

Should We Let Markets Look After Themselves?: Evidence from the Crisis for Economic Theory

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What has De Giorgi got to do with us?

I geni rovinati dalla stessa idea

La storia. Ennio De Giorgi risolse per primo un celebre enigma matematico, battendo il futuro Nobel John Nash. Ma il provincialismo dell'accademia italiana gli impedì di conquistare la celebrità. In un libro la sua avventura

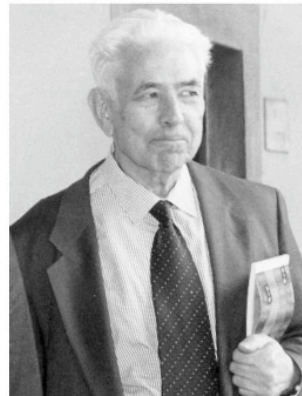
GABRIELE BECCARIA

Possono due geni coetanei avere la stessa idea quasi negli stessi momenti senza sospettare uno dell'altro e poi incontrarsi di sfuggita, due sole volte, e non riuscire a raccontarsi con le parole dei mortali le labirintiche equazioni che li hanno uniti per sempre nell'Olimpo dei matematici?

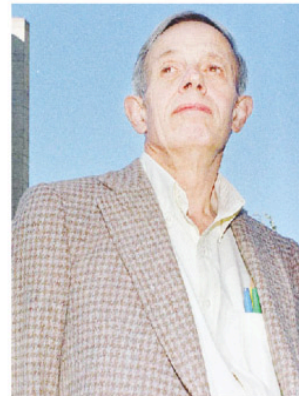
Certo che è possibile. A Trento c'è un professore di analisi che un giorno si è seduto in mezzo a loro e ha conosciuto due tipi che, per noi che sudiamo a controllare lo scottrino della spesa, sono alieni. Si chiama Mario Miranda e la strana coppia John F. Nash e Ennio De Giorgi, vale a dire il Genio Star e il Genio Ignorato.

Il primo genio, a 79 anni, si gode la doppia condizione di celebrità sia tra i colleghi sia tra la gente e il suo maggiore dispiacere è che il film «A Beautiful Mind» non l'abbia fatto diventare ricco come chi l'ha impersonato, l'ex giocatore Russell Crowe. Il secondo genio è morto nel '96 e, sebbene venerato dagli allievi della Scuola Normale Superiore di Pisa (uno è proprio Miranda) e osannato da ogni rappresentante della bizzarra comunità dei matematici, resta un Signor Nessuno tra le tribù che memorizzano voracemente nomi di veline, calciatori, cantanti.

Adesso un libro («Ennio De Giorgi matematico e filosofo», scritto da Luigi Ambrosio, Marco Forti, Antonio Marino e Sergio Spagnolo per le Edizioni ETS e in libreria in autunno) e un video del surreale incontro di 11 anni fa (curato da Miranda e a cui, al momento, pochi fortunati hanno avuto accesso) potrebbero incrinare il silenzio. E' lo stesso che ha a lungo incapsulato De Giorgi e Nash e le loro esistenze curiosamente parallele: impegnava l'atmosfera della stanza a Pisa, dove, disteso a letto, uno produceva formule



Carrelli a confronto Ennio De Giorgi e John F. Nash. Il secondo è diventato una star globale e il primo è il Genio Ignorato morto nel '96



senza mai toccare un pezzo di carta e imprigionava la mente schizofrenica dell'altro, alla deriva tra la clinica psichiatrica e Princeton.

E anche nello storico giorno del marzo '96 l'incantesimo del silenzio funzionò perversamente. Miranda lo ricorda così: «Ormai nel nostro mondo

Si incontrarono solo due volte senza riuscire a raccontarsi le loro straordinarie intuizioni

erano considerati due grandi e non si guardavano quasi. Nei 60 minuti del video non si trova un istante in cui Ennio e John incrocino gli sguardi e abbozzino la conversazione che avrebbe fatto la felicità effimera dei reporter e quella di lunga durata degli storici.

Il Web

Isiti
ENNIO DE GIORGI'S SUMMERAGE
<http://cvgmt.sns.it/people/de-giorgi/biografia/degiorgi.org.html>

UN'INTERVISTA DE GIORGI
<http://www.ams.org/motocci/1997/07/enrimes.pdf>

IL CENTRO DI RICERCA MATEMATICA ENNIO DE GIORGI ALLA SCUOLA NORMALE SUPERIORE DI PISA
http://www.crm.sns.it/index_02.html

Sembrano svagati, mentre si lasciano interrogare da una micro-audience di prof e studenti, eppure due frasi quasi identiche (e sillabine) rivelano l'Alchimia che un quarantennio prima li aveva condotti alla stessa avventura intellettuale. «E' pericoloso non andare a

fondo delle cose», disse Nash. «E' sbagliato parlare solo quando si sa già il risultato», disse De Giorgi.

Alcetra peggio era andata la prima volta, nel 1964: all'elitario «Courant Institute» di New York De Giorgi, ospite speciale, abbozzò qualche parola in inglese per arrendersi subito alla lingua madre, mentre Nash si confuse tra il pubblico e, vittima della malattia, probabilmente non riuscì a decifrare la natura della strana presenza. L'italiano era quello che pensava lui - gli aveva impedito di vincere il Nobel dei matematici, la Medaglia Fields, o un se stesso proveniente da un'altra dimensione?

L'interrogativo lo sciolse nel 1994, quando alla consegna del Nobel per l'economia (in ballo c'erano studi diversi, vale a dire la Teoria dei Giochi) onorò De Giorgi a modo suo,

con l'ennesima frase per iniziare: «Ha raggiunto la vetta prima di me». Era vero, anche se si era straziato prima di annetterlo. De Giorgi l'aveva battuto sul tempo nel 1965. Durante una passeggiata sulle Dolomiti con un altro prof, Guido Stampacchia, si lasciò catturare dal suggerimento del

Finalmente nel 1994 l'americano lo onorò: «E' lui che ha raggiunto la vetta prima di me»

maestro di risolvere un celebre enigma matematico, il «XIX problema di Hilbert». In meno di due mesi agguantò la soluzione che beffava tutti da mezzo secolo e la presentò al Convegno di Matematica di Pavia. Incredibilmente, con scarso successo (si era di nuo-

vo materializzato l'incantesimo del silenzio).

Nash, intanto, senza immaginare che cosa avvenisse in Italia lavorava allo stesso problema, spinto anche lui da un maestro, che si chiamava Louis Nirenberg, e fece pubblicare la sua soluzione solo nel 1965. Era passato un anno dall'annuncio ufficiale di De Giorgi, concessogli finalmente a un incolore convegno all'Accade-

Le formule dell'uno e dell'altro sono raccolte in un unico teorema «Applicazioni enormi»

ma dalle Scienze di Torino, ma il ritardo era stato fatale. Per l'uno e anche per l'altro. L'incantesimo maligno, che continuava a tenerli reciprocamente all'oscuro, era stato alimentato dall'ignoranza dell'inglese di De Giorgi e da mediocri rivalità accademiche italiane e nell'era pre-Internet era frequente che gli studiosi dei numeri vivessero una condizione da navigatori solitari.

