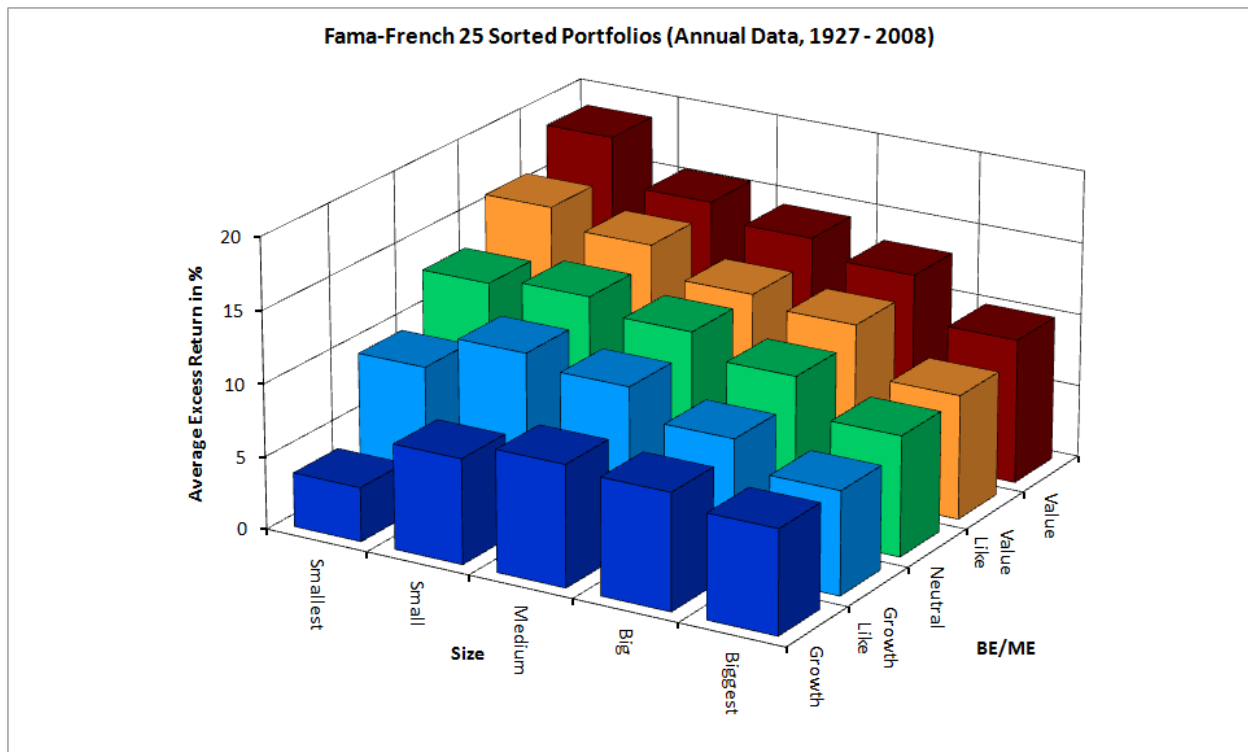


FINC 460-0 INVESTMENTS



Course Outline

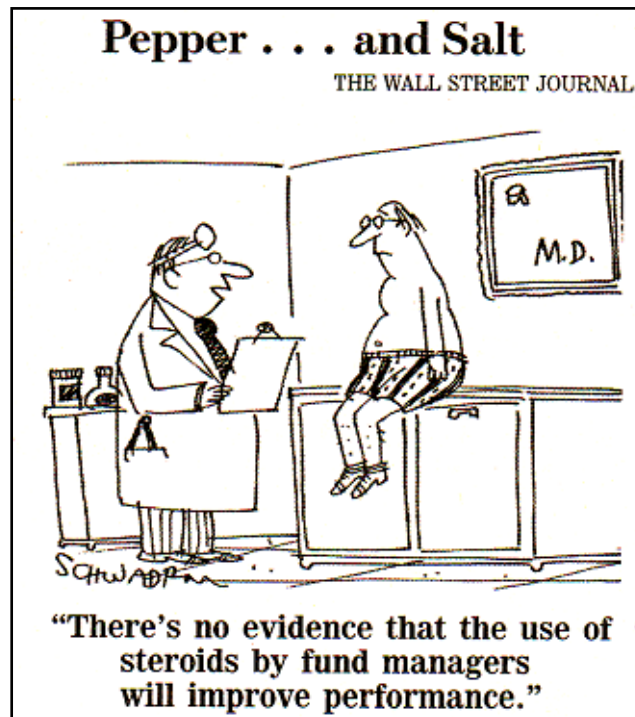
[TENTATIVE, 10/24/2011]

