Towards a fully fledged microfounded macroeconomics

Some reflections

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Today's Crisis

- We have been faced with a virtual collapse of the world's financial system which has had dire consequences for the real economy.
- The system has just gone through another paroxysm
- The explanations given involve networks of banks, trust and contagion at all levels
- These are not features of, nor characteristic of, economic models
- They are typical of complex systems

The origins of our problems in macroeconomics

- We have focussed on individual behaviour both at the level of consumers and banks and firms
- We have adhered to a nineteenth century static equilibrium notion
- We have made little progress in explaining how systems evolve towards equilibrium.
- We have largely assumed away the problem of how information is transmitted. (Saari and Simon)
- We have left to one side the importance of the structure of the interactions between individuals. (network analysis)
- We have insisted on two things. The rationality of the individuals and the idea that the aggregate behaves like a « rational individual ».

An economic model is not scientific if it does not have“Sound Micro-foundations”

- By this we mean that we have a model based on the rational optimising behaviour of the individuals in the market or economy.This has been widely criticised from Simon onwards. Yet, this is at the heart of the General Equibrium Model
- In standard market models we characterise aggregate behaviour as resulting from such an individual model.
- But in macro models we assimilate the behaviour of the aggregate to that of the individual
- Yet much structure is lost under aggregation so this is not legitimate theory.

The scientific approach

« There is something fascinating about science. One gets such wholesale returns of conjecture out of such a trifling investment of fact »

Mark Twain, Life on the Mississippi (1883)

The Easy Way Out

- Macroeconomists make the assumption that the aggregate economy or market acts like an individual.
- They use the « representative agent »
- This removes the problems raised by SMD since an economy with one agent has a unique and stable equilibrium
- But is this legitimate?

Correspondence with Bob Solow April 1988

- « My view of the way economists actually do behave coincides with yours , and most especially about macroeconomists. I have become a sort of common scold on this subject.
- I wholeheartedly agree with the point that economics self-destructs in part because we insist on supposing that everywhere and always individuals maximize purely individualistic preferences subject only to technological, legal, and budget constraints.

Correspondence continued

- It is a transparently false assumption, and the brotherhood expends vast ingenuity trying to account for facts within that silly framework.
- There are at least two of us. »

Robert M Solow

The result of the insistence on « scientific » foundations

- Modern macro-economists have built more and more abstract and mathematically sophisticated models (Dynamic Stochastic General Equilibrium Models) but continue to base these on the same foundations.
- These models do not contain the possibility of a crisis
- They bear no perceptible relation to reality.

Bob Solow's View today

- Maybe there is in human nature a deep-seated perverse pleasure in adopting and defending a wholly counterintuitive doctrine that leaves the uninitiated peasant wondering what planet he or she is on.—Robert M Solow 2009

Coordination v. Efficiency

- Efficiency is the major concern of economists
- We focus on efficient mechanisms
- Yet perhaps the problem of coordination is the most important
- How do collective outcomes emerge from the interaction between individuals each of whom has only a local vision of the situation?

Why are Aggregates Different from Individuals?

Revolutions and Crowds

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Who is responsible? The search for proximate causes.

- « In a an avalanche no single snowflake feels itself responsible »

