FNAN 436-001  
Probability Methods for Finance  
Spring 2017

SPECIFIC COURSE INFORMATION  
FNAN 436, Probability Methods for Finance  
Class Location: East 201  
Class Meeting Dates: Mondays and Wednesdays during the period Jan. 23 – May 3, 2017  
Class Meeting Time: 10:30 a.m. to 11:45 a.m.

PROFESSOR’S CONTACT INFORMATION  
David R. Gallay, D.Sc.  
Enterprise Hall, Room 233  
Telephone numbers: (703) 993-1869  
E-mail address: dgallay@gmu.edu  
Office hours: By appointment

COURSE WEBSITE ADDRESS  
Course Blackboard Web Site: http://mymasonportal.gmu.edu. At this site, you can access course materials (e.g., lecture slides) and course assignments.

COURSE PREREQUISITES:  
FNAN 301/303, Financial Management, and OM 210, Statistical Analysis for Management, or equivalent.

COURSE MATERIALS

Required:  

Other textbooks used as source material for this course;  
COURSE OBJECTIVES AND FOCUS

The objective of this course is to provide financial analysts with a basic understanding of probability methods and advanced skills in Monte Carlo simulation techniques to perform meaningful financial feasibility analyses of capital projects and risk assessments of financial investments, as well to make better capital budgeting decisions.

This course focuses on the development and use of probability models for analyzing risks and financial decisions. Emphasis is on Monte Carlo simulation modeling, real options analysis, linear programming, and decision analysis of complex problems in corporate finance and in investment analysis.

COURSE PLAN

The course will begin with instruction on probability methods for finance-related analysis and decision making from a Bayesian perspective. This will be followed by instruction on real options analysis and optimization techniques useful for financial analysis. Students will be encouraged to form small study groups (comprising no more than four people) to work on homework and the case analyses. Each group will be assigned to either the Gold Team or the Green Team for case assignment purposes. On the case analysis’ due date, each group will submit its written report of its case analysis, as well as give an oral presentation of its findings to the entire class.

Homework assignments (and due dates) will be posted on Blackboard.

COURSE SCHEDULE

Session 1
Date: Jan. 23, 2017
Topic: What is Bayesian Statistics?
Readings: Cowles, Chapter 1
    Course-pack, “Bayesian Estimation & Black-Litterman
    Course-pack, “A Bayesian Examines The Lady Tasting Tea”
    Course-pack, “How to Manage Risk (After Risk Management Has Failed)
Homework Due: None
**Session 2**  
Date: Jan. 25, 2017  
Topic: Review of Probability  
Readings: Cowles, Chap. 2  
Homework Due: Bayesian problem assigned in class on Jan. 23

**Session 3**  
Date: Jan. 30, 2017  
Topic: One-Parameter Models  
Readings: Cowles, Chap. 3  
Homework Due: Chap. 2

**Session 4**  
Date: Feb. 1, 2017  
Topics: One-Parameter Models and Bayesian Inference  
Readings: Cowles, Chap. 3  
Scan: Cowles, Chapter 4  
Homework Due: None

**Session 5**  
Date: Feb. 6, 2017  
Topic: Inference for a Population Proportion  
Reading: Cowles, Chap. 4 and 5  
Homework Due: Chap. 3

**Session 6**  
Date: Feb. 8, 2017  
Topic: Other One Parameter Models  
Reading: Cowles, Chap. 6 and 7  
Homework Due: None

**Session 7**  
Date: Feb. 13, 2017  
Topic: Other One Parameter Models / Fitting More Complex Models: MCMC  
Reading: Cowles, Chap. 6 and 7  
Scan: Cowles 8  
Homework Due: Chap. 4 and 5

**Session 8**  
Date: Feb. 15, 2017  
Topic: Fitting More Complex Bayesian Models: MCMC  
Reading: Cowles, Chap. 8  
Homework Due: None
**Session 9**  
Date: Feb. 20, 2017  
Topic: Hierarchical Models.  
Reading: Cowles, Chap. 9.  
Homework Due: Chap. 6 and 7