ADMINISTRATIVE INFORMATION

Instructor	: Akash Bandyopadhyay
E-Mail	: a-bandyopadhyay@kellogg.northwestern.edu
Phone / FAX	: +1-847-491-5903 (Day) / +1-847-491-5719 (FAX)
Office	: Jacobs 4207 (Evanston)
Office Hour	: Walk-in (potentially 1:30 – 6:30PM M-F), or by Appointment
TA (Grading)	: Zhuo Chen (E-Mail: zhuo-chen@kellogg.northwestern.edu)
Lecture Schedule	: Section 81: Wednesdays 6:30PM – 9:30PM at Jacobs 1246
Midterm Exam	: Sec 81: Wed February 8, 6:30PM – 8:00PM in Classroom
Final Exam	: Sec 81: Wed March 14, 6:30PM – 9:30PM in Classroom
Website (Blackboard)	: https://courses.northwestern.edu/

Goal

This quantitative course presents the classical and modern ideas of financial investments with an applied focus. You will master the analytical tools and financial theory necessary for making smart investments in stocks, bonds, and derivatives. I believe students who plan to work in the financial industry as a portfolio/asset manager or financial advisor will find this course immensely rewarding. Fund managers are under tremendous pressure to perform well. A cartoon from Wall Street Journal (2004) says it all.



This course is the place to learn how to allocate capital, manage portfolio risk, and maximize its performance in every possible economic condition.

What We Plan to Cover

We will cover a wide range of topics, such as, the behavior and distribution of stock returns; portfolio selection based on mean-variance optimization; cross-sectional models of risk and return, such as, the CAPM, the Fama-French 3-factor model, and the general multifactor models based on Ross’s APT; risk-adjusted returns and fund performance evaluation based on the asset pricing models; market efficiency (including asset pricing anomalies and behavioral finance); bond valuation, and the term structure of interest rates; financial instruments for interest rate risk management; option pricing models (Cox-Ross-Rubinstein binomial model and the Black-Scholes/Merton model). We will also glance at a few advanced topics, such as, momentum investing (Jegadeesh-Titman winners-losers portfolios and Carhart’s 4-factor fund performance model), return predictability, market timing, default risk, various trading strategies used by the hedge funds, stochastic nature of volatility, and risk management issues, such as, portfolio insurance, portfolio Value-at-Risk (VaR), immunization/hedging of bond portfolios, etc as time permits.

What We Don't Cover

We do not cover the fine art of stock picking, or provide you with foolproof ways to make money in the financial markets. The detailed analysis of individual companies and their balance sheets lies outside the scope of this course. Even though I have attempted to fit as much material as possible in a ten week course, a number of important topics, such as, various institutional details of the markets, financial statement analysis, the impact of taxes on investments, and the issues related to various capital markets regulations will remain beyond the scope of this course.