Così una sfasatura temporale fece saltare l'appuntamento con la storia. «Nash avrebbe vinto il Nobel con equazioni di tutt'altro tipo e De Giorgi il Premio Wolf inventando formule ancora diverse», spiega Miranda, ma, se il primo spezzò l'incantesimo, il secondo non se ne liberò mai del tutto. A un'iri c'è però una creatura ibrida: battezzata Teorema De Giorgi-Nash: delinea percorsi differenti (equazioni ellittiche ed equazioni paraboliche), che magicamente conducono allo stesso risultato, come gli agnari stralunati di Ennio e John nel giorno del '96. Poi, quando chiedete a un matematico come Ambrosio, vi dirà che tra le due soluzioni l'autentica è quella creata da De Giorgi, con immense applicazioni che si cominciano ad apprezzare solo nel XXI secolo: dovranno riciclare come mentre si fanno funzionare i supercomputer per interpretare lo scioglimento dei ghiacciai.

The source of the battle

- Ennio De Giorgi, Sul la differenziabilita e l'analiticit`a del le estremali degli integrali multipli regolari, Mem. Accad. Sci. Torino. Cl. Sci. Fis. Mat. Nat. (3) 3 (1957), 25-43
- J. Nash, Continuity of solutions of parabolic and elliptic equations, Amer. J. Math. 80 (1958), 931-954.

Confidence in our theory

The “central problem of depression-prevention has been solved,” , Robert Lucas 2003 presidential address to the American Economic Association.

In 2004, Ben Bernanke, chairman of the Federal Reserve Board, celebrated the « Great Moderation » in economic performance over the previous two decades, which he attributed in part to improved economic policy making.

Today's Crisis

- Yet we are faced with a virtual collapse of the world's financial system which has had dire consequences for the real economy.
- 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**

Explaining economic phenomena

- Everyone wants to know how the economy can suddenly go into a downturn like the current crisis.
- Do economists build models to explain this or do they offer ad hoc explanations without really questioning their models, (DSGE for example)?
- We fell into the trap of coming to believe that our macroeconomic models were « correct » and a couple of decades was enough to make us forget the lessons from the past.
- When the crisis happened it was attributed to exogenous shocks and market failures.
- Yet, in the models developed over recent years markets do not play a role.
- They are abstract to the point of being incomprehensible.

Bob Solow's View

- 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 Solow

The Absence of Markets

- “It is a peculiar fact that the literature on economics...contains so little discussion of the central institution that underlies neoclassical economics—the market.” (North, 1977, p.710)
- “Although economists claim to study the market, in modern economic theory the market itself has even a more shadowy role than the firm” (Coase, 1988, p.7).
- Arrow and Hahn’s *General Competitive Analysis* asserts in passing that it takes the “existence of markets...for granted” (1971, p.348).

The Nature of the Market

- The market is more properly treated as a set of rules and conventions than as a collective actor: a social agent. Scott, Institutions and Organizations 1995

Did Theorists think about real markets?

- “Even in the few instances when key thinkers in economics felt they should discuss the actual sequence of bids and asks in their models of trade – say, for instance, Walras with his *tâtonnement* and his *bons*, or Edgeworth with his recontracting process – what jumps out at the economic historian is the extent to which the sequence of activities posited therein had little or no relationship to the operation of any actual contemporary market”. Mirowski (2007)

Theorists and Markets

- Even the pioneers of modern economic theory were not interested in **market institutions** per se.
- Walras was interested in price adjustment mechanisms and makes allusions to La Bourse but was not interested in the functioning of the real institutions. (Walker)
- Even Marshall does not spend time on markets. His discussion of the corn market is hypothetical.
- There is a long tradition of interest in the **firm** as an institution but not in actual markets nor in how individuals learn to behave in markets and how institutions adapt.

A Puzzle for Many Goods

We observe different market institutions in different places

What is the explanation for this?

1. the nature of the product (McMillan associates auctions with perishable goods)
2. heterogeneous agents
3. important differences between items.

The puzzle remains :We observe different institutions for the same product, fish, auctions in Iceland, Marseille vs. Sete and Ancona

The notion of market equilibrium

- Even when economists leave markets to one side, they are concerned with market equilibrium.
- « An organism that is in equilibrium is dead »
Stuart Kauffman
- Our notion is a static one from classical mechanics.
- Existence is proved under very general conditions but what does it mean?
- How realistic is it as a description of empirical facts? What does it have to do with the states of empirical markets?

Should we leave markets to themselves? Lessons from the crisis in Economic Theory

Alan Kirman

Dime Conference: Evolution and Market
Behaviour in Economics and Finance, Pisa,
October 2nd-3rd 2009

An old but basic problem: Stability of Price Adjustment

- Even if we like the equilibrium notion, we cannot guarantee that a market or economy will ever get there.
- Change the adjustment process
- The problem of information: The road from Walras to Smale to Saari and Simon.
- How are we going to get out of this?
- The « representative individual »?

Market Adjustment

- Say, James Mill, and David Ricardo, all argue that markets will automatically adjust towards equilibrium
- Their explanations differ but for example Ricardo assumes full employment of resources and therefore if there is an overproduction of a good there must be an underproduction of another and the relative prices of the two will adjust accordingly.
- D. Ricardo, *The Principles of Political Economy and Taxation* pp.19 2-3
- James Mill. *Elements* pp 228-229

"THE PROBLEM OF A RATIONAL ECONOMIC ORDER IS DETERMINED PRECISELY BY THE FACT THAT THE KNOWLEDGE OF THE CIRCUMSTANCES OF WHICH WE MAKE USE NEVER EXISTS IN CONCENTRATED OR INTEGRATED FORM, BUT SOLELY AS THE DISPERSED BITS OF INCOMPLETE AND FREQUENTLY CONTRADICTORY KNOWLEDGE WHICH ALL THE SEPARATE INDIVIDUALS POSSESS.

THE PROBLEM IS THUS IN NO WAY SOLVED IF ONE CAN SHOW THAT ALL OF THE FACTS, IF THEY WERE KNOWN IN A SINGLE MIND, (AS WE HYPOTHETICALLY ASSUME THEM TO BE GIVEN TO THE OBSERVING ECONOMIST), WOULD UNIQUELY DETERMINE THE SOLUTION; INSTEAD WE MUST SHOW HOW A SOLUTION IS PRODUCED BY THE INTERACTIONS OF PEOPLE EACH OF WHOM POSSESSES ONLY PARTIAL KNOWLEDGE".

FRIEDRICH VON HAYEK, "THE USE OF KNOWLEDGE IN SOCIETY"

Networks and Markets

- *"Applications of economic theory to market or group behaviour require assumptions about the mode of interaction among agents as well as about individual behaviour"*
Lucas (1988).
- This underlines the need to study the networks in the economy.

