Before and After Book

For

Financial Markets and Investments

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Contents of This Pamphlet

For each topic in the syllabus this pamphlet provides:

1. Concise definitions of new vocabulary to help you prepare for the lecture. It is NOT meant to be exhaustive or comprehensive.

2. A list of important concept questions that you should be able answer after the lectures.

3. A list of sub-topics that will be followed during the lectures.

How To Use This Pamphlet

1. **Before** you read the material assigned for class, review the new vocabulary and the concept questions at the beginning of each topic outline so that you are aware of the new words and important issues while reading the assigned material. You should also review the outline of the sub-topics so that when you reach the section in the readings, handouts, news clippings, etc. that relate to these sub-topics, you can pay close attention to them. The vocabulary and topic outline should also prepare you to understand the words and topic sequence when hearing them during the lecture.

2. **After** each lecture go home and review your class notes. Check the sub-topic outline to make certain you have covered all of the material. Then review carefully the concept questions and make certain that you can answer the questions based on your notes. Discuss each heading and subheading in the topical outline as well as the concept questions in your *weekly group meetings.*

How Not To Use This Pamphlet

1. This is not a substitute for reading assigned material before class.
2. This is not a substitute for class notes.
3. This is not a comprehensive outline of what is done in class.
4. This is not a description of everything you must know on the exam.

Note: Although there are some sections that are marked optional below, if we cover them in class they are required. Bill Tanyeri (Stern MBA) helped prepare the vocabulary sections.

Detailed Course Outline, Vocabulary, and Concept Questions

Topic 1: Overview and Market Structure (2 Sessions)

A) Key New Vocabulary for Topic 1

Secondary Market: A market where previously issued financial products are bought and sold. The New York Stock Exchange is a secondary market.

Market Maker: A person who provides a ready market (see liquidity below) by quoting bid and ask (offer) prices for a financial product. The market maker profits by buying at the lower bid and selling at the higher ask. Also referred to as a dealer.

Bid: Price at which a dealer buys from the public. "I *bid* $22.80 for your Facebook shares."

Offer (ask): Price at which a dealer sells to the public. "I *offer* you Facebook shares at 22.90.

Bid-ask spread: Difference between the bid and ask. For example, if a market maker is quoting a bid-ask of $22.80-$22.90, the bid-ask spread is $0.10. It is a measure of the cost of transacting since the public buys from the dealer at the offer and sells to the dealer at the bid.

Liquidity: The ability to transact quickly, in large size, without significantly affecting the price. Microsoft stock, for example, with a narrow bid-ask spread, is very liquid, while shares in a privately held business are not.

Risk aversion: A risk-averse investor prefers an asset with a fixed return of (say) 5 % over an otherwise identical asset with an expected but uncertain return of 5% (e.g. an equal chance 0% or 10%). Risk aversion implies riskier securities must offer higher expected returns

Market Order: An order to buy or sell something immediately at the best price, whatever that price might be. "Sell 100 shares of IBM now!"

Limit Order: An order to buy or sell at a specific price. "Sell IBM at $200."

Issuer (of a bond): The entity that is borrowing funds. For example, Coca Cola borrows money by selling bonds to investors. The investors (bond buyers) lend money to Coke.

Call Auction: A market where buyers and sellers get together to transact at fixed time, e.g. an art auction at Sotheby's at 1:30pm.

Continuous Auction:
          A market where buyers and sellers may trade throughout the day, e.g. buying / selling IBM on the NYSE.

B) Concept Questions for Topic 1

After topic 1 you should be able to answer the following questions:

1. What are the characteristics of the cash flows on an asset that must be adjusted for in determining the value of the asset? How do those characteristics get embedded in the price of the asset?

2. What is the definition of risk aversion? Why are people risk averse and what are the consequences of risk aversion for asset prices?

3. How do you define liquidity and what are the consequences of illiquidity for the price of an asset?

4. What determines whether a secondary market is organized as an auction or a dealer market? Is this always a clear distinction?

5. What causes transactions prices to deviate from equilibrium prices? How does dealer behavior make transactions prices hover around the equilibrium price?

6. What is the distinction between a market order and a limit order? When would you use one rather than the other?

7. How do dealers 'know' whether their bid and ask (offer) prices straddle the equilibrium price?

8. What determines whether the bid / ask spread is wide or narrow? Is the bid / ask spread the only dimension to market liquidity?

C) Sub-topic Outline for Topic 1

Definition of a Security
          Rights to Cash Flows

Value of a Security
          Nature of Cash Flows
          Credibility of Issuer

Four Principles of Valuation
    Present Value
    Option value
    Risk Adjustment/ Diversification
    Arbitrage
Adjustments to Cash Flows
    Present Value
    Option Value
    Risk

Asset Prices Reflect Cash Flow Adjustments
    Supply and Demand
    Arbitrage

Risk Aversion
    Diversification Stems from Risk Aversion
    Definition of Risk Aversion
    Source: Diminishing Marginal Utility of Income
    Implication: Riskier Projects Must Offer Higher Expected Returns

Liquidity
    Definition: Transact Quickly Close to Equilibrium Price
    Importance for Valuation

Secondary Markets and Liquidity
    Call Auction: E-bay
    Continuous Auction: NYSE and ECNs
    Dealer Market: Almost Everyone, Including—NYSE and ECNs
    Dealers Quote Bids and Offers
    Dealers Earn Profits and Provide Liquidity

Key Issue: Transactions Prices versus Equilibrium Prices
    Definitions
    Integrated Call versus Continuous Auction
    Continuous Auction Fragments Order Flow

Transactions Price Volatility
    Role of Dealers
    Effect of Bid-Ask Spread

Bid-Ask Spread
    Price of Immediate Execution
    Liquidity Cost
    Market Orders versus Limit Orders

Dealer Behavior
    Inventory Signals

Determinants of Bid-Ask Spreads
    Volume of Trading
    Equilibrium Price Volatility

Liquidity and Transactions Cost
    Bid-Ask Spread
    Order Size that can be Accommodated at Prevailing Spread

Topic 2: Present Value, Yields and Returns (1 1/2 Sessions)

A) Key New Vocabulary for Topic 2

Simple Interest: A loan or investment where the rate of interest is paid only on the principal and not on the interest earned.

Compound Interest: A loan or investment where the rate of interest is paid on the principal and on the interest earned.

Annuity: A finite stream of equal cash flows. For example, receiving $1,000 in each of the next 5 years is an annuity.

Perpetuity: An infinite stream of equal cash flows. For example, receiving $1,000 each year forever is a perpetuity.

Bond: A security with fixed cash payments issued by a company or government. A coupon-paying bond typically pays a periodic fixed coupon (e.g. $50 per year) and returns the principal or face value (e.g. $1000) at maturity. Face value is also called par value.

Zero Coupon Bond: A bond that makes only a single fixed payment at maturity (e.g. $1,000) and is priced at a discount (e.g. $700) from par ($1,000) to reflect the interest that will be earned.

Discount Factor: A discount factor uses the interest rate to covert a future cash flow to its present value. Also called a present value factor.

Annual Percentage Rate (APR):
    The APR converts an interest rate quoted for part of a year into annual terms. For example a credit card that charges 2% per month has an APR of 24% (=12 x 2%). The APR calculation assumes simple interest.

