

COURSE NAME:	Models for Financial Economics
COURSE CODE:	MATH3803
LEVEL:	III
SEMESTER:	II
NUMBER OF CREDITS:	3
PREREQUISITES:	MATH3801: Financial Mathematics II

RATIONALE

Models for Financial Economics, is a broad term used to aid in decision and policy making that financial institutions and government ‘somewhat’ rely on. The financial crisis that took place in 2007, the impact and its effect, is still ongoing. This is why one needs to look at models, which are employed in the financial market and understand their limitations. Also, the course prepares the students for the professional examinations of the Society of Actuaries and the Institute and Faculty of Actuaries. In addition, this course will support the Department as we initiate accreditation as a Centre of Actuarial Excellence from the Society of Actuaries.

COURSE DESCRIPTION

This course will be built on the materials taught in Financial Mathematics II and introduce the general concepts, models and techniques used in the arena of finance. Students will be introduced to pricing models and their applications and limitations, arbitrage opportunities if they exist, valuation of derivatives and options, how financial institutions hedge their risk, and model simulations.

LEARNING OUTCOMES

On successful completion of this course, students should be able to:

- Explain how stock prices follow a diffusion process.
- Apply Itô’s lemma in the calculation of stock prices.
- Apply the Black-Scholes formula for the valuation of stock prices.
- Apply Interest Rate models for pricing and hedging of stocks.
- Identify arbitrage opportunities.
- Explain the cash flow characteristics of the following exotic options; Asian, barrier, compound, gap, and exchange.

- Define forward and future contracts, implied repo rate and cost of carry.
- Explain the use of derivative securities to manage financial risk.
- Discuss the reason for hedging.
- Define hedging, arbitrage, diversifiable risk, nondiversifiable risk, synthetic forwards, spreads, collars, straddles (including strangles), butterfly spreads, convertible bond
- Evaluate the payoff/profit of hedging strategies.
- Determine forward price from prepaid forward price.
- Explain the relationship between forward price and futures price.
- Use the concept of no-arbitrage to determine the theoretical value of futures and forwards.
- Given any four of call premium, put premium, forward price, strike price and interest rate, calculate the remaining item using the put-call parity formula.
- Define Swap, Notional Amount, Interest rate swap, and Deferred swap
- Use the concept of no-arbitrage to determine the theoretical value of a swap.
- Simulate lognormal stock price
- Apply variance reduction technique for convergence in simulation

COURSE CONTENT

Valuation of Derivative Securities: European and American option valuation (binomial model, Black-Scholes model, risk neutral model, state price vectors); put-call-parity; Greeks; properties of the lognormal distribution, and the Black-Scholes formula as a limited expected value for a lognormal distribution.

Simulation: Simulate lognormal stock prices and variance reduction techniques for accelerated convergence.

Risk Management: Hedging, arbitrage, hedging strategies, delta hedging of bonds and securities

Contracts: Forward contract, futures contract, forward price, no-arbitrage (theoretical) price

Swaps: Simple, commodity and interest rate swaps; arbitrage (theoretical) value of a swap

Interest Rate Models: Ornstein–Uhlenbeck, Vasicek and Cox-Ingeroll-Ross

TEACHING METHODOLOGY:

This course will be delivered by means of 39 hours of interactive lectures and problem based instruction. The course material (complimentary notes, practice problems and assignments) will be posted the course website, currently OurVLE 2 at <http://ourvle2.mona.uwi.edu/>. Instruction

will include a combination of guided and open inquiry based learning strategies. Tutorial sessions will involve students working individually or in a small groups to solve problems.

The contact and credit hours are as follows:

	Contact Hours	Credit Hours
Lectures	26	26
Tutorials	13	13
Total	39	39

ASSESSMENT:

The course will be assessed as follows:

One 2-hour written final examination	70%
One 1-hour In-course test	20%
Two written assignments each worth 5%	10%

REFERENCE MATERIALS

Prescribed Text:

Hull, J. C. (2009). Options, Futures, and Other Derivatives" (8thEdn), Prentice-Hall, ISBN: 0135009944

Recommended

Kellison, S.G. (2009).The Theory of Interest (3rdEdn). Irwin/McGraw-Hill; ISBN: 978-0-07338-244-9; other ISBN: 0073382442

Broverman, S. A. (2010), Mathematics of Investment and Credit (5thEdn), ACTEX Publications; ISBN: 978-1-56698-767-7; other ISBN: 1566987679.

Highly Recommended

McDonald, R.L. (2006).Derivative Markets (2ndEdn). Addison Wesley, ISBN-10: 0201729601, ISBN-13: 978-0201729603

Online resources:

The following are free online lectures which the student may access for revision purposes:

<http://www.scribd.com/doc/22351427/The-Theory-of-Interest-Stephen-G-Kellison>.