The Normality of Financial Crises
Prediction of Crises and Risk Management

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Chair of Entrepreneurial Risks
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-Member of the Swiss Finance Institute
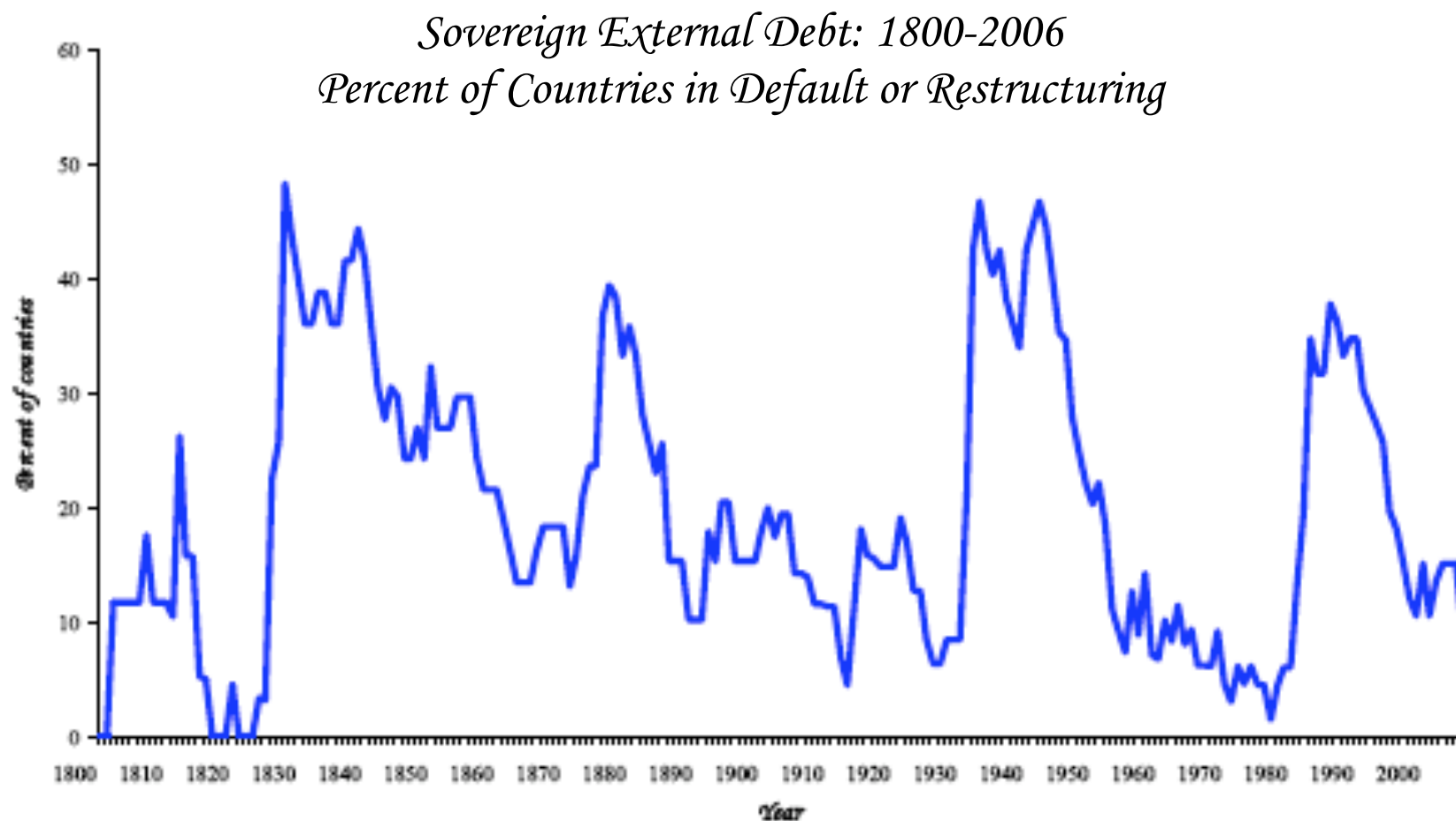-Director of the Financial Crisis Observatory (http://www.er.ethz.ch/fco/index)
-co-founder of the Competence Center for Coping with Crises in Socio-Economic Systems
ETH Zurich (http://www.ccss.ethz.ch/)

- **Putting financial and economic crises in context: a brief history of instabilities in financial and global markets**

- **Dragon-kings versus black swans**

- **Mechanism(s) at the origin of financial crises**

- **Precursors and predictability of financial instabilities**

- **Applications to the 5 successive bubbles leading to the 2007-2009 global crisis; CDS swap bubbles, Shanghai SSE composite bubble, ...**

- **Investment opportunities, (strategic + tactical) time varying risks**
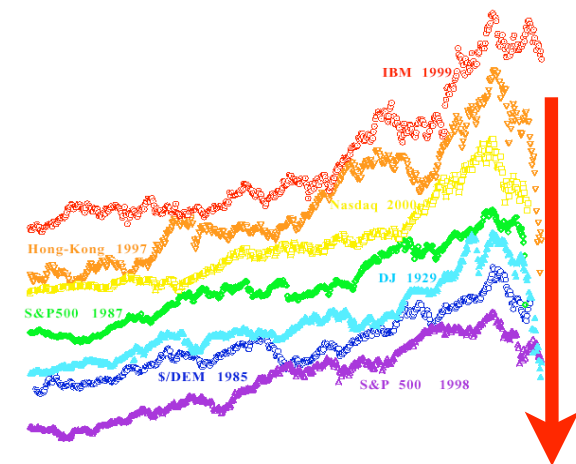
Crises frequently emanate from the financial centers with transmission through interest rate shocks and commodity price collapses. Thus, the recent US sub-prime financial crisis is hardly unique.

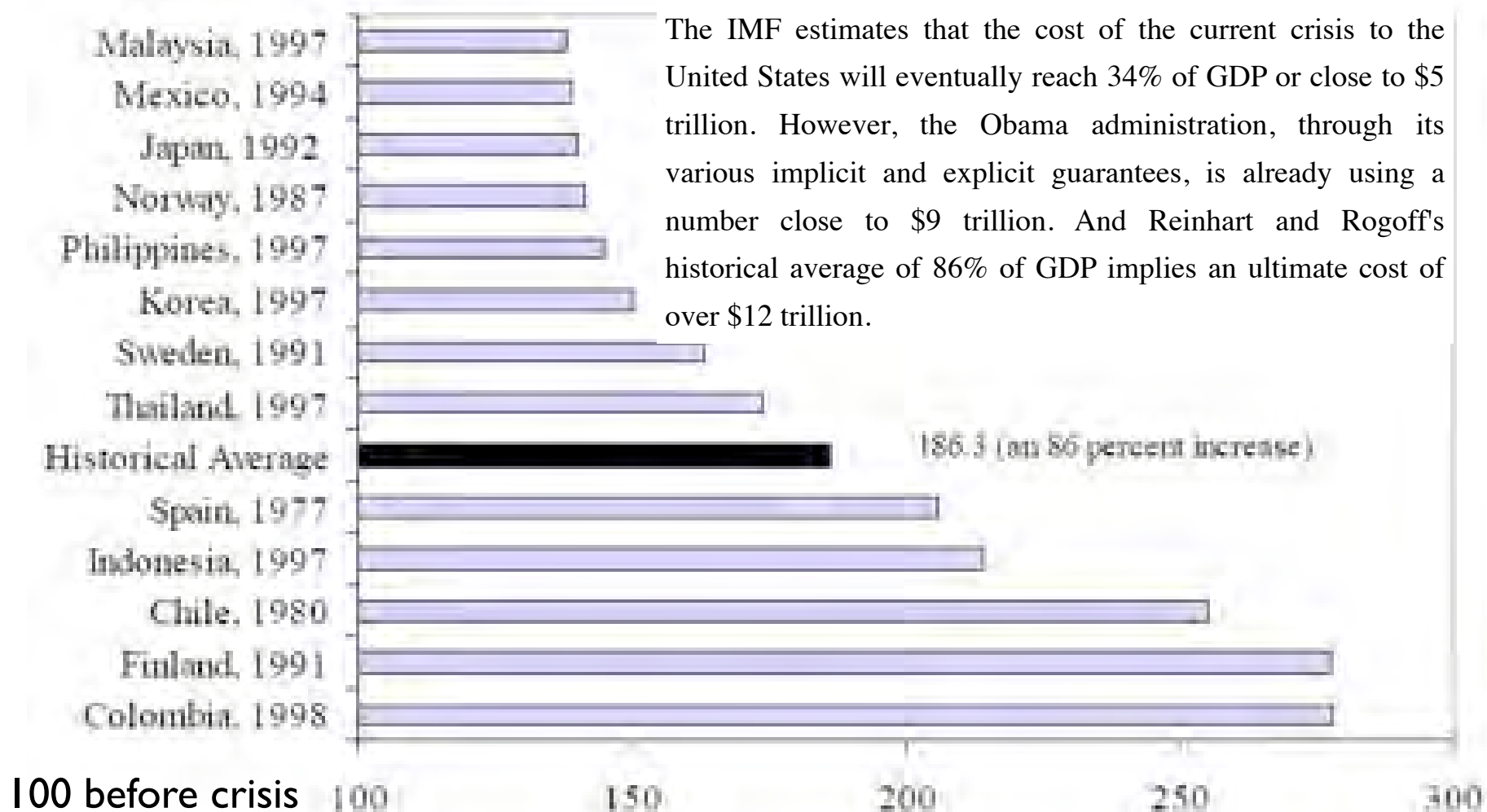*Sovereign External Debt: 1800-2006*
Percent of Countries in Default or Restructuring

This Time is Different: A Panoramic View of Eight Centuries of Financial Crises
Carmen M. Reinhart and Kenneth S. Rogoff, NBER Working Paper No. 13882, March 2008