Effective Annual Rate (EAR):

> The EAR converts a rate applicable to less than a year (a periodic rate) into an annual rate assuming compound interest. For example, 8% paid quarterly means the investor receives 2% every 3 months. Using the formula for compounding within a year, this periodic rate translates into an EAR of 8.24%. It is also the annual rate paid without compounding (8.24%) that produces the same amount of money as the quoted rate (8%) with compounding (4x per year).

Annual Return:

> The average annual rate of increase earned on an investment. It is derived by comparing the amount of money at the end of the investment period with the original amount invested.

Yield to Maturity (YTM):

> The average annual interest rate an investor earns by holding a bond to maturity. For a zero coupon bond it also measures the annual return (see above) the investor earns.

Holding Period Yield (HPY):

> The average annual return an investor earns by holding a bond for a period less than the maturity of the bond. This number will not necessarily equal the yield to maturity

B) Concept Questions for Topic 2

After topic 2 you should be able to answer the following questions:

1. Why do we usually use compound interest, rather than simple interest, in going from present value to future value (or the reverse) when the number of compounding periods (years) is large?

2. What makes you so certain that the price of a zero coupon bond will equal its discounted present value?

3. Under what circumstances does the price of a zero coupon bond increase monotonically as it approaches maturity? When does it not increase monotonically?

4. Why does it make sense that the price or present value (P) of a perpetuity equal to C dollars per annum is given by the formula, P=C/r, where r is the interest rate per annum. What does this tell you about the likely impact of the Federal Reserve on stock prices?

5. Provide a general formula to determine whether a one year investment at 7.5%, compounded quarterly, is a better investment than a one year investment at 7%, compound continuously? Which investment is better in this case?

6. What determines the relationship between the annual return on a zero coupon bond sold prior to maturity and the yield to maturity on that zero as of the day it is purchased?

7. Why is it more appropriate to characterize a fixed income security as having fixed cash flows rather than a fixed interest rate?

C) Sub-topic Outline for Topic 2

Present Value to Future Value
        Time Line: Single Payment Security
        Simple Interest
        Compound Interest

Future Value to Present Value
        Discount Factors

Application to Zeros
        Valuation
        Pull to Par
        Inverse Relationship of Price and Yield
        Definition of Basis Point

Measuring Yield on Zeros
        Yield to Maturity Assuming Annual Compounding

Annuities
        Time Line: Multiple Payment Security
        Present Value Formula
        Application to Perpetuities
        A Simple Look at Equity Valuation

Compounding Within a Year (Zeros)
        General Formula
        Continuous Compounding

Comparing Investments with Different Compounding Periods Per Year
        Effective Annual Rate (EAR)
        EAR Compared with APR

Returns
>Definition of Total Return
>Annual Return Derived From Total Return
>Annual Return and Yield to Maturity on Zeros

Holding Period Yield (HPY) on Zeros
>When HPY > Yield to Maturity
>When HPY < Yield to Maturity
>When is HPY Known with Certainty?

Returns with Cash Distributions
>Simple formula

Real Versus Nominal Rates
>Calculating the Difference
>TIPS

Note: Calculating Average Return over More Than One Period
>Geometric Mean versus Arithmetic Mean

Topic 3: Equilibrium One Period Yields (1/2 Session)

A) Key New Vocabulary for Topic 3

Nominal Interest Rate:
>The annual rate an investor earns in dollars. This rate does not take into account price inflation that erodes the purchasing power of those dollars

Real Interest Rate: The annual rate an investor earns after adjusting for changes in the dollar's purchasing power because of inflation.

Inflation: The increase in the overall level of prices for goods and services.

Expected Inflation: The expected increase in the price level for goods and services

Actual Inflation: The realized increase in the level of prices.

Supply of Credit: Entities willing to lend money, such as households that save, governments that run a surplus, and central banks, that are sources of funds in the credit market. They affect the potential supply of credit because they can buy bonds with their excess funds. Recall that bond buyers lend money.

Demand for Credit: Entities seeking to borrow money, such as households that spend more than they earn, governments that run a deficit, and most businesses, that are users of funds in the credit market. They affect the potential demand for credit because they issue corporate or government bonds or present IOUs to a bank in exchange for a loan. Recall that bond issuers borrow money.

Equilibrium Interest Rate:
The interest rate where there are no unsatisfied borrowers or lenders. The equilibrium rate has no tendency to change because all participants are satisfied, at least for the moment.

Riskless Interest Rate:
The interest rate an investor earns by purchasing a bond that is perfectly certain to make all its future cash flows. For our purposes, the obligations of the U.S. government are considered riskless, although it is possible for Congress to make it difficult for the US Treasury to honor its promise to repay all of its scheduled obligations.

B) Concept Questions for Topic 3

After topic 3 you should be able to answer the following questions:

1. Why does it make sense to describe the one period riskless interest rate as a reward to savers for giving up control over resources to investors?

2. If for some reason the equilibrium nominal rate does not rise by the *expected* rate of inflation, is it still true that the real rate is equal to the nominal rate minus the *actual* rate of inflation (ignoring the approximation associated with compound interest)?

3. Why does the Federal Reserve have to alter the supply of funds to the credit market in order to influence the equilibrium riskless interest rate?

C) Sub-topic Outline for Topic 3

Equilibrium Price and Equilibrium Yield
      Meaning of Equilibrium

Supply and Demand Determines Equilibrium Yield
      Bond Market
      Market for Credit or Loanable Funds

Behavioral Assumptions
       Demand for Funds
       Supply of Funds

Simple Applications
       How the Federal Reserve Affects Equilibrium Rates
       How Saving Impacts Equilibrium Yields
       How Expected Inflation Affects Equilibrium Yields

Topic 4: Arbitrage and the Law of One Price (1 1/2 Sessions)

A) Key New Vocabulary for Topic 4

Arbitrage: Buying something at a low price and simultaneously selling it at a higher price, with no outflow of cash. You would do an arbitrage as often as you can because it is riskless, requires no cash outlay, and earns a profit.

Short Sale: Selling an asset that you do not own. This means that you must borrow the asset to settle the trade. There is an active market for borrowing government bonds. A short sale that is part of a bond arbitrage locks in the sale price and generates a cash inflow to the short-seller equal to the price of the bond sold.

Trade settlement: When the buyer and the seller in a securities transaction complete their obligations: the seller delivers the securities and the buyer delivers the cash.

Spot transaction: When two parties agree to a trade that will settle 'immediately.' 'Immediately' typically means within 1 to 5 business days for most financial products.

Forward transaction:
When two parties agree on a price today for a transaction that will settle at some future time. For example, in a one-year forward currency trade, an investor might agree to exchange $1.40 for 1.00 euro (the exchange rate is the price). In one year's time, she will give $1.40 and receive 1.00 euro, regardless of what the prevailing exchange rate is in one year.

Uncovered Interest Arbitrage:
A trading strategy where investors attempt to take advantage of differences in interest rates between two countries with different currencies, usually borrowing in the low interest rate currency and lending in the high interest rate currency. Note: this strategy is not a true 'arbitrage' because of foreign exchange risk

Breakeven Rate: The exchange rate movement that leaves profit equal to zero in an uncovered interest arbitrage.

