

FINANCE AND ECOLOGY: LESSONS FROM INTERDISCIPLINARY RESEARCH

FOLLOWING THE FINANCIAL CRISIS, BANKERS HAVE A LOT TO LEARN FROM THE FIELDS OF ECOLOGY AND EMERGING INFECTIONS



In the wake of the 2007-8 economic crisis, the question on everyone's minds is how to prevent the global financial system from falling into such chaos again. The general consensus seems to be that there is an urgent need for a regulatory system capable of protecting the financial system as a whole. However, it is also clear that a far deeper understanding of the dynamic behaviour of the global banking network will be necessary if these regulatory changes are to have the desired effect.

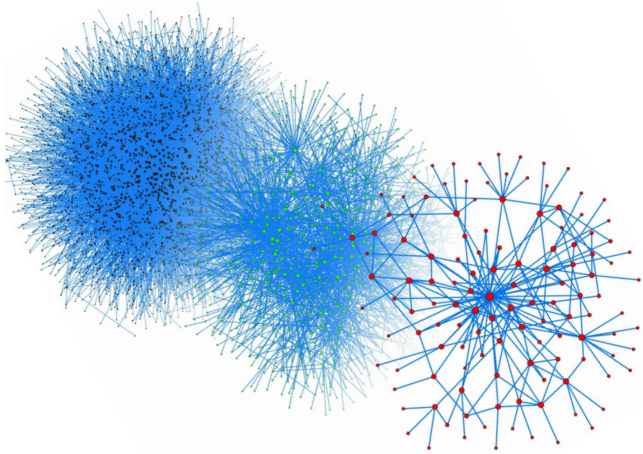
Firms, investors and policy makers are also beginning to realise that, while a lot of time has been dedicated to minimising risk for individual firms, very little attention has been paid to the changing dynamics of the whole system - that is to studying "systemic risk". Within financial circles there is therefore an unprecedented level of interest in the dynamics of complex networks. Specifically, in what lessons could be learned

from research in other fields of study where large-scale failures in complex systems can have major consequences for society, such as ecology and epidemiology.

COLLABORATION

In a recently published paper Dr Nim Pathy, a Research Fellow at the Institute for Emerging Infections (part of the 21st Century School), and Lord Robert May, former Chief Scientific Adviser to the UK Government and an expert in ecological networks, have attempted to answer some of these questions. Their most recent paper, "Systemic risk: the dynamics of model banking systems",¹ examines financial networks as complex systems, and their implications for financial stability.

This collaboration is a pertinent example of the benefits which can arise when knowledge from one field informs progress in another. Lord May



*Complexity in the New York garment industry
Image courtesy of Dave Smith, Oxford University*

and Dr Pathy's research paper draws lessons from work on complex systems in fields such as evolutionary biology, ecology and economics. In analysing this problem, their paper uses mathematical models to generate insights into how failure-causing shocks can arise in the banking network and how these may be propagated within the banking system to cause a global financial crisis or depression.

The recent banking crisis highlighted the fact that regulators spent too much time monitoring individual banks and failed to appreciate the complexities of how they might interact. In this paper Lord May and Dr Pathy ask what kind of regulatory reforms might be put in place in order to diminish the risk of systemic failure, while still preserving an appropriate degree of initiative and risk-taking within individual banks.

LOOKING TO THE FUTURE

Taking their project one step further, Dr Pathy and Lord May are now collaborating with Dr Sujit Kapadia, an economist at the Bank of England, exploring the practical applications that this knowledge might have for the banking system.

FURTHER INFORMATION

- 21st Century School: www.21school.ox.ac.uk
- CABDyN Complexity Centre: www.cabdyn.ox.ac.uk
- Institute for Emerging Infections: www.emdis.ox.ac.uk
- For more information on this collaboration, please contact: nim.pathy@zoo.ox.ac.uk

This innovative approach to financial modelling is prompting new and provocative questions, which need to be brought to the forefront of the agenda for policymakers and economists alike.

Questions include:

- What is the best way to monitor the health of the banking system, to ensure that regulators know about potential problems as early as possible?
- How can healthy financial institutions be insulated from failing ones?
- Would it be more effective for regulators to target big or small banks?
- What consequences might a severe regulatory system have on the health of the financial system as a whole?
- How should capital reserves depend on a bank's total assets?

SYSTEMIC RISK

The 2007-8 financial crisis was the first global systemic crisis of the 21st century, but the world is more interconnected and complex than ever before, and mankind will face deeper, potentially more damaging, global crises in the decades ahead. It is therefore vital that we learn the lessons of the financial crisis if we are to prevent similar failures in areas such as climate change and global pandemics.

Within the 21st Century School there is a great deal of expertise on complexity and systemic risk. For more information please contact the 21st Century School, or the CABDyN Complexity Centre (details below).