Capital Mobility and the Incidence of Banking Crisis: All Countries, 1800-2007

Share of Countries in Banking Crisis, 3-year Sum (right scale)

Capital Mobility (left scale)
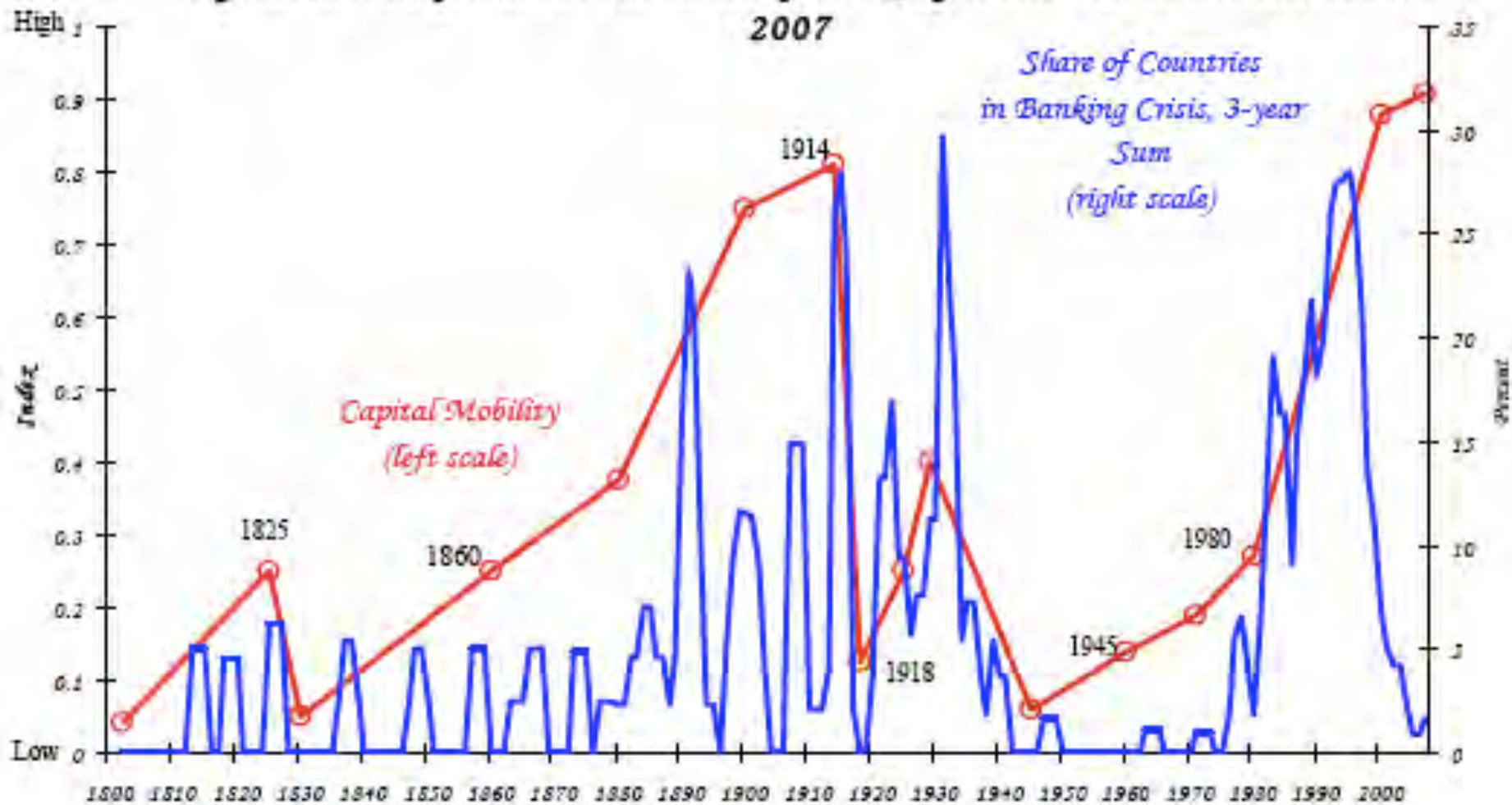
Sources: Bordo et al. (2001), Caprio et al. (2005), Kaminsky and Reinhart (1999), Obstfeld and Taylor (2004), and Carmen M. Reinhart and Kenneth S. Rogoff,

Increase in Public Debt in the 3 years following a banking crisis (inflation adjusted)

The IMF estimates that the cost of the current crisis to the United States will eventually reach 34% of GDP or close to $5 trillion. However, the Obama administration, through its various implicit and explicit guarantees, is already using a number close to $9 trillion. And Reinhart and Rogoff's historical average of 86% of GDP implies an ultimate cost of over $12 trillion.

Country	Value
Malaysia, 1997	
Mexico, 1994	
Japan, 1992	
Norway, 1987	
Philippines, 1997	
Korea, 1997	
Sweden, 1991	
Thailand, 1997	
Historical Average	186.3 (an 86 percent increase)
Spain, 1977	
Indonesia, 1997	
Chile, 1980	
Finland, 1991	
Colombia, 1998	

100 before crisis   100   150   200   250   300

The subsequent rise in government debt which, according to Reinhart and Rogoff, has been "... *a defining characteristic of the aftermath of banking crises for over a century*".

(Reinhart and Rogoff)

IMF estimate of the cost of the Banking crisis

Country	2008 GDP ($ billion)	IMF Estimate Δ Deficit (% of GDP)	Projected Bond Issuance ($ billion)
Australia	$1,069	26%	$278
Canada	$1,564	14%	$219
France	$2,978	21%	$625
Germany	$3,818	14%	$535
Italy	$2,399	28%	$672
Japan	$4,844	28%	$1,356
South Korea	$858	14%	$120
Mexico	$1,143	6%	$69
Spain	$1,683	35%	$589
Turkey	$799	12%	$96
UK	$2,787	29%	$808
US	$14,330	34%	$4,872
Total, G12	**$38,272**	**27%**	**$10,239**

	Δ Deficit (% of GDP)	Projected Bond Issuance ($ billion)
IMF Estimate	27%	$10,239
Rogoff, Best Case	40%	$15,309
Rogoff, Average	86%	$33,029

Source: CIA World Fact Book, IMF, Rogoff & Reinhart

total private wealth across the world today is about $37 trillion *less* the losses incurred in 2007-09, so the real number is probably closer to $30 trillion now.

Total global savings (loosely adjusted for the big losses in 2008) are probably somewhere in the region of $100 trillion.

In other words, financing this crisis could absorb one-third of total global savings.

Fund Type	As of End	$ Billion
Private Wealth	2006	$37,200
Pension Funds	2007	$28,228
Mutual Funds	2007	$26,200
Insurance Companies	2007	$18,836
FX Reserves	2007	$7,341
Sovereign Wealth Funds	2007	$3,300

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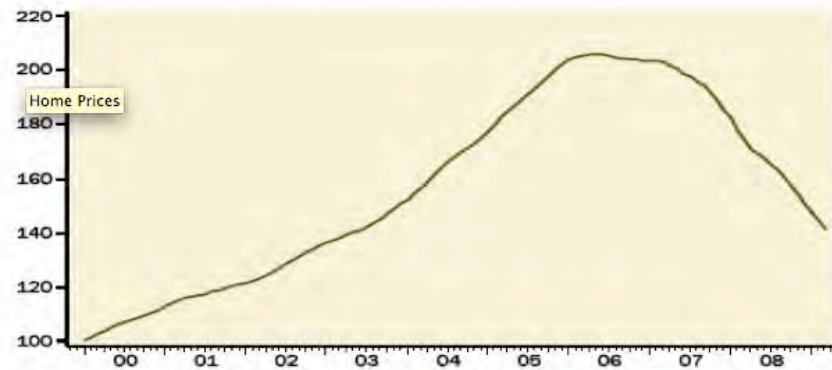- Investment opportunities, (strategic + tactical) time varying risks

Crises are not

but

"Dragon-kings"

Black Swan story

- Unknown unknowable event

  ★ cannot be diagnosed in advance,
    cannot be quantified,
    no predictability

- No responsability (wrath of "God")

- One unique strategy: long put and insurance

Chart 1: HOME PRICES — STILL DEFLATING AFTER ALL THESE YEARS

United States

S&P/Case-Shiller Home Price Index: Composite 20
(Jan 2000 = 100, seasonally adjusted)

Source: Haver Analytics, Gluskin Sheff

Initial Subprime Losses and Subsequent Declines in World GDP and World Stock Market Capitalization (in Trillions US Dollars)

Estimate of Subprime Losses on Loans and Securities by 10/2007 · Estimate of Cumulative World GDP loss · Decline in World Stock Market Capitalization 9/07 to 10/08
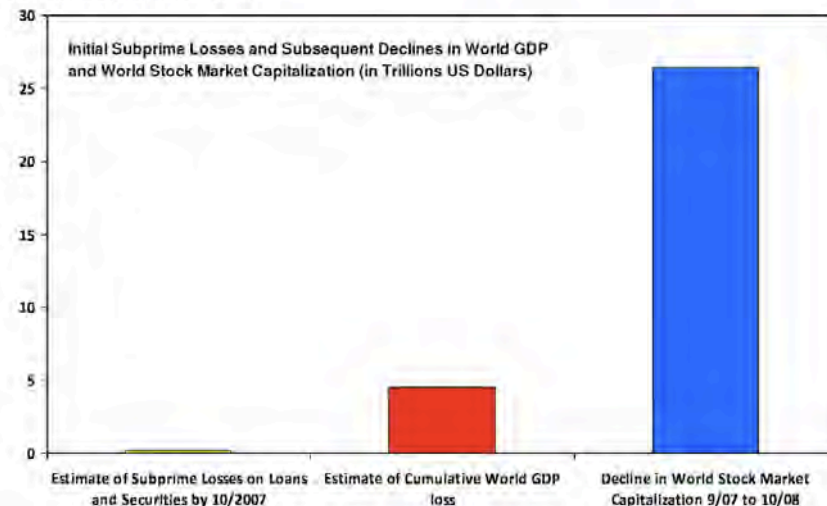
Source: IMF Global Financial Stability Report; World Economic Outlook November update and estimates; World Federation of Exchanges.

