

15.433 INVESTMENTS

Class 1: Introduction

Spring 2003

Outline

- Course Overview
- Market Overview
- Introduction to the Financial System
- Overviews of Equity, Fixed Income, Currencies and Derivatives
- Financial Innovations
- Summary
- Questions for Next Class

Course Mechanics

Course Grade:

Class participation	10%
5 group assignments	20%
Mid-tern exam	30%
Final exam	40%

Course Materials:

- Lecture Notes
- Textbook: Bodie, Kane and Marcus
- Articles in course reading packet
- Additional reading materials and handouts

Course Overview

Broadly speaking, this course will cover the following five themes:

- Financial theories: Portfolio theory, the CAPM and the APT
- Equity and equity options, and empirical evidence
- Fixed income instruments and fixed income derivatives, credit market and credit derivatives
- Market efficiency and active investments
- A brief introduction to behavioral finance

Course Objectives

Through this class I want to help you build the following skills:

- Analytical ability: modeling skills that are important in making investment decisions,
- Quantitative skills: developing problem solving skills, data analysis, probability evaluation of uncertain events.
- Empirical knowledge of the financial markets: equity, fixed income (default-free and defaultable) and their respective derivatives.

The Financial System

The financial system can be viewed from two different angles:

- *Institutional perspective:* the financial system encompasses the markets, intermediaries, instruments, clients etc.; and
- *Functional perspective:* the financial system facilitates the allocation and deployment of economic resources, across time and space and in uncertain environment.

While its institutional composition changes over time and space (different places on the globe), the basic functions of a financial system are essentially the same in all economies. The institutional dimension results from the functional needs.

Functional Perspective

The financial system provides six functions:

- Transferring economic resources across time (e.g. student loans, retirement funds) and space (global financial market, e.g. institutional investments)
- Clearing and settling payments to facilitate trades: money, check, ATM cards, mortgages and mortgage interest payments, etc.
- Pooling of resources to undertake large-scale indivisible enterprise (equities, money market funds, mutual funds etc.)
- Information to coordinate decision-making, facilitating information flow, "price discovery", the normal indices for equities, fixed income rates, volatilities etc.
- Dealing with agency problems, mitigate moral hazard, adverse selection and principal-agent based problems that are caused by asymmetry information or incentive mis-matches (collateralization, CEO incentive for company performance etc.).
- Managing risks, bundling, packaging, pooling and tranching of risk (insurance companies, CMO, CDO, exotic derivatives etc.)

Institutional Perspective

The institutional compositions of the financial system includes:

- *Financial markets:* equity, fixed income (debt), credits and derivatives
- *Financial intermediaries:* banks, insurance companies, pension funds, mutual funds, investment banks, venture capital firms, asset management firms and information providers etc.
- *Financial infrastructure and regulation:* trading rules, contract enforcement, account system, capital requirements etc.
- *Governmental and quasi-governmental organizations:* SEC, central banks (Federal Reserve System), the Bank for International Settlement (BIS), the International Monetary Fund (IMF), the World Bank, etc.

International markets differ in many ways:

- The US market is currently the only market offering *Financial Futures on individual stocks*;
- Germany closed the "Neue Markt", eliminating a *platform* for not very liquid stocks, regarding stock exchanges inexperienced companies, thus rising capital is getting more difficult for young companies;

- Investment attitudes and awareness are subject to national regulations, e.g. pension fund regulation - defined benefit vs. defined contribution plans.

Stocks

Common stocks, also known as Equities, represent ownership shares of a corporation.

- Two important characteristics: residual claim and limited liability;
- Sources of returns: dividends and capital gains;
- Calculating returns: buy at time 0 and pay P_0 , sell at time T and receive P_T and dividend D_T :

– The percentage return is calculated as:

$$r_T = \frac{P_T + D_T - P_0}{P_0} \quad (1)$$

– The log-return is calculated as:

$$r_T = \ln \left(\frac{P_T + D_T}{P_0} \right) \quad (2)$$

For small r_T , the log-return and percentage return are close.

Question: Why in some situations should we prefer to use log-returns?