What You Need

- Zvi Bodie, Alex Kane, and Alan J. Marcus, *Investments*, McGraw-Hill/Irwin, 9th Edition, 2011 (ISBN: 978-0-07-353070-3). Old Editions OK. Recommended, but will not be followed in lectures.
 [Bodie-Kane-Marcus took great care in explaining how finance theory work in practice. This book is very thorough on the classical topics and a valuable reference about the workings of financial markets and the details of its institutions. However, this book is much less quantitative and less analytical than the level of our course. Several modern discoveries (which are often used by the sophisticated portfolio managers, secretive hedge funds, and investment banks) such as, the Fama-French 3-factor asset pricing model, or Jegadeesh-Titman's momentum factor and Carhart's 4-factor performance evaluation model etc. are not covered in this book in sufficient details. Therefore I will not follow this book (or, any other book) in my lectures, but I strongly recommend you to read the chapters as a supplement to the lectures. It is also worth noting that Bodie-Kane-Marcus's book is regarded as the gold standard for MBA courses similar like our class in almost all top business schools. In case you are in the job market then you may find that potential recruiters are familiar with this text as the standard reference for MBA level investment courses.]
- Jon A. Christopherson, David R. Carino, Wayne E. Ferson, *Portfolio Performance Measurement and Benchmarking*, McGraw-Hill, 2009 (ISBN: 978-0-071-49665-0). Optional.
 [This well-written book on portfolio management practice is a perfect companion and an ideal complement to our course. Its focus on the practical issues faced by the portfolio managers is its greatest strength.]
- Warren Brussee, *Getting Started in Investment Analysis*, John Wiley, 2009 (ISBN: 978-0-470-28384-4). Optional.
 [It is an excellent introduction to the basic statistical methods and their applications in financial data analysis. It does a magnificent job in explaining intuitively how the statistical concepts work in finance practice.]
- Course Packet. Required.
 [Course pack is a compilation of cases and other copyrighted readings complimenting the lectures. In general, articles in the course pack are supplementary readings and they will not be directly tested in the exams; however, I may ask questions on the articles discussed in the lectures.]
- Access to computer with complete installation of EXCEL 2007/2010 or 2003 (must be able to install the "Solver Add-in" and the "Analysis ToolPak" Add-in). Required.
- A Calculator (Scientific?) that is capable of computing $\ln(x)$, e^x , x^y , π etc. It may not have word-processing or internet capabilities to use it in the exams. I use CASIO fx-115s. Required.

What I Expect

This quantitative course is conceptually and analytically challenging, and therefore this course may require significant time commitment from you. My most important expectation from you is:

- I EXPECT YOU TO TAKE YOUR OWN NOTES IN THE LECTURES.

This is very important. We will discuss several findings of modern research which are not available in sufficient details in the texts. Due to the technical nature of the subject, I deliver lectures in the classic chalk-and-board style without making use of power-point slides. I will make every effort to bring out the intuitions, to focus on the practical applications, and to relate the course material to current financial news and to the problems relevant to the practitioners. In order to review those materials after the lecture, there is no substitute to your own class-notes. Therefore, it is no-brainer but bear repeating that please do not be late for the classes, try not to leave the classroom during lectures, please turn-off your cell phone, and please do not engage in non class related activities during lectures. If you miss a class then you are required to find out what was covered from your classmates.

Class Participation

Class participation and discussion are essential to learning. This course should be an interactive one, and I encourage you to bring-up any relevant practical and professional experience you might have, and to augment or challenge any of the financial theories or models we discuss. Participation in the class will not be explicitly graded, but I will keep track of who is making valuable contributions to the class over the course of the quarter. This information may be used in determining grades in the borderline cases.

First Class Assignment

In order to benefit fully from this course, you need to be comfortable with the basics of the linear regression analysis, variance/covariance algebra, properties of normal distribution, solving systems of linear equations, and with EXCEL. Familiarity with these tools is necessary for making smart investments. The purpose of the first class assignment is to help you brush-up your knowledge in those prerequisites.

This assignment is due individually (not in a group) at the beginning of the first lecture. It will be graded, but your score on this problem set will not be counted to compute your course grade (with one exception: if you do not turn-in this assignment then I will be inclined to assign you a lower course grade). However, in case your course performance is very close to the borderline between two letter grades and you did well in this assignment, then I may consider assigning you the better letter grade. Therefore relax – your score on this assignment may improve your letter grade marginally, but it will never hurt your course grade.

This assignment is available at: <http://www.kellogg.northwestern.edu/faculty/bandyopadhyay/courses/>. I posted a set of articles to help you brush-up your knowledge in statistics, probability, and regression analysis. Reviewing your notes from Kellogg's prerequisite statistics courses might be very useful as well.