Causes of the 2007-20XX crisis?

- Real-estate loans and MBS as fraction of bank assets

- Managers greed and poor corporate governance problem

- Deregulation and lack of oversight

- Bad quantitative risk models in banks (Basel II)

- Lowering of lending standards

- Securitization of finance

- Leverage

- Rating agency failures

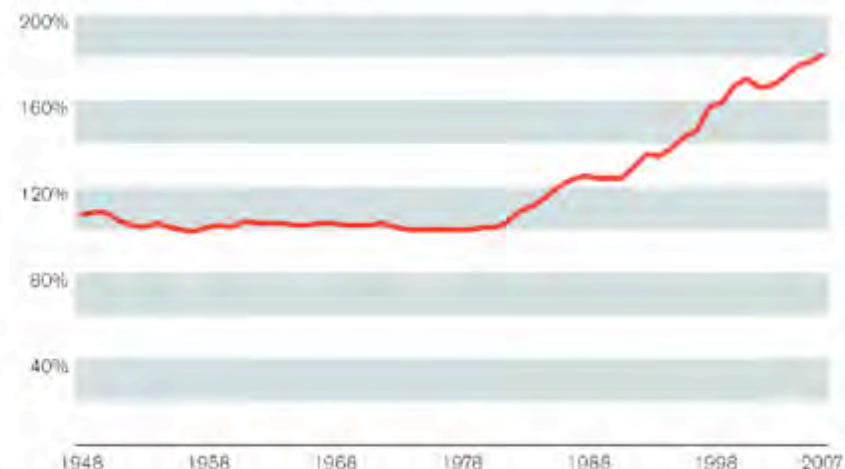- Under-estimating aggregate risks

- Growth of over-capacity

Dragon-king story

- Most crises are "endogenous"
  - ★ can be diagnosed in advance, can be quantified, (some) predictability

- Accountability, moral hazard, conflict of interest, regulations

- strategic vs tactical time-dependent strategy

FINANCIAL-INDUSTRY PROFITS AS A SHARE OF U.S. BUSINESS PROFITS

45%
35%
25%
15%
5%
1948   1958   1968   1978   1988   1998   2007
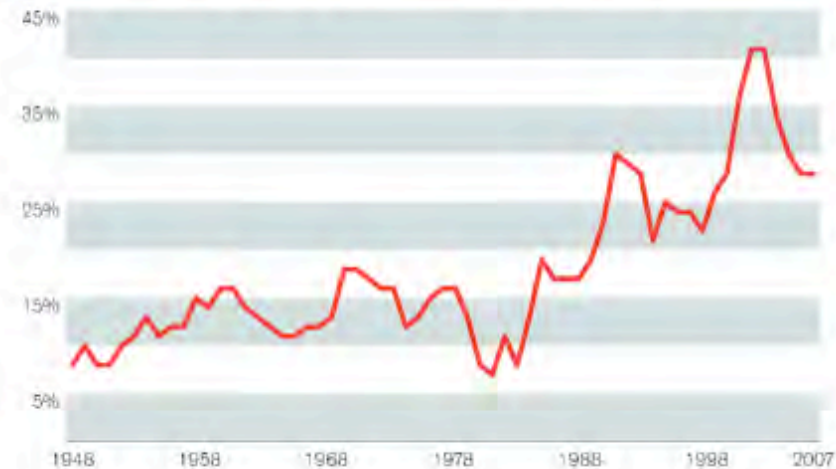
PAY PER WORKER IN THE FINANCIAL SECTOR AS A PERCENTAGE OF AVERAGE U.S. COMPENSATION

200%
160%
120%
80%
40%
1948   1958   1968   1978   1988   1998   2007

source: Simon Johnson (May 2009)

Endogenous vs Exogenous Crashes

1. **Systematic qualification of outliers/kings in pdfs of drawdowns**

2. **Theory of positive feedback loops of higher return anticipations competing with negative feedback spirals of crash expectations.**

3. **Existence of a "critical" behavior by LPPL signatures found systematically in the price trajectories preceding "outliers."**
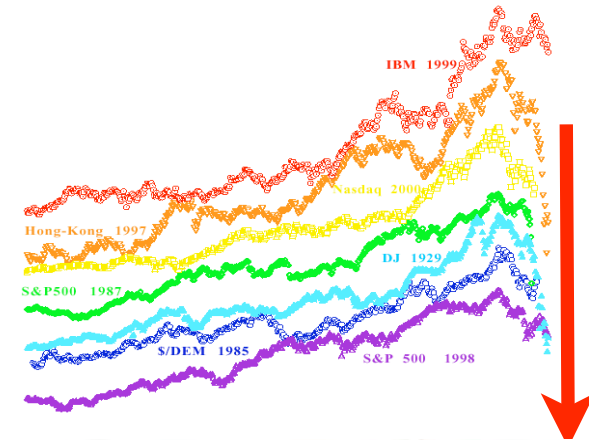
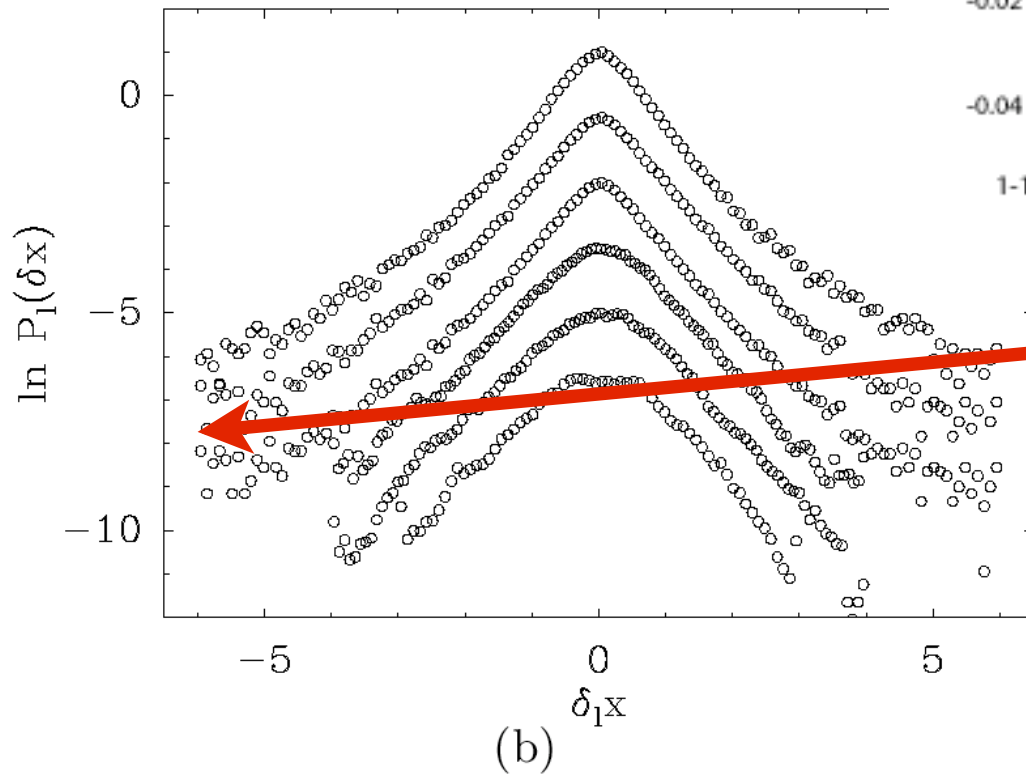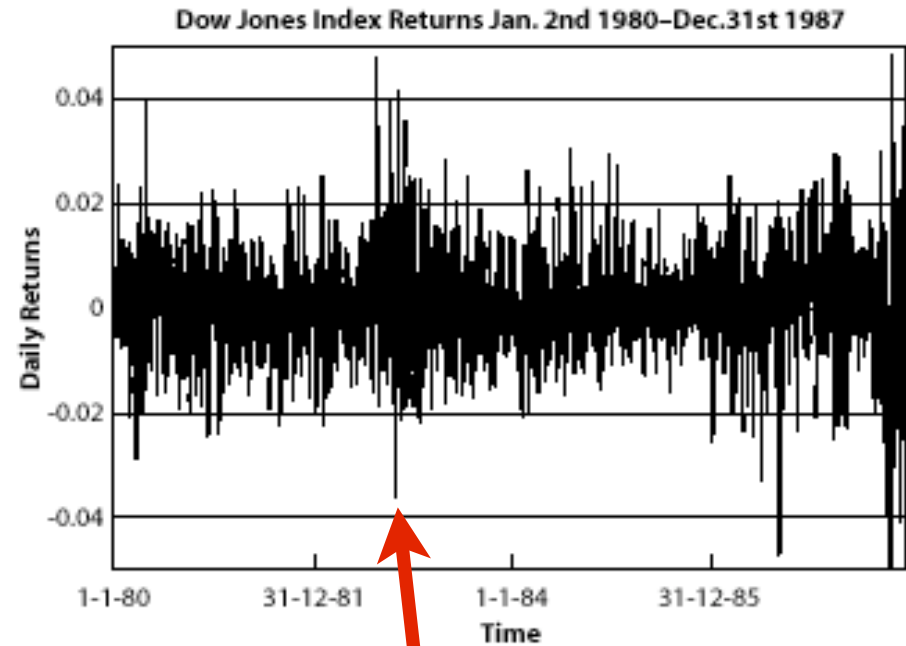**Results: In worldwide stock markets + currencies + bonds**
- **21 endogenous crashes**
- **10 exogenous crashes**