- Some determinants of stock returns:
 - Firm-specific condition: management, productivity, earnings, growth-potential, market-liquidity,

- Market condition: market indices (volatility, volume etc.), e.g. Nasdaq, SP500, DAX, FTSE etc.
 - Economic condition: macro-economic variables, e.g. GDP-growth, inflation, employment rate, business cycles, liquidity, interest rates etc.
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- Some important empirical evidence:
 - Patterns in the cross-section of stock return: value (value vs. growth), size (small vs. large), momentum (low vs. high);
 - Time-series behavior of stock returns: time-varying expected returns, predictability, stochastic volatility etc.

Stocks and Bonds

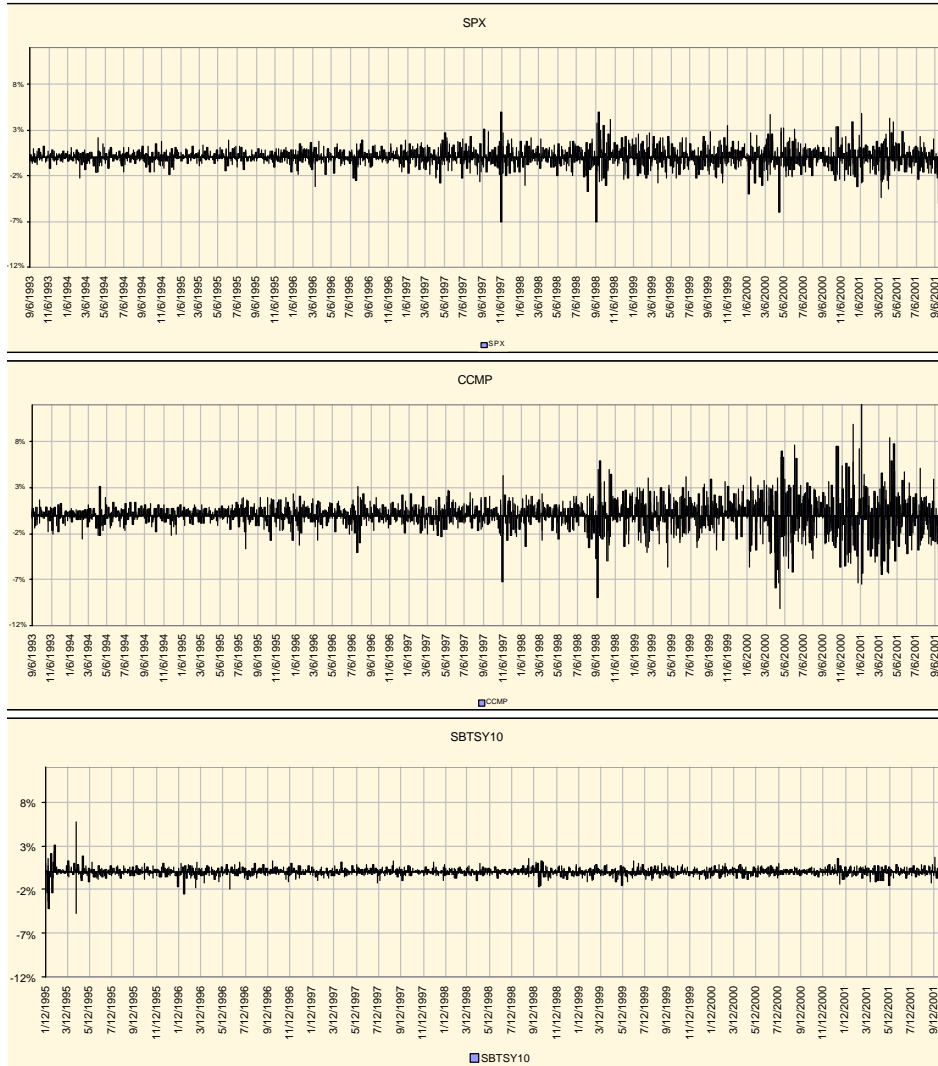


Figure 1: Daily returns of SP 500-index, Nasdaq-index and T-Bonds 10 years

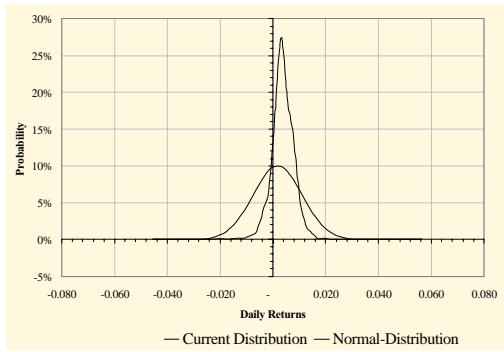


Figure 2: Return distribution of US 10 Year Bond

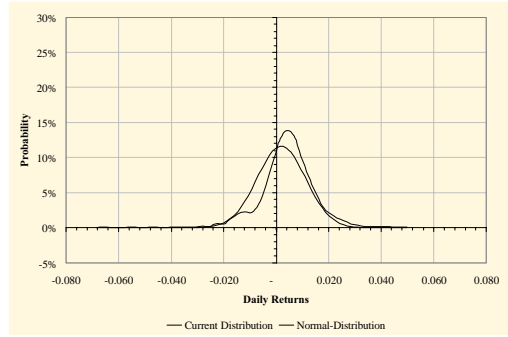


Figure 3: Return distribution of S&P 500 Index