Covered Interest Arbitrage:
The same idea as an uncovered interest arbitrage -- investors attempt to take advantage of differences in interest rates between two countries, usually borrowing in the low interest rate currency and lending in the high interest rate currency -- but the foreign exchange risk is eliminated by using a forward contract to lock in the foreign exchange rate.

Interest Rate Parity: The outcome of riskless 'covered Interest arbitrage' produces an equilibrium relationship between the spot exchange rate and the forward exchange rate that reflects the interest rate differentials between two currencies

B) Concept Questions for Topic 4

After topic 4 you should be able to answer the following questions:

1. In what sense is arbitrage more powerful than supply and demand?

2. Do large transactions costs guarantee that there will be two different prices for two identical assets traded in separate auctions?

3. Do regulations prohibiting sophisticated investors from doing arbitrage cause deviations from the law of one price?

4. How do complications arising from short sales help explain the different prices observed for zero coupon bonds maturing on the exact same date but that come from the principal versus the coupon of a particular U. S. Treasury bond ?

5. Most arbitrage opportunities disappear within seconds. If so, why is it necessary to be ready to 'settle the trade' and extract your profit 'at the end' (when the security matures)? Can't you just rely on reversing the transaction after prices return to the 'normal' relationship?

6. Why is selling short a one year zero coupon bond equivalent to borrowing money at a fixed rate for one year? Would selling short a two year zero bond accomplish the same objective, i.e., be equivalent to borrowing money at a fixed rate for one year? How about selling short your not-so-favorite stock?

7. When you borrow in a low interest currency and lend in a high interest currency without a 'covering' foreign exchange transaction, will fluctuations in the foreign exchange rate always reduce your profit?

8. If the forward rate quoted in the market differs from the equilibrium forward rate based on interest-rate parity, will you always have a riskless arbitrage profit (ignoring transactions cost)?

9. Can interest rates denominated in different currencies be arbitrarily far apart?

C) Sub-topic Outline for Topic 4

Principles of Arbitrage
     Examine Cash Flows
     Buy Cheap and Sell Expensive, Simultaneously
     Know How to Get Your Money Out: Settle the Trade
     Know the Details
     Implication: Law of One Price (LOOP)
     Qualifying LOOP I: Transaction Cost

Arbitrage with CATS and TIGRS
     Examine Cash Flows
     Qualifying LOOP II: Maintain Short Sale
     Importance of Short Sale
     Ability to Maintain Short Sale

Arbitrage with U.S. and Foreign Bonds
     Examine Cash Flows
     Sources of Risk: Uncertain Exchange Rate
     Does the Law of One Price Prevail?
     Can Domestic and Foreign Rates Be Arbitrarily Far Apart?
     Exchange Rate Variability

Uncovered Interest Arbitrage
     Break-even Analysis

Covered Interest Arbitrage
     Equilibrium Forward Rate

Topic 5: Portfolio Analysis

Topic 5a: Two Risky Securities (2 1/2 Sessions)

A) Key New Vocabulary for Topic 5a

Expected return: The mean (μ) of the distribution of returns.

Risk: The standard deviation (σ) of the distribution of returns.

Risk/Return Trade-off:
 The combinations of risk and return that are available to an investor. The shape of the risk return trade-off, when plotting a graph of return (vertical axis) versus risk (horizontal axis), depends on the correlation of returns (ρ) among the securities.

Efficient Portfolios: Portfolios with the highest expected return (μ) for a given level of risk (σ) or portfolios with the lowest level of risk for a given expected return.

Efficient Frontier: When plotting a graph of return versus risk it is the line or curve that represents efficient portfolios only.

Minimum Variance Portfolio:
 The portfolio with the lowest risk on the efficient frontier.

Indifference Curve: When plotting a graph of return versus risk it is the curve, based on an investor's subjective preferences, showing different combinations of risk / return that make an investor equally happy, i.e. the investor is indifferent between those combinations.

Optimal Portfolio: The portfolio most preferred by an investor given their risk/return preferences. It is the tangency point between the investor's indifference curve and the efficient frontier.

Risk Averse: An investor with a positively sloped indifference curve is risk averse because it means he or she requires an increase in return (vertical axis) to compensate for an increase in risk (horizontal axis).

Risk Obsessed: An investor with a vertical indifference curve because it means that no matter how much return (vertical axis) is offered the investor's preferences depend only on the level of risk (horizontal axis).

Risk Neutral: An investor with a horizontal indifference curve because it means that the investor's preferences depend only on the level of return (vertical axis), no matter how much risk (horizontal axis).

B) Concept Questions for Topic 5a

After topic 5a you should be able to answer the following questions:

1. Under what conditions regarding the distribution of returns are the mean and standard deviation of returns sufficient statistics for summarizing the characteristics of a single security for investment purposes? Would the same hold for a *portfolio* consisting of two securities?

2. When combining two securities into a portfolio, why is the standard deviation of returns of the combined portfolio usually less than a weighted average of the standard deviation of returns of the two underlying securities? When is that not the case?

3. Explain how it is possible to reduce the standard deviation of returns of a two-security portfolio when shifting the weight towards more of the security with the higher standard deviation of returns. When is it impossible to accomplish that magical feat?

4. Assuming your portfolio clients are risk averse, must you describe all of the risk/return combinations to them in order for them to make a rational investment decision? Which risk/return combinations can be ruled out for them?

5. Do risk averse investors always hold a diversified portfolio? Do they usually hold the portfolio with the lowest possible overall risk? If not, why do we call them risk averse?

C) Sub-topic Outline for Topic 5a

Single Security
        Summarize Probability Distribution
        Mean Return
        Standard Deviation of Return

Normal Distribution Assumption
        Standard Deviation Measures Risk
        Translating σ Into Loss Probabilities
        Implications of Fat Tails: Higher Loss Probabilities at Extremes

Portfolio of Two Securities
      Summarize Joint Probability Distribution

Variance of Return on a Two Security Portfolio
      General Formula for σ^2
      Importance of Covariance (Correlation)
      Own-Variance is a Poor Guide to Risk

Risk-Return Trade Off with Two Securities
      Numerical Example
      Risk/Return Combinations
      Importance of Correlation Less than One

Risk-Return Trade Off and Correlation: Geometric Analysis
      Correlation Equals One
      Correlation Equals Minus One
      Correlation Equals Zero

Zero Correlation Between Two Securities
      Minimum Risk Portfolio
      Magic of Diversification

Gains from Diversification
      σ of a Portfolio Less Than a Weighted Average of σ_1 and σ_2
      When that is not the Case

Choosing an Optimal Portfolio
      Identify Efficient Portfolios
      Choose Optimum Using Investor Preferences

Efficient Portfolios
      Principle of Dominance (Mean Variance Criterion)

Investor Preferences
      Indifference Curves
      Risk Aversion
      Slope of Indifference Curves

Optimal Portfolio
      Why Is the Tangency Point the Optimum?
      Proof in words

Implications of Optimal Portfolio
      Risk Averse Investors
      Risk Obsessed Investors
      Risk Neutral Investors

Topic 5b: Risk-Free and Multiple Risky Securities (2 Sessions)

A) Key New Vocabulary for Topic 5b

Systematic Risk: The part of a security's risk that cannot be diversified away when the security is in a portfolio. It comes from a security's return that is positively correlated with the returns of other securities.