A. Johansen and D. Sornette, Endogenous versus Exogenous Crashes in Financial Markets, (http://arXiv.org/abs/cond-mat/0210509)

(b) Hong-Kong

Textbook example of a series of super-exponential acceleration followed by crashes

Arrows show peaks followed by corrections of more than 15% in less than three weeks

Red line is 13.8% per year: but the market is never following the average growth; it is either super-exponentially accelerating or crashing

Hang-Seng

10000

1000

100

1970   1975   1980   1985   1990   1995   2000

Date

Patterns of price trajectory during 0.5-1 year before each peak: Log-periodic power law
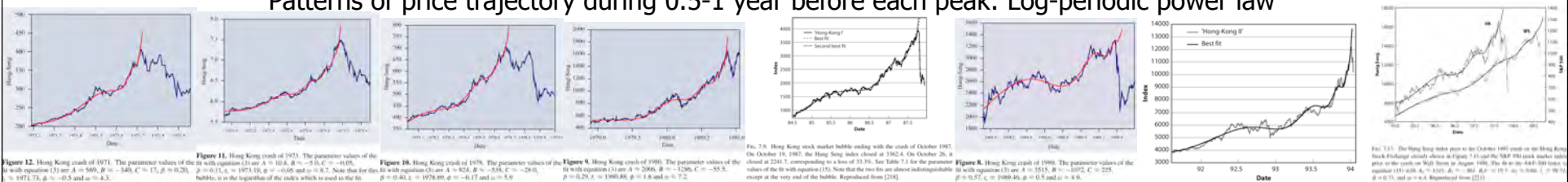
Black Swans in financial markets?

Traditional emphasis on Daily returns do not reveal any anomalous events

Dow Jones Index Returns Jan. 2nd 1980–Dec.31st 1987

"Black swans"

Better risk measure: drawdowns

"Dragons" of financial risks

A. Johansen and D. Sornette, Stock market crashes are outliers,
European Physical Journal B 1, 141-143 (1998)

A. Johansen and D. Sornette, Large Stock Market Price Drawdowns Are Outliers,
Journal of Risk 4(2), 69-110, Winter 2001/02
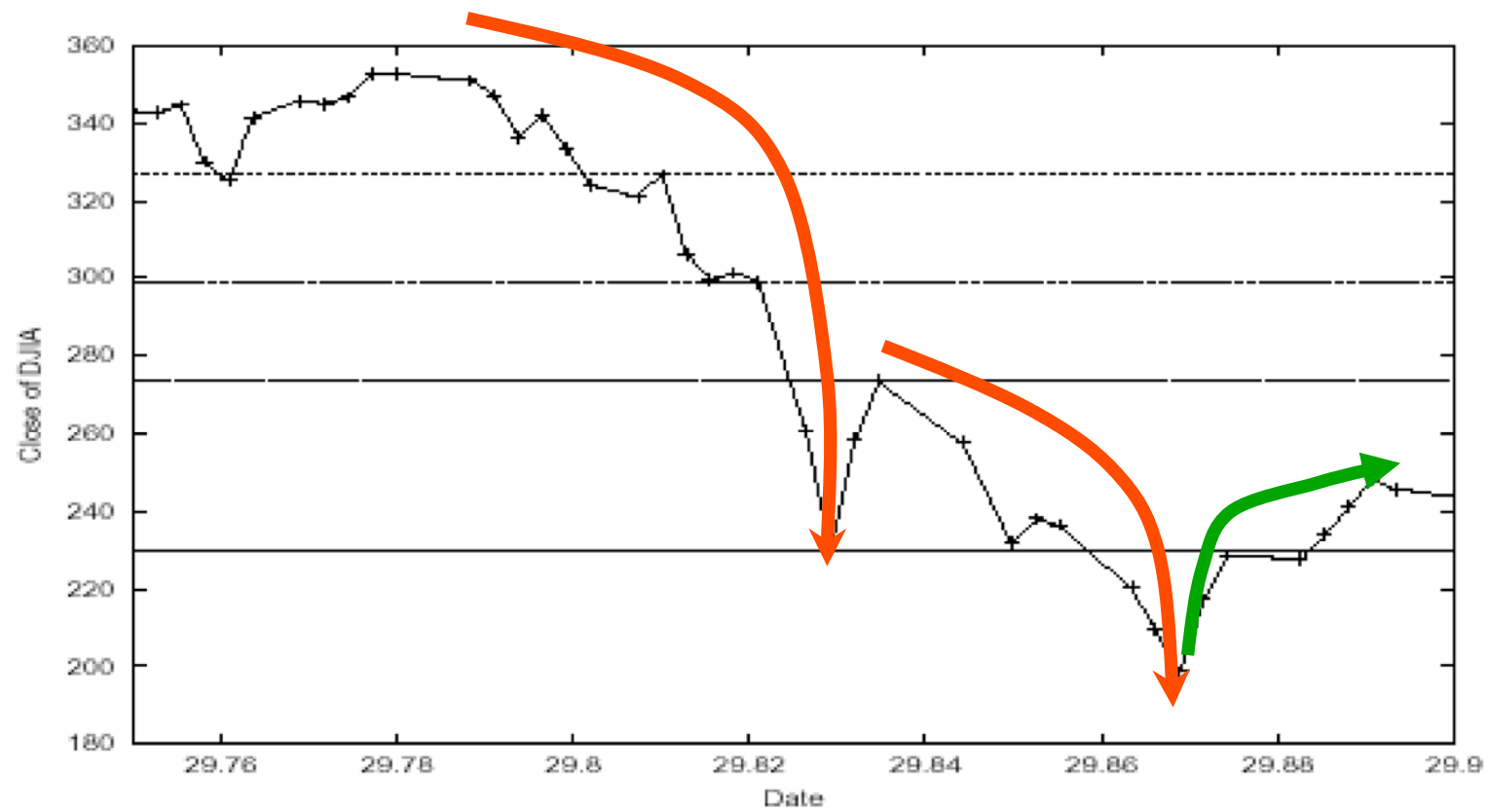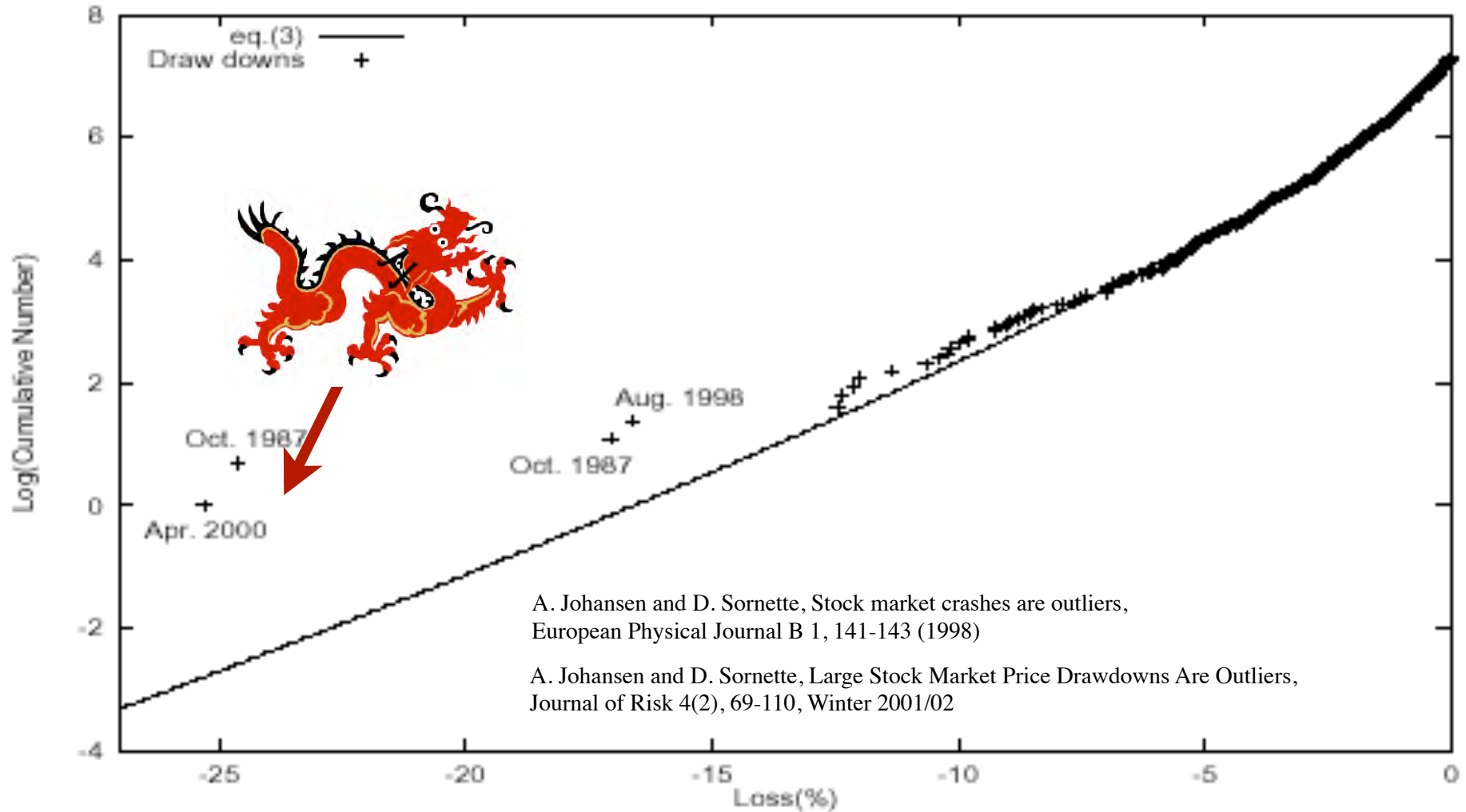
$$N\,(DD) = A\exp\left(-\left(|DD|/\chi\right)^z\right).$$