Data source for Figures 1, 2, and 3: Bloomberg Professional.

Fixed Income

Fixed income, also known as debt-instruments, promise to pay fixed, pre-determined stream of cash flows in the future: Coupon payments, Principal amount (denominations), Time to maturity, Sinking fund obligations, etc.

Figure 4: Cash Flows, Source: RiskMetricsTM, Technical Document, p. 109

Figure 5: Discounted Cash Flows, Source: RiskMetricsTM, Technical Document, p. 109

Treasury bills, notes and bonds vary in maturity. T-bonds may also be callable during a given period.

The value of a bond can be reported in terms of price or yield to maturity. Yield go and price go.

Market Performance

Monthly returns 1926/7 to 2000/12

	Equity Portfolio*	Treasury Bills
Mean	0.99%	0.31%
Standard Deviation	5.50%	0.26%
Total Return	\$1'828	\$16.27

* Value-Weighted

The Term-Structure of Interest Rates (Yield-Curve)

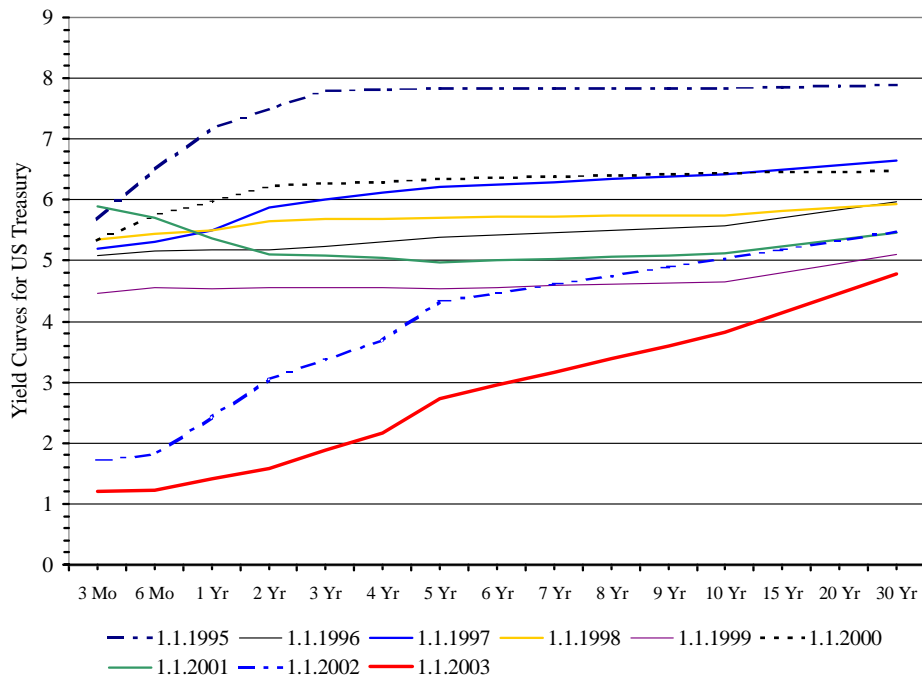


Figure 6: Treasury Yield Curve, Source: Bloomberg Professional.

