF_t}{(1+r)^t}} \tag{31}$$

Decision Rule

- If $NPV > 0$: Accept the project
- If $NPV < 0$: Reject the project
- If $NPV = 0$: Indifferent

3.8 Important Considerations

Include in Analysis	**Exclude from Analysis**
Opportunity Costs	Sunk Costs
Project Externalities (Cannibalization)	Fixed Overhead (if unchanged)
Changes in NWC	Past R&D Expenditures
Salvage Values	Interest Expense (in discount rate)
Tax Effects	

4 Chapter 11: Risk and Return in Capital Markets

4.1 Realized Returns

4.1.1 Single Period Return

$$\boxed{R_{t+1} = \frac{Div_{t+1} + P_{t+1} - P_t}{P_t} = \underbrace{\frac{Div_{t+1}}{P_t}}_{\text{Dividend Yield}} + \underbrace{\frac{P_{t+1} - P_t}{P_t}}_{\text{Capital Gain Rate}}} \tag{32}$$

4.1.2 Compounding Returns Over Multiple Periods

$$\boxed{1 + R_{annual} = (1 + R_1)(1 + R_2)(1 + R_3)(1 + R_4)} \tag{33}$$

For quarterly returns that make up a year.

4.2 Average Return

$$\boxed{\bar{R} = \frac{1}{T}(R_1 + R_2 + \cdots + R_T) = \frac{1}{T}\sum_{t=1}^{T} R_t} \tag{34}$$

4.3 Variance and Standard Deviation

4.3.1 Variance (Sample)

$$\boxed{Var(R) = \frac{1}{T-1}\sum_{t=1}^{T}(R_t - \bar{R})^2} \tag{35}$$

4.3.2 Standard Deviation (Volatility)

$$\boxed{SD(R) = \sqrt{Var(R)}} \tag{36}$$

4.4 Normal Distribution and Prediction Intervals

4.4.1 95% Prediction Interval

$$\boxed{95\% \text{ Interval} = \bar{R} \pm 2 \times SD(R)} \tag{37}$$

- About 68% of outcomes fall within ± 1 standard deviation
- About 95% of outcomes fall within ± 2 standard deviations

4.5 Types of Risk

Type of Risk	Diversifiable?	Risk Premium?
Systematic (Market) Risk	No	Yes
Unsystematic (Firm-Specific) Risk	Yes	No

Key Insight

Only systematic risk is compensated with higher expected returns. Investors can diversify away unsystematic risk by holding a portfolio.

5 Chapter 12: Systematic Risk and the Equity Risk Premium

5.1 Portfolio Concepts

5.1.1 Portfolio Weights

$$\boxed{w_i = \frac{\text{Value of Investment } i}{\text{Total Portfolio Value}}} \tag{38}$$

Note: $\sum_{i=1}^{n} w_i = 1$ (weights sum to 100%)

5.1.2 Portfolio Return

$$\boxed{R_P = w_1 R_1 + w_2 R_2 + \cdots + w_n R_n = \sum_{i=1}^{n} w_i R_i} \tag{39}$$

5.1.3 Expected Portfolio Return

$$\boxed{E[R_P] = w_1 E[R_1] + w_2 E[R_2] + \cdots + w_n E[R_n]} \tag{40}$$

5.2 Portfolio Volatility (Two-Stock Portfolio)

$$\boxed{Var(R_P) = w_1^2 SD(R_1)^2 + w_2^2 SD(R_2)^2 + 2 w_1 w_2 Corr(R_1, R_2) SD(R_1) SD(R_2)} \tag{41}$$

$$\boxed{SD(R_P) = \sqrt{Var(R_P)}} \tag{42}$$

5.2.1 Correlation

$$\boxed{Corr(R_i, R_j) = \frac{Cov(R_i, R_j)}{SD(R_i) \times SD(R_j)}} \tag{43}$$

- $Corr = +1$: Perfect positive correlation (no diversification benefit)
- $Corr = -1$: Perfect negative correlation (maximum diversification)
- $Corr = 0$: No correlation

5.3 Beta

Definition of Beta

Beta measures the sensitivity of a stock's return to the market return, representing the amount of systematic risk in the stock.

- $\beta = 1$: Stock moves with the market
- $\beta > 1$: Stock is more volatile than the market
- $\beta < 1$: Stock is less volatile than the market
- $\beta < 0$: Stock moves opposite to the market (rare)

5.3.1 Portfolio Beta

$$\boxed{\beta_P = w_1 \beta_1 + w_2 \beta_2 + \cdots + w_n \beta_n = \sum_{i=1}^{n} w_i \beta_i} \tag{44}$$

5.4 Capital Asset Pricing Model (CAPM)

$$\boxed{E[R_i] = r_f + \beta_i \times (E[R_{Mkt}] - r_f)} \tag{45}$$

Where:

- $E[R_i]$ = Expected return on asset i (also called required return)
- r_f = Risk-free rate
- β_i = Beta of asset i
- $E[R_{Mkt}]$ = Expected return on the market portfolio
- $(E[R_{Mkt}] - r_f)$ = Market Risk Premium