The Nature of Markets

- « Markets are socially constructed institutions in which the behavior of traders is suspended in a web of customs, norms, and structures of control...Traders negotiate the perpetual tension between short-term self-interest and long-term self-restraint that marks their respective communities, » *M Aboulafia (1997)*
- « Markets are not self-operating, objective mechanical objects. They are, rather, a complex set of constraints, rules, rights, regulations, and laws, guiding human participants in making their multiple, various trades, purchases, and exchanges. The motivating force that generates benign market outcomes is the willingness of all to obey the guidelines and deal openly—transparently—with each other. Invisible to the naked eye are the common social bonds of trust among all, strangers and acquaintances alike. The bonds of trust are what create and sustain truly efficient, effective markets. » *J Kuhn (1995)*

The Nature of Markets 2

- In another context Alan Greenspan, Chairman, at the time, of the Federal Reserve, has remarked that,
- « It is hard to overstate the importance of reputation in a market economy. To be sure, a market economy requires a structure of formal rules--a law of contracts, bankruptcy statutes, a code of shareholder rights--to name but a few. But rules cannot substitute for character. In virtually all transactions, whether with customers or with colleagues, we rely on the word of those with whom we do business. If we could not do so, goods and services could not be exchanged efficiently. Even when followed to the letter, rules guide only a small number of the day-to-day decisions required of corporate management. The rest are governed by whatever personal code of values corporate managers bring to the table ». *Greenspan (2003)*

Two different theoretical views of how markets work

- In the first through some given mechanism, agents acting in isolation in response to market signals, optimise and their decisions are coordinated by some central figure such as the auctioneer.
- In the second, and it is this that should interest the people here, agents, using simple rules, learn to coordinate and the result may or may not be efficient.

The modern macro view

- This corresponds to the first view.
- The representative agent is omnipresent
- Then we have no trade theorems
- Yet in financial market there is a great deal of trade
- « These transactions are just the adjustments which keep the market in equilibrium »
- But we have to **prove** that this works.

Cournot's view of markets

- « economists understand by the term *market* not any particular market place in which things are bought and sold but the whole of any region in which buyers and sellers are in such free intercourse with each other that the prices of the same goods tend to equality easily and quickly »
- A. Cournot, « Recherches sur les Principes Mathématiques de la Théorie des Richesses », Chapter IV

A more recent view (McMillan (2002 and 2007))

Markets, to work as they should, need institutions. Defining the rules of the game, institutions consist of the constraints, formal and informal, on economic and political actors (North, 1991). Market institutions serve to limit transaction costs: the time and money spent locating trading partners, comparing their prices, evaluating the quality of the goods for sale, negotiating agreements, monitoring performance and settling disputes (McMillan, 2002).

The notion that institutions matter is as old as the study of economics. For markets to create gains from trade, as Adam Smith recognised, the state must define property rights and enforce contracts.

That institutions matter is also one of the chief insights from modern economics.

Two views of what is important in Market Theory

- Cournot emphasises the adjustment of a market to equilibrium. McMillan emphasises the capacity of markets to transmit information and talks about the importance of institutions.
- These are aspects of themes of interest to economists, equilibrium from Walras and Pareto to Arrow and Debreu, information through Hayek and Hurwicz
- Yet the GE market model which underlies modern macro models, came to be concerned with the existence problem and informational efficiency **at equilibrium**. It has specifically NOT been interested in institutions and has essentially left out of equilibrium dynamics to one side.
- Leaving markets alone corresponds to the assumption that they will somehow get to equilibrium, or in more acceptable terms will « self organise » into that state.
- BUT, where is the proof of this?

The three « merits » of the GE market model

- The **rationality** of the individuals
- A well-defined notion of **equilibrium**
- The **informational efficiency** of the allocation mechanism

Rationality and “Sound Micro-foundations”

- At the heart of modern macromodels is the belief that only macro analysis with “sound micro-foundations” is **scientific**.
- By this is meant a model based on the rational optimising behaviour of the individuals in the market or economy. This has been widely criticised from Simon onwards.
- In standard market models and in particular in macro models we characterise **aggregate** behaviour as resulting from such an individual model.
- 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)*

Rationality

- Why are we so attached to our rational individuals?
- Mathematical convenience or economic plausibility?
- The assumptions are not testable they come from introspection. (Pareto, Koopmans, Hicks.....)
- They do not allow for development of preferences over time. Sidgwick to Parfit

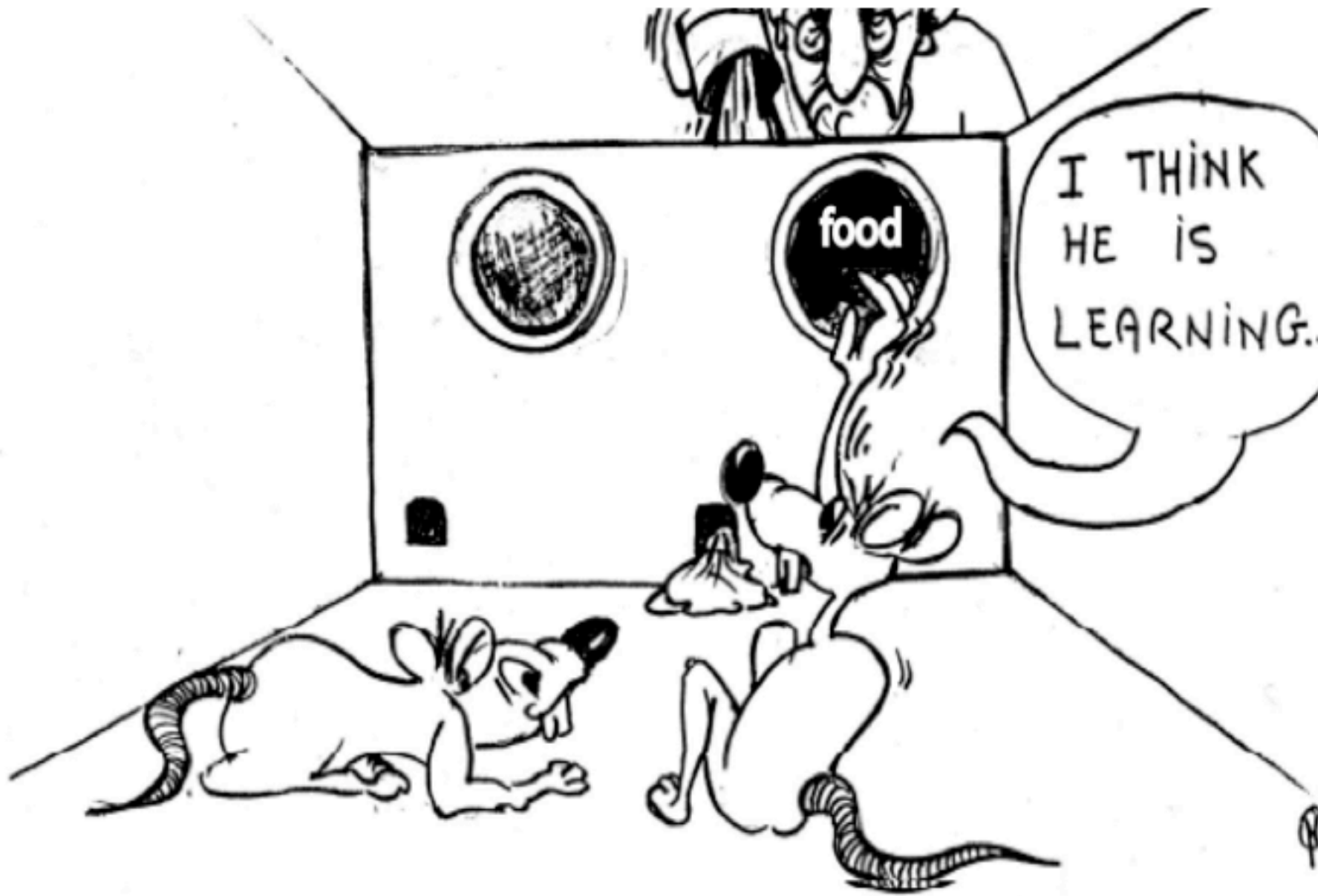
Another Way Out: Learning

- Lucas: Agents do not optimise they just use those rules which have done well in the past.
- The basic problems with learning.
- Which is learning in economics, the learner or the environment? Particularly when the environment is a market composed of other agents.

