CCFEA

Centre for Computational Finance and Economic Agents

CCFEA PhD Workshop

2011

16th February 2011

Venue		Session	Presenter	Title
09:00 - 09:10	LTB 4	*Opening Address*	**Edward Tsang**	
09:10 - 10:10	LTB 4	*Invited Lecture*	**Richard Olsen**	*How to trade? How do you make a million?*
10:10 - 10:35	LTB 4	*1*	**Monira Aloud**	*Minimal Agent-Based Model for the Origin of Trading Activity in Foreign Exchange Market*
10:35 - 11:00	LTB 4	*1*	**Ali Rais Shaghaghi**	*Systemic Risk in Financial Derivatives Markets: A Complex Agent-based Dynamic Network Approach*
11:00 - 11:20	LTB 4	*Coffee Break*		
11:20 - 11:45	LTB 4	*2*	**Elton Sbruzzi**	*Arithmetic Average Vs. Geometric Mean on Leveraged Returns*
11:45 - 12:10	LTB 4	*2*	**Neil Rayner**	*Robust Agent Based Models of Long Memory Phenomena in Financial Time-Series*
12:10 - 12:35	LTB 4	*2*	**Minh Khoa Nguyen**	*Calibration of agent-based models using Empirical Likelihood*
12:35 - 13:00	LTB 4	*2*	**Davi Baccan**	*The Role of Surprise in Agent-based Computational Economics*
14:00 - 14:25	4SB.5.3	*3*	**Azusa Takeyama**	*The specification of risk parameters of CDS using stock options*
14:25 - 14:50	4SB.5.3	*3*	**Jenny Castellanos**	*Consistent CDS scenarios for Credit VaR*
14:50 - 15:15	4SB.5.3	*4*	**Alexander Guarin I**	*An Application of Meshfree Methods in Option Pricing under Stochastic Volatility*
15:15 - 15:40	4SB.5.3	*4*	**Javed Iqbal**	*International Index Portfolio Optimization using Regime Switching: Case of Asia Pacific*
15:40 - 16:00	4SB.5.3	*Coffee Break*		
16:00 - 16:55	4SB.5.3	*Invited Lecture*	**Evdoxia Pliota**	*HSBC De-peg Risk Measure*
16:55 - 17:00	4SB.5.3	*Best Presentation Award*		

Agent-based Modelling (I)

Chair: Edward Tsang

Minimal Agent-Based Model for the Origin of Trading Activity in Foreign Exchange Market

Monira Aloud

Abstract: In this paper, we show that a minimal agent-based model for the Foreign Exchange (FX) market is capable of reproducing, to a certain extent, FX market trading activity. The model is minimal in that it has the advantage of having the minimum set of elements necessary for modelling the FX market in order to reproduce the FX market trading activity. The key elements are zero-Intelligence directional-change events traders, historical prices, actual FX traders' behaviour, limit orders, FX market trading sessions, market holidays, and the activation of the initial condition. All of these play a fundamental role. Most importantly, the simulation output is evaluated by contrast against the microscopic behavioural analysis of high-frequency data of individual traders' transactions on an account level provided by OANDA LTD. The results of this comparison prove that the trading agents' behaviour reproduces the FX market trading activity. Overall, the model leads to the identification of the key elements that may be responsible for the emergence of FX market trading activity in an agent-based model.

Systemic Risk in Financial Derivatives Markets: A Complex Agent-based Dynamic Network Approach

Ali Rais Shaghaghi

Abstract: As with the US Office of Financial Research that aims to overcome problems of balkanization of financial and banking data and to have better models to provide quantitative oversight of the financial system nationally or globally, institutions such as the European Central Bank, International Monetary Fund and newly set up financial stability divisions in different countries have intensified efforts to investigate new modelling tools such as financial network analysis. These can yield bottom up holistic visualizations of interconnections of financial obligations that can help identify systemically important players and more importantly model the threats to system stability from the growing interconnectedness between banks and financial derivatives markets.

This work highlights the paradigm shift involved in implementing database-driven complex agent-based dynamic financial network models where strategic behaviour of

financial intermediaries and regulatory incentives and constraints shape the structure and stability of the complex interconnected system. We focus on three main US financial derivatives markets, viz.: Interest Rate Swaps, Foreign Exchange and CDS markets. Their network topology will be analyzed on an individual basis for their structural propensity for systemic risk and to propagate financial contagion. This will be followed by a brief introduction to the requirements for generalized simple bilateral network analysis which incorporates the activity of financial intermediaries in multiple markets. For this we utilise the theory of hyper-graphs and hyper-networks.

Agent-based Modelling (II)

Chair: Steve Phelps

Arithmetic Average Vs. Geometric Mean on Leveraged Returns

Elton Sbruzzi

Abstract: The relevance of studies about leverage depends upon the formula used. Leverage is linear in arithmetic average formula, thus, considering such formula, studies about leverage is irrelevant; but leverage is concave on geometric mean formula, thus, considering such formula, studies about leverage is relevant. In this paper, we analyse the appropriate formula to estimate leverage returns between two different formulas: arithmetic average and geometric mean. The result is that arithmetic average formula is rejected as a estimator of the rate of growth of leveraged investments while geometric mean formula is accepted as a such estimator.