Voltaire

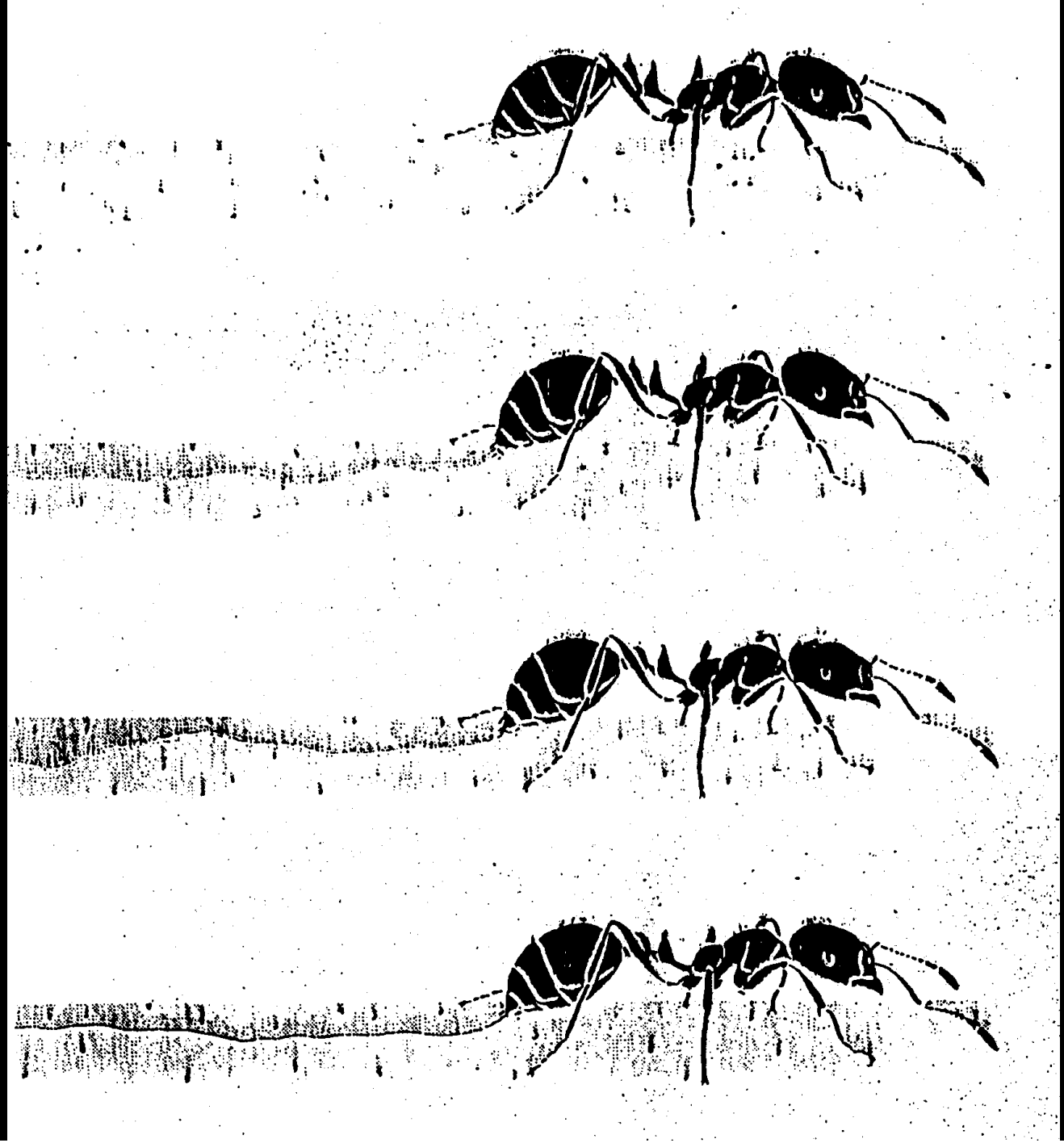
Isaac Newton

« I can calculate the motion of heavenly bodies, but not the madness of people »

Markets are made up of rational individuals optimising in isolation

A Less Demanding View

- Think of a world in which agents use simple rules and interact with those around them
- They learn from and about those with those with whom they are linked
- If we take this view « externalities » are central and not an inconvenient imperfection.
- Once we accept this we have to specify the nature of interaction and how individuals take account of each others' actions and decisions The network of relations governs the evolution of the economy
- Understanding the structure and evolution of this network is crucial to understanding macroeconomic phenomena.



Self Organisation

- We have shared (with ecologists in the ‘70s) the comfortable myth of a natural equilibrium into which a society or system organises itself.
- As Robert May has pointed out this myth was destroyed and scientists were forced to look at the non-linear dynamics of complex systems.
- We have not really taken this lesson on board.

Self Organisation

- This idea that markets self organise was espoused by Hayek
- This has been used as a justification for not interfering with markets.
- Markets do clearly self organise but we have no reason to believe that this is a stable process.
- As the actors within them modify their rules new norms appear and these can gently lead the system to major “phase transitions”.

Different dynamics

- Rather than trying to return to our basic assumptions perhaps we should rethink the whole structure.
- Ben Bernanke « The brief market plunge was just an example of how **complex and chaotic, in a formal sense**, these systems have become… What happened in the stock market is just a little example of how things can cascade, or how technology can interact with market panic »

  Interview with the IHT May 17th 2010

Information

- This central problem is swept under the rug by the « efficient markets hypothesis »
- But again the interaction between individuals undermines this.
- Informational cascades.

Looking into the sky quickly gets passers-by to follow.

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Presentation at the Workshop for
Chief Economists of Central Banks,
Bank of England May 2010