**Session 10**  
Date: Feb. 22, 2017  
Topic: Regression and Hierarchical Regression.  
Reading: Cowles, Chap 10.  
Homework Due: Chap. 8

**Session 11**  
Date: Feb. 27, 2017  
Topic: Assorted Advanced Techniques  
Readings: None  
Homework Due: Chap. 9

**Session 12**  
Date: Mar. 1, 2017  
Topic: Model Checking and Hypothesis Testing and Review  
Reading: Cowles, Chap. 11.  
Homework Due: Chap 10  
Assignment: Take-home exam (due Mar 6)

**Session 13**  
Date: Mar. 6, 2017  
Topic: Decision Analysis – Bayesian Decision Theory  
Reading: None  
Take-home Exam Due: Assigned take-home exam

**Session 14**  
Date: Mar. 8, 2017  
Topic: Decision Analysis – Bayesian Decision Theory  
Reading: None  
Homework Due: TBA

**Session 15**  
Date: Mar. 20, 2017  
Topic: Decision Analysis – Value of Information  
Reading: None  
Homework Due: TBA
Session 16
Date: Mar. 22, 2017
Topic: Decision Analysis – Inference and Decision
Reading: None
Homework Due: TBA

Session 17
Date: Mar. 27, 2017
Topic: Spreadsheet Modeling
Reading: Course-pack, Analyzing Uncertainty: Probability Distributions and Simulation
Homework Due: TBA

Session 18
Date: Mar. 29, 2017
Topic: Optimization
Reading: None
Homework Due: Spreadsheet modeling homework

Session 19
Date: Apr. 3, 2017
Topic: Gold Team Presentations: Avalanche Corporation
Reading: Course-pack, “Avalanche Corporation: Integrating Bayesian Analysis into the Production Decision-Making Process”
Homework Due: Gold Team Groups’ written report and class presentation.

Session 20
Date: Apr. 5, 2017
Topic Green Team Presentations: Ratnagiri Alphonso Orchard
Reading: Course-pack, “Ratnagiri Alphonso Orchard Case: Bayesian Decision Analysis”
Homework Due: Green Team Groups’ written report and class presentation.

Session 21
Date: Apr. 10, 2017
Topic: Real Options
Reading: Course-pack: “Introduction to Real Options”
  Course-pack: “Investment Opportunities as Real Options: Getting Started on the Numbers”
  Course-pack: “Real Options: Valuing Managerial Flexibility”
  Course-pack: “Options Games: The Key to Competing in Capital-Intensive Industries”
Homework Due: None.

Session 22
Date: Apr. 12, 2017
Topic: Real Options
Reading: None
Homework Due: Real options homework
Session 23  
Date: Apr. 17, 2017.  
Topic: Green Team Presentations: American Solar, Inc.  
Homework Due: Green Team Groups’ written report and class presentation.

Session 24  
Date: Apr. 19, 2017.  
Topic: Gold Team Presentations: Yangarra Resource Limited  
Reading: Course-pack, “Yangarra Resource Limited”  
Homework Due: Gold Team Groups’ written report and class presentation.

Session 25  
Date: Apr. 24, 2017.  
Topic: Bayesian Networks (Probabilistic Graphical Models)  
Reading: None  
Homework Due: None

Session 26  
Date: Apr. 26, 2017.  
Topic: Bayesian Networks (Probabilistic Graphical Models)  
Reading: None  
Homework Due: TBA

Session 27  
Date: May 1, 2017  
Topic: Gold Team Presentations: Laura Martin  
Reading: Course-pack, “Laura Martin: Real Options and the Cable Industry”  
Homework Due: Gold Team Groups’ written report and class presentation.

Session 28  
Date: May 3, 2017  
Topic Green Team Presentations: The Right of Acquisition  
Reading: Course-pack, “The Right of Acquisition: Options in Commercial Real Estate”  
Homework Due: Green Team Groups’ written report and class presentation.

STUDENT RESPONSIBILITIES  
Students are expected to be prepared for class, do their homework, and participate in class discussions.

