Kogan and Wang   15.415
E62-636 and E62-614   Summer 2020

15.415 Foundations of Modern Finance

This course provides a rigorous introduction to the foundations of modern finance and their applications to business challenges in valuation, investment and risk management, and corporate financial decisions. The five major sections of the course are: (A) an introduction to the financial challenges firms and households face and the analytical framework, basic principles and methodology of modern finance to tackle these challenges; (B) introduction to corporate finance and capital budgeting; (C) valuation of stocks, bonds, forwards and futures, options; (D) risk and return, including risk analysis, the Arbitrage Pricing Theory (APT), portfolio theory, and the Capital Asset Pricing Model (CAPM); and (E) corporate financial decisions, including cost of capital and real options, capital structure, interaction between investment and financing decisions, payout and risk management.

Course Materials

- **Required Textbook:** Brealey, Myers, and Allen, *Principles of Corporate Finance* (13e), Irwin/McGraw Hill. (BMA)

- **Recommended Textbook:** Bodie, Kane, and Marcus, *Investments* (12e), Irwin/McGraw Hill. (BKM)

- **Class Notes:** Class notes will be available on the course website.

- **Assignments:** Problem sets and case write-ups will be available on the course website.

Course Requirements and Grading

Course requirements include regular attendance and participation in class, reading of relevant chapters in the textbooks, the completion of problem sets and case write-ups, and two exams. Problem sets should be completed individually. Case write-ups should be completed within assigned groups. The following weighting scheme will be used to determine each student's course grade:

10%	Class participation
16%	Problem Sets
4%	Case Write-Ups
25%	Mid-term exam
45%	Final Exam

Class participation

Students are expected to attend all lectures during the regular class time window; to join the class on time and to stay engaged for the entire duration of the class; to

participate in the polls and break-out rooms during the class, and to keep their cameras turned on as much as their connectivity allows.

Classroom values

Students should abide by the norms of academic honesty and integrity, and professional behavior as described in the attached document Classroom Values@MITSloan.

Recitations

TAs will hold regular recitations to review class material and present additional applications and exercises.

Administrative Assistant

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Additional Readings (not required)

B. Malkiel, *A Random Walk Down Wall Street*, 2018.
  – This best-selling introduction to investing is now in its 12th edition and as popular as ever because of its entertaining style and sage advice. This is a great way to ease into financial markets, particularly for those who are not financially inclined.

P. Bernstein, *Capital Ideas*, Free Press, 1993.
  – Bernstein is one of the most well-respected and influential practitioners in the financial industry, and the founding editor of the *Journal of Portfolio Management*. This is a lively and beautifully written account of the most important ideas in academic finance, many of which were developed at MIT in the 1960's and 1970's.

Wall Street Journal
  – Often called the diary of financial markets, the *Journal* is still the leading business publication in the world and familiarity with its various columns, sections, and op-ed pieces is a must for any serious finance professional.

Course Outline
(This draft: July 2, 2020)

PART A **INTRODUCTION**

1 Introduction to Finance
- Financial decisions of households and corporations
- Approaches to valuing financial and real assets
- An overview of the financial market and its basic economic roles
- Unifying principles of finance

Reading: BMA Chapter 1; BKM Chapters 1, 2, 3, 4
Problem Set 1

2 Market Prices and Present Value
- State-space model for time and risk
- Arbitrage/relative pricing
- Present Value (PV) and future value
- Inflation, nominal and real cash flows and discount rates

Reading: BMA Chapter 2, 7
Problem Set 2

3 Discounting and Compounding
- Historic returns on asset classes: return and risk
- Special cash flows: Annuities and perpetuities
- Compound interest
- Mortgage calculation

Reading: BMA Chapter 2, 7; BKM Chapter 5
Problem Set 3

PART B **CORPORATE FINANCE I**

4 Introduction to Corporate Finance
- Corporate financial decisions
- Opportunity cost of capital and NPV
- Financial objective of corporate managers

Reading: BMA Chapter 1
Problem Set 4

5 Capital Budgeting I
- NPV rules
- Cash flow calculations from capital investments
- Project interactions
- Alternatives to NPV