Idiosyncratic Risk: Also called non-systematic risk, it is that part of a security's risk that can be diversified away when the security is in a portfolio. It comes from a security's return that is independent (uncorrelated) with the returns of other securities.

Beta: The regression coefficient of the returns of an individual security versus the returns on a mutual fund consisting of many securities (sometimes, but not always, represented by the market). A positive beta means the security's return moves together with the returns on other securities, hence it has systematic risk that cannot be diversified away.

Leverage: Borrowing money to buy an asset, e.g. using a mortgage to buy a home, using borrowed funds to invest, buying stocks on margin.

Capital Allocation Line:
The risk-return combinations available to an investor by combining the risk-free asset with a risky security (or risky portfolio).

Tangency Portfolio: In a graph of risk versus return, draw a line connecting the risk free security to the efficient frontier of risky securities, and make the slope (risk/return ratio) as high as possible. The point where that line touches the efficient frontier is the tangency portfolio.

Separation Theorem:
The separation theorem states that investors can 'separate' the decision of how much risk they are willing to take from the optimal combination of risky securities. In particular, all investors will choose the tangency portfolio (the optimal combination of risky securities) and then adjust their risk exposure by varying the fraction they hold in the risk free asset versus the tangency portfolio. For example, some investors may place only 25% of their portfolio in the tangency portfolio of risky securities, holding the remaining 75% in the risk-free security, while other investors might place their entire net worth in the tangency portfolio.

B) Concept Questions for Topic 5b

After topic 5b you should be able to answer the following questions:

1. Explain why the portfolio weights attached to individual securities at any point along an efficient frontier of risky securities differs from a simple diversification rule that says divide your net worth equally among all available securities. What are the characteristics of a security that will increase (decrease) its allocation in the portfolio?

2. Explain what underlies the proof that when the correlation of returns among the underlying securities is zero, that portfolio risk approaches zero as the number of securities increases. Why is this principle so important for diversification among stocks if we know that all stock returns are positively (but not perfectly) correlated with one another?

3. Does a security that has a high standard deviation of returns necessarily have high systematic risk? Does a security with low idiosyncratic risk necessarily have a low standard deviation of returns? Why are these distinctions important?

4. How is it possible for a single mutual fund of risky securities to be optimal for all your portfolio clients, no matter what their degree of risk aversion, as long as they can borrow and lend at the risk free rate? Must they all invest some fraction of their portfolio in the risk free rate for this to be true?

5. Explain how and why the composition of risky securities entering the optimal portfolio of risky securities (the tangency portfolio) differs from the composition of risky securities entering the global minimum variance portfolio. In particular, in which portfolio should a security with the highest mean return have the greatest weight, holding everything else constant?

6. Does selling short the risk-free asset and investing in the optimal portfolio of risky securities mean that you are not risk averse? If not, why would you do such a thing? If yes, how can you recommend such a thing?

C) Sub-topic Outline for Topic 5b

Portfolios with More Than Two Securities
    General Formula for Risk and Return
    Identify Efficient Frontier
    Importance of Covariance

Special Case of Zero Correlation
	Risk Approaches Zero with More Securities
	Insurance Principle

Implications of Zero Correlation *Component* of Securities Returns
	Diversifiable (Nonsystematic) Risk
	Nondiversifiable (Systematic) Risk
	Statistical Decomposition via Single Index Model

Single Index Model
	Beta and Systematic Risk
	Error Term and Nonsystematic Risk

Introduce Risk-Free Asset
	Concept of Asset Allocation
	Formula for Risk-Return Trade-Off
	$R = R_f + [(R_m - R_f)/\sigma_m] \bullet \sigma$ is the Capital Allocation Line (CAL)
	CAL Applies to Efficient Portfolios

Capital Allocation Line
	Slope Equals Excess Return per Unit Risk
	Slope Equals Reward to Variability Ratio
	Slope Equals "Price" of Risk

Selling Short Risk-Free Security
	Equivalent to Borrowing
	Extends Capital Allocation Line
	Leverage: Good and Bad

Implications of Risk-Free Asset
	New Efficient Frontier
	Separation Theorem
	Choice Makes Investors Better Off

Implications of Separation Theorem for Portfolio Managers
	Recommend Single Optimal Portfolio
	Use Risk-Free Asset to Adjust Investor Risk

Proper Mutual Fund Portfolio Weights
	Using Interactive Optimizer
	Importance of Covariance

Topic 6: Capital Market Equilibrium (2 Sessions)

A) Key New Vocabulary for Topic 6

Capital Asset Pricing Model (CAPM):
> CAPM specifies the equilibrium structure of returns on individual securities and portfolios in the capital market. It is based on investor portfolio decisions and the condition that supply equals demand for each security and for risky securities versus the riskless asset. The two equilibrium outcomes are (1) investors will hold the market portfolio and (2) the excess returns of risky securities above the risk free rate depends only on systematic risk (as measured by a security's beta with the market portfolio) .

Market Portfolio:
> An index fund where the value held in each security (price times number of shares outstanding) is the same fraction in the index fund as it is in the market as a whole. Broad market indices (such as the S&P500 and the Nikkei225) are often used as a proxy for the market portfolio.

Capital Market Line:
> It is the special capital allocation line (see Topic 5b) in equilibrium which gives the risk / return trade-off between the risk free security and the market portfolio. Expected return is on the vertical axis and standard deviation on the horizontal axis in the graph.

Security Market Line:
> The equilibrium relationship, according to CAPM, between the expected return on a risky security, or risky portfolio, and the beta of the security or portfolio. Expected return is on the vertical axis and beta on the horizontal axis in the graph.

Security Characteristic Line:
> The regression between the return on an individual security (or portfolio) and the return on the market. The slope of the regression line is the security's beta. The security's return is on the vertical axis and the market's return on the horizontal axis in the graph.

Sharpe Ratio:
> A performance measure that scales the excess return of a portfolio above the risk-free rate by the portfolio's standard deviation.

Treynor Ratio:
> A performance measure that scales the excess return of a portfolio above the risk-free rate by the portfolio's beta.

B) Concept Questions for Topic 6

After topic 6 you should be able to answer the following questions:

1. Why is the separation theorem necessary, in addition to the assumption that investors have homogeneous expectations, to demonstrate that in equilibrium every investor holds the market portfolio of risky securities (if they hold any risky securities at all)?

2. In equilibrium, what determines whether the market price of risk is high or low? Can you predict what effect an increase in the risk free rate has on the market price of risk?

3. What should happen in the market place if the excess return of any security above the risk-free rate were not proportional to the beta of the security, i.e., how does the portfolio behavior of market participants restore the CAPM mandated relationship? Why does this relationship of excess return to beta mean that you should never hold an individual security by itself?

4. Would it ever make sense to hold a security with a high standard deviation of return even if its expected return is less than the risk free rate? If so, explain the circumstances.