Yes But!

So Lucas argues that we can safely assume that individuals act as if they were optimising

But, if the environment consists of other individuals who are also learning what guarantee do we have that the system will converge to « as if » optimising behaviour?



The Aggregation Problem

We insist on a simple link between
individual and aggregate
behaviour

Individual and Aggregate Behaviour

- Even in the most traditional model, rejection of some conclusion about individual behaviour at the aggregate level may not be a rejection at the individual level.
- Quote from Larry Summers

The other side of the coin: Aggregation may add structure

- It may well be the case that the aggregate is better behaved than the individuals.
- Some property that may hold at the aggregate level may not hold at the individual level.
- Testing on aggregate data may induce us to validate an erroneous individual model
- Gode and Sunder's "zero intelligence" traders

Individual and Collective Rationality

- In the sort of world in which individuals interact directly, aggregate outcomes may be more, or less, “rational” than individual behaviour.
- The result at the aggregate, or market, level may be consistent with standard models
- However this may not reflect the standard maximising behaviour of the individuals.

Theoretical Markets

- Standard market models provide us with few, if any, refutable propositions.
- In stripping away all but the assumptions on the individuals we have thrown away explanations of economic phenomena as the result of interaction and the way that interaction is organised. Markets and their institutions have been left to one side.
- Our assumptions on individuals do not bear close examination. They are what we want them to be and not what we observe them to be.

The Nature of Markets

Some comments.

History, sociology and anthropology

- Each of these disciplines has been involved in the analysis of markets and their evolution over time.
- There are literally thousands of careful studies of particular markets as well as descriptions of how markets have evolved over time.

Markets: An ancient tradition

« Ce très vieux type d'échange se pratiquait déjà à Pompei, à Ostie ou à Timgad la Romaine, et des siècles, des millénaires plus tôt: la Grèce ancienne a eu ses marchés; des marchés existent dans la Chine classique comme dans l'Égypte pharaonique, dans la Babylonie où l'échange était si précoce...En Ethiopie, les marchés par leurs origines se perdent dans le temps »

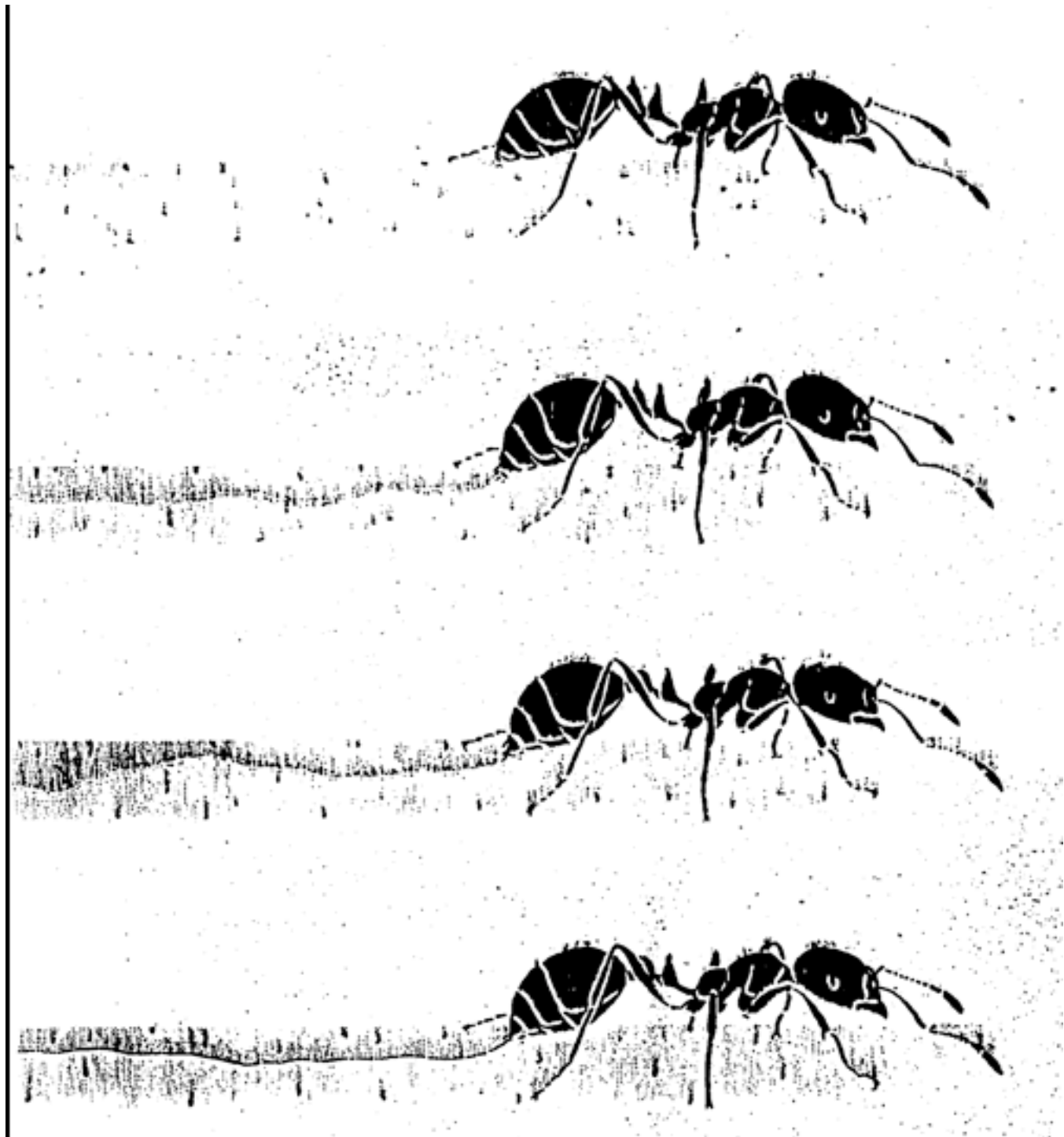
Ferdinand Braudel, « Les Jeux de l'Échange »

Some examples.

- Claire de Ruyt's study of the agora in ancient [Rome](#), its functioning, its structure and its rules.
- John Padgett's study of some markets in [Florence](#), his comparison of the differences between the markets for wool and silk
- Clifford Geertz's study of [North African souks](#)
- Theodore Bester's study of [Tsukiji](#), the Tokyo fish market.
- Mitchel Abolafia's study of Bond traders on Wall Street [Making Markets](#) ,

What do these have in common?

- A rich tapestry of interactions between different agents
- A variety of rules which emerged over time
- Self-organisation and continuous change
- Aggregate features which cannot be reduced to the behaviour of a typical or « representative » individual.



