**MATH 6385-01, Lec 12153** **3/17/2020**

**Continuous-Time Models in Finance**

**Spring, 2020**

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|---|---|
| Instructor: | Edward P. C. Kao |
| Time: | TTH 2:30 – 4:00 pm |
| Class Room: | SEC 201 |
| Office: | 629-PGH (713) 743-3456, website: www.math.uh.edu/~edkao<br>edkao@math.uh.edu |
| Office Hours: | TTH 10-11 a.m. and 1:00 - 2:00 p.m., or by appointment |
| Course Objective: | The course is an introduction to continuous-time models in finance. We first cover tools for pricing contingency claims. They include stochastic calculus, Brownian motion, change of measures, and martingale representation theorem. We then apply these ideas in pricing financial derivatives whose underlying assets are equities, foreign exchanges, and fixed income securities. In addition, we will study models involving jump diffusion and mean reversion and the use of levy processes in finance. |
| Grading Guide: | Homework 50%<br>Final (a take home project) 50% |
| Required Text: | *Arbitrage Theory in Continuous Time*, 3rd edition, by Tomas Bjork, Oxford University Press, 2009. |
| References: | The Heston Model and Its Extensions in Matlab by Fabrice Douglas Rouch, Wiley, 2013<br>*Financial Modelling with Jump Processes*, by Rama Cont and Peter Tankov, Chapman & Hall, 2004<br>*Applied Conic Finance*, by Dilip Madan and Wim Schoutens, Cambridge University Press, 2016. |

MATH 6385, Spring 2020, **Tentative** Schedule. Professor Kao

| Week | Dates | Topics | Chaps in Bjork |
|---|---|---|---|
| 1 | 1/14, 1/16 | Stochastic Integrals, Ito formulas | 4 |
| 2 | 1/21, 1/23 | Stochastic Differential Equations, Ito's Lemma | 5 |
| 3 | 1/28, 1/30 | Forward and Backward Kolmogorov Equations | 5 |
| 4 | 2/4, 2/6 | Portfoilio Dynamics | 6 |
| 5 | 2/11, 2/13 | Black-Scholes-Merton PDE and Formulas | 7 |
| 6 | 2/18, 2/20 | Futures and Forwards, Completeness, Hedging | 8, 9 |
| 7 | 2/25, 2/27 | Hedging, Matingale Approach to Arbitrage Theory | 9, 10, 11 |
| 8 | 3/3 , 3/5 | Multidimensional Models | 12, 13, 14 |
| 9 | 3/10, 3/12 | **Spring Holidays (no classes)** | |
| 10 | 3/17, 3/19 | Currency Derivatives | 17 |
| 11 | 3/24, 3/26 | Bonds and Interest Rates | 22 |
| 12 | 3/31, 4/2 | Short Rate Models | 23, 24 |
| 13 | 4/7, 4/9 | Forward Rate Models | 25, 26 |
| 14 | 4/14, 4/16 | LIBOR and Swap Market Models | 26, 27 |
| 15 | 4/21, 4/23 | American Options | 21 |