Andrew W. Lo | MIT | E52–432
Fall 2004 | Sloan School of Management | 3–8318

15.407 Finance Theory

Course Description

This course provides a rigorous introduction to the fundamentals of modern financial analysis and their applications to business challenges in capital budgeting, project evaluation, corporate investment and financing decisions, and basic security analysis and investment management. The major topics to be covered are: (1) the time-value of money and net present value rule; (2) the impact of uncertainty on securities such as stocks and bonds, portfolio theory, and pricing models such as the Capital Asset Pricing Model and Arbitrage Pricing Theory; (3) capital budgeting and corporate financing decisions; and (4) the pricing of options and other corporate liabilities.

This course covers the same topics as 15.401 but in greater depth. The intended audience is graduate students with solid quantitative backgrounds and career objectives in the financial services sector.

Course Prerequisites

This course has no prerequisites other than the usual admissions requirements of the MIT Sloan MBA program, i.e., working knowledge of calculus, probability and statistics, and basic computer literacy (e.g., Excel, Matlab). This course is a prerequisite for most finance electives.

Course Materials

Required:

- Brealey and Myers, *Principles of Corporate Finance*, 7th edition, McGraw Hill.
- 15.407 Readings Packet, MIT Copy Technology Centers (E52–045), Fall 2004.
- Lo and Wang, *15.407 Lecture Notes, Fall 2004* (available on SloanSpace).

Recommended:

- Bodie, Kane and Marcus, 2005, *Investments*, 6th edition, McGraw Hill.
- Bernstein, 1992, *Capital Ideas*, Free Press.
- Malkiel, 2003, *A Random Walk Down Wall Street*, 8th edition, W.W. Norton.
- *Wall Street Journal* and *Financial Times*.

Course Requirements

- Lectures are on Tuesdays, 18:00–21:00, E51–345. *No laptops or cellphones please.*
- Assignments include readings and problem sets:
  - Readings are to be done *in advance* of the class for which they are assigned.
  - Students may be "cold-called" during class, and participation is graded.
  - Problem sets are to be done in assigned groups.
  - Each assignment must be handed in at the assigned time and location.
  - Late assignments will not be accepted.
  - There is an optional recitation for each problem set.
- There will be a midterm and a final examination, both of which will be closed-book. However, students will be allowed to bring one 8.5"×11" two-sided sheet of notes into each examination. The final examination will be comprehensive.
- *The midterm examination will be given during the first half of class (18:00 to 19:30) on Tuesday October 26th, and the final examination will be given during the MIT-scheduled final examination date—please reserve these dates immediately and schedule your interviews and travel plans accordingly.*
- Course grades will be determined according to the following weighting scheme:

10%	Class preparation and participation
20%	Problem sets
20%	Midterm examination
50%	Final examination

Course Staff and Office Hours

- Teaching Assistant: Katy Kaminski, E40–139 (`katykam@mit.edu`).
- Course Assistant: Svetlana Sussman, E52-430 (`ssussman@mit.edu`).
- Office Hours for Prof. Lo: Tuesdays 16:00–17:30.
- Office Hours for Ms. Kaminski: Mondays 16:00–18:00.
- Recitation: Fridays 11:00–12:00.

15.407 Schedule of Lectures and Assignments

Part A. Introduction

September 14 **Introduction to Finance**

Financial decisions of households and corporations. Unifying principles of finance. Approaches to valuation of financial and real assets. Roles of financial markets. Objectives of corporate financial managers.

Readings: Brealey and Myers (BM) Chapters 1–2.

September 21 **Present Value (PV)**

Present value. Mechanics of PV calculations. Compound interest. Real vs. nominal cash flows.

Readings: BM Chapter 3.

Assignment: Problem Set 1 due Tuesday, September 28.

Part B. Valuation

September 28 **Fixed-Income Securities**

Fixed-income markets. Term structure of interest rates. Forward interest rates. Market conventions. Properties of bond prices. Interest rate risk. Measuring and hedging interest rate risk. Inflation risk. Credit risk.

Readings: BM Chapters 3, 24–25.

Assignment: Problem Set 2 due Tuesday, October 5.

October 5 **Common Stocks**

Discounted Cash Flow Model (DCF). EPS, D/P, P/E, PVGO, and discount rates.

Readings: BM Chapter 4.