The reaction of economists

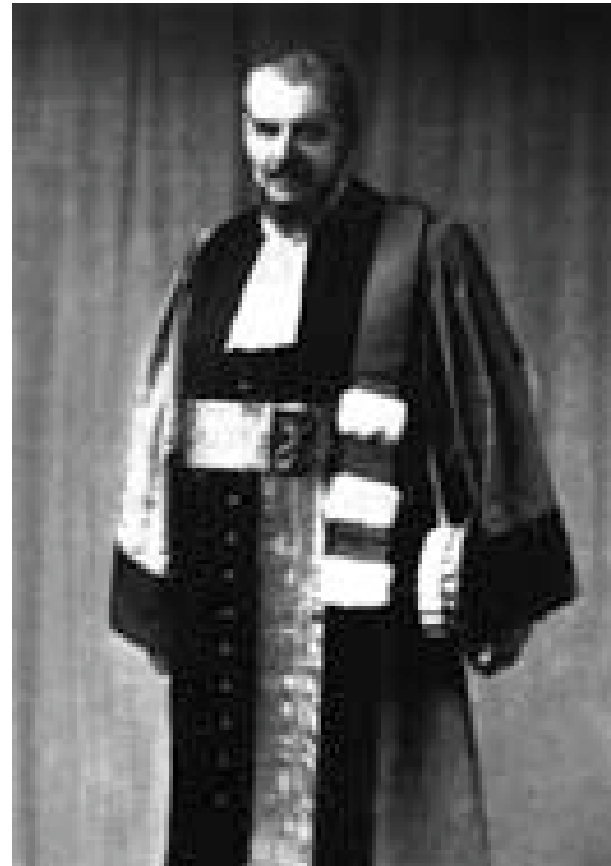
- « Yes, but all this is too complicated, we have to simplify to model »
- Why simplify away market structure?
- To retain individual rationality.
- Yet, physicists and other scientists would not expect global phenomena to be like individual phenomena.
- Why not allow for a difference between individual and market behaviour?
- Individuals are simple, markets are not.
- Economists have concentrated on **agents**, not on **markets** or **coordination**.

Financial Markets

These are the markets that some people would most like to leave alone

Financial Markets

- In the standard model, the evolution of asset prices follows a *Geometric Brownian Motion* in the spirit of Bachelier (1900)
- Markets are efficient in that all information is contained in the prices
- Yet this poses many problems when compared with reality



Modelling Financial Price Fluctuations

In Mathematical Finance the asset price process is usually modelled as the trajectory of a stochastic process.

- The standard reference model is the **Black Scholes model**:

$$dS_t = S_t(\mu dt + \sigma dW_t)$$

- Mathematically convenient, possibility of pricing derivatives, ...
- **But**: Prices are generated by the **interaction** of market participants.
- A geometric Brownian motion model should be justified by an economic model of **interacting agents**.

How to justify diffusion models from an economic point of view?

Justifying Geometric Brownian Motion

Geometric Brownian motion can be justified as a rational expectations equilibrium in a model

- ... with **homogeneous** and
- ... highly **rational** and sophisticated agents
- ... having very specific preferences
- ... that all believe in this kind of price dynamics
- ... where prices reflect fundamentals

Sudden shifts in the mood of the market reflect rational adjustments in the assessments of fundamentals.

Bick, A. "On the consistency of the Black-Scholes Model with a general equilibrium framework," *J. Financial Quant. Anal.*, 22 (3), 259–275.

The Efficient Market Hypothesis

- This is very simple
- All relevant information is contained in prices therefore there is no need to look anywhere else: paradox
- This basic argument comes from the work of Bachelier but his thesis adviser said...

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)*

Un avertissement

- Quand des hommes sont rapprochés, ils ne se décident plus au hasard et indépendamment les uns des autres ; ils réagissent les uns sur les autres. Des causes multiples entrent en action, et elles troublent les hommes, les entraînent à droite et à gauche, mais il y a une chose qu'elles ne peuvent détruire, ce sont leurs habitudes de moutons de Panurge. Et c'est cela qui se conserve

Henri Poincaré La Valeur de la Science 1908

Isaac Newton

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

No Panic!



And!

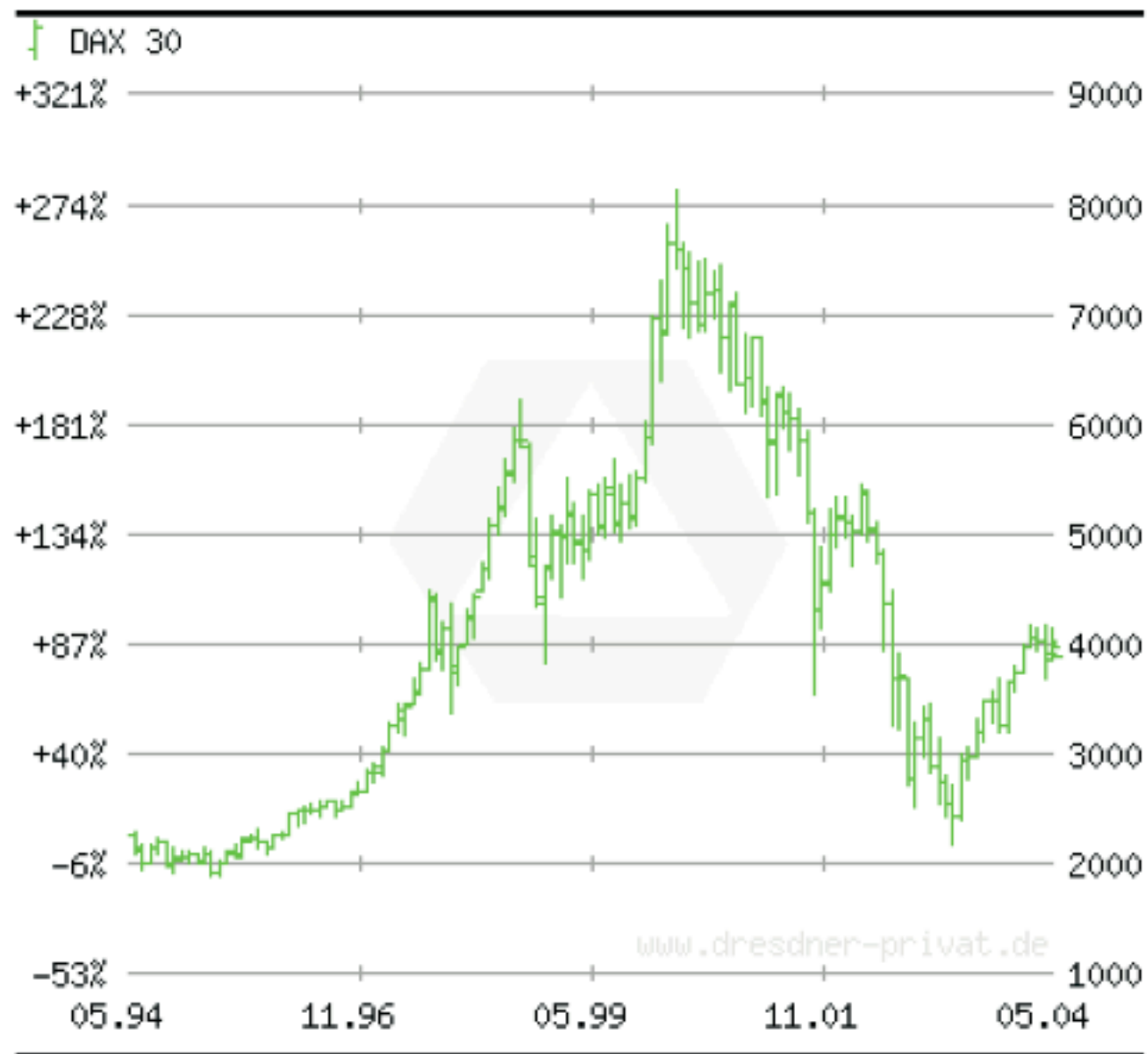
Speaking of the « efficient markets hypothesis »
« The whole intellectual edifice collapsed
in the summer of last year »

Alan Greenspan, testimony to House of
Representatives Committee on Government
Oversight and Reform, October 23rd 2008

Mencken cited by Krugman

- H. L. Mencken: “There is always an easy solution to every human problem — neat, plausible and wrong.”