How do we describe the term-structure:

- Shift
- Twist
- Butterfly

The Federal Funds Target Rates (set by FOMC) and the Discount Rates:

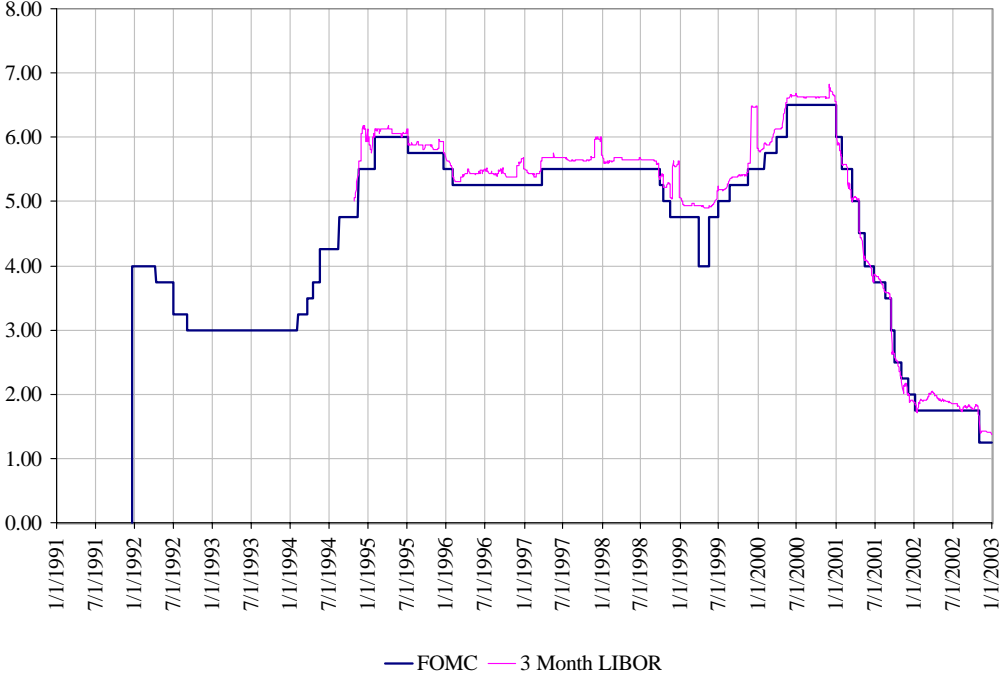


Figure 7: Short Term Interest Rates FED, Discount rates over the last 4 years, Source Bloomberg Professional.

Corporate Bonds

Corporate bonds are similar in structure to Treasury issues, with one important difference: *default risk*.

- Because of the default risk, corporate bonds are cheaper (than their respective Treasury counterparts), paying higher yields.
- The difference in yields is referred to as credit spread.
- The probability of default varies across firms of different credit qualities (e.g. countries, industries, guarantees etc.)
- The probability of default varies over time!

Figure 8: Standard & Poor's one year transition matrix, Source: RiskMetricsTM – Technical Document, p. 69.

Derivatives

Overview of Derivatives by Structure:

- Forward and Futures;
- Options;
- Futures;
- Path dependent (e.g. look-back), etc.

Overview of Derivatives by Underlying:

- Equity Derivatives: stock options, index futures, futures options etc.;
- Fixed-Income Derivatives: caps/floors, swaps, swaptions, etc.;
- Credit Derivatives: credit swap, collateralized loan obligations, etc.;
- Other derivatives: FX, weather, "exotics", etc.

Currencies

Currencies are the most liquid financial instrument.

Currency instruments have generally spoken the same type of parameters, however with different characteristics, e.g. currency return volatility, which is not shaped in the same form as the equity return volatility.

Currency positions usually have a much shorter maturity proprietary traders on Wall Street take positions up to half an hour!

Financial Innovation

Does financial innovation add value? If taken to excess, any virtue can readily become a vice: The market has seen examples of failed financial products, erroneous assumption and strategies, abusive usage of derivatives, distressed hedge funds etc. Empirical evidence supports the statement, that financial innovation does provide social wealth:

- It caters to the investment diversity desired by the investors;
- It improves the opportunities for investors to receive efficient risk-return trade-offs;
- It provides risk management tools for all market participants; and
- It promotes broad distribution and liquidity to economic resources.