5.4.1 Components

$$E[R_i] = \underbrace{r_f}_{\text{Time Value of Money}} + \underbrace{\beta_i \times (E[R_{Mkt}] - r_f)}_{\text{Risk Premium for Systematic Risk}} \tag{46}$$

5.4.2 Security Market Line (SML)

The graphical representation of CAPM:

- X-axis: Beta (β)
- Y-axis: Expected Return ($E[R]$)
- Y-intercept: Risk-free rate (r_f)
- Slope: Market risk premium ($E[R_{Mkt}] - r_f$)

6 Chapter 13: The Cost of Capital

6.1 Capital Structure

$$\text{Market Value of Assets} = \text{Market Value of Equity} + \text{Market Value of Debt} \tag{47}$$

6.1.1 Leverage

- **Unlevered Firm**: Financed entirely with equity
- **Levered Firm**: Uses both debt and equity financing

6.2 Weighted Average Cost of Capital (WACC)

6.2.1 General Formula (with Preferred Stock)

$$\boxed{r_{WACC} = r_E \times \frac{E}{E+D+P} + r_{pfd} \times \frac{P}{E+D+P} + r_D(1-T_c) \times \frac{D}{E+D+P}} \tag{48}$$

6.2.2 Without Preferred Stock

$$\boxed{r_{WACC} = r_E \times \frac{E}{E+D} + r_D(1-T_c) \times \frac{D}{E+D}} \tag{49}$$

Where:

- r_E = Cost of equity
- r_D = Cost of debt (yield to maturity)
- r_{pfd} = Cost of preferred stock
- E = Market value of equity
- D = Market value of debt
- P = Market value of preferred stock
- T_c = Corporate tax rate

6.2.3 Unlevered Firm

$$r_{WACC} = r_E \quad \text{(for a firm with no debt)} \tag{50}$$

6.3 Cost of Debt

6.3.1 Pre-Tax Cost of Debt

Use the yield to maturity (YTM) on the company's existing debt.

6.3.2 After-Tax (Effective) Cost of Debt

$$\boxed{\text{Effective Cost of Debt} = r_D \times (1-T_c)} \tag{51}$$

Example: If $r_D = 6\%$ and $T_c = 25\%$:

$$\text{Effective Cost of Debt} = 0.06 \times (1-0.25) = 4.5\%$$

6.4 Cost of Preferred Stock

$$\boxed{r_{pfd} = \frac{Div_{pfd}}{P_{pfd}}} \tag{52}$$

Where:

- Div_{pfd} = Annual preferred dividend
- P_{pfd} = Current price of preferred stock

6.5 Cost of Equity

6.5.1 Method 1: CAPM

$$\boxed{r_E = r_f + \beta_E \times (E[R_{Mkt}] - r_f)} \tag{53}$$

Steps:

1. Estimate the firm's equity beta (usually from regression)
2. Determine the risk-free rate (Treasury yield)
3. Estimate the market risk premium (historical: 5-7%)
4. Apply the CAPM formula

6.5.2 Method 2: Constant Dividend Growth Model (CDGM)

$$\boxed{r_E = \frac{Div_1}{P_0} + g} \tag{54}$$

Where:

- Div_1 = Expected dividend next year
- P_0 = Current stock price
- g = Expected dividend growth rate

CAPM	**CDGM**
Requires: - Equity beta - Risk-free rate - Market risk premium	Requires: - Current stock price - Expected dividend - Growth rate estimate
Assumes: - Beta is correct - MRP is accurate - CAPM is valid	Assumes: - Dividend estimate is correct - Growth rate matches expectations - Constant future growth

6.6 WACC Weight Calculations

Use Market Values

Portfolio weights should be based on **market values** because the cost of capital reflects investors' current assessment of value, not book values.

$$\text{Weight of Equity} = \frac{\text{Market Value of Equity}}{\text{Total Market Value}} \tag{55}$$

$$\text{Market Value of Equity} = \text{Share Price} \times \text{Shares Outstanding} \tag{56}$$

$$\text{Market Value of Debt} = \text{Face Value} \times \% \text{ of Face Value} \tag{57}$$

6.7 Using WACC to Value Projects

6.7.1 Levered Value of a Project

$$\boxed{V_0^L = \sum_{t=0}^{T} \frac{FCF_t}{(1 + r_{WACC})^t}} \tag{58}$$

6.7.2 For a Growing Perpetuity

$$\boxed{V_0^L = FCF_0 + \frac{FCF_1}{r_{WACC} - g}} \tag{59}$$

6.7.3 Key Assumptions for Using WACC

1. **Average Risk**: Project has similar risk to firm's existing projects
2. **Constant Debt-Equity Ratio**: Firm maintains target capital structure
3. **Limited Leverage Effects**: Interest tax deduction is main effect of debt

6.8 Project-Based Cost of Capital

When a project has different risk than the firm's existing projects:

Different Risk Requires Different WACC

Use the WACC of a comparable company in the same industry as the project, not the firm's own WACC.