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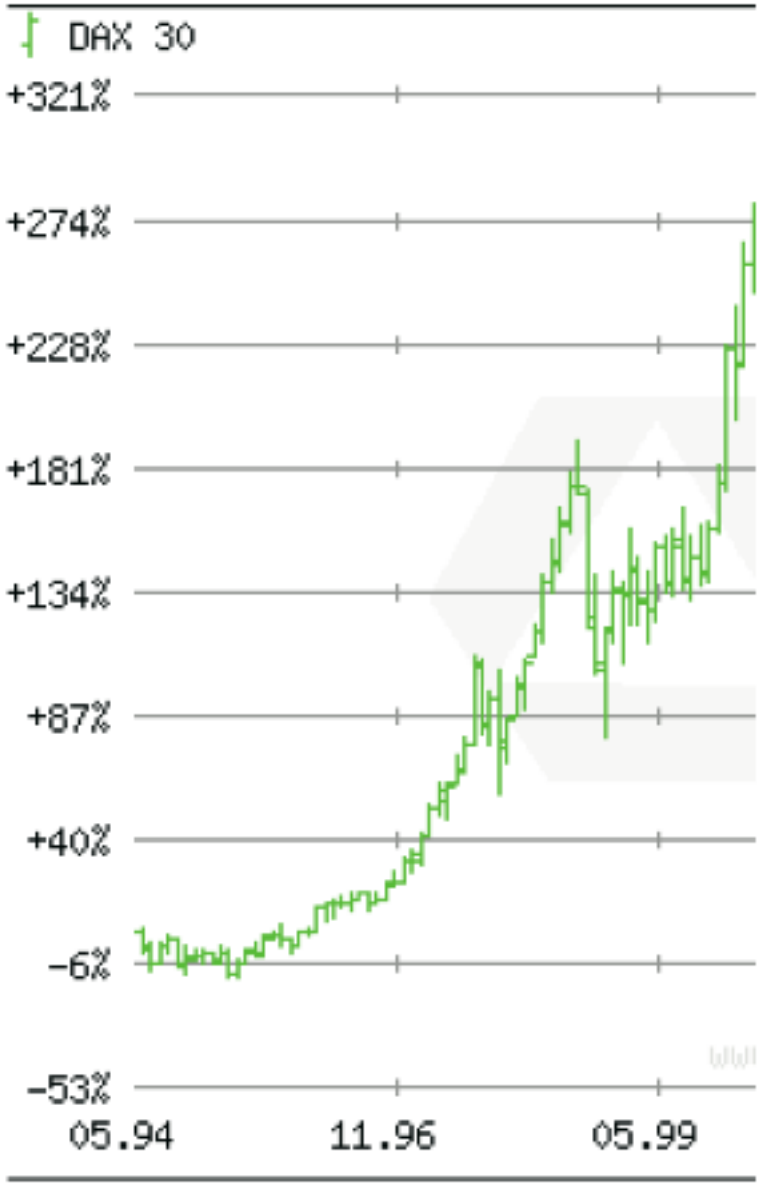
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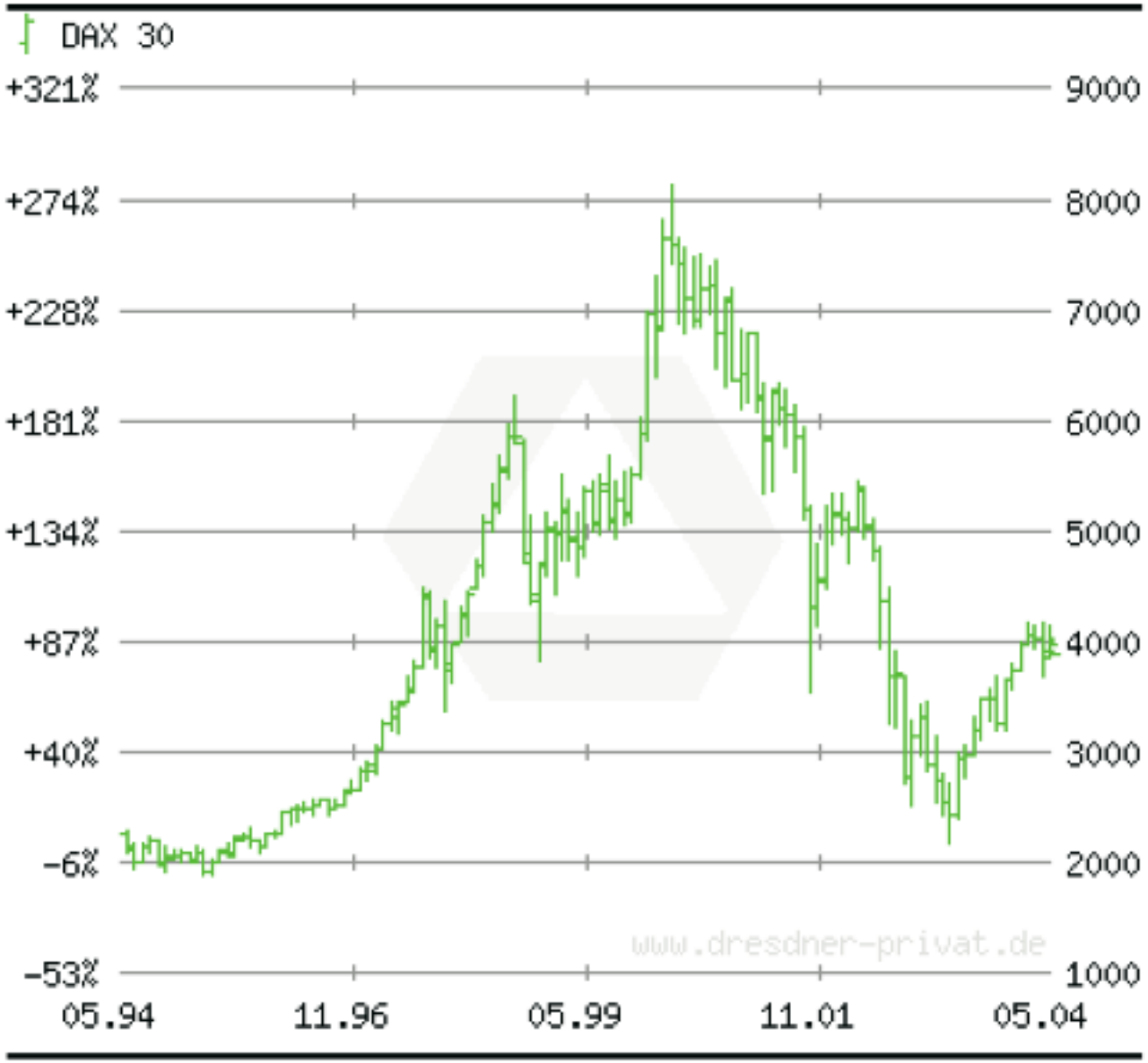
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The Distribution of Stock Prices