Homework Assignments and Group Work

This course shall strongly emphasize on how to apply the financial models and the economic ideas into real world problems. Thus, most homework assignments will contain a set of paper-and-pencil problems and a set of "real world" problems which will require analysis of financial data on EXCEL spreadsheets (those problems are designed to apply techniques learned in the class to real financial data in a manner similar to what might be applied in practice).

There will be a problem set due almost every week except the weeks of the midterm and the final exams. Out of the 8 problem sets in total, your best 5 sets will be counted towards the course grade. Thus, no late assignment will be accepted.

Homework should be completed in groups of 1 - 4 students and a single copy should be handed-in at the beginning of class on the date it is due with the names of the group members clearly visible at the front page. I much prefer typed work to handwritten and please do not hand in reams of computer output! Edit the output carefully to enable the grader to easily identify the results and method of analysis.

You are free to form your own group, to join any group, to move from one group to another, or to decide working on your own at any time during the course and as many times as you like. I prefer this 'free market policy' because it minimizes the 'free-riding problem' sometime occurs in the group-work. You can fire your group at any time if you feel they are not doing the fair share of their work.

However, please speak with me in case you want to join a group but you are unable to find one.

While working on homework, you may consult with any other class members (even students outside of your group), use any book or article or research paper or any library material, and of course refer to the class materials, but you are not allowed to use the solution sets from the previous quarters, and each student should be able to explain his/her group's solution in class.

Review Sessions

Most part-time students are employed and therefore cannot attend daytime sessions. They travel great distance after work to take a class and then travel back home in the late night. Traveling during winter nights is not a pleasant experience in Chicago. These constraints leave no room for conducting review sessions which every student enrolled in the class may be able to attend. Therefore, to help you out, I have decided to post my solutions of the homework in Blackboard by 6:00PM of every Friday, that is, 5 days before the due date. Your group should make every effort to do an assignment before looking into its solutions. If you get stuck on a problem then, and only then, you should look at the solution to learn the idea, and then work it out on your own. I hope the posted solutions will substitute for the review sessions to help you learn the material. I trust your rational judgment in using them. Remember that working through the homework assignments is the only way to prepare for the tests.

I will post the video recordings of the Spring 2010 review sessions in Blackboard site. In addition, I may hold review sessions on the prerequisites (attendance optional) in some weeks during 5:50 - 6:20PM.

Exams

There will be a midterm exam on the week of 6th class and a final exam on the week of 11th class. A practice test from the previous quarter and the video recording of the exam reviews for Spring 2010 will be available in the Blackboard site.

Both exams will be closed books/notes, but you are allowed to use a single 8.5" × 11" sheet of paper with anything written on any side of it. For the midterm, you may use only one side of the sheet. For the final, you may use both sides. Bring your calculator (it should be capable of handling $\ln(x)$, e^x , x^y , π etc). Use of laptop, cell phone, or other devices with word-processing or internet capabilities is not allowed.

- **MIDTERM EXAM:** A 1.5-hours long test will take place on Wednesday February 8 during the first-half of the lecture, 6:30PM-8:00PM. Midterm will cover lectures 1-5 and homework 1-4.
- **FINAL EXAM:** A 3-hours long final exam will take place on Wednesday March 14 during 6:30PM - 9:30PM. Final will be cumulative covering all lectures and all homework assignments.

PLEASE NOTE: THERE ARE NO MAKE-UP EXAMS. Therefore please make note of the exam schedule and make your quarter's plan accordingly¹.

Course Grade

Your course grade will be based on your rank in your section (no curve, you earn your grade by working hard for the course). Students are ranked according to the maximum of following three scores:

Final:	55%		80%		50%
Midterm:	25%	OR	0%	OR	30%
Homework (best 5):	20% (4% each)		20% (4% each)		20% (4% each)

The midterm is worth 25% of your grade and the final is worth 55% of your grade. However, the midterm is a free option – if it doesn't help your grade, 80% of the grade will be based on the final. In case you perform better in the midterm than the final then you will receive a 5% credit for the midterm.

Active class participation may help decide letter grades at the margin. It is no-brainer but worth noting that those who submit less than 5 homework assignments will potentially receive a significantly lower grade. Dean's office recommend that no more than 45% "A" grades in the elective classes and around 5% "C" grades. There will be no "+"s and "-"s in letter grades.

