

Economics and Finance

Wednesday, 20th August 2014

10:00 - 11:00

Economics and Finance 1

A BRAVE NEW MODEL FOR A BRAVE NEW MARKET

Ash Booth, University of Southampton, UK (ash.booth@soton.ac.uk)

Based on recent theoretical, empirical and regulatory developments, this paper proposes an agent-based model for analysing trade execution algorithms. Five types of agents occupy a limit order-book market: liquidity consumers, market makers, mean reverters, trend followers and noise traders. The first group creates large one-directional orders based on portfolio considerations. When they submit an order to the market they split it up into smaller parts to evade price impact costs. The second group of agents act as liquidity providers that forecast order flow and supply liquidity at both sides of the order book. The third and fourth trader types represent typical high frequency trading strategies known to effect market volatility. Noise traders represent all other strategies in the market. The model is able to produce known stylised market facts as well as temporary and permanent market impact and concave market impact functions in order sizes.

AN AGENT-BASED FRAMEWORK FOR ANALYSING INSOLVENCY RESOLUTION MECHANISMS FOR BANKS

Bob De Caux, University of Southampton, UK (rdc1g11@soton.ac.uk)

The issue of bankruptcy and how to handle distressed banks has become an extremely important topic in the wake of the global financial crisis. The decision to allow Lehman Brothers to fail and subsequent bank bail-outs have exposed the fact that the systemic effects of different bank resolution measures are not well understood. Consequently there is a great deal of discussion as to the relative effectiveness of bail-outs, bail-ins and other forms of special resolution.

Most existing network models of bankruptcy are based on simple epidemiological-style contagion and make the unrealistic assumption that banks will passively stand by and do nothing as problems begin to occur. They also begin at the point of the first bankruptcy, so fail to capture the “moral hazard” effect that advance knowledge of a proposed resolution mechanism can cause. By contrast, game theoretical models do examine the incentives of both banks and the financial regulator ex-ante and ex-post to establish the system equilibria that form. However they do not include detailed contagion dynamics, so the true costs of a systemic failure are not fully captured in the payoff matrices that banks use to strategise and the paths that these systems take to reach a given equilibrium state are not captured.

We propose a novel agent-based framework, where a network of asset and liability contagion channels are endogenously formed over time according to individual bank investment strategies. In addition, each bank has the ability to adapt its strategy in a game-theoretic manner. Using this model, we are able to analyse how different resolution mechanisms affect economic stability. We also investigate how timing can impact the effectiveness of any form of resolution, in terms of the point at which a regulator should intervene with a struggling bank and the indicators it should use to do so.

THE EMERGENCE OF MONEY: NETWORK FORMATION IN MONETARY SEARCH

Timothy Moran, University of Southampton, UK (tam1g09@soton.ac.uk)

Why does money exist, and how does the emergence of money and banking depend on network structures? We use two models to begin to address these questions. An agent-based model considers the evolution of particular commodities as currencies based on intrinsic properties of the commodities themselves. The production and consumption behaviours of

agents combined with an endogenous process of price discovery allow commodity moneys to emerge. Goods that are less intrinsically useful may function well as money because agents are more willing to offer them in trade during the early stages of price discovery, so they are more frequently encountered by the trading agents. They may subsequently become highly valued as exchange goods as a result of a process of reinforcement learning.

This is compared to more standard economic search models that allow intrinsically worthless promisory notes to function as media of exchange. The expected value of these notes in facilitating exchange is sufficiently high that agents may remain willing to accept them even when there is a high probability that their issuers will refuse to redeem them. Adaptability and forgiveness may be essential in monetary economies. In both cases the trading and learning behaviours of agents determine the type, stability and acceptability of the money.

Thursday, 21th August 2014

9:00 - 10:00

Economics and Finance 2

UNIVERSALITY IN FIRM DYNAMICS: INSIGHTS FROM BIG DATA

Alvis H. T. Tang, Imperial College London, UK (ho.tang11@imperial.ac.uk)

In the UK, a new company is formed every single minute on average, a rate just slightly smaller than the population growth at 1.38 baby per minute. Undoubtedly, companies are the lifeblood of any economy. They generate economic activities to support of our society. However, despite studies of economics have flourished since Adam Smith, our understanding of the dynamics of companies remains very limited.