5. Why must you adjust the performance of a mutual fund for its risk? How should you measure its risk?

C) Sub-topic Outline for Topic 6

Equilibrium Process
　　Supply Equals Demand
　　Call Auction at NYSE Opening

Implications of Homogeneous Expectations
　　Everyone Holds Market Portfolio
　　Capital Allocation Line = Capital Market Line
　　Slope = Market Price of Risk
　　Investor Preferences Influence Market Price of Risk

Equilibrium Expected Returns on Risky Securities
　　$\partial \sigma / \partial x_i$ is Risk Contribution to Market Portfolio

$$\frac{R_i - R_f}{\partial \sigma / \partial x_i} = \frac{R_j - R_f}{\partial \sigma / \partial x_j} = \frac{R_m - R_f}{\sigma_m} \text{ is Equilibrium}$$

　　Excess Returns per Unit Risk Are All Equal

Beta of Security
        Summarizes Risk of Security Relative to Market
        Estimated Statistically by Security Characteristic Line

Security Market Line
        Cross-section Description of Equilibrium Expected Returns
        $R_i = R_f + (R_m - R_f) \beta_i$: Applies to Any Risky Security
        Market Pays for Systematic Risk Only
        High Beta Stocks Have Higher *Expected* Returns

Implications of Capital Asset Pricing Model (CAPM)
        Mutual Fund Theorem (Separation Theorem)
        Never Hold a Single Security by Itself

CAPM and Performance Measures
        Risk-Adjusted Expected Returns
        Portfolio Performance: Sharpe versus Treynor

Extensions of CAPM
        Multi-factor Model

Topic 7: Introduction to Capital Budgeting (1 Session)

A) Key New Vocabulary for Topic 7

Capital Budgeting: The process of deciding which projects (usually risky and long term) a company should undertake.

NPV: The net present value (NPV) of an investment project is the difference between the discounted value of the expected future cash flows minus the current cash outflow. A CEO should choose only those projects where the NPV > 0.

IRR: The internal rate of return (IRR) on an investment project is that rate of discount that equates the present value of the future cash flows to its current cost. It is a measure of the average annual return on the project. A CEO should choose only those projects where the IRR > firm's cost of capital.

Cost of Capital: For an all-equity firm it is the risk-adjusted discount rate investors need in order to hold the firm's equity. According to CAPM it is the return specified for the company's equity by the security market line.

Mutually Exclusive Projects:

        When firm can choose only one project from among a number of alternatives, e.g., whether to build a twenty-story warehouse or an amusement park on its Manhattan property.

B) Concept Questions for Topic 7

After topic 7 you should be able to answer the following questions:

1. What is the proper discount rate to use in an NPV calculation for an all equity firm to determine whether the firm should undertake a risky investment project? Does your choice depend on whether the project has idiosyncratic risk as well systematic risk? Why or why not?

2. Why does the IRR sometimes give a different answer in ranking projects compared with NPV? Which is preferred and why?

C) Sub-topic Outline for Topic 7

Applications of CAPM to Capital Budgeting
        Objective: Increase the Value of the Firm
        Discounted Cash Flow (DCF) Valuation
        Net Present Value Calculation
        Cost of Equity Capital
        Why Only Systematic Risk Matters.

Net Present Value Versus IRR
        Defining IRR
        When It Works
        When It Doesn't

Topic 8: Common Stock Valuation (1 1/2 Sessions)

A) Key New Vocabulary for Topic 8

Dividend: A payment made by a company to the owner of its stock.

Dividend Discount Model:

        A model used to price a stock based on the present value of all expected future dividend payments.

Price/Earnings Ratio (P/E):
        The ratio of the current stock price to the company's annual earnings.

Plowback Ratio (b): The fraction of earnings a company keeps (reinvests) in the company, e.g., a plowback ratio of .7 means it retains 70 cents out of every dollar in earnings.

Payout Ratio (1-b): The fraction of earnings a company pays out in dividends, e.g., a payout ratio of .3 means it pays 30 cents out of every dollar in earnings to stockholders as dividends. The payout ratio equals 1 minus the plowback ratio (because they must sum to 1).

Dividend Growth Model:
        A model used to price a stock based on the present value of all expected future dividend payments which are assumed to grow at a fixed rate (g) per annum.

Implied Growth Rate:
        It is possible to use the dividend growth model, combined with the current stock price, to solve for the implied growth rate (g). The result is the growth rate implied by the market price.

Dividend yield: A company's annual dividend divided by its current stock price.

B) Concept Questions for Topic 8

After topic 8 you should be able to answer the following questions:

1. How can you value a company that has never paid a dividend using the dividend discount model? Do earnings matter in the dividend discount model? How can you reconcile the dividend discount model with the common sense notion that investors buy stocks in anticipation of capital gains?

2. Why and how does the expected growth rate in a company's earnings affect the value of a company according to the dividend growth model? Why is earnings growth so important?

3. How do you explain the fact that a company may retain a high fraction of its earnings and reinvest them in the company and the stock market still does not value the company as a 'growth stock'.

4. How is the price-earnings ratio of a company affected by its cost of capital? How is it affected by the firm's return on equity? How is it affected

by the firm's plowback (or payout) ratio? Under what conditions does the price-earnings ratio of a company equal the inverse of its cost of capital?

5. At what rate should a company's stock price grow according to the dividend growth model?

C) Sub-topic Outline for Topic 8

Dividend Discount Model
      A Discounted Cash Flow (DCF) Approach
      Proper Capitalization Rate
      Assume Constant Dividends: Perpetuity
      Dividends versus Capital Gains
      Non-dividend Paying Stocks
      Dividends versus Earnings

Price-Earnings Ratio
      Importance of Capitalization Rate

Valuing Stocks as Perpetuities: A Test
      The Problem of Growth Stocks

Constant Growth Dividend Discount Model
      Stocks Valued as a Growing Perpetuity

More on Price-Earning Ratio
      Importance of Growth

Sources of Growth
      Plowback
      Return on Equity (ROE)

When ROE Equals Capitalization Rate
      Stock Valued as a Perpetuity

Another Cost of Capital Formula (Optional)
      Dividend Yield Plus Growth

Topic 9: Fixed Income Securities

Topic 9a: Yield Calculations (1 1/2 Sessions)

A) Key New Vocabulary for Topic 9a

Bond Yield Equivalent (BYE):
A measure used to annualize the periodic return on Treasury bills (needed because T-bills have maturities of 6 months or less). The BYE is often used to compare this annualized yield on a T-bill with the yield to maturity on a bond (see below).

Discount Rate: A calculation for T-bills that resembles a yield but is properly used only for quoting bids and offers on bills. The discount rate is based on the face value (100) rather than on the price and uses 360 days rather than 365 days to annualize the return. Both simplifications (helpful before investors had financial calculators) make the discount rate on the bill smaller than the BYE of the same bill.

Coupon Rate: The coupon rate of a bond equals C, the annual coupon, divided by F, the face value of the bond. A bond with a face value of $1,000 that pays a total of $80 in coupons every year has a coupon rate of 8%.

Current Yield: The current yield on a bond equals C, the annual coupon, divided by P, the price of the bond. A $1,000 face value bond selling for a price of $900 has a current yield of $80 / $900 = 8.88%.

