M609 Projects in Mathematical and Computational Finance

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Course Description

The projects course is designed to give students the opportunity to demonstrate attained mastery of the material studied in the core courses on the program. Projects also desirably will extend students knowledge of specific areas beyond what was covered in core courses. (Examples include advanced time series methods such as particle filtering or optimization techniques for term structure model calibration.) A central goal is to take the students classroom focus to more unconstrained, open ended, and less well defined context more frequently encountered in practice.

Several project outlines will be presented to students from which to choose, and students will be encouraged early in the program to think ahead about projects on which they would like to work. Projects may include literature survey, critical analysis of published papers, research including theoretical development, simulations, or applications.

The required deliverable is a project report which must be professionally constructed as noted in the addendum. Expected to be exhibited in the report is a mature synthesis of material relevant to the projects central goal, demonstrating the students grasp of concepts and methodologies of financial theory and related mathematical techniques as they pertain to the project.

Project Deliverables

The project course deliverable comprises two parts. Foremost is a written report. Second is an oral presentation. The oral presentation will be a summary of the project, lasting 10-15 minutes. It is important to note that a poor oral presentation will limit the final project grade. Written project reports are required to be produced in a professional manner: typeset, high quality graphics and tables (where included) and grammatically correct English.

In particular, the following areas will be critical to securing a good grade:

Exposition	Organization, clarity, content.
Originality	Description and standard analysis and results pertinent to the work is expected, but only to support the students contribution. A summary or rendition of (other) course work alone will not secure a grade.
Critical analysis	Understanding of the problem and/or model; discussion of advantages or limitations of method/analysis/results.
Data	Full description, sources, location where data may be obtained.
Software	Properly described and commented. Where a data analysis is performed in (say) Matlab, the code for the analysis will be expected in an appendix. The goal should be to enable reproduction of the described analysis with the same or other data. Where a program (or collection of program modules) is part of the project deliverable a test harness and associated results will be expected.

Project Topic Suggestions

Several project descriptions will be posted separately. They are designed to get you thinking about the kinds of tasks that constitute a substantive piece of applied work satisfying the course goals elucidated above. The subject matter addressed relates directly to material you have studied in the program: credit risk models are not included since that course runs contemporaneously with the projects course.

The suggestions may be combined: some of the individual project descriptions may be too limited to form an entire project (Vasicek1 for example), and some may be too large to complete in one semester (Numerical Methods). The goal is to review these outlines using them as prompts for your own project ideas. You may use the outlines directly if you wish (particularly those involving models not studied in detail in class, such as stochastic volatility or jump diffusions).

Project Descriptions (Separate Documents)

Project: Numerical Methods

Project: Vasicek One and Two Factor

Project: Black-Derman-Toy Examples

Project: SimulationOnTrees

Project: Stock Time Series

Project: Zero Price Inference

Project: Libor Market Model

Project: Stochastic Volatility Models

Project: Monte Carlo Analysis of Jump Diffusions

Project: Valuing Exotic Options

Project: Black-Scholes Correction by Gram-Charlier

Project: Derivatives Pricing Using Transform Techniques