TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI
VICTORIA
UNIVERSITY OF WELLINGTON

VICTORIA INTERNATIONAL APPLIED FINANCE PROGRAMME
School of Economics and Finance

MMAF537 Special Topic: VOLATILITY TRADING

Trimester 1, 2013

COURSE OUTLINE

Names and Contact Details
The lecturer for this course is Professor Ser-Huang Poon, preferred contact is via email (ser-huang.poon@mbs.ac.uk)

The administrator is Rachel Zhang. Room RH 307, Email: viaf-programme@vuw.ac.nz , Ph: 04 463 6148

Trimester Dates

Teaching Period: Monday 4 March – Friday 17 June

Block Release Times

9:00am Saturday 6th April – 12.30pm Monday 8 April 2013.
9:00am, Saturday 8 June – 12:30pm Monday 10 June, 2013

A detailed schedule of each block release course will be supplied closer to the April and June sessions. Classes will take place at the Kelburn Campus – please see the schedule for details.

Attendance at all sessions of both block releases is compulsory.

Withdrawal from Course
Your fees will be refunded if you withdraw from this course on or before Friday 15 March 2013.

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2. The standard last date for withdrawal from this course is Friday 17 May. After this date, students forced to withdraw by circumstances beyond their control must apply for permission on an '*Application for Associate Dean's Permission to Withdraw Late'* including supporting documentation. The application form is available from either of the Faculty's Student Customer Service Desks.

Course Delivery
The contact hours of the course will be during the two block releases detailed above. During the rest of the trimester, students will be expected to be engaged in self directed study using their textbooks and material posted on Blackboard, and completing assignments which will be posted on Blackboard.

Group Work
There will be some group work based on discussion questions at the block releases. Whilst this is not formally assessed, participation in this will be factor in determining the marks awarded for participation as detailed below.

Expected Workload
Total average expected workload of 200 hours. During the approximately 6 weeks of term prior to each block release, students will need to allow about 14 hours per week for study, research and preparation of assignments for this course. The two block courses each involve approximately 18 hours of work.

Course Learning Objectives
After completing this course, students should be able to

- DISTINGUISH between historical and implied volatility
- UNDERSTAND the impact of volatility on option pricing
- UTILIZE historical and implied volatility calculation techniques
- DIFFERENTIATE between volatility smiles and skews
- DEFINE the VIX index and how it is calculated
- EVALUATE volatility-based derivative products
- DESCRIBE variance swaps and how they are utilized
- DEVELOP and ANALYSE derivative trading strategies for volatility
- DEVELOP and ANALYSE volatility dispersion and correlation trade strategies
- Understand and use key volatility models such as local vol and Heston

Course Content
Volatility is the heart of any investment strategy – and also the biggest source of risk in the capital markets. Most mission-critical metrics utilized to monitor and manage risk in investment portfolios are based on an assessment of volatility. One of the most widely followed indices of risk, the VIX (also called the "Fear Index") was at an all-time high during the recent crisis and continues to be a focus of attention for market participants. In this course, you'll explore various ways to measure volatility. But more importantly, you'll learn how to trade volatility to manage risk – by using cutting edge products, structures, and strategies. Learn to hedge existing exposures, take profitable positions in volatility, and create opportunities to maximize portfolio performance that were unavailable just a few years ago.

See the end of document for topic details.

Readings
The support reference textbooks for this class are John Hull, Options, Futures and Other Derivatives, Prentice Hall; and Jim Gatheral published by Wiley finance on "volatility surface" You can access the books via VUW library. Other readings, mainly consist of articles and journal papers, and notes written by the instructor will be uploaded on and made accessible via blackboard.

Materials and Equipment
It is necessary to bring a calculator to the block courses. A good financial calculator such as the HP17BII or HP10BII is strongly recommended.

Assessment Requirements

Tests:	One test at each block release session based on reading assigned for period leading up to the block release and material presented at the block release. Please bring your calculator. Test one: 8 April (30%); Test two: 10 June (30%)	**60%**
Assignments:	The first assignment (20%) is due 15th April, 2013. The second assignment (20%) is due 24th June, 2013	**40%**
Total Assessment:		**100%**

Each assignment will be distributed to you at least four weeks in advance of its due date.

Penalties
Assignments are due at any time on the date specified. Late assignments will incur a penalty of 5% of the final grade per day late. Work submitted more than one week late will not be graded. Assignments should be submitted through Blackboard in accordance with the assignment guidelines.

Use of Turnitin
Student work provided for assessment in this course may be checked for academic integrity by the electronic search engine http://www.turnitin.com. Turnitin is an on-line plagiarism prevention tool which compares submitted work with a very large database of existing material. At the discretion of the Head of School, handwritten work may be copy-typed by the School and submitted to Turnitin. A copy of submitted materials will be retained on behalf of the University for detection of future plagiarism, but access to the full text of submissions will not be made available to any other party.