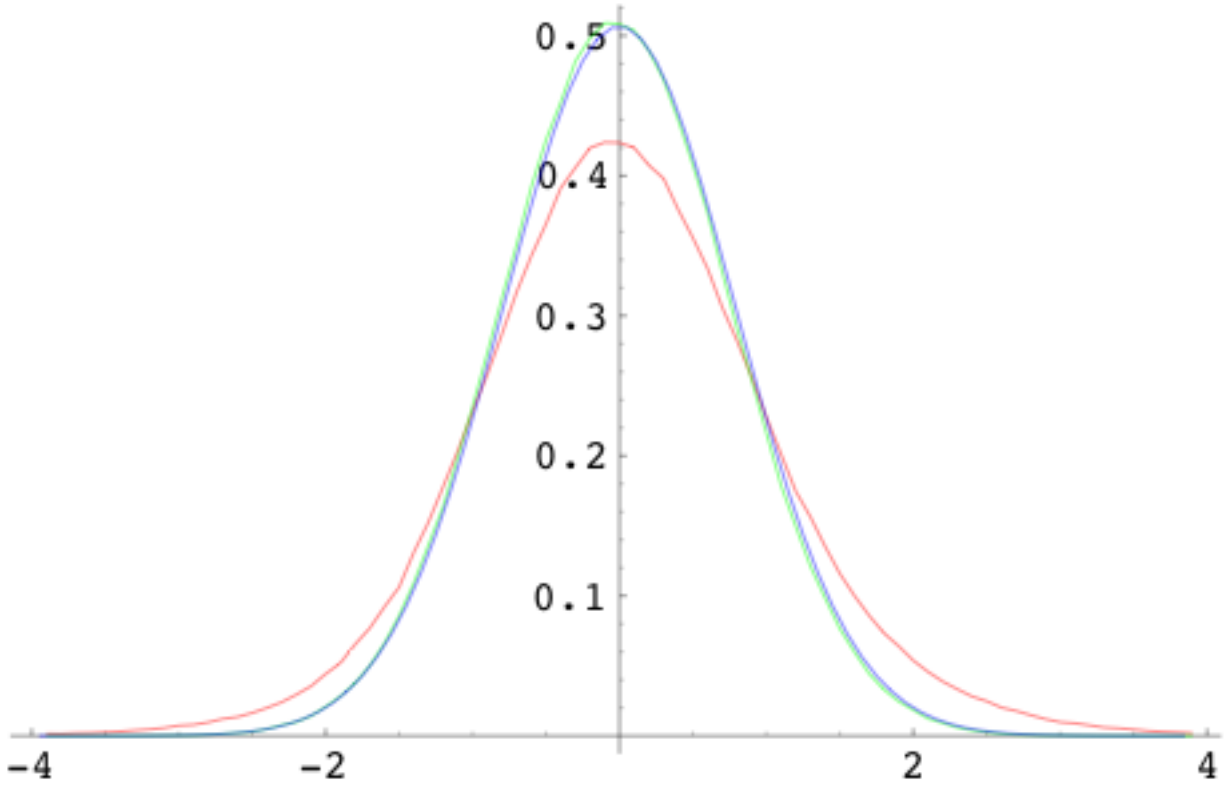


Figure 1: Empirical stationary distribution of asset prices in a model with (red) and without (green) chartists.