Where did the switch come from?

- Derive a more complicated stochastic process to retrieve the standard model but which still has all available information contained in prices.
- Put it down to an exogenous shock, but then you must be able to identify the shock
- Leave the beaten track and find a market model of interacting agents which generates this sort of shift

Back to the Different and Simpler Approach

A More Realistic Approach to Information Transmission

Herding behaviour and Informational Cascades

- Here rational individuals, by their interaction, achieve an inefficient result
- They infer information from the behaviour of others and may as a result throw away their own information.
- This can lead to “inefficient” results.



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

A week on the wild side



Herding

"It is better (...) to fail conventionally than to succeed unconventionally."

J.M. Keynes (1936)

"Forget about the fundamentals and think about the investors."

The Economist (1998)

"The herd is never stupid for too long."

T. Fiedman (2000)

Replace optimisation with simple Rules

- Agents use simple rules
- They choose amongst these rules
- Their motivation may be different
- Experience
- Imitation of success
- Conformism

Different views of predicted Prices

If markets are **efficient** then we have:

$$E(S_{t+1}|I_t)=S_t$$

In the sort of models in which agents interact they **assume** that they can **predict**, I.e

$$E(S_{t+1}|I_t)=(\Delta S_{t+1}|I_t)+S_t$$

Forecasting rules

- What form should they take?
- Typically “Fundamentalists” and “Chartists”
- The idea here is that people choose a forecasting rule.
- Which rule to choose ?
- Use your own experience.
- Why not that of others ?
- Rules do best when they have many followers.
- This will cause a self-reinforcing swing to the currently more successful rule if success is a criterion for choice.
- However when rules are not "perfect" forecasters other less popular rules may do better.

The Distribution of Stock Prices

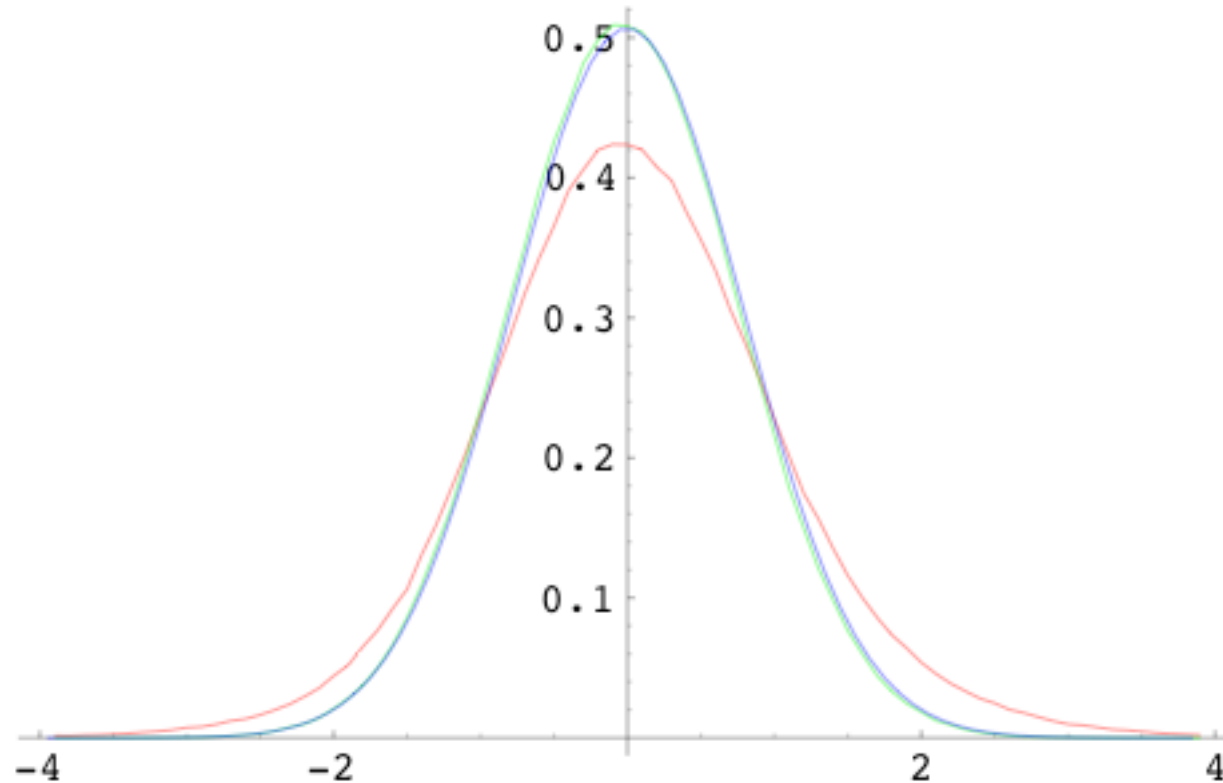


Figure 1: Empirical stationary distribution of asset prices in a model with (red) and without (green) chartists.

Bubbles and Crashes

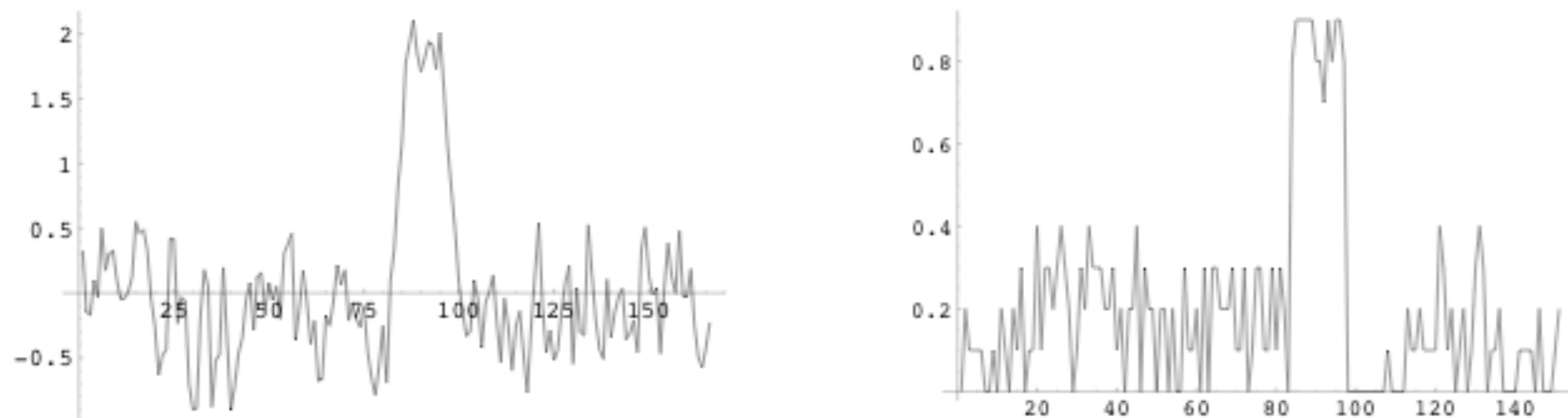


Figure 2: A bubble and the corresponding fraction of chartists.