"Dragons" of financial risks
(require special mechanism and may be more predictable)

Dow Jones Industrial Average

Cut-off u	Quantile	z	$\ln(L_0)$	$\ln(L_1)$	T	Proba
3%	87%	0.916, 0.940	4890.36	4891.16	1.6	20.5%
6%	97%	0.875, 0.915	4944.36	4947.06	5.4	2.0%
9%	99.0%	0.869, 0.918	4900.75	4903.66	5.8	1.6%
12%	99.7%	0.851, 0.904	4872.47	4877.46	10.0	0.16%
15%	99.7%	0.843, 0.898	4854.97	4860.77	11.6	0.07%
18%	99.9%	0.836, 0.890	4845.16	4851.94	13.6	0.02%

Zipf law
for city sizes (France)

$y = -3,263x + 13,682$
$R^2 = 0.9944$

—— agglo c=0.18, xo=7, x95=3100
—■— Paris = King
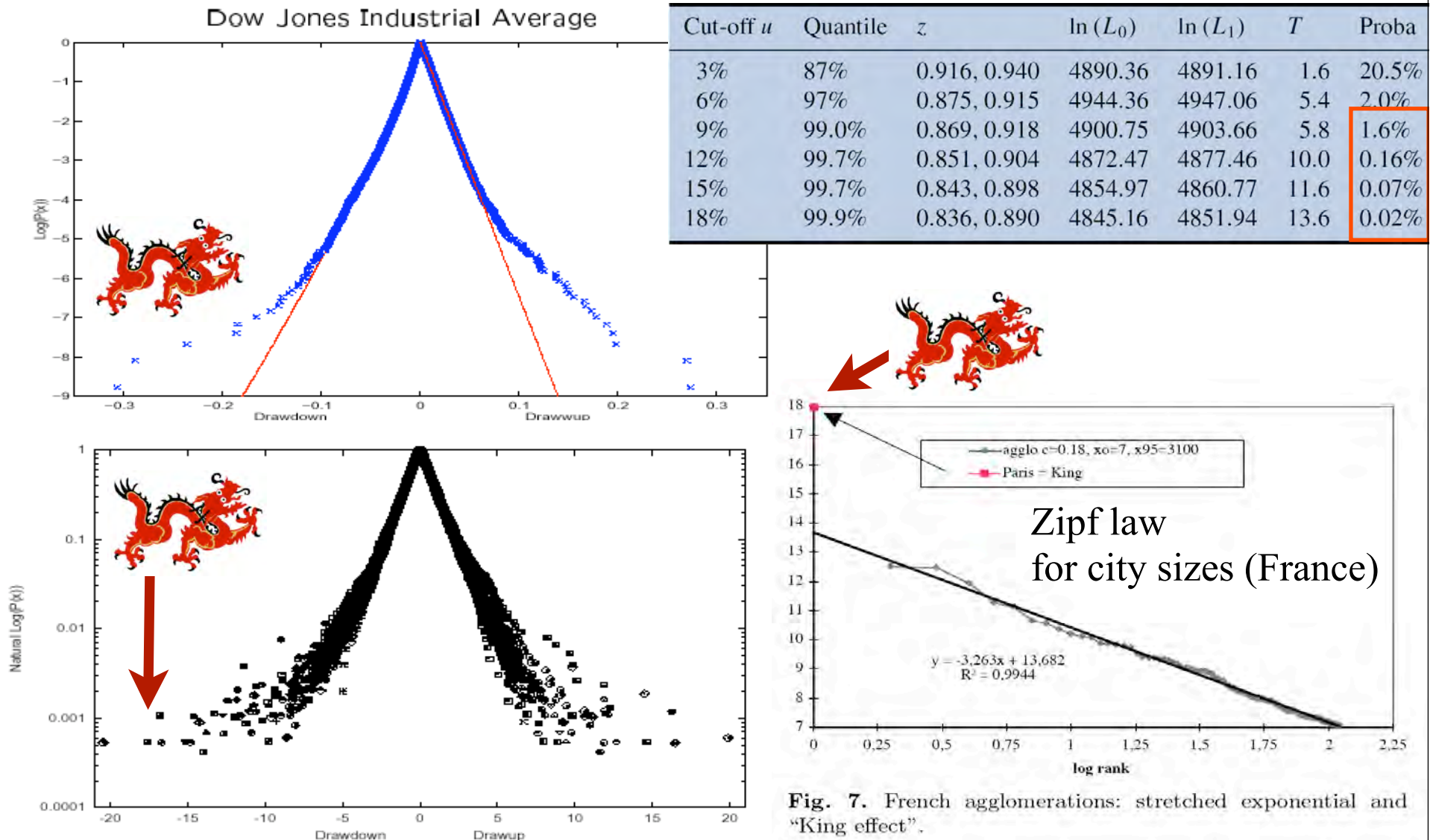
Fig. 7. French agglomerations: stretched exponential and "King effect".

Beyond power laws: 6 "Dragons-kings"

Financial economics: Outliers and dragons in the distribution of financial drawdowns.

Population geography: Paris as the dragon-king in the Zipf distribution of French city sizes.

Material science: failure and rupture processes.

Hydrodynamics: Extreme dragon events in the pdf of turbulent velocity fluctuations.

Brain medicine: Epileptic seizures

Geophysics: Gutenberg-Richter law and characteristic earthquakes.

Dragon-king story

- Most crises are "endogenous"
- Follow excesses ("bubbles")

What is a bubble?

Academic Literature: No consensus on what is a bubble...

Ex: Refet S. Gürkaynak, Econometric Tests of Asset Price Bubbles: Taking Stock (2008)
Can asset price bubbles be detected? This survey of econometric tests of asset price bubbles shows that, despite recent advances, econometric detection of asset price bubbles cannot be achieved with a satisfactory degree of certainty. For each paper that finds evidence of bubbles, there is another one that fits the data equally well without allowing for a bubble. We are still unable to distinguish bubbles from time-varying or regime-switching fundamentals, while many small sample econometrics problems of bubble tests remain unresolved.

Professional Literature: we do not know... only after the crash

The Fed: A. Greenspan (Aug., 30, 2002):

"We, at the Federal Reserve…recognized that, despite our suspicions, it was very difficult to definitively identify a bubble until after the fact, that is, when its bursting confirmed its existence… Moreover, it was far from obvious that bubbles, even if identified early, could be preempted short of the Central Bank inducing a substantial contraction in economic activity, the very outcome we would be seeking to avoid."

What is a bubble?

The Law of Supply & Demand in Utilitarian Economics

Price (low → high) vs. Quantity (low → high)

Consumers (Supply)
Producers (Demand)

Herding Impulse in Finance

Price (low → high) vs. Quantity (low → high)

Issuers (Supply)
Investors (Demand)
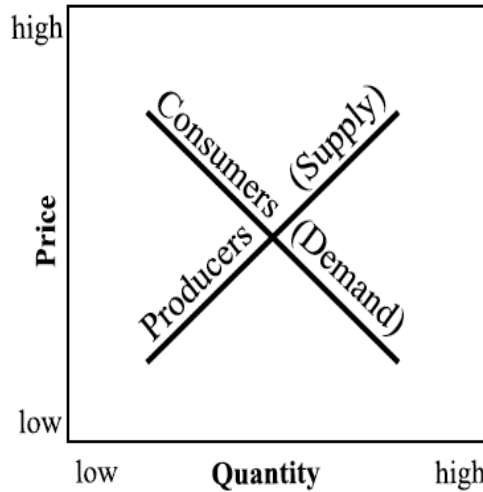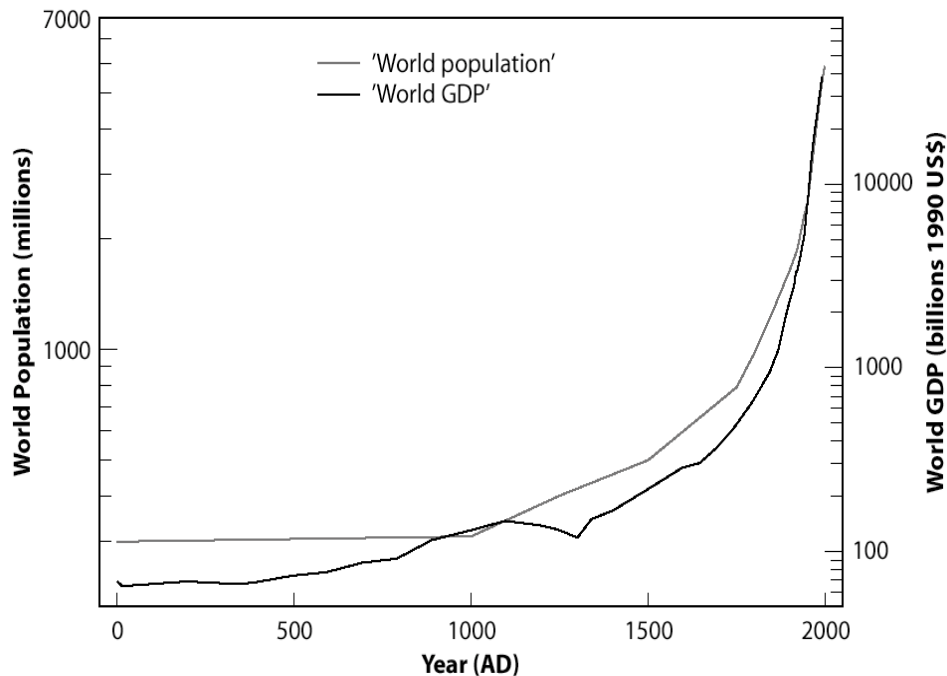
© 2003 Robert R. Prechter, The Socionomics Institute
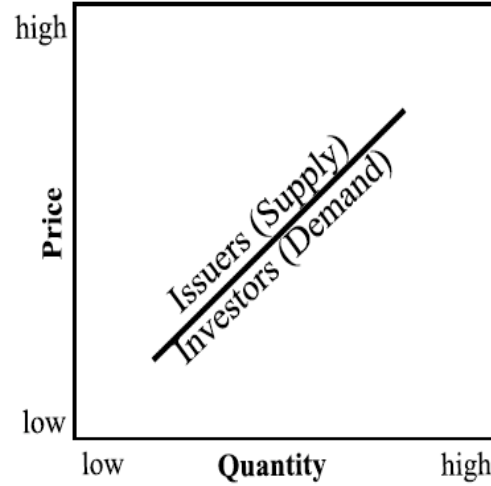
Positive feedbacks

$$\boxed{\frac{dp}{dt} = cp^d}$$

$$p(t) = \left(\frac{c}{m}\right)^{-m}(t_c - t)^{-m}$$

$$m = 1/(d-1) > 0 \text{ and } t_c = t_0 + mp_0^{1-d}/c.$$

World Population (millions) — 'World population'
World GDP (billions 1990 US$) — 'World GDP'