TA is responsible for grading the homework assignments and the tests.

¹ In case of Deans' office approved circumstances (such as, religious holidays or ½-quarter visiting students or returning exchange students from INSEAD): If you must take an exam early then please notify me 2 weeks before the exam date. Please note that, under no circumstances you will be allowed to take the 11th week final exam late.

I adhere to the Kellogg's policy on re-grading, which is available at the student affairs website (see "Policies and Procedures"): http://www.kellogg.northwestern.edu/stu_aff/policies/registration.htm. In particular, any request for reconsideration of exam or assignment grading must be submitted in writing within 10 days of when the material is returned. If a re-grade is requested, the entire exam/assignment will be reevaluated and there is no guarantee that the score will not be lowered with the re-grade. Re-grade is not possible if your exam/assignment is written by using pencil or other erasable media.

Honor Code

All students are required to adhere to the standards of conduct in 'The Kellogg Honor Code':

http://www.kellogg.northwestern.edu/stu_aff/policies/honorcode.htm

I consider using previous quarters' solution sets of the homework assignments and/or free-riding in a group work as honor code violation. Exams must be completed independently and within the allotted time. You are required to sign the following pledge on the front page of each exam:

"I pledge my honor that I have not violated 'The Kellogg Honor Code' during this examination. In addition to the usual violations of the code, additional violations of the code for this exam would include using material other than those allowed for this exam (only a calculator and one double-sided cheat-sheet whose one side should be blank in the midterm exam), obtaining information from other students about the exam, informing other students about the exam, and working on the exam beyond the allotted time."

Etiquette

The purpose of etiquette rules is to ensure that no one interferes with the learning of another. Your classmates and I will appreciate your adherence to the Kellogg's 'Classroom Etiquette' described in the "Policies and Procedures" at: http://www.kellogg.northwestern.edu/stu_aff/policies/registration.htm.

Feedback

I welcome your feedback about the course and suggestions for its improvements. Please do not hesitate to stop by my office or e-mail me if you have any comment or concern about the course. E-mail your section liaison if you have feedback that you'd like to provide anonymously.

Acknowledgement

I thank Professors Robert Korajczyk (Kellogg), Ravi Jagannathan (Kellogg), Ernst Schaumburg (then at Kellogg, now at NY Fed), Dimitris Papanikolaou (Kellogg), Costis Skiadas (Kellogg), Gene Fama (Chicago), John Cochrane (Chicago), John Heaton (Chicago), Toby Moskowitz (Chicago), Lubos Pastor (Chicago), John Campbell (Harvard), Nick Barberis (Yale), Ronald Balvers (West Virginia), and Steve Ross (MIT) for numerous discussions, and for helping me organize this course, which is partially based on their own.

Topic Outline and Suggested Readings (Flexible, Permanently Tentative)

Readings are supplemental to the lectures. "BKM" stand for the text by Bodie-Kane-Marcus. Cases and articles marked as (*) are available in the course packet. Other articles (and several additional readings) will be posted in the Blackboard site to reduce your cost for the course pack. The pre-class readings may help you work on the 'First Class Assignment'. Those articles are available in the following website and in the Blackboard site: <http://www.kellogg.northwestern.edu/faculty/bandyopadhyay/courses/>.

I have included a number of optional readings for those interested in going beyond what is covered in class. We will decide in real-time the best ordering of the material/reading, which readings are required, which are optional, and post this information in the Blackboard site. You should plan to do the assigned readings from the Blackboard before each class in order to be able to benefit most from the lectures.