Are models with interacting agents an improvement?

- Interaction between market participants can generate realistic phenomena.
- The asset price does not settle to a steady state.
- In the long run the stochastic price process has structure. A new idea of equilibrium, (Foellmer Horst and Kirman (2005))
- The presence of chartists generates long memory and fat tails.
- Beliefs, commonly held, are self fulfilling

The Bank of England's View

When comparing the failure of Lehman bros and the epidemic of bird flu, Haldane says,

« These similarities are no coincidence. Both events were manifestations of the behaviour under stress of a complex, adaptive network. Complex because these networks were a cat's-cradle of interconnections, financial and non-financial. Adaptive because behaviour in these networks was driven by interactions between optimising, but confused, agents. Seizures in the electricity grid, degradation of ecosystems, the spread of epidemics and the disintegration of the financial system – each is essentially a different branch of the same network family tree. »

Andy Haldane, Director of the Bank of England responsible for financial stability.

Chart 1: Global Financial Network: 1985

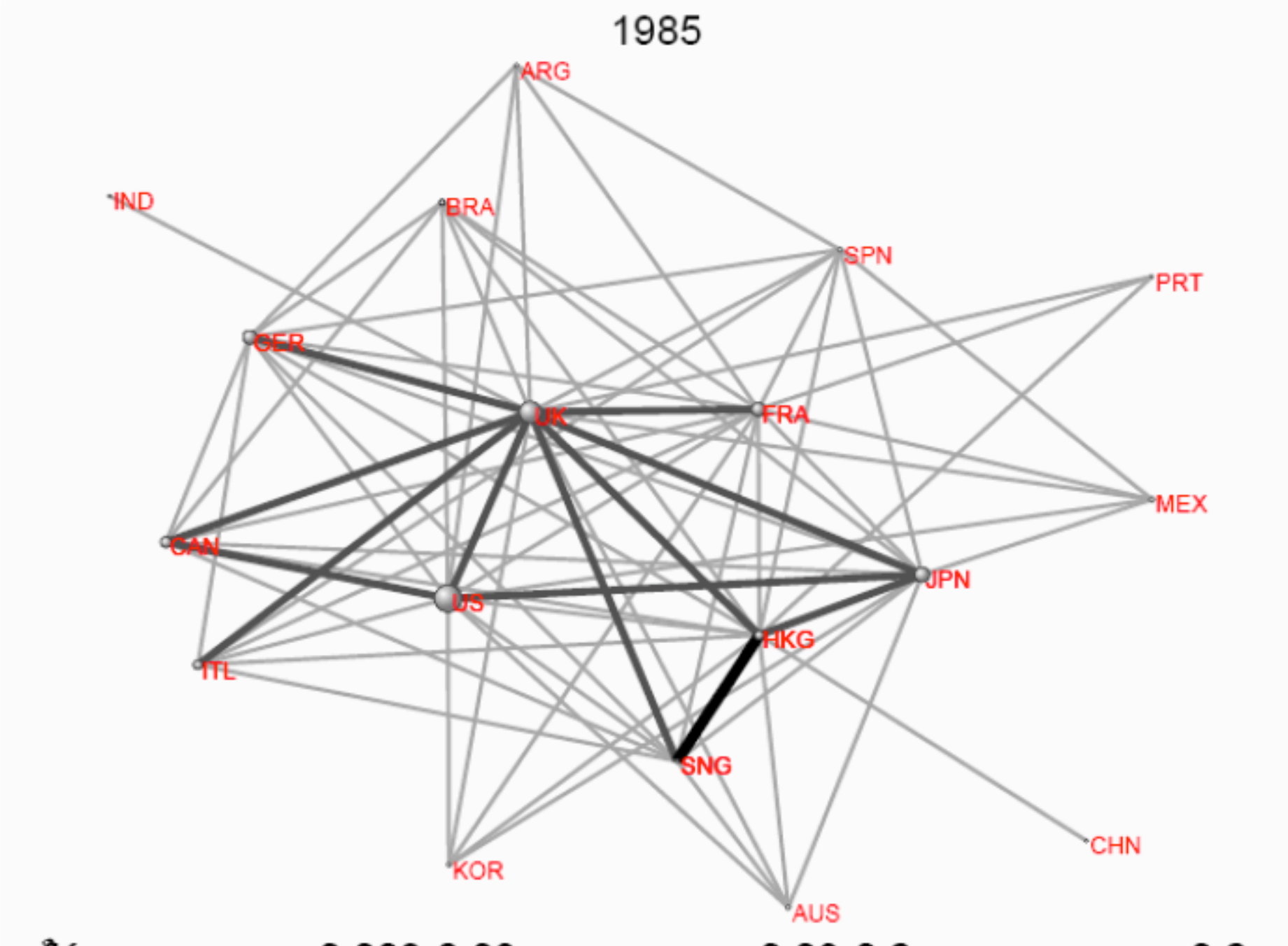


Chart 2: Global Financial Network: 1995

1995

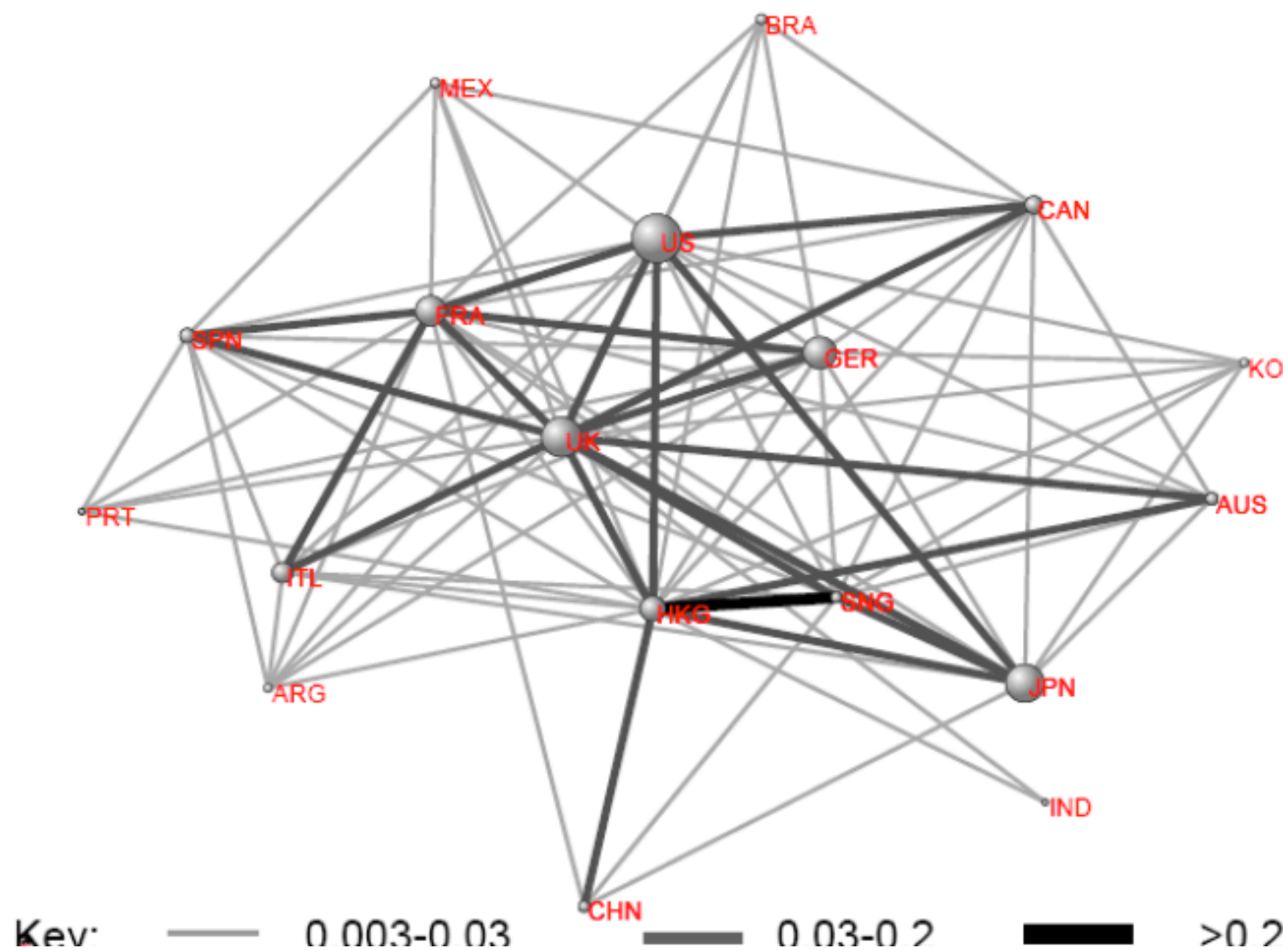
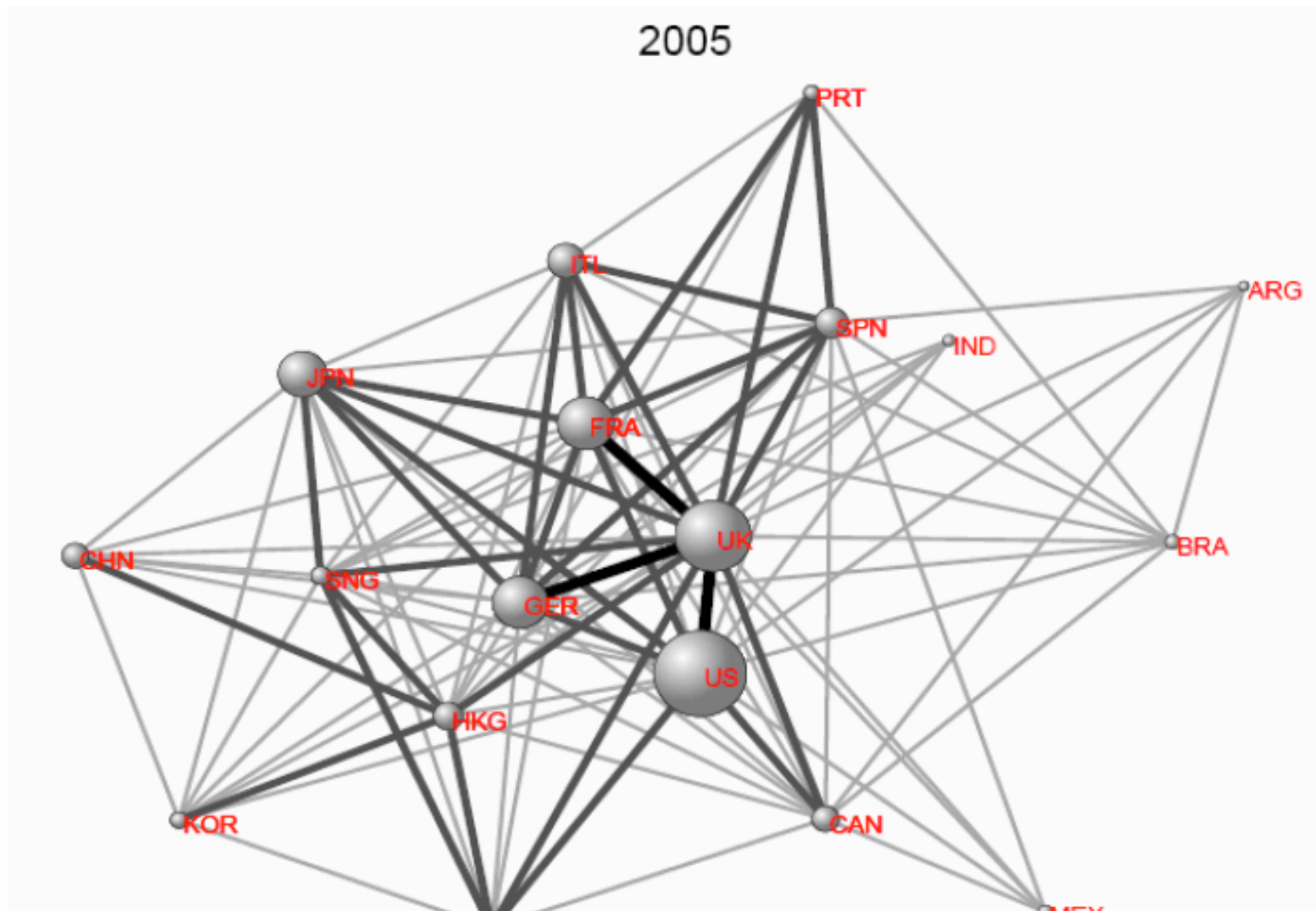


Chart 3: Global Financial Network: 2005



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”.

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.

:

“if the traditional markets of the past have diminished in importance, new markets have emerged in recent times of comparable importance in our modern economy. I refer to commodity exchanges and stock exchanges. (...) All exchanges regulate in great detail the activities of