This course introduces students to quantitative asset management. The building blocks of the course are portfolio theory and factor models, active firm-level and portfolio-level quantitative investment strategies, advanced trade execution and performance evaluation. Special topics change from one year to another to reflect recent trends and practices in the industry. This year’s special topic will cover (1) portfolio risk management; (2) distress securities investment; (3) risk and return profiles of hedge funds.

In addition to regular lectures, this course uses case studies and guest lectures to enhance student understanding of the decision making process and the problem-solving skills of asset managers. This class integrates what you have learnt in various courses at Mendoza, and it emphasizes hands-on practices.

The course objectives are achieved through a combination of lectures, valuation exercises, case studies, presentations by leading practitioners (followed by discussion of the issues such presentations bring forth). Homework problem sets are integral component of the learning process and you are expected to spend considerable amount of time working on them.

MAIN TOPICS

1. Portfolio Theory and Mean-Variance Analysis
2. Linear Factor Models and Applications
3. Asset Allocations Decisions
4. Active Equity Strategies
5. Transaction Costs and Execution
6. Performance Attribution and Style Analysis
7. Risk and return profiles of hedge funds

PREREQUISITES

- The only prerequisite of this class is Finance 30600: Investment Theory.
- You should also be familiar with basic statistics concepts and simple regression analysis.
- You are assumed to be familiar with Excel or you are willing to learn Excel during the class.

READINGS

There is no required textbook for the class. I list several textbooks for your reference and comment on how we use this book in our class. More references are provided on page 7.

- Bruce Greenwald, Judd Kahn, Paul D. Sonkin and Michael Van Biema, *Value Investing: from Graham to Buffett and Beyond*, John Wiley, New York, 2001 (*Value Investing*). (We will follow this book on the discussion of firm-level active strategies.)
- Teaching Notes, Cases, News clips, and Articles (to be posted on the course website or distributed in class).
ATTENDANCE
Attendance of classes is not taken. However, you are responsible for all the materials discussed.

ADMINISTRATIVES

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<thead>
<tr>
<th></th>
<th>Session 01</th>
<th>Session 02</th>
<th>Session 03</th>
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</thead>
<tbody>
<tr>
<td>Class Sessions</td>
<td>T/TH 12:30 – 1:45</td>
<td>T/TH 2:00 – 3:15</td>
<td>T/TH 3:30 – 4:45</td>
</tr>
<tr>
<td>Office Hours</td>
<td>T/TH 11:00 – 12:00, Mendoza 246; and by appointment</td>
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</tr>
<tr>
<td>Review Sessions (optional)</td>
<td>Date: 2/14, 3/21, 4/18  Time: 10:30 – 12:00  Room: L050</td>
<td></td>
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</tr>
<tr>
<td>Midterm</td>
<td>2/17, 3/24, 4/21 – in class (with one exam optional)</td>
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<tr>
<td>Final Exam</td>
<td>Time / Room: by University Registrar Office</td>
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REVIEW SESSIONS (OPTIONAL)
I will hold several review sessions on Saturdays prior to the midterm exams. I will discuss problems, answer questions and review difficult materials. These review sessions are entirely optional and not required, and no new materials will be discussed. However, if you are having any difficulties with the material, the review sessions are highly recommended.

OFFICE HOURS
Office hours are Tuesdays and Thursdays, 11:00 – 12:00am. If you want to see me outside office hours, please make an appointment so I can make sure we would not miss each other. The best way to reach me is via e-mail (pgao@nd.edu).

GRADING POLICY
Homework Problem Sets: Graded homework will be assigned throughout the course, and the due day will be clearly noted on the homework problem sets. The homework assignments should be done in groups of three to five members. Only one assignment should be turned in for each group. Each member of the group will receive the same grade on the homework. Answers to the homework will be available on the website the day after the homework is due. You should hand in the homework problems before the specified deadlines and they will be graded. Because of the nature of the course, there will be more homework problem sets during the first half of the semester and less problem sets during the second half of the semester. No late homework assignment will be accepted unless you receive my explicit approval in advance.

Optional Problems The Optional Problems are designed to help you to review some materials and skills developed in other classes you may have taken. Optional Problems will be specified denoted. The solutions are usually provided so you do not have to hand in those questions. Nevertheless you should make sure that you know these materials and know how to solve those problems.