Mandatory Course Requirements
Attendance at all sessions of both block releases is compulsory.

If you have, or become aware of, any health condition that could prevent you attending a VIAF compulsory block release, then you should notify the Programme Director immediately, preferably by email, dawn.lorimer@vuw.ac.nz.

Class Representative
A class representative will be elected in the first class, and that person's name and contact details made available to VUWSA, the course coordinator and the class. The class representative provides a communication channel to liaise with the course coordinator on behalf of students.

Communication of Additional Information
Additional information including assignment questions, details of the block course schedule, feedback on course assessments, etc will be provided online via Blackboard. Students are responsible for logging onto Blackboard regularly to check for any updates or announcements, and for ensuring that the VIAF Senior Administrator has their up to date email and postal addresses. Viaf-programme@vuw.ac.nz . If you have, or become aware of, any health condition that could prevent you attending a VIAF compulsory block release, then you should notify the Programme Director immediately, preferably by email, dawn.lorimer@vuw.ac.nz.

Link to general information
For general information about course-related matters, go to
http://www.victoria.ac.nz/vbs/studenthelp/general-course-information

Note to Students
Your assessed work may also be used for quality assurance purposes, such as to assess the level of achievement of learning objectives as required for accreditation and academic audit. The findings may be used to inform changes aimed at improving the quality of VBS programmes. All material used for such processes will be treated as confidential, and the outcome will not affect your grade for the course.

Detailed Topic Outline:
Part I (April 6-8)

Option revision

- Structure of contracts; Buying (long) and selling (short) option positions; Calls and puts
- "Hockey stick" payoff (P&L) diagrams
- Underlying; Strike price; Expiration
- Exercise - American/European/Bermudan
- Moneyness; In, at, or out of the money
- Intrinsic value, Total value, Time value
- Single Option trading strategies; Bullish and bearish single option strategies; Writing
- covered calls
- Portfolio insurance – protective puts; Caps and floors
- Option combination trading strategies; Collars, bull and bear spreads; Calendar spreads
- Volatility plays – straddles and strangles
- Insured volatility plays - butterflies and iron condors

How do people trade volatility?

- What is a volatility smile?
- How to read a volatility surface?
- How does smile dynamic impact on P&L?
- Trading vol using 1st generation instruments
- Trading vol using 2nd generation instruments
- When you did not know you are trading vol; Option combination strategies
- Creating synthetic assets using options and the underlying, Illustration of put-call parity
- Exotic Options; Chooser, Digital, Cliquet, Path-dependent (barrier, knock-in, knock-out),
- Asian

Option pricing models

- Black Scholes, Cox-Ross-Rubenstein (Binomial Lattice)
- Calculating Volatility; Historical volatility & standard deviation, Implied volatility & option
- pricing models
- Option Pricing Model Components; Price of underlying, Strike price, Time to expiration,
- Interest rates, Volatility of underlying
- Stochastic assumptions about valuation; Normal (returns) vs. lognormal (prices),
- distributions, Random walk (lognormal diffusion)
- The Greeks & Partial derivatives of option pricing model; Delta – Underlying, Gamma
- (second order partial derivative), Theta - Time, Rho - Rates, Vega - Volatility
- Spreadsheet model – Greek dynamic sensitivity analysis; Delta hedging, Immunization
- from the underlying, Delta hedging example, Volatility
- Review of historical vs. implied Volatility vs. variance

Part II (June 8-10)

The Impact of An Incorrect Volatility Assumption

- Sticky Moneyness vs. Sticky Strike
- What is the impact on pricing?
- How many Greeks do you need?
- What is the impact on hedging?

VIX and Variance Swaps

- The VIX (Volatility Index), Calculating the VIX, Other volatility indices
- Volatility index products, Futures, Option, ETNs
- Variance Swaps (Structure, Payoff, Notional/Vega)
- Hedging/Pricing (option equivalent postions);
- Static hedges vs. dollar gamma (Trading examples)
- Variance Futures (Structure, Payoff, Notional/Vega, Trading examples)
- Volatility Dispersion Trading
- Volatility vs. correlation
- Directional correlation trades with options
- Trading individual components of indices against the index

Local Vol

- Is local vol a Stochastic vol?
- Dupire Equation
- Implementation
- Stochastic vol with embedded local vol
- Why local vol may be used to price barrier but not cliquet?

Heston:

- Solving Black-Scholes through fourier transform
- The Heston equation & the problem with complex root
- Heston fundamental PDE, Fourier transform and characteristic function
- FFT, FFFT or Direct Integration?
- Vol surface Sensitivity to Heston parameters
- Simulating the Heston dynamics
- Using Heston to price barrier and cliquet
- The mixing models

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