Bubbles and Crashes

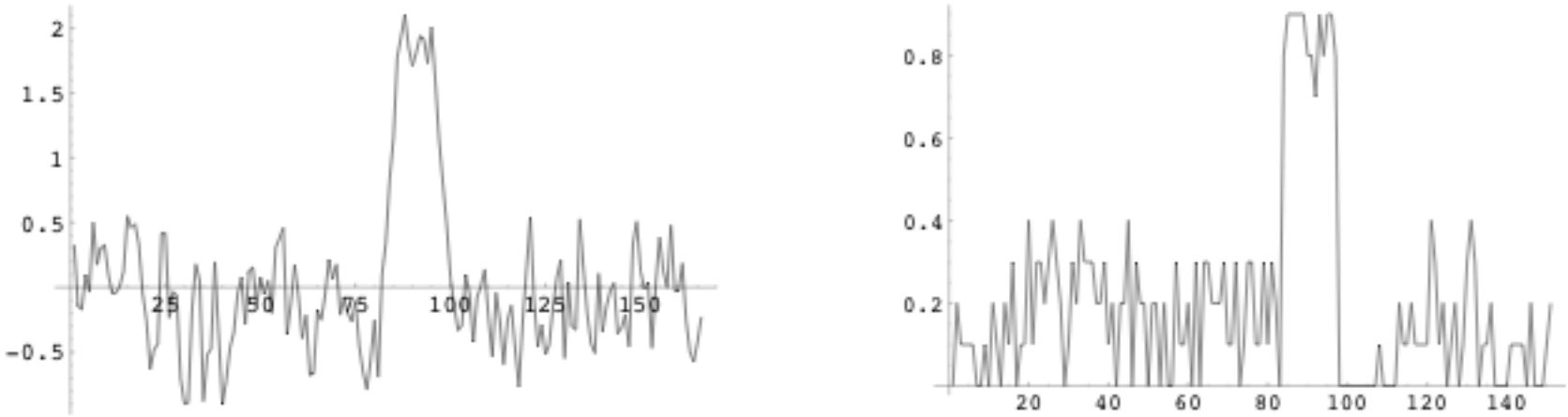


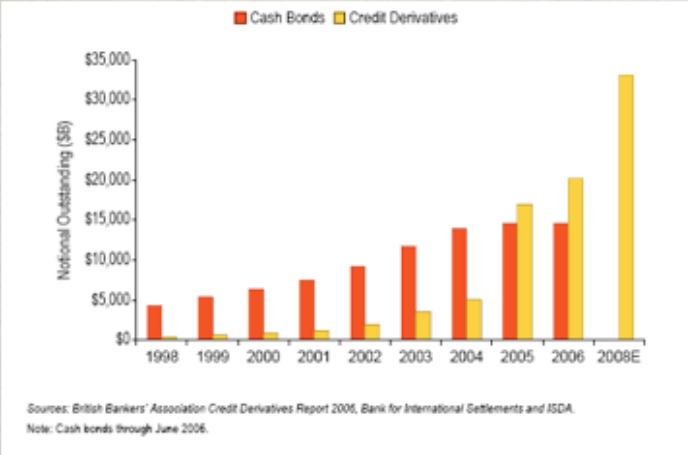
Figure 2: A bubble and the corresponding fraction of chartists.

Where did the switch come from?

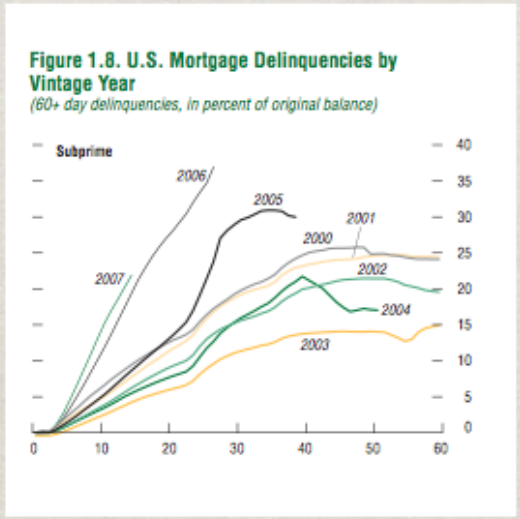
- With Hans Foellmer and Ulrich Horst,we have built models of financial markets to help understand where these sudden changes come from
- These models incorporate the idea that people follow the behaviour of others particularly when that behaviour is successful
- The behaviour is not irrational. These models capture the contagion effects
- There is structure in financial time series but no convergence to equilibrium in the standard sense.

Historical motivation

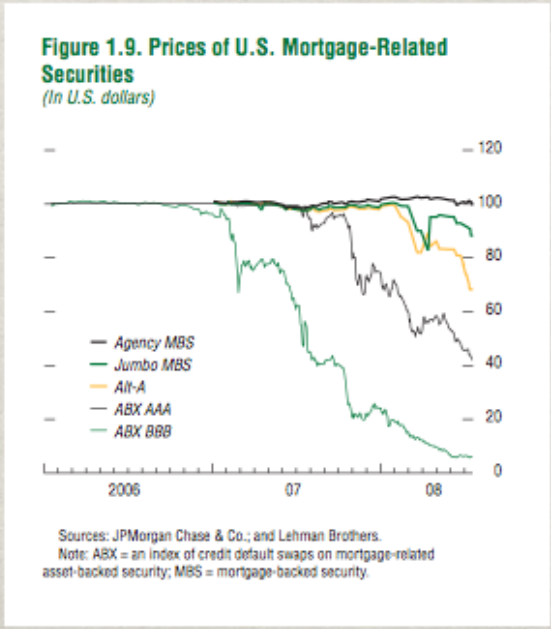
1. trading complex credit derivative products without really understanding what they're worth



2. ... in the face of bad news accumulating ...



