PhD course

Continuous-Time Models for Empirical Corporate Finance (2 ECTS)

24-26 October, 2023

Lecturer: Professor Christopher Hennessy

This course is intended for multiple audiences. First, the course offers a non-technical introduction to continuous-time methods—inasmuch as more technical expositions of the material can stand in the way of applied researchers using the tools. Second, the course shows how continuous-time tools and methods have been applied successfully to consideration of classic questions within corporate finance: optimal accumulation of stocks of capital/labor and optimal financing. Finally, we will focus on how to write easy-to-solve models that can be used to motivate empirical tests or how to write models that can be taken directly to the data. Thus, the course is intended primarily for empiricists who want to develop a better facility with modeling strategies, and for theorists who are looking to do some empirical work.

It is recommended that you review Ito's lemma from a non-technical source, such as the textbook of Dixit and Pindyck, "Investment under Uncertainty." Nevertheless, our objective will be to build and develop tools in-class in a heuristic way, one that emphasizes intuition and empirical applications. We will build up the tools gradually, reaching the state-of-the-art in terms of tractable models that mimic the data generating processes that empiricists often hope to exploit.

For those more technically oriented, one can think of the course in the following way. We will begin with applications of continuous-time pricing methods. Then we will move on to instantaneous optimal control problems when there is a single geometric Brownian motion generating risk. Then we will introduce into our canonical models a second Markov chain for shocks to objects like tax rates and regulations. Finally, we will introduce learning, with agents and the econometrician not knowing the true Markov matrix, but engaging in Bayesian updating. For those less-technically oriented, don't be put off by the big words here—it all boils down to a simple equilibrium condition, and we'll work our way up gradually.

The class will run from 9AM-Noon on each of the 3 class days, with brief coffee breaks during the sessions. The afternoons will be devoted to self study, such as working on practical implementation of the tools and methods learned in class.

In order to receive credit for the course, you will be required to submit a brief research proposal (5-10 pages), and/or a model sketch, illustrating how you might apply the tools learned. Similarly, you can describe a corporate finance decision problem and describe technical barriers to using the methods developed in the course—perhaps you will be the one to break down those technical barriers in your own future research. For example, we will be focusing on models of investment and financing, but corporations, firms and households face a rich set of dynamic decision problems. Can you simply lift the tools we have learned and re-label variables, or does one need to overcome some technical hurdles to solve realistic depictions of other firm decision margins? The work on the research proposal is equivalent to 35 teaching hours.

Learning Goals

- The students should be able to understand the basic nature of continuous-time methods.
- The students should be able to explain how continuous-time methods are applied within corporate finance.
- The students should be able to write easy-to-solve models that can be used to motivate empirical tests and write models that can be taken directly to the data.

Suggested lecture readings (in addition to lecture notes and slides):

Static Models of Optimal Financial Structure:
Leland (Journal of Finance, 1994);
Mella-Barral and Perraudin (Journal of Finance, 1997).

Dynamic Models of Optimal Financial Structure:
Goldstein, Ju and Leland (Journal of Business, 2001).

Empirical Models of Dynamic Investment:
Hayashi (Econometrica, 1982);
Abel and Eberly (AER, 1994);
Abel and Eberly (JEDC, 1998).

Investment with Financial Frictions:
Hennessy (JF, 2004);
Hennessy, Levy and Whited (JFE, 2006).

Shock-Based Econometric Inference:
Hennessy and Strebulaev (JF, 2016);
Kashara, Hennessy and Strebulaev (JFE, 2016);
Hennessy and Livdan (JME, 2021)

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