Year (AD): 0, 500, 1000, 1500, 2000

Our proposition:
Faster than exponential transient unsustainable growth of price

Mechanisms for positive feedbacks in the stock market

- **Technical and rational mechanisms**
    1. Option hedging
    2. Insurance portfolio strategies
    3. Trend following investment strategies
    4. Asymmetric information on hedging strategies

- **Behavioral mechanisms:**
    1. Breakdown of "psychological Galilean invariance"
    2. Imitation(many persons)
        a) It is rational to imitate
        b) It is the highest cognitive task to imitate
        c) We mostly learn by imitation
        d) The concept of "CONVENTION" (Orléan)

Imitation

-Imitation is considered an efficient mechanism of social learning.

- Experiments in developmental psychology suggest that infants use imitation to get to know persons, possibly applying a 'like-me' test ('persons which I can imitate and which imitate me').

- Imitation is among the most complex forms of learning. It is found in highly socially living species which show, from a human observer point of view, 'intelligent' behavior and signs for the evolution of traditions and culture (humans and chimpanzees, whales and dolphins, parrots).

- In non-natural agents as robots, tool for easing the programming of complex tasks or endowing groups of robots with the ability to share skills without the intervention of a programmer. Imitation plays an important role in the more general context of interaction and collaboration between software agents and human users.

Thy Neighbor's Portfolio: Word-of-Mouth Effects in the Holdings and Trades of Money Managers

HARRISON HONG, JEFFREY D. KUBIK, and JEREMY C. STEIN*

A mutual fund manager is more likely to buy (or sell) a particular stock in any quarter if other managers in the same city are buying (or selling) that same stock. This pattern shows up even when the fund manager and the stock in question are located far apart, so it is distinct from anything having to do with local preference. The evidence can be interpreted in terms of an epidemic model in which investors spread information about stocks to one another by word of mouth.

A fundamental observation about human society is that people who communicate regularly with one another think similarly. There is at any place and in any time a *Zeitgeist*, a spirit of the times.... Word-of-mouth transmission of ideas appears to be an important contributor to day-to-day or hour-to-hour stock market fluctuations. (pp. 148, 155) Shiller (2000)

Humans Appear Hardwired To Learn By 'Over-Imitation'

ScienceDaily (Dec. 6, 2007) — Children learn by imitating adults--so much so that they will rethink how an object works if they observe an adult taking unnecessary steps when using that object, according to a new Yale study.

Universal Bubble and Crash Scenario

Displacement

↓

Credit creation

↓

Euphoria

↓

Critical stage / Financial distress

↓

Revulsion

Charles Kindleberger, Manias, Panics and Crashes (1978)

Didier Sornette, Why stock markets crash (2003)

Crash = result of collective behavior of individual traders

Water level vs. temperature

Extrapolation?

1cm

1cm

1cm

?

The breaking of **macroscopic linear extrapolation**

1Kg 1Kg 1Kg

95^0C 97 99 101
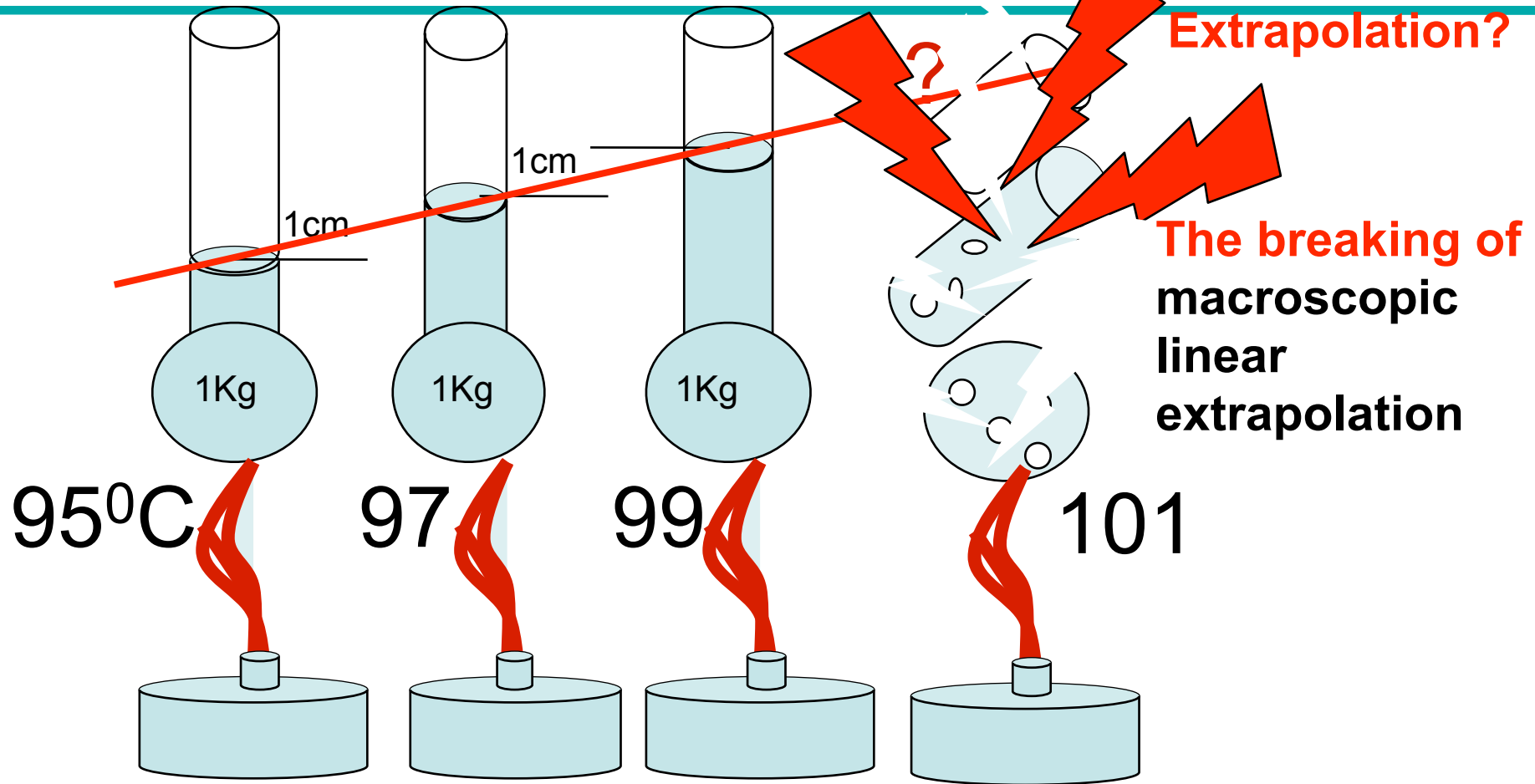
BOILING PHASE TRANSITION

More is different: a single molecule does not boil at $100C^0$

Example of "MORE IS DIFFERENT" transition in Finance:

Dow Jones Industrials
Weekly Chart

http://www.lowrisk.com

**Instead of
Water Level:**
**-economic index
(Dow-Jones etc…)**
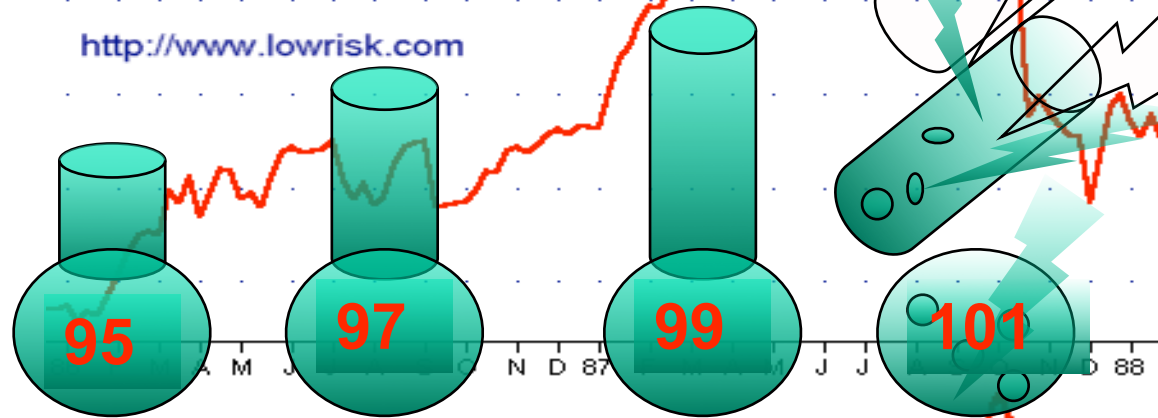
DJIA Weekly

**Crash = result of collective
behavior of individual traders**

95   97   99   101

A M J   N D 87   J J   88

10/29

http://www.lowrisk.com

27   28   29   30

**Apparent unpredictability comes from lack of recognition
of collective behavior**

Various Bubbles and Crashes

price

Each bubble has been rescaled vertically and translated
to end at the time of the crash

