

FRE 6083 Quantitative Methods in Finance

Professor: _____ Daniel H. Totouom-Tangho

Description

This course focuses on employing quantitative methods for construction and application of models in financial engineering. Modern probability, stochastic processes and optimization are the required mathematical foundations introduced and needed for further study in financial engineering.

Topics include Partial Difference Equations, probability spaces; conditional probability; densities; distributions; density estimators; multivariate probability; moment-generating functions; random walks; Markov processes; Poisson processes; and the Brownian-motion process.

These techniques are applied to model, assess and simulate (using Python/ R/ C++ or Java) essential derivative and related problems of practical importance in finance

Pre-Requisite: Students are expected to know calculus and elementary probability.

Reference: Recommended, not required,

- Paul Wilmott on Quantitative Finance 3 Volume Set, Publisher: Wiley; 2 edition (March 13, 2006), ISBN-10: 0470018704 or ISBN-13: 978-0470018705
- An Introduction to the Mathematics of Financial Derivatives, Salih Neftci, ISBN: 0-125-15392-9
- An Introduction to Probability Models 10th Edition, Sheldon M. Ross, ISBN: 978-012-375-6862

Grading

Grading will be 30% homework, 60% final project, and 10% class participation.

Indicative program:

- Introduction to statistics
- Martingale
- Multivariate stochastic processes
- Introduction to Option pricing & Hedging
- Volatility as an asset class and the smile
- Statistical Arbitrage in the Stock Market
- Numerical methods in Stochastic finance
- Focus on Finite Difference Methods
- Interest Rate Modeling
- Convertible bonds / Callable Bonds pricing
- Credit Market & CDS Pricing
- Copulas & applications

- Value at Risk & Optimization technics
- Applications to credit & Interest rate pricing