Exams: All exams will be closed book, but a sheet with particularly difficult formulas will be attached to the exam. The formula sheet will be passed out several days prior to the exam. In addition, you can bring one extra formula sheet made by yourself (8-1/2 x 11” size; and yes, on both sides.) Approximately 30% of the problems on the midterm and final exams will be taken from the graded and optional homework and sample exams with minor changes. Sample exams will be posted on the course website at least one week before the exam; and the solutions to the sample exam will be posted shortly afterward. You should attempt to solve the sample exams without looking up the solutions first. There is no makeup exam unless I explicitly approve your absence due to unusual circumstances.
Grades Distribution: There are two binding constraints in terms of determining letter grades distribution. First, different sessions have different number of enrolled students. Second, Finance Department’s policy limits the highest average GPA of all enrollments of any undergraduate finance class at Mendoza to be 3.40/4.00. Therefore, to be fair and consistent with department policy, grades will be determined across all sessions.

Presenting Best of Your Work: Grades will be based on several Homework Problem Sets (almost one homework assignment every other week, with one optional homework), three Midterm Exams (with one optional midterm and two required midterm exams), and one Final Exam (required).

You have considerable flexibilities in presenting your best work:

- You have the option to drop one of the homework problem sets with the lowest scores. All the remaining homework problem sets are equally weighted.
- There are three midterm exams. Again, you have the choice of taking one of the exams as optional. If you take all three midterm exams, only the highest two exams will be counted into your final grades.

Group Evaluation: You will evaluate each member of your group and produce a score card and hand it to me during the last class. Each member of an N-person group will score each of the N members on a 0 to 1 scale (including fractions such as 0.3, 0.4, 0.9 etc). For example, if you assign a score of 1 to every member (including yourself) of the group that means everyone in the group contributed equally to the assignments throughout the class. Based on the score cards I get I will assign a weight W to each member of an N-person group using the formula,

\[ W = \frac{\text{Sum of the scores a person receives}}{N}. \]

Note that \( W = 1 \) when you get a score of 1 from every member of the group including yourself. The number of points you get will be the number of points your group gets multiplied by your weight in that group W.

<table>
<thead>
<tr>
<th>Homework Problem Sets</th>
<th>30% ( \times ) W</th>
<th>300( \times ) W points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midterms (2 out of 3)</td>
<td>30%</td>
<td>300 points</td>
</tr>
<tr>
<td>Final Exam</td>
<td>40%</td>
<td>400 points</td>
</tr>
<tr>
<td>Total (Maximum)</td>
<td>100%</td>
<td><strong>1000</strong> points</td>
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CLASS ETIQUETTES
I expect everyone in class pay attention to what is going on in class, and not to distract others. I don’t mind eating or drinking in class (as long as you do so quietly!). Please do not work on computers, reading papers, or engage in other classroom unrelated activities.

HONOR CODE
All individual and group activities must adhere to the Honor Code in every respect, including each group member having a full understanding of any written material that includes a student’s name. For example, even though one student may do the principal work on a spreadsheet, all group members are expected to fully understand the spreadsheet and be able to answer questions regarding it or any other aspect of the group’s product.
Weekly Course Outline

Week 1 and Week 2
Mean-Variance Optimization: Theory and Applications (I) – (IV)
Readings: BKM Chapters 5, 6, 7, & 8; Excel Tutorial on Markowitz II; Teaching Notes
- Risk return tradeoff
- Investor preferences
- Allocation between a risky and risk free asset
- Portfolios of two risky assets
- Optimal risky portfolio with many assets
- Diversification
- Optimization with constraints
- Socially responsible investing;
- “sin” stocks/industry investment
- Using Excel to solve the portfolio problem

Week 3
Mean-Variance Optimization: Theory and Applications (V) and (VI)
Readings: Teaching Notes
- Example #1: Tracking errors
- Example #2: Value at Risk (VaR)
- Example #3: Harvard Management Company - TIPS case
- Example #4: Harvard Management Company - Asset Allocation case

Week 4
Multifactor Model: Theory
Readings: BKM Chapters 8, 13 (on multifactor models), BKM Chapter 24.
- CAPM Review
- Single-factor model
- Introduction to the multi-factor model

Multifactor Model: Applications
- Controlling risk using factor models
- Asset allocation using factor models