IBM 1999

Nasdaq 2000

Hong-Kong 1997

DJ 1929

S&P500 1987

$/DEM 1985

S&P 500 1998

time
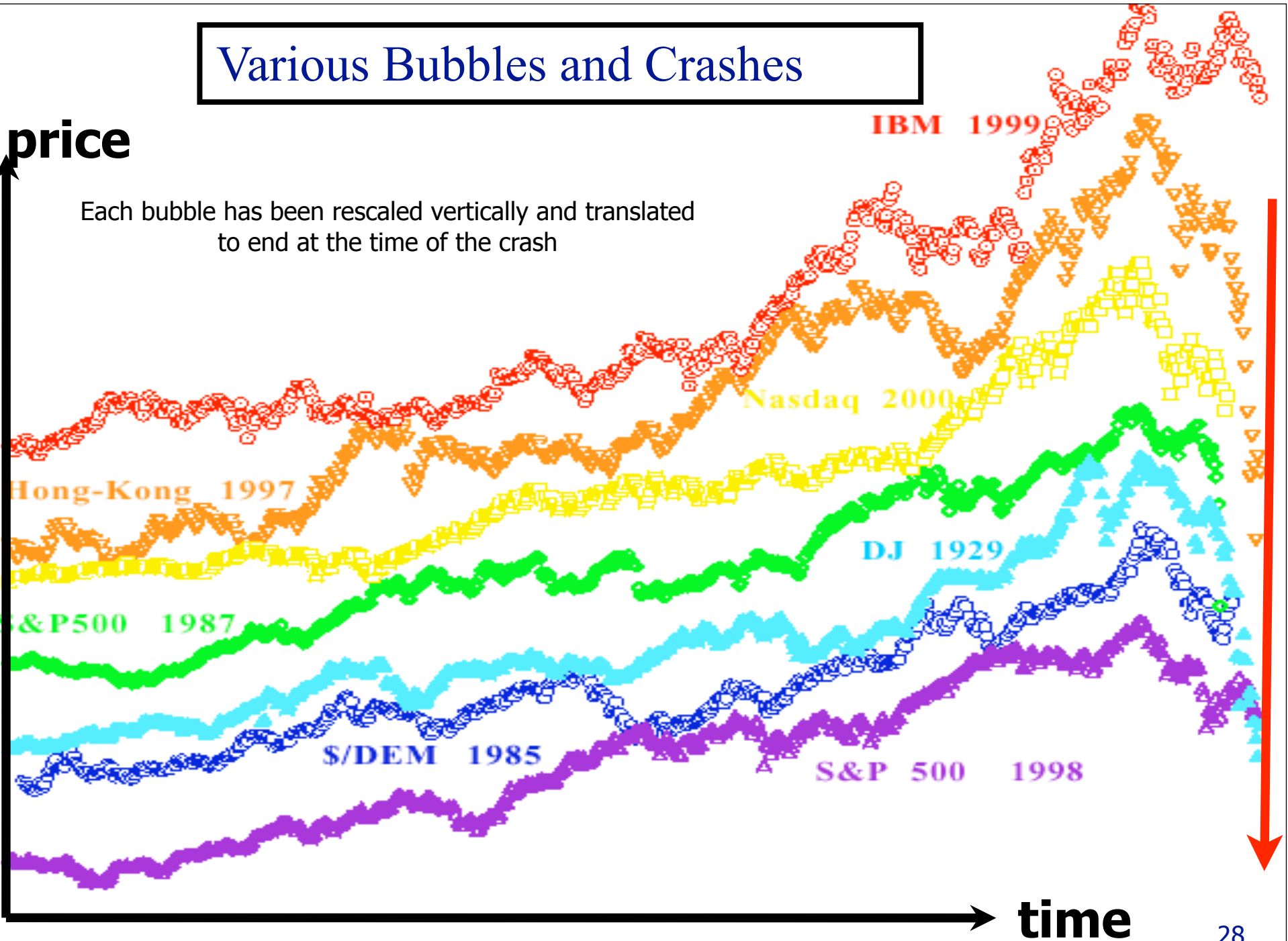
Many bubbles and crashes

❑ Hong-Kong crashes: 1987, 1994, 1997 and many others

❑ October 1997 mini-crash

❑ August 1998

❑ Slow crash of spring 1962

❑ Latin-american crashes

❑ Asian market crashes

❑ Russian crashes

❑ Individual companies
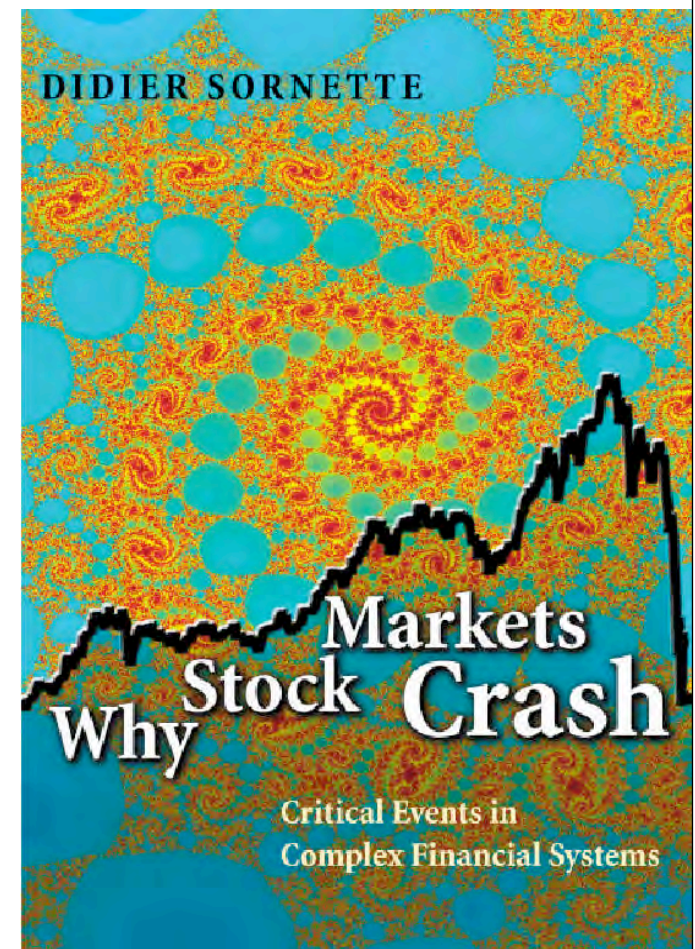
DIDIER SORNETTE

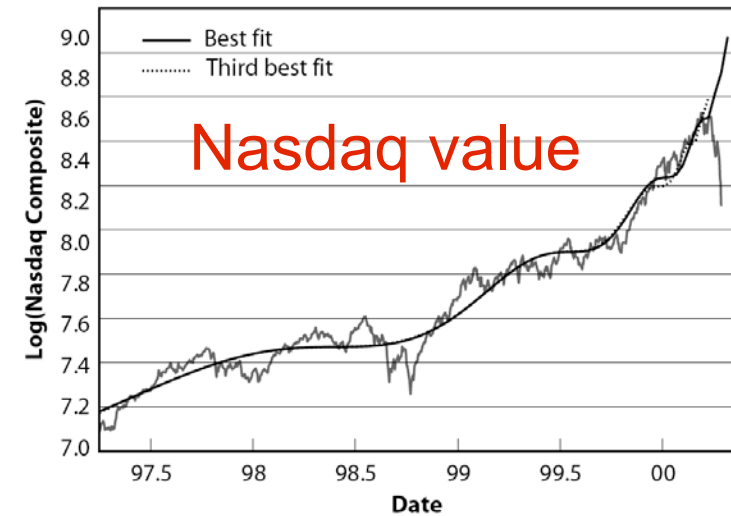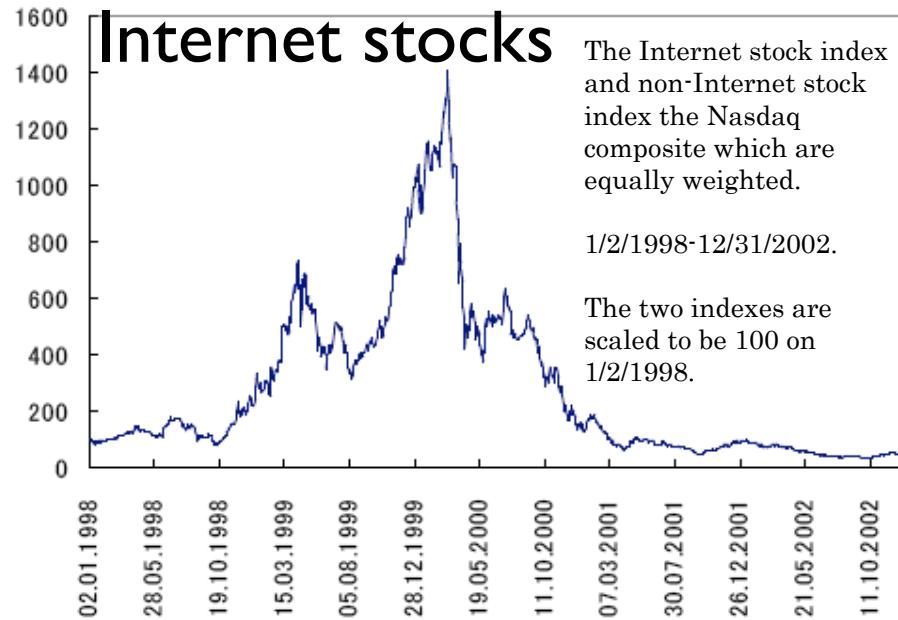Why Stock Markets Crash

