1 Basic Information About The Course

**Instructors:** Rody Manuelli, (email: riomalleo@gmail.com)

**Time and Location:** To be Determined

**Textbooks:** The first lecture will discuss (briefly) some technical issues about stochastic calculus. The dynamic stochastic optimization material will be covered at the level of chapters 3 and 4 of the book *Investment Under Uncertainty (IUU)* by Avinash Dixit and Robert Pyndick, Princeton, 1994. Pretty much the same material is covered in the relevant chapters of *The Economics of Inaction* by Nancy Stokey (Princeton University Press, 2009). I will follow some notes (available online) that discuss the basic math results.

Given the emphasis on applications, I will not go into the derivations of the basic mathematical results, and I will state them without proof. I will follow a set of notes that extract the most useful results from several sources.

**A. Optimal Control**


**B. Stochastic Calculus and Optimization**

*Brownian Motion and Stochastic Flow Systems (BMSF)*, J. Michael Harrison, Krieger 1990


2 Topics

This is a list of all possible topics. Given the time limits it is impossible to cover them all. I expect we will be able to discuss 1-7. A (*) indicates a paper that we will probably cover.

1. Background Material. IUU, chapters 1 and 2. (I will not cover this material. It is your responsibility to read the relevant chapters)

   - Stochastic Processes and Brownian Motion: Basic Results.
   - Stochastic Integration and Ito’s Lemma: Definitions and Results.
   - Stochastic Differential Equations and the Feynman-Kac Theorem.
   - Notes on Optimal Stopping and Smooth Pasting.
   - In addition, the material is covered in IUU, chapter 3, SCT (several chapters), as well as the other references. (Almost every book listed covers this topic. See, in particular, the appendix in BMSF.)

3. Options: Real and Financial. IUU (chapters, 5, 6, and 7), EI (chapters 4 and 5). Additional readings:
• Miltersen, K. and E. Schwartz, (2007), “Real Options with Uncertain Maturity and Competition,” NBER working paper # 12990. (*)

4. Neoclassical Investment


5. Consumption Dynamics


6. Macro Models with Financial Sectors


• ——— and ————-, (2016),“Macro, Money and Finance: A Continuous Time Approach,” working paper (June) (*)


7. Principal Agent Models


• Philippon, T. and Y. Sannikov, 2007, “Real Options in a Dynamic Agency Model, with Applications to Financial Development, IPOs, and Business Risk,” NBER working paper No 13584. (*)


8. Asset Pricing:

• Arbitrage Pricing: Market Price of Risk. Class Notes: Asset Pricing I.

• General Equilibrium: Lucas’ Tree Model. Class Notes: Asset Pricing II.

• General Equilibrium: Non-standard Preferences:
  
  

• Fixed Income Pricing:
  