Assignment: Problem Set 3 due Tuesday, October 12.

October 12 **Forwards and Futures**

Forward and futures contracts and prices. Hedging with forward and futures.

Readings: BM Chapter 27.

Assignment: Problem Set 4 due Tuesday, October 26.

October 19	**Options**
	Options contracts and basic properties. Valuation of options, binomial model, risk-neutral pricing, Black-Scholes formula.
Readings:	BM Chapters 20–21, Black (1989).
October 26a	**Midterm Examination**
October 26b	**Historical Asset Returns**
Readings:	BM Chapter 7.1.

Part C. Time Value of Money and the Price of Risk

November 2	**Time Value of Money and Theories of Interest Rates**
	Intertemporal consumption/saving decisions. Theory of real interest rates. Term structure models.
Readings:	BM Chapters 24.1, 24.4.
Assignment:	Problem Set 5 due Tuesday, November 9.
November 9a	**Risk**
	Asset returns. Measures of risk. Risk and horizon.
Readings:	BM Chapter 7.
November 9b	**Portfolio Theory**
	Diversification. Systematic risk and non-systematic risk. Portfolio theory. Efficient risk-return trade-offs. Dynamic considerations.
Readings:	BM Chapters 7–8.1.
Assignment:	Problem Set 6 due Tuesday, November 16.
November 16	**Capital Asset Pricing Model (CAPM) and Its Extensions**
	The CAPM and linear risk/return trade-offs. Applications of the CAPM. Empirical evidence and extensions of the CAPM.
Readings:	BM Chapter 8.2-8.3, Black (1993), Jagannathan and McGrattan (1995).
Assignment:	Problem Set 7 due Tuesday, November 23.
November 23a	**Arbitrage Pricing Theory (APT)**
	Factor models of asset returns. The APT and its implications.
Readings:	BM Chapter 8.4.
Assignment:	Problem Set 8 due Tuesday, November 30.

Part D. Introduction to Corporate Finance

November 23b	**Market Efficiency**
	Efficient Market Hypothesis (EMH). Implications and empirical tests of the EMH.
Readings:	BM Chapter 13, Ball (1998), Lo (2004), Rubinstein (2001).
November 30	**Capital Budgeting**
	Capital budgeting criteria. Cash-flow calculations. Discount rates. Project Interactions. Real options.
Readings:	BM Chapters 5–6, 9, 22, Borison et al. (2003).
Assignment:	Problem Set 9 due Friday, December 3.
December 7	**Financing**
	Leverage and the MM theorems. Corporate taxes.
Readings:	BM Chapters 17–18, Tufano (2003).
December 9	**Final Review Session, Thursday, 17:30 to 19:00**
	General course review.

15.407 Readings

1. Ball, R., 2003, "The Theory of Stock Market Efficiency: Accomplishments and Limitations", in J. Stern and D. Chew (eds.), *The Revolution in Corporate Finance*, 4th Edition. Malden, MA: Blackwell Publishers.

2. Black, F., 1989, "How We Came Up with the Option Formula", *Journal of Portfolio Management* 15, 4–8.

3. Black, F., 1993, "Beta and Return", *Journal of Portfolio Management* 20, 8–18.

4. Borison, A., Eapen, G., Mauboussin, M., McCormack, J. and A. Triantis, 2003, "University of Maryland Roundtable on Real Options and Corporate Practice", *Journal of Applied Corporate Finance* 15, 8–23.

5. Jagannathan, R. and E. McGrattan, 1995, "The CAPM Debate", *Federal Reserve Bank of Minneapolis Quarterly Review* 19, 2–17.

6. Kahneman, D. and A. Tversky, 1982, "The Psychology of Preferences", *Scientific American* 246, 160-173.

7. Lo, A., 2004, "The Adaptive Markets Hypothesis: Market Efficiency from an Evolutionary Perspective", *Journal of Portfolio Management* 30.

8. Rubinstein, M., 2001, "Rational Markets: Yes or No? The Affirmative Case", *Financial Analysts Journal* 57, 15–29.

9. Tufano, P., 2003, "Financial Innovation", in G. Constantinides, M. Harris, and R. Stulz (eds.), *Handbook of the Economics of Finance: Volume 1a, Corporate Finance*. Amsterdam: Elsevier/North-Holland.