Yield to Maturity: For annual pay bonds, yield to maturity is the discount rate (internal rate of return, IRR) that equates the future coupon and principal payments to the current price. For semi-annual pay bonds the yield to maturity is 2 x IRR. For a bond selling at par (100) the yield to maturity equals both the current yield and the coupon rate. The yield to maturity is designed to measure the annual return on the bond if held to maturity (see the next entry for a qualification).

Reinvestment assumption:
It is the assumption that the coupons are reinvested at the same rate as the yield to maturity. Yield to maturity is an imperfect measure of the annual return (realized compound yield) on a bond because it implicitly assumes the reinvestment of the coupons at the yield to maturity, and this may not be possible.

B) Concept Questions for Topic 9a

After topic 9a you should be able to answer the following questions:

1. Is the discount rate on a Treasury bill always less than the bond yield equivalent on that same bill? Is the difference between those two rates always a constant number of basis points? Why or why not? And finally, why should you use the bond yield equivalent when comparing a Treasury bill's yield with a Treasury bond.

2. What is the relationship between the yield to maturity on a coupon bond and the *current* yield on that same coupon bond assuming that the bond is selling at a discount? How about if the bond is selling at a premium? What does the yield to maturity include in its calculation that the *current* yield ignores?

3. Do annual pay and semi-annual pay coupon bonds both use the same IRR methodology to calculate the yield to maturity? If both a semi-annual pay bond and an annual pay bond have the same yield to maturity do they also have the same effective annual rate?

4. In what sense does the IRR methodology implicitly assume that the coupons on a bond are re-invested at the yield to maturity? When does the realized compound yield on a bond (the annual return) differ from the yield to maturity even if you hold the bond to maturity? When are they the same? Is your answer to the last question the same for annual versus semi-annual pay bonds?

C) Sub-topic Outline for Topic 9a

Role of Yield to Maturity
      Yardstick and Summary Measure

Yield on Treasury Bills
      Bond Yield (Coupon Yield) Equivalent
      Effective Annual Rate
      Discount Yield
      Relating Discount Yield and Bond Yield Equivalent

Coupon-Bearing Bonds: Annual Pay
      Cash Flow Time Line
      Pricing: A Package of Zeros
      Pricing: Discount Cash Flows by Zero (Spot) Rates
      Yield to Maturity (YTM) Calculations

YTM on Annual Pay Coupon Bonds
     Internal Rate of Return
     A Single "Average" Discount Rate
     Trial and Error Calculation

Coupon Rate Versus Current Yield versus YTM
     Bond Selling at Par
     Bond Selling Below Par
     Bond Selling Above Par

Reinvestment Assumption in YTM
     Implicit in Discounting Process
     Importance for Future Value Accumulation
     YTM is a Flawed Metric

Semi-Annual Pay Bonds
     Cash Flow Time Line
     Yield to Maturity Calculation

Yield to Maturity on Semi-Annual Pay Bond
     Calculation: Double the Periodic IRR
     Distinguish EAR and YTM

Annual Returns Versus YTM on Coupon Bonds
     Realized Compound Yield (Realized Annual Return)
     Role of Reinvestment Rate: Numerical Example
     Semi-Annual Versus Annual Pay Bonds

Topic 9b: Yield Curve and Forward Rates (2 Sessions)

A) Key New Vocabulary for Topic 9b

Term structure of Interest rates:
     The relationship between interest rates on securities that differ only in their term-to-maturity.

Yield Curve: A graph that plots the term structure of interest rates. Yield to maturity is on the vertical axis and the number of years to maturity of the bond is on the horizontal axis. It shows whether yields are higher or lower on long-dated bonds versus short-dated bonds. For example, a downward sloping yield curve (sometimes called an inverted yield curve) means that short-maturity bonds have higher yields than long-maturity bonds.

Spot interest rate: The interest rate on a loan that begins today and matures at some date in the future. All yield calculations that we have discussed so

far this semester are for spot interest rates. The yield curve plots spot interest rates.

Forward interest Rate:

> The interest rate on a loan that begins at some date in the future and matures after that date. For example, if the one-year forward rate starting next year were 5%, then an investor could enter a forward contract to lend $100 in one year and receive $105 in two years. Forward rates are objective facts that can be calculated from spot interest rates in the term structure.

Expected future short term interest rate:

> The short term interest rate that investors expect to prevail at some date in the future. For example, investors may expect the one year interest rate to be six percent next year. Expected rates are subjective and may or may not be equal to forward rates, depending on how the equilibrium term structure is determined.

Expectations Theory:

> An explanation for the shape of the yield curve that focuses on the relationship between expected future short-term interest rates versus the current short term interest rate. In equilibrium, according to the expectations theory, long-term interest rates are an average of current and intervening expected short-term interest rates. In this case, forward rates are equal to expected short term rates.

Liquidity Premium Theory:

> An explanation for the shape of the yield curve that modifies the expectations theory. In equilibrium, according to the liquidity premium theory, long-term interest rates are *above* an average of the current and intervening expected short-term interest rates because of a liquidity (really risk) premium.

Preferred Habitat Theory:

> Because investors prefer to hold securities in specific maturity ranges (their preferred habitats), the equilibrium term structure may depend on the relative supplies of short term and long-term securities, in addition to expectations.

B) Concept Questions for Topic 9b

After topic 9b you should be able to answer the following questions:

1. What are the usual (and unusual) shapes of the yield curve? How do you measure the magnitude of the slope of the yield curve? Do all countries have roughly the same shape at the same time?

2. Describe in words what a forward rate is. How can you actually transact at a forward rate using conventional securities?

3. Why is the long-term rate an average of the current and expected future short-term rates according to the expectations theory of the term structure? What would happen if that were not the case?

4. Does the liquidity premium theory of the term structure imply that expectations do not matter? Can you have a downward sloping yield curve according to the liquidity premium theory? How is that possible if long-term securities require a 'liquidity premium'?

5. What is the best explanation for the hump that sometimes emerges in the middle of the yield curve? Can you calculate a forward rate when the yield curve has such a peculiar shape?

6. Should risk averse one-year investors ever buy two year securities with the intention of selling them after one year? Under what circumstances?

C) Sub-topic Outline for Topic 9b

Slope of Yield Curve
        Historical Examples: U.S. and Foreign
        Measuring Slope: Long Rate (10 yr) Minus Short Rate (3 month)

Forward Rates
        Formulas for Calculating Forward Rate

Constructing a Forward Loan
        Combining a Two-Year with a One-Year Security
        A Note on Repurchase Agreements (optional)
        Financial Engineering: Focus on Cash Flows

Equilibrium Term Structure
        Pure Discount Bonds
        No Default
        Key to Equilibrium: Investor Behavior

Expectations Theory
        Equilibrium Relation Between Long and Short Rates
        Key Role of Investor Behavior
        Equilibrium Forward Versus Expected Rates: They are Equal
        Precise Numerical Examples
        Shape of Yield Curve: Expected Future vs. Current Short-term Rates
        Pluses and Minuses of Expectations Theory

Liquidity Premium Theory
Risk Aversion
Uncertain Expectations of Futures Rates
Too Many Long-term Securities for Natural Long-Term Investors
Long-rates are Above the Average of Current and Expected Short Rates
Forward Rates are Upward Biased Estimates of Expected Short Rates

Segmented Markets
Preferred Maturity Ranges
Supply and Demand Determine Rate Structure

Synthesis
Substitutability Among Different Maturities
Each Theory Explains Some Real-world Observations

Topic 9c: Duration (1 Session)

A) Key New Vocabulary for Topic 9c

Duration: For a bond with fixed cash flows, (Macaulay) duration is a weighted average of the time periods when payments are made. Because coupon payments come before the return of principal at maturity, the duration of a coupon bond is always less than its maturity. Duration also measures the percentage price volatility of a bond per percentage change in interest rates.