Robust Agent Based Models of Long Memory Phenomena in Financial Time-Series

Neil Rayner

Abstract: It is well known that empirical financial time-series data exhibit long-memory phenomena: the behaviour of the market at various times in the past continues to exert an influence in the present. One explanation for these phenomena is that they result from a process of social-learning in which poorly-performing agents switch their strategy to that of other agents who appear to be more successful. We test this explanation using an agent-based model and we find that the robustness of the model is directly related to the dynamics of the learning process; models in which learning converges to a stationary steady-state fail to produce realistic time-series data. In contrast, models in which learning leads to dynamic switching behaviour in the steady-state are able to reproduce the long memory phenomena. We demonstrate that a model which incorporates a contrarian trading strategy results in more dynamic behaviour in steady-state, and hence is able to produce more realistic results. Our contrarian agent-based model of long memory is more robust to changes in free-parameters than an existing social-learning

Calibration of agent-based models using Empirical Likelihood

Minh Khoa Nguyen

Abstract: Agent-Based (AB) models are becoming increasingly popular in economics and finance, however there are still a number of methodological issues which have prevented them from being accepted by the mainstream research community. Any scientific model or theory has to be *testable* for example by comparing predictions which are contingent on the model against empirical observations. If they coincide the model can be considered as provisionally true, else it is falsified and at least one of the model axioms is false. However, in order to derive testable implications a meaningful calibration and estimation procedure is required, and this issue has been given relatively little attention in the literature. In this talk I will introduce and examine a calibration procedure for AB models which is based on a statistical methodology called Empirical Likelihood.

The Role of Surprise in Agent-based Computational Economics (ACE)

Davi Baccan

Abstract: In addition to the inherent complexity of a stock market, highly unexpected market movements together with behavioral economics findings constitute evidences that market participants are not fully rational, stressing the necessity of adopting novel approaches. This has been the focus of the Agent-based Computational Economics (ACE), which consists in the computational study of economies, and make use of different computational fields such as multi-agent-based simulation. Additionally, in response to this dynamic environment and in order to "survive , artificial agents often need to adapt their expectations, and modify their behaviour. In human beings, emotions have been significantly contributing to preserve the survival. In this context, surprise and its associated cognitive process have been of great importance by allowing human beings to adapt to complex and dynamic environments. Surprise is an emotion that can be elicited in response to an unexpected event, or when there is the detection of a contradiction or conflict between newly acquired and a pre-existing belief. Additionally, the associated cognitive process involves the appraisal of the event/information, focus of attention on the event that elicited surprise, analysis of the event, and immediate reaction to the unexpected event and/or update, extension, or revision of the expectations that originated surprise. In a stock market, participants are often confronted with unexpected events and receive contradicting new information. My research focus on providing evidences that cognitive models of surprise (i.e. unexpected events and contradicting information) help us to better explain and understand the behaviour of financial markets, both on the micro and macro level.

Credit Default Swaps

Chair: Wing Lon Ng

The specification of risk parameters of CDS using stock options

Azusa Takeyama

Abstract: I suggest a methodology of the estimation of the risk parameters of CDS, probability of default and loss given default. While it is possible to determine the no arbitrage price of CDS given probability of default and loss given default, it is not possible to specify these risk parameters directly from the CDS spread. To calibrate an option pricing model with credit risk as well as stochastic volatility and interest rate, I use the perturbation method based model. The model is an enhanced version of Bayraktar and Yang (2010) model. I demonstrate the model provides the better fitness of option prices as well as the estimation of probability of default.

Consistent CDS scenarios for Credit VaR

Jenny Castellanos

Abstract: Two approaches to generate scenarios for credit default swap (CDS) VaR estimation under the historical simulation framework are discussed. In addition, a methodology for "correcting" arbitrageable scenario curves is proposed. Non-arbitrageable curves are defined as those where the marginal default probabilities are non negative and the cumulated default probability is within the [0,1] interval.

Numerical Methods and Optimisation

Chair: John O'Hara

An Application of Meshfree Methods in Option Pricing under Stochastic Volatility

Alexander Guarin Lopez

Abstract: In this paper, we apply RBF interpolation as a spatial approximation scheme in the numerical pricing of European and American options. We consider both constant and stochastic volatility. We run several experiments to evaluate the accuracy and computational efficiency of this approach. Specifically, we consider the commonly adopted Heston stochastic volatility model. This is used as benchmark and compared against alternative solutions provided by Monte Carlo simulations, the finite difference method and semi-analytical solutions using numerical integration and the fast Fourier transform. Numerical tests give evidence of the robustness of the method.

International Index Portfolio Optimization using Regime Switching: Case of Asia Pacific

Javed Iqbal

Abstract: Hamilton (1989) gave idea to model regime shifts, and Ang, A. and G. Bekaert (2002) used it with CAPM for the returns and portfolio optimisation. I have tried to implement their methodology to model behaviour of international index portfolios in order to check its empirical validity. The Index data from six stock exchanges, Koreas SE Comp, Nikkei 225 Stock Average, FTSE Bursa Malaysia (KLCI), Jakarta SE Composite, Shanghai SE All Share Index and S&P ASX 200 Australia to be evaluated against MSCI World Index was used. The idea was to invest 1 USD in this portfolio and to continuously rebalance the portfolio from the weights generated by the regime switching model and compare them with simple mean-variance portfolio and market value portfolio. Previously, we have been able to show that Regime Switching Strategy has been successful and this data also supports the same argument that Regime Switching strategy performs better against other strategies.