3. Crash!!!

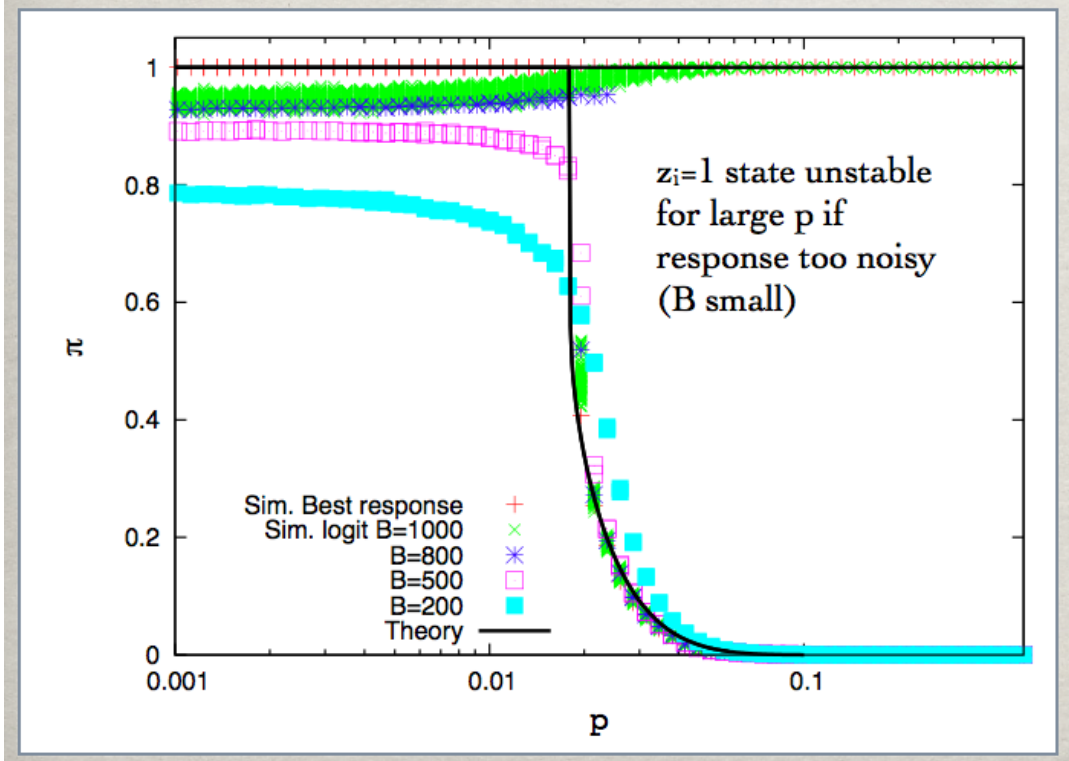


Why so sharp?

Figures from Global Financial Stability Report Oct. 2008

Noisy best response

Logit: $P\{z_i = 1\} \propto e^{B[u_i(1) - u_i(0)]}$



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Systemic Risk and the Role of the financial network

- The network of interactions in the economy is extremely important.
- As Haldane has pointed out the evolution of structure of the financial network, (self organisation) and of the links between countries or financial institution can play a major role in undermining the stability of the system.
- Increased connectivity is not enough to guarantee stability, other features are important.