Convexity: The percentage price volatility of a bond per percentage change in interest rates is larger at lower levels of interest rates (the relationship is convex) because the duration of a bond is larger at lower levels of interest rates.

Portfolio Immunization:
An individual or institution can eliminate (immunize) the impact of changes in interest rates on the net worth of its portfolio by matching the duration of assets with the duration of liabilities.

B) Concept Questions for Topic 9c

After topic 9c you should be able to answer the following questions:

1. Why does lengthening the maturity of a bond result in a less than proportional increase in the duration of a bond? What does that mean about the relative importance for a portfolio's risk exposure of deciding

between a five year bond versus a ten year bond compared with deciding between a ten year bond versus a fifteen year bond?

2. If duration is equal to the weighted average of the time periods when payments are made, how is it also the elasticity of price with respect to (one plus) the interest rate. Are these relationships true by definition or because of market forces?

3. Why is matching the duration of a bank's asset's with its liabilities a better risk reduction strategy than matching the maturity of assets with the maturity of liabilities? If a bank does this, how does it make any money?

4. Are longer duration bond really riskier than shorter duration bonds in the sense of exposing investors to greater price volatility over a particular time period? If not, explain when longer duration equates with greater risk.

C) Sub-topic Outline for Topic 9c

Duration versus Maturity
    The Coupon Problem
    Price Volatility is Related to Duration

Duration Definition
    Macaulay Duration
    Weighted Average of Time Periods
    Bonds with the Same Duration Have Equal Price Volatility

Factors Affecting Duration
    Maturity
    Coupon
    Yield to Maturity
    Nonlinear Impact of Maturity

Duration and Price Volatility
    Precise Formula for Price Volatility
    Price Volatility *Per Unit Change* in *Rates*
    Another Duration Definition: $(dP/P)/[di/(1+i)]$
    Numerical Example

Convexity
    Why Duration is an Approximation

Portfolio Immunization
    Dedicated Portfolio
    Duration Matching
    Reinvestment Risk Offset by Capital Gain/Loss

Duration and Risk
   Are Shorter Duration Bonds Less Risky?
   Duration Equals Risk Only for Parallel Shifts in a Flat Yield Curve

Topic 9d: Swaps (1 Session)

A) Key New Vocabulary for Topic 9d

Derivative: A financial asset that derives its value from another (underlying) financial asset.

Swap: A contract between two counterparties who agree to exchange cash flows over a future time period. The cash flows can be based on anything – interest rates, equities, currencies – but we will typically limit our discussion to interest rate swaps. The counterparties to an interest rate swap are the fixed rate payer and the floating rate payer (see below).

Notional Amount: The dollar values that are exchanged in a swap are determined by applying the interest rates referenced in the swap to a 'notional' amount. For example, if the notional amount is $100,000 and the interest rate is 10 percent then the cash payment is .10x$100,000= $10,000. The notional amount does not change hands in a swap.

Fixed Rate Payer: In an interest rate swap, the counterparty that is obligated to periodically pay a fixed rate (times the notional amount). As part of the swap, the fixed rate payer will receive floating payments (see below).

Floating Rate Payer:
   In an interest rate swap, the counterparty that is obligated to periodically pay a floating rate (times the notional amount). As part of the swap, the floating rate payer will receive fixed payments.

Replication: The ability to create the swap payoffs with a position in the underlying assets (bonds for an interest rate swap). Replication is the key to valuing a swap (or any derivative).

B) Concept Questions for Topic 9d

   After topic 9d you should be able to answer the following questions:

   1. How can a swap reduce the risk exposure of a firm's balance sheet? Does everyone who uses a swap do so to reduce risk exposure? How can you tell what the counterparties are doing?

2. Which counterparty to the standard interest rate swap gains when all interest rates go up? How about when they go down? How can you determine by how much the value of an interest rate swap changes when the level of rates changes?

3. Use the replication principle to explain why swaps do no more (or less) than what can be done with the underlying assets. Why, then, are swaps so popular?

C) Sub-topic Outline for Topic 9d

Definition
    Exchange of Future Cash Flows
    Types of Swaps

Interest Rate Swaps
    Fixed Rate Payer
    Floating Rate Payer
    Notional Principal Amount
    Reference Rate

Simple Numerical Example
    Cash Flows of Counterparties

Objectives of a Swap
    Eliminating Duration Mismatch
    Sources of Trouble: Speculation

Valuation of Swaps
    Replicate Cash Flows
    Long Security A and Short Security B
    Who Gains When Rates Go Up (Down)?
    Pricing the Swap through the Underlying Assets
    Swaping S&P 500 and LIBOR

Topic 9e: Risk and Tax Structure (Required Reading Assignment)

This is a reading assignment explaining yield differentials on securities with identical duration. Here is a list of summary points:

Default

1. Bonds with higher default risk require higher promised yields.

2. Promised yield does not equal expected yield because expected yield must take account of default probabilities.

3. Default probabilities are influenced by many factors, including earnings, leverage (debt/equity), indenture provisions, collateral, sinking funds.

4. Default risk is measured by rating agencies.

<u>Taxes</u>

Exemption of interest payments on municipal bonds from federal income taxes produces the following equilibrium relationship (holding all else constant), with t = marginal tax rate:

$$r_{municipal} = (1\text{-}t) \; r_{corporate}$$

<u>Marketability</u>

Securities with better marketability (e.g., narrower bid asked spreads) will have lower equilibrium yields (higher prices) because they are more desirable. An extreme example is restricted stock, where prices on otherwise identical shares sell at an <u>average</u> 30% discount.

<u>Call Provisions</u>

Bonds with call provisions will sell for higher equilibrium yields compared with otherwise identical noncallable bonds. The owner of the callable bond must be compensated for the option granted to the issuer

<u>N.B.</u> This is just a series of bullet points. It is not meant to be an exhaustive summary.

Topic 10: Options (3 1/2 Sessions)

A) Key New Vocabulary for Topic 10

Call option:　　　　A financial instrument whose owner has the right but not the obligation to purchase the underlying asset at a specified fixed strike (exercise) price.

Put option:　　　　A financial instrument whose owner has the right but not the obligation to sell the underlying asset at a specified fixed strike (exercise) price.

Exercise an Option:

> The owner of the option can force the option seller to perform the contractual obligations. For example, someone who owns a call (said to be long a call) can ask the option seller (also called the option writer) to deliver the underlying asset (e.g.100 shares of IBM) and will then pay the fixed exercise price (e.g., $200 per share).

Option premium:

> The price of the option. Paid by the buyer to the seller for the rights conferred in the option.

European Option:

> An option that can be exercised only on the expiration date of the option.