those who trade in these markets (the times at which transactions can be made, what can be traded, the responsibilities of the parties, the terms of settlement of disputes and impose sanctions against those who infringe the rules of the exchange). It is not without significance that these exchanges, often used by economists as examples of a perfect market and perfect competition, are markets in which transactions are highly regulated. It suggests, I think correctly, that for anything approaching perfect competition to exist, an intricate system of rules and regulations would normally be needed”

R. Coase *The Firm, The Market and the Law* (1988):

Overall Conclusions

- Much has been written about markets in other disciplines but economic theorists have paid little attention to how actual markets function.
- Markets and the individuals who participate in them learn and adapt
- Market behaviour is not like individual behaviour
- The self-organisation of interacting individuals generates precisely the market phenomena which we wish to avoid.
- If we wish to leave markets to themselves then we will have to explain how they will achieve efficiency and equilibrium.

Overall Conclusions 2

- Information is dispersed across individuals and is not transmitted through some central signals
- How markets with individuals behaving in a simple but plausible way, come to be coordinated is what we need to explain
- This can only be done by accepting that there is a co-evolution of market institutions and individual behaviour.
- Nothing in theory nor in the empirical evidence suggests that they will find their way to a social optimum if we do not interfere and worse they may generate major disasters!

Sneaky Ad.

*Complex Economics: Individual
and Collective Rationality*

Alan Kirman

Forthcoming Routledge 2009