CLASS POLICY  
Assignments are due at the beginning of class. Students will submit their homework via the appropriate dropbox in Blackboard. Late submissions will not be accepted unless the student has obtained permission from the instructor prior to the submission date.
GRADING STANDARDS
Grades will be awarded based on your homework, take-home exam, and case study analysis.

Grading criteria for your homework:

- Excellent: accurate and clear response to all questions (A / A-)
- Good: accurate and clear responses to most questions, with limited number of minor inaccuracies or omissions and no major inaccuracies or omissions (B+ / B)
- Marginal: significant omissions or inaccuracies in responses to one or more questions (B)
- Unsatisfactory: significant omissions or inaccuracies in responses to most questions (C)

Grading criteria for your exam:

- Percent of correct solutions.

Grading criteria for your case analyses:

Case analysis format:
- Executive summary (including your recommendations)
- Methodology or techniques (which are best used for the problem)
- Analysis (complete and logical process employed)
- Conclusion/recommendations and concerns

<table>
<thead>
<tr>
<th>Executive summary</th>
<th>15%</th>
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</thead>
<tbody>
<tr>
<td>Methodology/techniques used</td>
<td>25%</td>
</tr>
<tr>
<td>Presentation of analysis</td>
<td>40%</td>
</tr>
<tr>
<td>Conclusion and concerns</td>
<td>10%</td>
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<tr>
<td>Writing style/format</td>
<td>10%</td>
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Final Grade Weights

<table>
<thead>
<tr>
<th>Graded Material or Activity</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bayesian homework</td>
<td>20%</td>
</tr>
<tr>
<td>Take-home exam</td>
<td>20%</td>
</tr>
<tr>
<td>Case analysis project: Avalanche or Ratnagriri</td>
<td>20%</td>
</tr>
<tr>
<td>Case analysis project: American Solar or Yangarra</td>
<td>20%</td>
</tr>
<tr>
<td>Case analysis project: Laura Martin or Right of Acquisition</td>
<td>20%</td>
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</tbody>
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Letter grades are: A, A-, B+, B, B-, C, or F. Expected overall class GPA for this course ranges from 3.40 to 3.80.

The professor reserves the right to change the grading policy for the course.
SCHOOL OF BUSINESS STANDARDS OF BEHAVIOR
The mission of the School of Business at George Mason University is to create and deliver high-quality educational programs and research. Students, faculty, staff, and alumni who participate in these educational programs contribute to the well-being of society. High-quality educational programs require an environment of trust and mutual respect, free expression and inquiry, and a commitment to truth, excellence, and lifelong learning. Students, program participants, faculty, staff, and alumni accept these principles when they join the School of Business community. In doing so, they agree to abide by the following standards of behavior:

- Respect for the rights, differences, and dignity of others
- Honesty and integrity in dealing with all members of the community
- Accountability for personal behavior

Integrity is an essential ingredient of a successful learning community. Ethical standards of behavior help promote a safe and productive community environment, and ensure every member the opportunity to pursue excellence. School of Business can and should be a living model of these behavioral standards. To this end, community members have a personal responsibility to integrate these standards into every aspect of their experience at the School of Business. Through our personal commitment to these Community Standards of Behavior, we can create an environment in which all can achieve their full potential.

HONOR CODE STATEMENT
Honor System and Code: The Honor System and Code adopted by George Mason University will be enforced for this class: [http://oai.gmu.edu/the-mason-honor-code/](http://oai.gmu.edu/the-mason-honor-code/)

In your work on all written assignments, keep in mind that you may not present as your own the words, the work, or the opinions of someone else without proper acknowledgement. You also may not borrow the sequence of ideas, the arrangement of material, or the pattern of thought of someone else without proper acknowledgement. Please note: Faculty are obligated to submit any Honor Code violations or suspected violations to the Honor Committee without exception.