6.9 Net Debt Approach

$$\boxed{\text{Net Debt} = \text{Debt} - \text{Cash and Risk-Free Securities}} \tag{60}$$

$$r_{WACC} = r_E \times \frac{\text{Market Value of Equity}}{\text{Enterprise Value}} + r_D(1 - T_c) \times \frac{\text{Net Debt}}{\text{Enterprise Value}} \tag{61}$$

7 Summary of Key Formulas

7.1 Bond Valuation

$$\text{Coupon Payment:} \quad CPN = \frac{\text{Coupon Rate} \times FV}{\text{Payments per Year}} \tag{62}$$

$$\text{Zero-Coupon YTM:} \quad YTM_n = \left(\frac{FV}{P}\right)^{1/n} - 1 \tag{63}$$

$$\text{Coupon Bond Price:} \quad P = CPN \times \frac{1}{y}\left[1 - \frac{1}{(1+y)^N}\right] + \frac{FV}{(1+y)^N} \tag{64}$$

7.2 Stock Valuation

$$\text{Constant Growth DDM:} \quad P_0 = \frac{Div_1}{r_E - g} \tag{65}$$

$$\text{Dividend Growth Rate:} \quad g = \text{Retention Rate} \times \text{ROI} \tag{66}$$

$$\text{Cost of Equity (DDM):} \quad r_E = \frac{Div_1}{P_0} + g \tag{67}$$

7.3 Capital Budgeting

$$\text{Free Cash Flow:} \quad FCF = (Rev - Cost)(1 - T_c) + T_c \times Dep - CapEx - \Delta NWC \tag{68}$$

$$\text{After-Tax Salvage:} \quad \text{AT-CF} = \text{Sale Price} - T_c \times (\text{Sale Price} - \text{Book Value}) \tag{69}$$

$$\text{NPV:} \quad NPV = \sum_{t=0}^{T} \frac{FCF_t}{(1+r)^t} \tag{70}$$

7.4 Risk and Return

$$\text{Average Return:} \quad \bar{R} = \frac{1}{T}\sum_{t=1}^{T} R_t \tag{71}$$

$$\text{Variance:} \quad Var(R) = \frac{1}{T-1}\sum_{t=1}^{T}(R_t - \bar{R})^2 \tag{72}$$

$$\text{Standard Deviation:} \quad SD(R) = \sqrt{Var(R)} \tag{73}$$

$$95\% \text{ Interval:} \quad \bar{R} \pm 2 \times SD(R) \tag{74}$$

7.5 Portfolio Theory

$$\text{Portfolio Return:} \quad R_P = \sum_{i=1}^{n} w_i R_i \tag{75}$$

$$\text{2-Stock Variance:} \quad Var(R_P) = w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2\rho_{12}\sigma_1\sigma_2 \tag{76}$$

$$\text{Portfolio Beta:} \quad \beta_P = \sum_{i=1}^{n} w_i \beta_i \tag{77}$$

7.6 CAPM and WACC

$$\text{CAPM:} \quad E[R_i] = r_f + \beta_i(E[R_{Mkt}] - r_f) \tag{78}$$

$$\text{WACC:} \quad r_{WACC} = r_E \times \frac{E}{E+D} + r_D(1-T_c) \times \frac{D}{E+D} \tag{79}$$

$$\text{Effective Cost of Debt:} \quad r_D^{eff} = r_D(1-T_c) \tag{80}$$

$$\text{Cost of Preferred:} \quad r_{pfd} = \frac{Div_{pfd}}{P_{pfd}} \tag{81}$$

8 Quick Reference Tables

8.1 Bond Price vs. YTM Relationship

Coupon Rate vs YTM	Price vs Par	Trading Status
Coupon Rate $>$ YTM	Price $>$ Par	Premium
Coupon Rate $=$ YTM	Price $=$ Par	At Par
Coupon Rate $<$ YTM	Price $<$ Par	Discount

8.2 Free Cash Flow Components

Component	Effect on FCF
Unlevered Net Income	$+$
Add Back Depreciation	$+$
Capital Expenditures	$-$
Increase in NWC	$-$
Decrease in NWC	$+$

8.3 Risk Summary

Risk Type	Other Names	Diversifiable?	Compensated?
Systematic	Market, Non-diversifiable	No	Yes
Unsystematic	Firm-specific, Idiosyncratic	Yes	No

8.4 Beta Interpretation

Beta Value	Interpretation
$\beta = 0$	Risk-free asset
$0 < \beta < 1$	Less risky than market
$\beta = 1$	Same risk as market
$\beta > 1$	More risky than market
$\beta < 0$	Moves opposite to market

8.5 MACRS 5-Year Depreciation Schedule

Year	1	2	3	4	5	6
Rate	20.00%	32.00%	19.20%	11.52%	11.52%	5.76%