

MTH 9862 Stochastic processes for Finance I

Syllabus, Spring 2010

- *Brownian Motion.*
 1. Review of basic properties and related martingales.
 2. Quadratic Variation process.
- *Stochastic Calculus.*
 3. Ito's Integral.
 4. Ito's Formula in one dimension.
 5. Black-Scholes-Merton equation.
 6. Multivariable Stochastic Calculus
 7. Brownian Bridge (time permitting)
- *Risk-Neutral Pricing.*
 8. Risk-Neutral Measure and Girsanov's Theorem in one dimension.
 9. Martingale Representation Theorem and its application to hedging.
- 10. Fundamental Theorems of Asset Pricing.
- 11. Dividend-Paying Stocks.
- 12. Forwards and Futures.
 - *Connections with Partial Differential Equations.*
- 13. Stochastic Differential Equations.
- 14. Partial Differential Equations.
- 15. Feynman-Kac formula.
 - *Exotic Options.*
- 16. Maximum of Brownian Motion with Drift.
- 17. Knock-out Barrier Options.
- 18. Lookback Options.
- 19. Asian Options. Change of Numeraire.
 - *American Derivative Securities.*
- 20. Perpetual American Put.
- 21. Finite-Expiration American Put.
- 22. American Call.