Pre-Class: Prerequisites (may help for 'First Class Assignment')

Read before January 4

- Review of Basic Statistics and Regression Analysis.
- Introduction to Financial Markets.
 - BKM: Chapters 1 – 5.
 - Article: "[Regression Analysis: Review of the Basics](#)" – Douglas Downing, and Jeffrey Clark (pages 114-115, 179-182, 193-195 from *Forgotten Statistics: A Refresher Course with Application to Economics and Business*, Barron's, 1996).
 - Article: "[Fundamentals of Probability](#)" - Philippe Jorion, and GARP (pages 33-65 (Chapter 2) from *Financial Risk Manager Handbook*, 3rd Edition, John Wiley, 2005).
 - Article: "[Fundamentals of Statistics](#)" - Philippe Jorion, and GARP (pages 67-86 (Chapter 3) from *Financial Risk Manager Handbook*, 3rd Edition, John Wiley, 2005).
 - Article: "[Table of Useful Statistics Formulas](#)" – G. Vidyamurthy (pages 12-13 from *Pairs Trading: Quantitative Methods and Analysis*, John Wiley, 2004); edited by me. (*)

Class 1: Asset Allocation – I

January 4

- Rationality, No-Arbitrage, and Risk-Return Tradeoff.
- Present Value Formula – Equity Valuation.
- Portfolio Selection based on Mean-Variance Criteria, and the Sharpe Ratio.
- Diversification – Benefits/Importance of Correlations.
 - BKM: Chapter 6, 18.
 - Article: "[Correlation Economics](#)" – Robert Engle (pages 1-14 (Chapter 1) from *Anticipating Correlations*, Princeton University Press, 2009). (*)

Class 2: Asset Allocation – II

January 11

- The Mean-Variance Efficient Frontier.
- Allocating Investment Capital between Riskfree and Many Risky Assets.
- Portfolio Optimization with Constraints.
 - BKM: Chapter 7.
 - Article: "Understanding Risk Parity: So, You Think You're Diversified..." – Brian Hurst, Bryan W. Johnson, and Yao Hua Ooi (*AQR Capital Management, LLC*, Fall 2010). (*)

Class 3: The Capital Asset Pricing Model (CAPM).

January 18

- Covariance as the Measure of Risk – the Concept of "beta".
- Risk Adjusted Return and Abnormal Returns – the Concept of "alpha".
- 1-Factor Market Model and the Static Passive Investment Style.
- Roll's Critique, and the CAPM in Practice.
- Bayesian Learning and the Black-Litterman Model (if time permits).
 - BKM: Chapters 8 – 9, 27 (have a first look).
 - Article: "The Capital Asset Pricing Model: Theory and Evidence" - Eugene F. Fama, and Kenneth R. French (*Journal of Economic Perspectives*, volume 18, Number 3, page 25-46, Summer 2004). (*)
 - Article: Goldman Sachs - "The Intuition Behind Black-Litterman Model Portfolios".

Class 4: Multiple Sources of Systematic Risk: Empirical Evidences and Models.

January 25

- Major Empirical Evidence of Asset Return Anomalies:
 - Small versus Large.
 - Growth versus Value.
 - Post Earning Drift.
 - Return Predictability.
 - Momentum.
- Multi-Factor Asset Pricing Models:
 - The Arbitrage Pricing Theory (APT).
 - The Fama-French 3-Factor Model.
 - The "Momentum" Factor and the 4-Factor Model.
- Dynamic Passive Investment Management Styles, Portfolio Tilting.

- BKM: Chapters 10, 13.
- Article: "Anomalies and Market Efficiency" - G. William Schwert (pages 937-972 from "*Handbook of the Economics and Finance*", North-Holland, 2003).
- Case: "Understanding Risk and Return, the CAPM, and the Fama-French Three-Factor Model" - Kent Womack and Ying Zhang et. al. (*Tuck School of Business Cases*, Case No. 03-111, 2003). (*)
- Case: "Dimensional Fund Advisors, 2002" – Randolph Cohen (*Harvard Business School Cases*, Case No. 9-203-026, Rev. January 28, 2003). (*)
- Article: "The Arbitrage Pricing Theory Approach to Strategic Portfolio Planning" – Richard Roll and Stephen A. Ross (*Financial Analysts Journal*, volume 18, Number 3, page 14-26, May/June 1984a).
- Article: "Size Factor, Value Factor, Price Momentum Factor, and Other Factors" - Francois-Serge Lhabitant (pages 189-197 from "*Hedge Funds: Quantitative Insights*", John Wiley, 2004).

Class 5: Issues of Equity Portfolio Management.