Chart 1: Global Financial Network: 1985

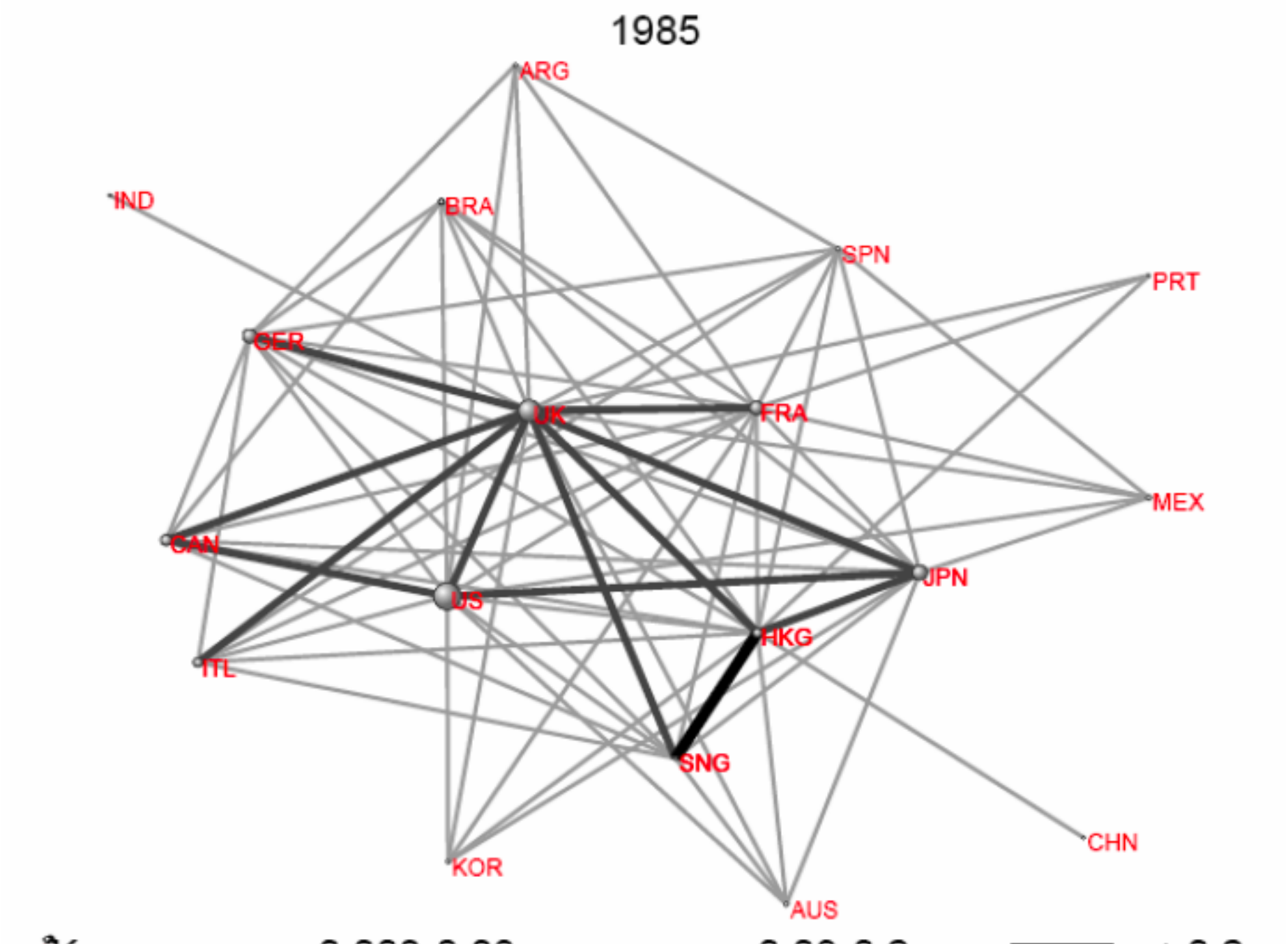


Chart 2: Global Financial Network: 1995

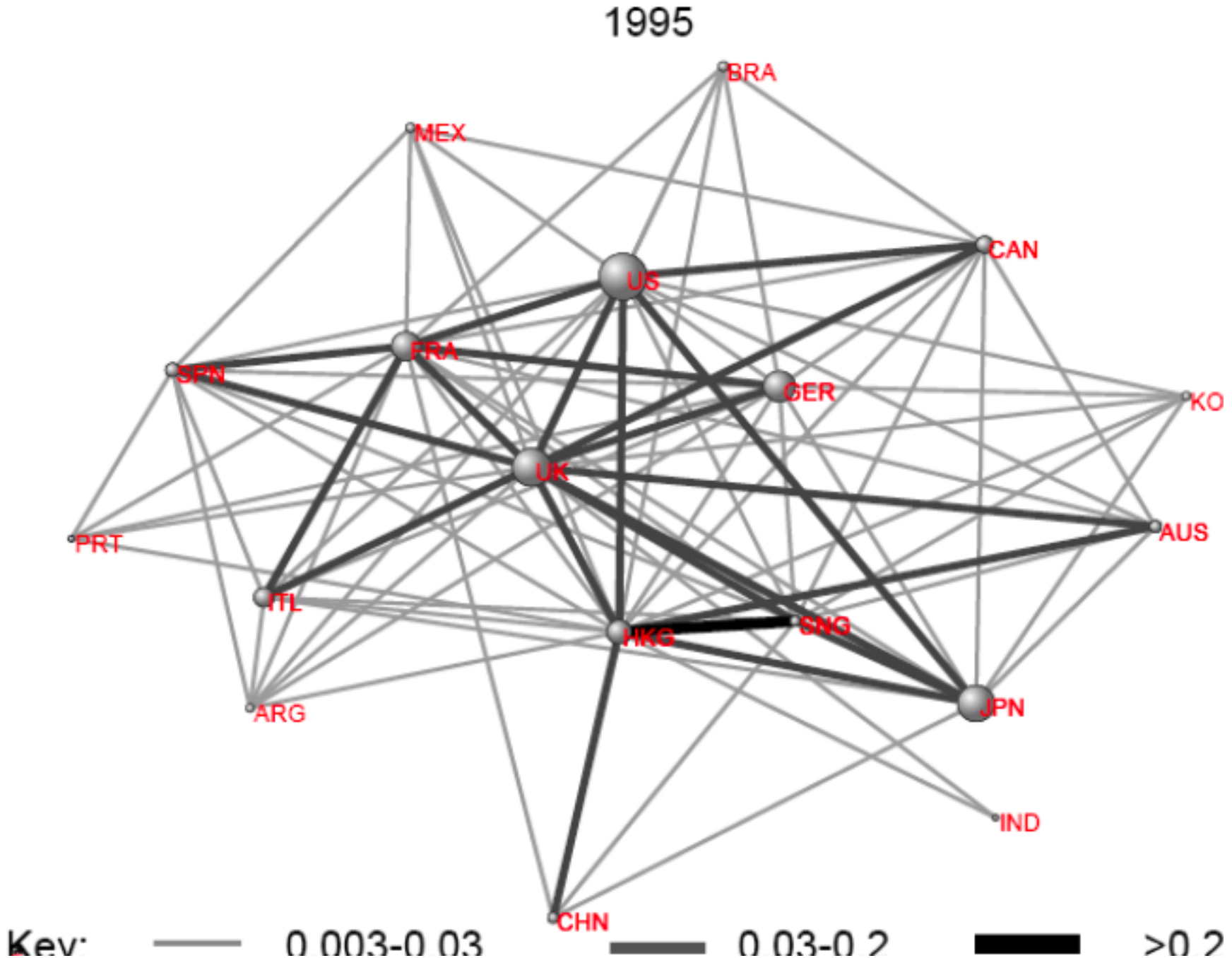
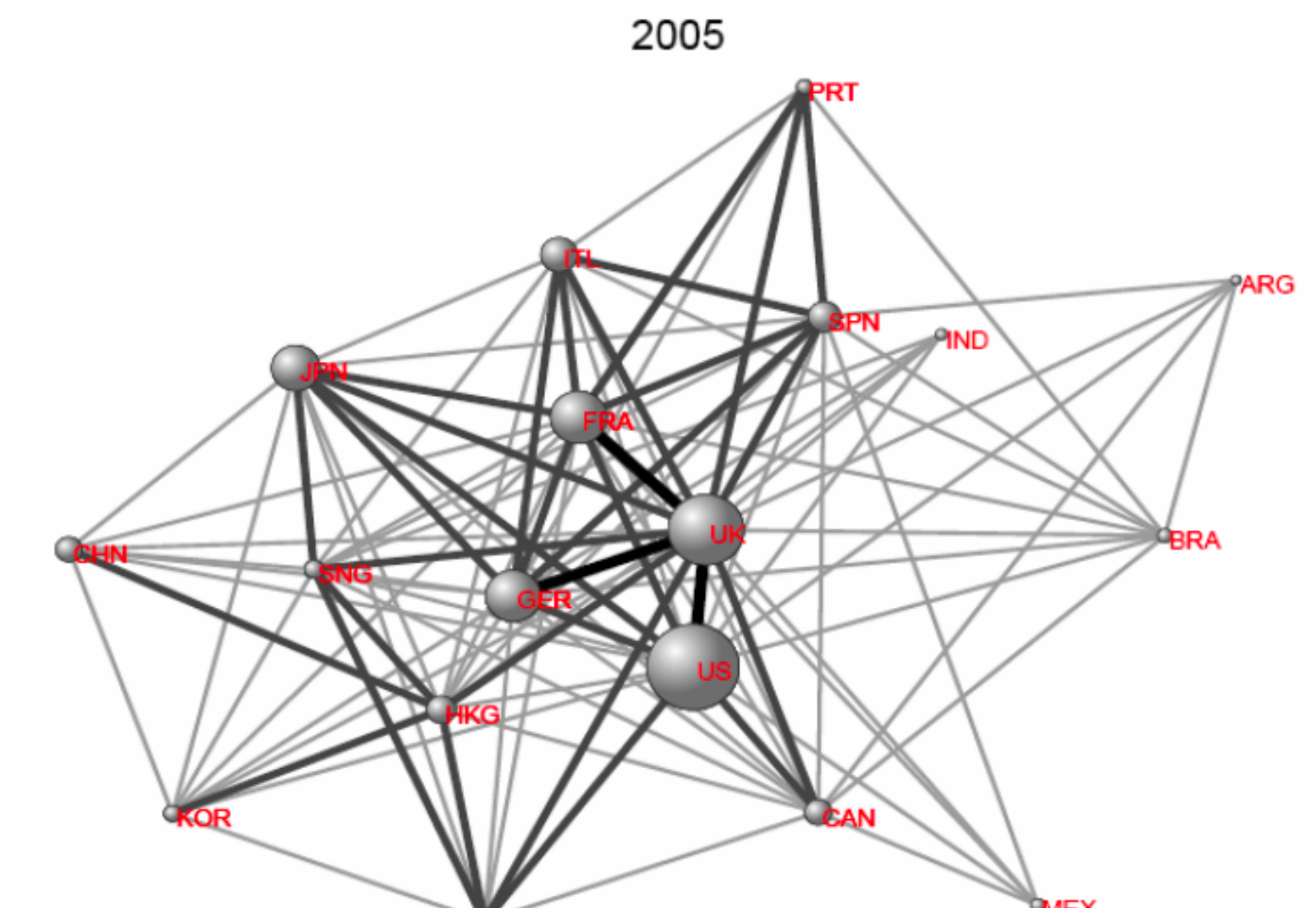