Unlike a deterministic system, the dynamics of companies are full of uncertainties. Two identical companies founded at the same time doing exactly the same business can archive two very different levels of success. There are infinitely many reasons of such variation at the individual level. Studies are usually done in case-by-case reviews. However, despite the fate of a startup is never certain, at the macroscopic level, a number of empirical observations indicate that the randomness has unique signatures. For instance, the shapes of distributions such as income, wealth and growth are almost identical across different countries and periods of time. It suggests some unknown stochastic laws which governing the dynamics may exist. However, due to the limit of small data size in the past, none of the existing theories can be verified or falsified. In addition, a general theory which does not depend on particular circumstances is lacking.

The aim of the work is to deliver a macroscopic and probabilistic description of companies. To draw a clear global picture, financial information of more than a million companies (1/3 of all companies) in the UK have been traced. The data confirm the existence of universal signatures of company dynamics regardless of time and industry type. Based on this detailed information, some properties have also been identified. In the conference, I will share some insights from the data and ideas in my head.

THE REGULATORY DILEMMA: AN AGENT-BASED APPROACH TO POLICY MAKING WITHIN INNOVATION SYSTEMS

Christopher Hughes, University of Southampton, UK (hughsi.ch@googlemail.com)

In any industry where innovation plays a key role, we want to reward entrepreneurs for their investments in cumulative and sequential innovation. But we want to do this without prohibiting follow-on creativity and without raising unreasonable barriers to market entry. Getting this balance right in sectors such as pharmaceuticals, entertainment, and ICT is a significant 21st century policy challenge. Government regulation plays a pivotal role in influencing the innovation activities of companies, industries and whole economies. However, sound regulation must be based on an understanding of how a policy change will affect the behaviour of various actors in the market. This implies that some form of predictive modelling is necessary for intelligent policy formation. However, the modern business landscape is sufficiently complex that predicting responses to policy using traditional methodological approaches such as spreadsheets, regression

analysis, and system dynamics is becoming increasingly difficult (Bonabeau, 2002). The ICT innovation system is a case in point. Previous research illustrates that it is a system with highly inter-connected and dynamic elements with multiple feedback loops, oscillations and side effects. Modelling a system with this degree of complexity requires an appropriate methodological technique. With this in mind, an agent-based approach was chosen. This is an underutilized methodological approach and is the most suitable for testing the effects of a wide range of strategies. Similarly, it allows one to examine the expected behaviour of companies in response to different levels of regulatory aggression. This research begins with an in-depth literature review of research on the ICT Innovation system. The review allows us to identify gaps in our current understanding, and thus to find pertinent research questions for the agent-based approach. A model is subsequently developed where agents adapt using a hill-climbing technique. This is in order to look at the effects of regulatory aggression on the amount of innovation that is produced within the system.

MULTIPLE AGENT FASHION GAME

Zuzanna Kosowska-Stamirowska, Sciences Po, Paris, France (zuzanna.stamirowska@sciencespo.fr)

The market of luxury exists thanks to the feeling of exclusiveness which it creates. Such specificity creates externalities. On the one hand, luxury firms want to make their product desirable to a big audience in order to maximise profits, but on the other hand they need to take into account the feeling of exclusivity, which is one of the most important features of their products. As a result, such firms face a tradeoff between delivering a large number of products to as many clients as possible, and preservation of exclusivity. In this paper we develop a model of Multiple Agent Fashion Game, which captures both conformist and non-conformist behaviour of agents (consumers) connected by a network, which signifies interactions between them. Non-conformism implies a repulsion of the same, a denial to conform to a rule or standard, whereas conformity implies imitation. In this paper the agents have two alternatives to choose from. We present efficient algorithms for maximisation of social utility in such a setting for special topologies of graphs. In order to solve the problem in general we present approximation algorithms which make use of semidefinite programming. We also provide some auxiliary results on Nash equilibria of the game and the Price of Anarchy.