February 1

- Performance Evaluation of Money Management Industry.
 - Mutual Funds: Style Analysis.
 - Hedge Funds: Portable Alpha.
 - Speculators: Market Timing.
- Market Efficiency.
- Limits to Arbitrage and Behavioral Finance.
- Transaction Costs and Liquidity Risk (if time permits).
- International Investment: Benefits and Risks.
 - BKM: Chapters 24; 11 – 12; 25 – 27.
 - Case: "Extraordinary Value Partners, LLC" – Ravi Jagannathan (*Kellogg School of Management Cases*, Case No. KEL325, 2007). (*)
 - Article: "Giving Markets a Human Dimension" - Richard Thaler (*Financial Times Supplement*, volume 6, June, 1997). (*)
 - Article: "Aspects of Investor Psychology: Beliefs, Preferences, and Biases Investment Advisors Should Know About" - Daniel Kahneman, and Mark W. Riepe (*Journal of Portfolio Management*, volume 24, Number 4, Summer 1998).
 - Article: "Transaction Costs and Liquidity Risk" - Gregory Connor, Lisa Goldberg, and Robert Korajczyk (pages 241-270 (Chapter 12) from *Portfolio Risk Analysis*, Princeton University Press, 2010). (*)

- Article: "Asset Allocation with Hedged and Unhedged Foreign Stocks and Bonds" - Philippe Jorion (*Journal of Portfolio Management*, volume 15, Number 4, page 49-54, Summer 1989). (*)

Class 6: Midterm Exam +

February 8

- **MIDTERM EXAM: 6:30PM – 8:00PM, in Classroom, February 8, 2012**
- 8:15PM – 9:30PM: Catch-up Lecture on any Unfinished Material and/or a Guest Lecture.

Class 7: Issues of Equity Portfolio Risk Management.

February 15

- Value-at-Risk (VaR).
- Derivatives Strategies: Speculation and Leveraging using Call and Put Options:
 - Common Strategies: Covered Positions, Spreads, Straddles and Strangles, Butterfly.
- Derivatives Strategies: Hedging and Risk Management by Using the Options:
 - Portfolio Insurance.
 - Cashflow Restructuring and Securitization (Financial Engineering).
- BKM: Chapters 20.1 – 20.4; 20.6 – 20.7.
- Case: "Value-At-Risk" – Sanjiv Das and Stephen Lynagh (*Harvard Business School Cases*, Case No. 9-297-069, Rev. July 15, 1997). (*)
- Article: "Six Ways Companies Mismanage Risk" – René M. Stulz (*Harvard Business Review*, March 2009; available for download at HBR's website at: <http://hbr.org/hbr-main/resources/pdfs/comm/fmglobal/six-ways-companies-mismanage-risk.pdf>).

Class 8: Valuation, Hedging, and Risk Management of Options.

February 22

- One Period Binomial Model.
- The Black-Scholes/Merton Model and the Concept of Implied Volatility.
- Stochastic Nature of Volatility.
- BKM: Chapter 21.3 – 21.6.
- Article: "How to Use the Holes in Black-Scholes" – Fischer Black (*Journal of Applied Corporate Finance*, volume 1, Number 4, page 67-73, Winter 1989).

Class 9: Fixed Income Assets.

February 29

- Pricing of Riskfree Bonds.
- Term Structure of Interest Rates, and Yield Curves Strategies.
- Forward Rates.
- Default Risk.
- Corporate Bonds.
- Convertible Bonds

– BKM: Chapters 14, 15, 20.5.

Class 10: Fixed Income Portfolio Management.

March 7

- Duration, Convexity, and Immunization.
- Instruments for Interest Rate Risk Management.

– BKM: Chapter 16.

Class 11: FINAL EXAM

March 14

- **FINAL EXAM: 6:30PM – 9:30PM, in Classroom, March 14, 2012**

ADDENDUMS: (1)Auditors are not allowed (except in the first lecture). If you have an extraordinary situation that require special consideration then please discuss it with me ahead of time. (2)There will be a 15 minutes break at the middle of every lecture. (3)It is your best interest to submit as many homework as you can even if you have completed the minimum requirements with full 100% credit. (4)Attendance in lectures is strongly recommended. Try minimizing missing classes. (5)Class liaison will be selected in the first meeting.