Reading: BMA Chapters 5, 6, 10, 11, 12
Problem Set 5

Case: "Acid Rain"

PART C	**RELATIVE VALUATION**

6   Fixed Income Securities
- Fixed-income markets
- Term structure of interest rates
- Arbitrage valuation of bonds
- Bond duration and interest rate risk
- Inflation risk

Reading: BMA Chapter 3; BKM Chapters 14, 15, 16
Problem Set 6

7   Common Stocks
- Discounted Cash Flow (DCF) model
- Gordon model, multi-stage growth model
- Forecasting dividends
- Valuation of growth opportunities and valuation multiples

Reading: BMA Chapter 4; BKM Chapter 18
Problem Set 7

8   Forwards and Futures
- Introduction to forwards and futures
- Arbitrage pricing relations
- Forward interest rates
- Swaps

Reading: BMA Chapter 26; BKM Chapters 22, 23
Problem Set 8

9, 10   Options
- Introduction to options
- Basic properties of options
- Arbitrage pricing relations
- Binomial model of option pricing
- Risk neutral pricing
- Black-Scholes-Merton option pricing model

Reading: BMA Chapters 20, 21, BKM Chapters 20, 21
Problem Set 9, 10

Midterm Exam (during exam time, 3 hours, closed book, 1 page of notes)

PART D	**RISK, RISK PREMIUM, AND MARKET EQUILIBRIUM**

11   Risk

- Decisions under uncertainty and expected utility theory
- Risk aversion
- Diversification and portfolio analytics
- Systematic and idiosyncratic risk

Reading: BMA Chapter 7; BKM Chapters 6, 7
Problem Set 11

12   Arbitrage Pricing Theory (APT)
- Factor models for risk
- Derivation of APT
- Applications of APT

Reading: BKM Chapter 8, 10
Problem Set 12

13   Portfolio Theory
- Portfolio optimization
- Mean-variance efficient portfolios
- Capital Market Line and leverage

Reading: BMA Chapter 8; BKM Chapter 7
Problem Set 13

14   Capital Asset Pricing Model (CAPM)
- CAPM and linear risk/return trade-offs
- Applications of the CAPM
- Empirical tests of CAPM, asset pricing anomalies

Reading: BMA Chapter 8; BKM Chapter 9
Problem Set 14

15   Market Efficiency
- Efficient Market Hypothesis (EMH)
- Implications of EMH
- Empirical evidence on EMH

Reading: BMA Chapter 13, BKM Chapters 11, 12, 13
Problem Set 15

PART E   CORPORATE FINANCE II

16   Capital Budgeting II and Real Options
- Capital budgeting and discount rates
- Risk and horizon
- Introduction to real options
- Identifying and valuing real options

Reading: BMA Chapters 9, 22
Problem Set 16

17   Financing/Capital Structure I
- Financing decisions and capital structure
- Modigliani-Miller theorems
- Weighted average cost of capital (WACC)
- Business risk vs. financial risk
- Corporate debt and default risk
- Default premium and risk premium

Reading: BMA Chapters 14, 15, 17, 18, 23, 24
Problem Set 17
Case: "Ameritrade"

18   Financing/Capital Structure II
- Impact of taxes on financing
- Financial distress
- Cost of financial distress
- Information and agency costs
- Trade-off theory of capital structure
- Information asymmetry and agency costs
- Impact of personal taxes

Reading: BMA Chapters 14, 15, 17, 18
Problem Set 18

19   Interaction between Investing and Financing
- Leverage with tax shield
- Adjusted Present Value (APV)
- Weighted Average Cost of Capital (WACC)

Reading: BMA Chapter 19
Problem Set 19

20   Payout and Risk Management
- Payout overview
- Modigliani-Miller irrelevance theorem on payout policy
- Impact of frictions on payout
- Corporate risk management
- Impact of frictions on risk management
- Hedging mechanics for different risks

Reading: BMA Chapters 16, 26
Problem Set 20

21   Course Summary

Final Exam (during exam time, 3 hours, closed book, 2 pages of notes)