<table>
<thead>
<tr>
<th>School of Business Recommendations for Honor Code Violations</th>
<th>Approved May 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UG-Non-Freshman Students (including transfer students)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Type of Violation</strong></td>
<td><strong>First Offense</strong></td>
</tr>
<tr>
<td>Plagiarism</td>
<td></td>
</tr>
<tr>
<td>1. Failure to cite/attribute sources</td>
<td>An F in the class; referral to Writing Center; and Academic Integrity Seminar completion</td>
</tr>
<tr>
<td>2. Representing someone else’s work as the student’s own (e.g., copying and pasting)</td>
<td>An F in the class; referral to Writing Center; and Academic Integrity Seminar completion</td>
</tr>
<tr>
<td>Cheating</td>
<td>An F in the class; and Academic Integrity Seminar completion</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------</td>
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<tr>
<td>1. On a minor assignment (e.g., homework, quizzes)</td>
<td>An F in the class; and Academic Integrity Seminar completion</td>
</tr>
<tr>
<td>2. Cheating on a major assignment or exam, submitting coursework from another course as original work</td>
<td>An F in the class; and Academic Integrity Seminar completion, and at least one semester suspension</td>
</tr>
<tr>
<td>Lying (e.g., providing fraudulent excuse documents, falsifying data)</td>
<td>An F in the class; Academic Integrity Seminar completion; termination from the School of Business; and at least one semester suspension</td>
</tr>
<tr>
<td>Egregious Violation (e.g., stealing an exam; submitting coursework from another class as original work across multiple courses; lying to an employer about academic performance, false identification or posing as another, in person or online)</td>
<td>An F in the class, Academic Integrity Seminar completion; termination from the School of Business; and at least one-year suspension</td>
</tr>
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**BUSINESS LIBRARY LIAISON INFORMATION**

Jo Ann J. Henson, MLIS  Business and Economics Liaison Librarian

Fenwick Library Fairfax Campus:  [http://infoguides.gmu.edu/business](http://infoguides.gmu.edu/business)

**DISABILITY**

If you have a disability and you need academic accommodations, please see me and contact the Office of Disability Services (ODS) at 703-993-2474. All academic accommodations must be arranged through the ODS. Please take care of this during the first two weeks of the semester. More information about ODS is available at [http://www.gmu.edu/student/drc](http://www.gmu.edu/student/drc)

**RELIGION**

Students who will miss class for religious reasons should inform me of their anticipated absences as soon as possible.

**COUNSELING CENTER**

George Mason University has a counseling center that can provide assistance if you find yourself overwhelmed by life, want training in academic or life skills, or the like. More information is available at [http://www.gmu.edu/departments/csdic/](http://www.gmu.edu/departments/csdic/)

**WRITING ASSIGNMENT STANDARDS**

All writing assignments should be formatted as follows: double-spaced, Times New Roman, 12-point font, and 1-inch margins. To cite and reference professional or academic sources, please use Chicago style. Specific instructions for in-text citations and referencing are found at [https://owl.english.purdue.edu/owl/resource/717/01/](https://owl.english.purdue.edu/owl/resource/717/01/)
To help manage the citations and seamlessly create reference lists, Mason supports a free software called Zotero. Please go to [https://www.zotero.org/](https://www.zotero.org/). This program offers:

- Centralized bibliography management
- Ability to sync across computers
- Ability for teams to combine contributions to the references
- Word plug-in that allows citation management within MS word

George Mason University has a writing center that can help you improve your English writing skills. More information is available at [http://writingcenter.gmu.edu/](http://writingcenter.gmu.edu/)

**INCLEMENT WEATHER AND CAMPUS EMERGENCIES**
Information regarding weather related changes in the University’s schedule (e.g., closing or late opening) will be provided on the GMU website and via MasonAlert. Students sign up for the Mason Alert system to provide emergency information of various sorts at [https://alert.gmu.edu](https://alert.gmu.edu).

If the Fairfax campus closes, the professor will post on Blackboard a video version of the regularly scheduled class lecture later in the day. Students will be alerted by e-mail once the video is available for viewing. (This approach will eliminate the need for a make-up class session later in the semester.)

An emergency poster exists in each classroom explaining what to do in the event of crises and that further information about emergency procedures exists on [http://www.gmu.edu/service/cert](http://www.gmu.edu/service/cert).