

School of Economics and Finance

## **FINA 411 STOCK PRICES AND VOLATILITY MODELLING**

Trimester Two 2011

### **COURSE OUTLINE**

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<b>Lecturer:</b>	John Randal, RH331, phone 463-5558 (coordinator) contact by email: john.randal@vuw.ac.nz
<b>Lecture times:</b>	Thursdays, 12:30–2:30
<b>Lecture venue:</b>	RWW128
<b>Lab time and venue:</b>	TBC
<b>Teaching period:</b>	Monday 11 July – Friday 14 October
<b>Study period:</b>	Monday 17 October – Thursday 20 October
<b>Examination period:</b>	Friday 21 October – Saturday 12 November (inclusive)

#### **Withdrawal from Course:**

Your fees will be refunded if you withdraw from this course on or before 22 July 2011.

The standard last date for withdrawal from this course is Friday 23 September. 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 content**

An intensive examination of volatility modelling. Topics include simulation and data analysis techniques; continuous-time stock price models; conditional and stochastic volatility modelling; and modelling heavy tails and regimes. The course will follow Stephen Taylor’s book, *Asset Price Dynamics, Volatility, and Prediction* Princeton, 2007 (\$94 at Vicbooks) less closely than in the past, though it is still a useful resource. Changes to the schedule will be notified in class.

**Lectures 1-2, 14 & 21 July** Topics include: data generating process vs model; theory vs simulation; defining terms; stochastic processes; estimation; a simple volatility model. Taylor: §1-3, 8.3.

*Lectures 3-4, 28 July & 4 August* Stylised facts of stock prices. Data analysis techniques. Taylor: §4

*Lectures 5-9, 11 & 18 August, 8, 15 & 22 September* The Markov Switching Model: its definition, properties, estimation theory, comparisons to GARCH. Taylor: §11, (10)

*Lectures 10-12, 29 September, 6 & 13 October* The Jump Diffusion Model: its definition, properties, estimation theory, comparisons to GBM and CEV models. Taylor: §13.

### **Course learning objectives**

This course has been designed to introduce students to some of the special features of financial data and the specialised techniques used to cope with these features. The course is intended to be useful preparation for a job as a quantitative analyst, or for postgraduate study in finance. Throughout the course, general and transferable computer skills will be developed, including the ability to program modern financial techniques.

By the end of this course, students should be able to:

- C1 explain clearly the difference between a data generating process and a model;
- C2 explain clearly the relative merits of theoretical analysis of models, and simulation-based analysis;
- C3 list stylised facts of stock prices, and suggest techniques to identify and appraise these for individual time series;
- C4 recognise features of volatility models and how they relate to empirical facts;
- C5 derive theoretical properties of Markov Switching models, and the Jump Diffusion process;
- C6 describe aspects of market microstructure and distortions in market data, including price rounding.

### **Course delivery**

This course covers a mixture of theory and practice. Consequently our time will be divided between a lecture room (RWW128) and a lab (TBC). The lab schedule will be advised at lectures and via Blackboard.

### **Expected workload**

You are expected to spend roughly 150 hours completing this course. This includes preview, attendance and review of the lecture material, preparation and attendance at the lab tutorials, completion of lab exercises, completion of projects, preparation and attendance of the exam. On average, this is roughly 10 hours per week between the start of the course and the exam, but the actual load is unlikely to be uniform.

### **Group work**

There is no group work component for this course.

### **Readings**

Taylor's book is recommended reading for this course. There are two copies on three day loan at the Commerce library (call number HG4636 T246 A).

## Course Materials

The statistical software R has been installed on the SCS computers. If you regularly use a non-VUW PC, R is available free of charge at <http://www.r-project.org/> for Windows, Mac or Linux. Alternatively, bring a blank CD-R or a memory stick to John, and he will give you a copy of the most recent version.

## Assessment requirements

The course content will be assessed by way of four written assignments and a final exam.

The assignments will be distributed throughout the course, and will consist of a mixture of research, theory, and computer work. Some will require additional background reading. They will be worth 15% each, i.e. 60% in total.