Chart 3: Global Financial Network: 2005



The danger signs

1. The scale and interconnectivity of the international financial network has increased significantly over the past two decades.
2. Nodes have increased 14-fold and links have increased 6-fold.
3. The degree distribution has a long-tail. Measures of skew and kurtosis suggest significant asymmetry in the distribution. There is a small number of financial hubs with multiple spokes.
4. The average path length of the international financial network has shrunk over the past twenty years. Between the largest nation states, there are fewer than 1.4 degrees of separation.

Result: Vulnerability

- Such systems are vulnerable to the transmission of problems, particularly those originating in one of the large nodes.
- But nobody planned that the system should develop in this way, it is the result of self organisation.

Regulating the system

- My main argument in this context is that the sort of complex system I have described is intrinsically difficult to control
- If we put in place a set of constraints and rules today they will have to be continually adapted as markets adapt
- We cannot simply design from scratch a « new regulatory framework » and then let things run.

Regulating the system

- Ben Bernanke again,

  « I just think it is not realistic to think that human beings can fully anticipate all possible interactions and complex developments. The best approach for dealing with this uncertainty is to make sure that the system is fundamentally resilient and that we have as many fail-safes and back-up arrangements as possible »

  Interview with the IHT May 17th 2010

Conclusion

- We have been wedded to an architecture which has simply revealed itself to be inadequate as a model of the evolution of the contemporary economy.
- It will not be enough to add considerations of the sort I have evoked to the standard model.
- We have to rethink the paradigm