Securitization

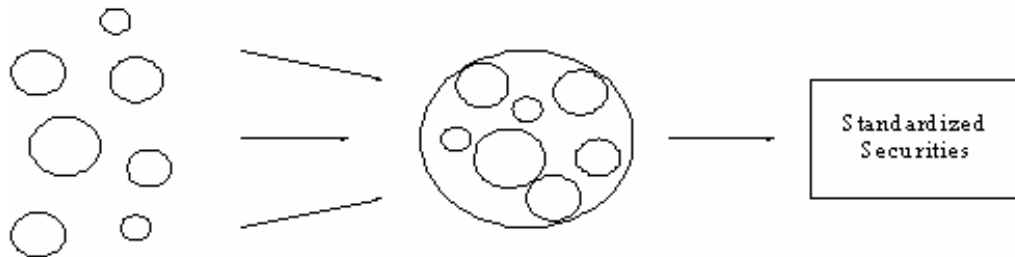


Figure 9: Securitization of "stand-alone" mortgages in liquid standardized mortgage-backed securities.

Securitization of the mortgage market: The national mortgage market and mortgage-backed securities transform the residential house finance from fragmented, local-based sources to a free-flowing, international base of capital with depth and usually a higher credit rating.

Other examples: collateralized debt (loan or bond) obligations, asset backed debt, etc.

Credit Enhancement

FleetBoston plays "Good Bank/Bad Bank," unloading \$1.35 Billion in troubled Loans Patriarch Partners LLC, a NY fund management boutique, created a CLO to raise about \$1 billion to acquire the loans.

See the following figure how FleetBoston's problem loans made their way from Fleet's books to a special collateralized-loan obligation, funded by investors.

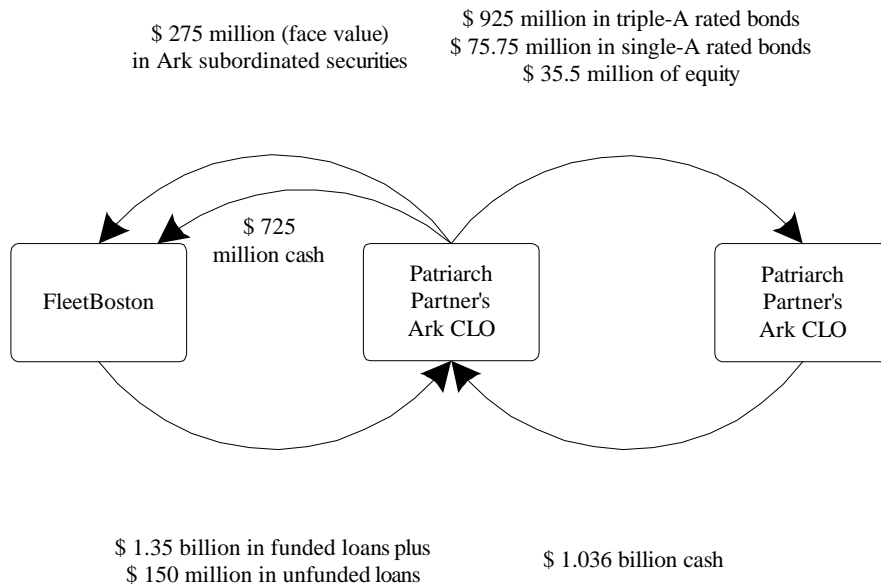


Figure 10: Setting-up a special purpose vehicle.

Summary

What to learn in this course? Analytical modeling skills, quantitative tools, and empirical knowledge about the financial market and the financial instruments.

How to think about the financial system?

- Functional perspectives: across time and space;
- Institutional compositions: results from the functional needs.
- Does financial innovation add value?
- Sometimes abusive usage of financial innovation causes disruptions.

Overall, however, financial innovation provides diversified investment opportunities for investors, risk management tools and techniques for market participants and liquidity to the overall market.

Focus:

BKM Chapters 1 & 2;

- p.16/17 (market structure);
- p.19 (securitization);
- p.28-46 (know the different instruments, e.g. CD, CP, Bankers Acceptances etc.);

- p.48-54 (know the most important market indexes, what kind of different weighting-schema exist etc.);

Reader: Sharpe (1995);

Type of potential questions: p. 60ff. questions 1, 5, 11, 17, 23

Preparation for Next Class

Please read:

- BKM Chapters 3 & 5,
- Fama (1995), and
- Kritzman (1993).

Questions:

- What is a normal distribution?
- How do we model uncertainty?
- Is variance the only measure of uncertainty?
- What is the average daily return?
- What about the average variability?
- What assumptions did you have to make in order to obtain the estimates?
- How accurate are your estimates?
- If given more observations (a large N), can you improve the precision of your estimates?