*Essay 1 Stylised facts of stock prices.* Critical review of the current state of the stylised facts of the stock price literature and the methods used to identify these features, demonstrating wider reading. 4-6 pages, including a minimum of 5 references. Due at or before the lecture, Thursday 28 July (week 3). Learning objectives 1, 3, 6.

*Project 2 Theory vs simulation.* Simulation study allowing comparison of “empirical evidence” with theory. Short discussion of the implications when the theory is not available. 2-4 pages. No wider reading expected. Due at or before the lecture, Thursday 18 August (week 6). Learning objectives 1, 2. *A sheet outlining specific tasks will be distributed in class and via Blackboard.*

*Project 3 Volatility switching model.* Detailed analysis of a two-state Markov Switching model. Brief summary of the model’s properties. Estimation and simulation of it. Analysis of data features. Discussion of implementation, and the model’s strengths and weaknesses. 5-8 pages. No wider reading expected. Due at or before the lecture, Thursday 6 October (week 11). Learning objectives 1, 2, 4, 5. *A sheet outlining specific tasks will be distributed in class and via Blackboard.*

*Essay 4 Rounding vs thin trading.* Absence of price changes can be due to: insufficient trading of the asset or imperfect measurement of the price. Discuss these two issues, and suggest methods for disentangling them. 4-6 pages, including a minimum of 5 references. Due at or before the lecture, Tuesday 12 October (week 12). Learning objectives 1, 2, 3, 6.

A two hour exam will be in the University exam period (22 October to 13 November inclusive). The exam will test appreciation and understanding of the techniques covered and their role in financial research. It may reassess work covered in the assignments. The exam will be worth the remaining 40%.

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 audit purposes. The findings may be used to inform changes aimed at improving the quality of FCA programmes. All material used for such processes will be treated as confidential, and the outcome will not affect your grade for the course.

## Examinations

Students who enrol in courses with examinations are obliged to attend an examination at the University at any time during the formal examination period.

The final examination for this course will be scheduled at some time during the period **Friday 21 October – Saturday 12 November 2011 (inclusive)**.

## **Penalties**

Assignments handed in late will attract a 10% penalty per day for the first five days, and be awarded zero after five days. Extensions may be negotiated prior to the deadline but not after.

## **Mandatory course requirements**

None.

## **Class representative**

An overall student class representative will be chosen to represent all SEF Honours classes.

## **Communication of additional information**

Additional information will be conveyed to students via Blackboard and/or email.

Emails may be sent to the address that you supplied with your enrolment; but they may also be sent to your SCS email address, which is your official university email address. You should keep an eye on both email addresses.

## **For the following important information follow the links provided:**

### **Academic Integrity and Plagiarism**

<http://www.victoria.ac.nz/home/study/plagiarism.aspx>

### **General University Policies and Statutes**

Find key dates, explanations of grades and other useful information at

<http://www.victoria.ac.nz/home/study>

Find out about academic progress and restricted enrolment at

<http://www.victoria.ac.nz/home/study/academic-progress>

The University's statutes and policies are available at

<http://www.victoria.ac.nz/home/about/policy>,

except qualification statutes, which are available via the Calendar webpage at

<http://www.victoria.ac.nz/home.study/calendar> (See Section C)

Further information about the University's academic processes can be found on the website of the Assistance Vice-Chancellor (Academic) at

[http://www.victoria.ac.nz/home/about\\_victoria/avcacademic/default.aspx](http://www.victoria.ac.nz/home/about_victoria/avcacademic/default.aspx)

### **AVC (Academic)Website: information including: Conduct, Academic Grievances, Students with Impairments, Student Support**

[http://www.victoria.ac.nz/home/about\\_victoria/avcacademic/Publications.aspx](http://www.victoria.ac.nz/home/about_victoria/avcacademic/Publications.aspx)

### **Faculty of Commerce and Administration Offices**

<http://www.victoria.ac.nz/fca/studenthelp/>

### **Te Putahi Atawhai**

#### **Maori and Pacific Mentoring Programme**

[http://www.victoria.ac.nz/st\\_services/tpa/index.aspx](http://www.victoria.ac.nz/st_services/tpa/index.aspx)