

## *Economics 4360 Empirical Finance – Spring 2016*

- *Tuesday, Thursday: 3:30-4:45 pm, Monroe Hall 110*
- *Instructor: Steven Peterson ([speterson@virginia.edu](mailto:speterson@virginia.edu))*
- *Office hours: by appointment*

### *Texts and Software:*

Investment Theory and Risk Management (2012). Steven P. Peterson, Wiley Finance. (Since I am in the process of revising this text for a second edition, I will post chapters and you need not purchase the text). All of the spreadsheets can be downloaded for free at:

[http://www.wiley.com/WileyCDA/WileyTitle/productCd-1118129598\\_descCd-DOWNLOAD.html](http://www.wiley.com/WileyCDA/WileyTitle/productCd-1118129598_descCd-DOWNLOAD.html)

**Matlab** (If you don't already have a version of **Matlab**, you can purchase the student version at the bookstore for about \$50). Almost all the homework and virtually all in-class applications will be completed in **Matlab**.

(Optional) Asset Pricing (2001 or 2005). John Cochrane, Princeton University Press. This is recommended background reading and is the source for my notes below on the stochastic discount factor, GMM and state contingent claims. I will be sampling material from throughout the text.

### *Grading:*

Your grade in the course will be a function of four parts: (1) homework sets (2) midterm (3) final and (4) attendance and participation. Both the midterm and final are in-class. The homework will not be equal weighted (some homework assignments will be more challenging than others).

- Homework      30%
- Midterm        30%
- Final            30%
- Attendance    10%

Class attendance is critical to your success in this course. My objective is to apply the theory to real-world problems in portfolio and risk management currently facing portfolio managers. I will do most of the initial heavy lifting leaving more and more to you as the semester proceeds. We will adhere expressly to the University of Virginia honor code. As always, there are topics omitted (e.g., FX, Swaps, CDS, Structured Credit, etc.) and, time permitting, I am happy to expand our work to include any of the above.

The outline below is tentative. Homework assignments, in particular, may differ from the outline.

### *Course Outline\**

- I. Asset Pricing Models and Tests
  - a. Models of deterministic cash flows (chapters 1-3, Peterson)
    - i. Fixed income pricing models, duration, convexity, solving geometric series, IRR, immunization and portfolio construction.
      1. Homework 1 (discounting cash flows)

- 2. Homework 2 (writing functions in Matlab – Newton’s method)
      - 3. Homework 3 (writing functions in Matlab – Duration)
    - b. Models of stochastic cash flows (chapter 1 Cochrane, chapter 4 Peterson)
      - i. Prices, payoffs, future v. present consumption, the stochastic discount factor and its properties. State contingent claims, risk neutral pricing.
        - 1. Homework 4 – CCAPM
        - 2. Homework 5 – SCC
        - 3. Homework 6 – Fama-French, Macro factor models
        - 4. Homework 7 – Barra cross-sectional regression models
      - ii. Matlab OLS review
      - iii. IV – GMM review
      - iv. Newey-West estimation of covariances
      - v. Testing CCAPM using GMM
- MIDTERM – MARCH 3 (THURSDAY)***
- II. Models of Stock Price Dynamics (chapter 17, Peterson)
    - a. Weiner Processes, Brownian motion, correlated Brownian motion (with Matlab applications).
    - b. Monte Carlo (chapter 12, Peterson, Matlab)
    - c. GMM tests of various interest rate models (CKLS, Vasicek, CIR)
      - i. Homework 8 – Matlab application of GMM test
  - III. Optimal Portfolios and their properties (chapter 6-9, Peterson)
    - a. Risk and return attribution, risk budgeting.
    - b. Efficient frontier
    - c. Various applications (min var, max diversification, risk parity, duration matching).
  - IV. Resampling methods
    - a. Monte Carlo
    - b. Bootstrapping
    - c. Shrinkage estimators (of the covariance matrix)
      - i. Homework 9 – Scenario analysis
  - V. Options and Derivatives (chapter 16-18, Peterson)
    - a. Binomial Trees, Black-Scholes, option strategies
    - b. The Greeks
    - c. Risk controls and portfolio management
      - i. Delta hedging
      - ii. Gamma trading
      - iii. Homework 10a (strangles)
      - iv. Homework 10b (Gamma trading)
- FINAL – MAY 9 (MONDAY, 9 am – noon)***

**\*Notes will be posted for all topics.**