American Option:

> An option that can be exercised at any time up to and including the expiration date of the option.

Callable bond:

> A bond with a clause that permits the issuing company to repay the bond at a fixed price (often the face value) before maturity. A callable bond has an embedded option that can be quite valuable to the issuer. For example, assume Coca Cola issued callable bonds when interest rates were 10%, but subsequently interest rates fell to 5%. Rather than continue to pay a 10% rate, Coca Cola could "call" their 10% bonds and re-borrow the same amount at 5%.

Protective put:

> When an investor who owns stock buys a put option in order to protect against a decline in the stock price.

Collar:

> When an investor who owns stock buys a put option to protect the downside but also sells a call option with a higher strike price (which helps to offset the cost of the put). Investors may do this if they believe the stock will not appreciate greatly in the near future.

Straddle:

> When an investor purchases both a call and a put option on a stock with the same strike price and the same expiration date. Investors may do this before a news announcement that can be either very good or very bad. They profit if prices go up or down, but if the stock price stays more or less the same they lose two premiums.

B) Concept Questions for Topic 10

After topic 10 you should be able to answer the following questions:

1. What is the most important contractual distinction between the buyer and the seller of an option? What is the most important distinction between an American option versus a European option? What is the

distinction between a call option and a warrant? Why are options important for valuing callable bonds and mortgages?

2. Why must the value of an option at expiration equal its intrinsic value? What would happen if that were not the case?

3. What advantage does buying a call confer on the investor compared with buying the underlying stock? How about a call compared with buying the underlying stock and a trading strategy designed to replicate the call?

4. Since buying a straddle involves owning both a put and a call, why don't you always make money at expiration? Since selling a straddle means you take in two premiums, why don't you always make money at expiration?

5. Why do options sell for more than their intrinsic value prior to expiration? What are the factors determining how much more? Did you list the expected future price of the underlying asset? If not, why not?

6. Explain how you can capture the interest value represented by the minimum value of a non-tradeable European call. Why does an increase in the risk-free rate increase the minimum value of this call, holding everything else constant? Why is the total value of the call greater than this minimum value?

7. How does the Black-Scholes model use arbitrage to come up with a value for a call prior to expiration if stock prices are always changing? How do you get an estimate of stock price volatility using the Black-Scholes formula?

8. According to put-call parity, why does the value of a call prior to expiration exceed its minimum value? Can you use the put-call parity relationship to explain why you should never exercise an American call on a non-dividend paying stock prior to expiration?

C) Sub-topic Outline for Topic 10

Contract Specification
    Long/Short Call
    Long/Short Put

Implications of Contractual Terms
    Rights Versus Obligations
    Premium

Exercising an Option
    American versus European

Types of Options
    Exchange Traded
    OTC
    Exotics
    Embedded Options: Convertible bonds, Callable Bonds, Mortgages

Valuation at Expiration
    Intrinsic Value Formulas
    Focus on Cash Flows
    Introduce Arbitrage Principle: Long Call, Short Stock

Payoff/Profit Tables and Diagrams
    Value at Expiration Varies with Underlying Price
    The Power of Downside Protection

Comparison of Basic Positions
    Long Call versus Long Stock
    Long Put versus Short Stock
    Short Call and Short Put

Combination Positions
    Protective Put
    Collar
    Straddle

Valuation Prior to Expiration
    Intuition
    Expected Value of Positive S-E or E-S

Factors Influencing Option Value Prior to Expiration
    Probable Magnitude of Intrinsic Value
    S, E, σ, t, r
    Importance of σ
    Where are Expectations?

Application to Real Investments
    Option Value vs. NPV

Arbitrage Proof of Minimum Value of a Call
    Call Value Reflects Interest Saved = Leverage Value
    How to Capture Interest Via Arbitrage: Numerical Example
    Application to Executive Stock Options

Call Is Worth More than Minimum Value
    Downside Protection

Exact Value of a Call
    Requires Precise Hedge Ratio and Rebalancing

Black-Scholes Formula
    Arbitrage Underlies the Exact Value of a Call
    Understanding the Formula
    Using the Formula: Fair Value
    Implied Volatility versus Actual Volatility

Revisiting Executive Stock Options
    Calculate Black-Scholes Value
    Insurance Value/Put Value

Put/Call Parity
    Formula
    Arbitrage Proof

Implications of Put/Call Parity
    Put Value of a Call
    Call Value of a Put
    Does It Ever Pay to Exercise Early?

Summary of Key Option Formulas
    On Expiration: Intrinsic Value
    Minimum Value Prior to Expiration
    Exact Value Prior to Expiration: Black Scholes versus Put / Call Parity

Topic 11: Efficiency (1 Session)

A) Key New Vocabulary for Topic 11

Market Efficiency: The concept that current market prices reflect all available information. It implies that investors cannot earn abnormal returns consistently, after transactions costs, and on a risk-adjusted basis. There are three categories of market efficiency, depending on which type of information is reflected in the price (see below).

Weak Form Market Efficiency:
    Market prices and returns reflect all the information in the history of prices.

Semi-Strong Form Market Efficiency:
>Market prices and returns reflect all publicly available information.

Strong Form Market Efficiency:
>Market prices and returns reflect all public and private information.

Market Anomalies: An investment strategy that seems to earn abnormal returns consistently, after transactions costs, and on a risk-adjusted basis. The existence of market anomalies may imply that markets are not efficient, or there are some unmeasured risks that have not been taken into account, or we have simply mined historical data to uncover a strategy that would have worked in the past (had it been known) but cannot be exploited going forward.

B) Concept Questions for Topic 11

After topic 11 you should be able to answer the following questions:

1. Is the concept of market efficiency a purely academic concept? According to proponents of market efficiency, is it ever possible for someone to outperform the market on a risk-adjusted basis? Why do we believe that markets are efficient?

2. How can you test whether markets are efficient with respect to *all* publicly available information? How quickly is a public announcement incorporated into stock prices according to the proponents of market efficiency? Does this concept of semi-strong form efficiency rule out the possibility of a single stock rising (falling) for two, three, or more, consecutive days after a surprise public announcement?

3. What are some of the explanations for the statistical anomalies that are consistent with the principle of market efficiency? What do you think is the truth?

A. Why do you think professional money managers are, on average, outperformed by a passive buy and hold strategy? Do you think, according to market efficiency, that it is impossible for a mutual fund that specializes in some sector of the economy to outperform the market as whole (on a risk-adjusted basis)?

B. What have you learned this semester?

C) Sub-topic Outline for Topic 11

Definition of Efficiency
       Not Just an Academic Concept
       What Efficiency Doesn't Mean

Checkpoints for Efficiency
       Market Adjusted Returns
       Risk Adjustment
       Transactions Cost
       Consistency

Empirical Evidence on Weak-Form Efficiency
       No Exploitable Trends
       Why Technical Trading Doesn't Work

Empirical Evidence on Semi-Strong Efficiency
       Public Information
       Event Studies
       Anomalies

Empirical Evidence on Strong-Form Efficiency
       Mutual Fund Performance

A Final Overview: The Obvious and Not-so Obvious
       Present value
       Option value
       Risk/Diversification
       Arbitrage

An Overall Investment Strategy
       Diversify