Week 5
Factor model in practice – investment signals in quantitative portfolio management
Readings: Teaching Notes
- Value/Growth Strategies
- Price and Earning Momentum Strategies
- Earning Quality Strategies
- Operation Efficiency Factors
- Financial Distress Factors
- Style and attributes analyses using factor model

Factor model in practice – combining investment signals in quantitative portfolio management
Readings: Teaching Notes
- Readings: Teaching Notes
- Portfolio Ranking Method
• Portfolio Scoring Method
• Linear Regression Models (time series and cross-sectional regressions)
• Example #1: Seeking alpha from value portfolios
• Example #2: Seeking alpha from growth portfolios

Week 6
Active Factor Model Based Strategies; Black-Litterman Assets Allocation Models
Readings: Teaching Notes; GSAM Research Reports; Case Study on the US Assets Allocation in 2006
• Incorporating views in factor model
• Basic Idea of Black-Litterman Asset Allocation Model
• Applying Black-Litterman Asset Allocation Model with Factor Models

Week 7 and 8
Introduction to Behavioral Finance: (I) – (IV)
Readings: Teaching Notes; Barberis and Thaler book chapter; Schwertz book chapter; UBid/PC Mall Case;
• Evidence against traditional EMH
• Return Predictabilities at short-, intermediate- and long- horizons
• Overconfidence and self-attribution bias
• Law of small numbers
• Difference of Opinions
• Short-sale constraints, volatilities and Limit to arbitrage

Week 9
Event-driven Strategies
Readings: Teaching Notes; Mitchell and Pulvino (2001)
• Merger Arbitrages
• Nonlinear Payoff in Hedge Fund Returns

Performance Evaluation – Advanced Topics
Readings: Teaching notes
• tax considerations
• market timing (legal and illegal)
• asset illiquidity and return autocorrelations

Week 10
Trading Costs
Readings: Teaching notes; Case study on the Numeric Investors LLP; Replicating S&P 500 index and trading costs
• Trading costs in the equity markets
• Case study on the Numeric Investors LLP
• Replicating S&P 500 index and trading costs using Stocks, E-mini, ETFs and Total Return Swaps

Week 11
Residual Income Model and Quantitative Portfolio Management
Readings: Easton (2008) book manuscripts – chapter 1 to chapter 8; Frankel and Lee (1998); Lee and Swaminathan (2001)
• Residual income models (RIMs) as metrics of intrinsic values in quantitative portfolio management
• Demystifying Numeric Investors “fair value model”
• Empirical performance of RIMs
• Limitations of RIMs

Week 12
**Introduction of Value Investment**
Readings: Teaching Notes; “Value Investing”, Chapters 1-4 (till page 65 of Chapter 4)
• Stock Screening and Theme of Value Investment
• Calculating Asset Values (AV)
• Earning Power Valuation (EPV)
• Dynamics implied by EPV and AV
• Margin of Safety
• Example #1: Pilgrim Chicken and Bird Flu
• Example #2: Texas Real Estimate Bubbles and Local Banking Industry
• Example #3: Hurricane Bets on Nova Chemical
• Example #4: General Housewares, 2000

Week 13
**Fundamentals of Value Investment: Earnings Power Valuation and Asset Valuation (I) and (II)**
Readings: “Value Investing”, Chapters 1-4 (till page 65 of Chapter 4); Trump Entertainment (TRMP), 2005
• Reviewing DCF and multiple-based valuation models
• Fundamentals approach to firm level investment strategies
• Computing asset value
• Computing earnings power value.
• Example: Trump Entertainment (TRMP)

Week 14
**Fundamentals of Value Investment: Earnings Power Valuation and Asset Valuation (III) and (IV)**
Readings: Selected Journal Articles; “Value Investing”, Chapters 4, 5, 6, 7, 8.
• Discussion of Hudson General, Microsoft, WD40, Intel
• Active value investing
• Barriers to entry, role of intangibles, risk, winner’s curse, and the margin of safety

*** The course syllabus is tentative and subject to change ***
Optional Readings Related to This Class

For introduction to quantitative assets management, there are several reference books. Relevant materials from each book will be distributed to the class when necessary, and there is absolute no need to buy these books just for this class. However, if you decide to pursue investment management, then these books are good to keep on your bookshelf.