Critical Events in Complex Financial Systems

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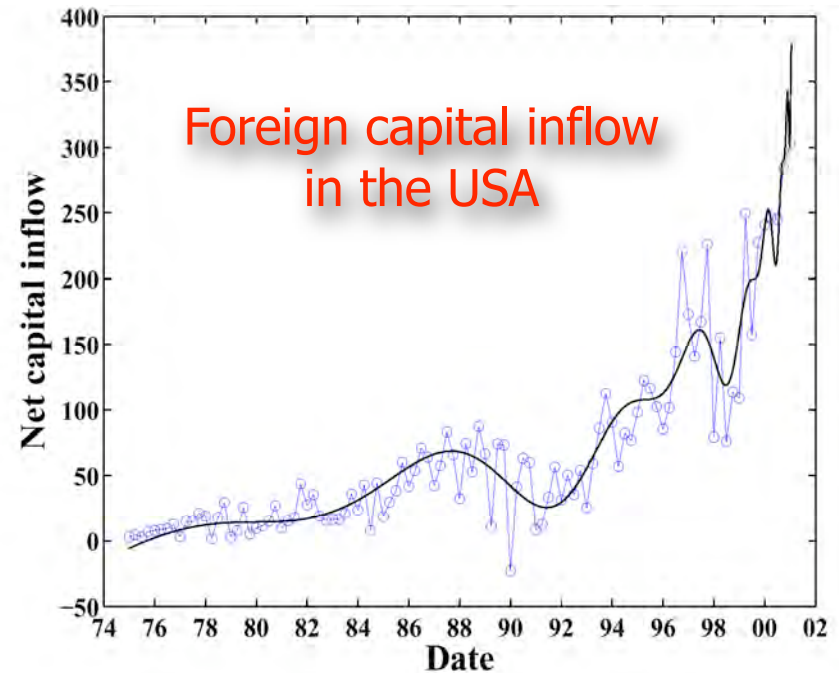- Investment opportunities, (strategic + tactical) time varying risks

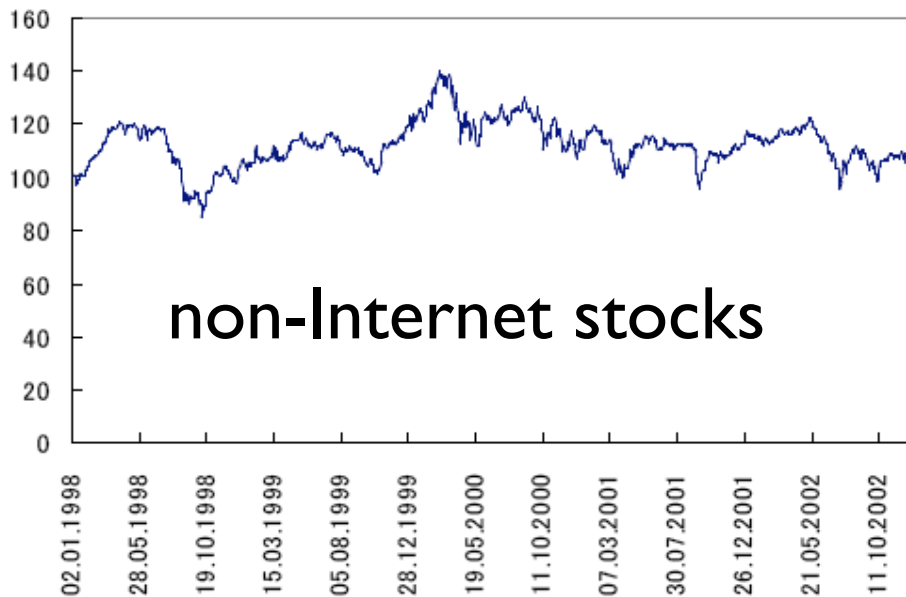# Generic predictability diagram

Interaction (coupling) strength

SYNCHRONIZATION
EXTREME RISKS

Coexistence of SOC and Synchronized behavior

SELF-ORGANIZED CRITICALITY

INCOHERENT

Heterogeneity; level of compartmentalization
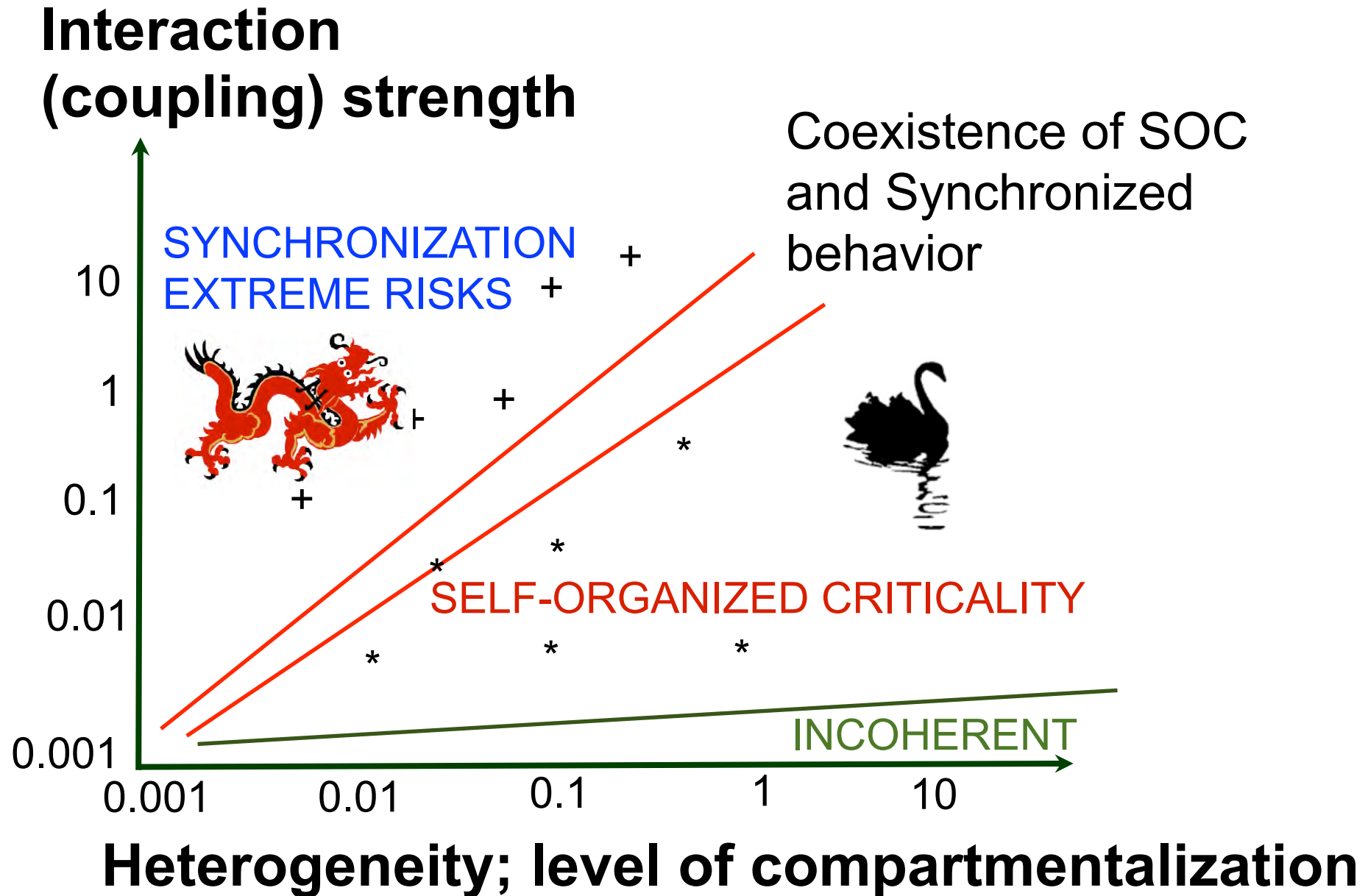
Methodology for predictability of crises

Strategy: look at the forest rather than at the tree

Rocket-science application!
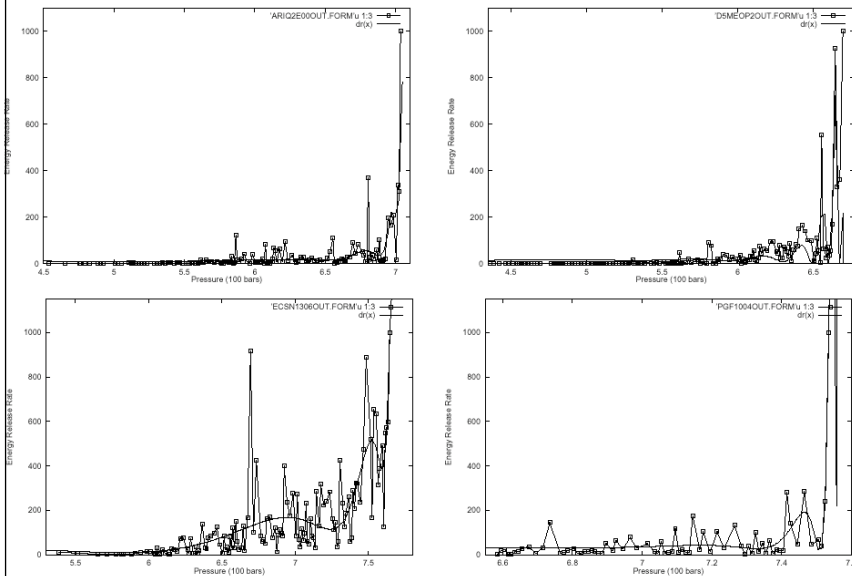
Our prediction system is now used in the industrial phase as the standard testing procedure.

J.-C. Anifrani, C. Le Floc'h, D. Sornette and B. Souillard
"Universal Log-periodic correction to renormalization group scaling for rupture stress prediction from acoustic emissions", J.Phys.I France 5, n°6, 631-638 (1995)

EADS LAUNCH VEHICLES

Methodology for predictability of crises

A Consistent Model of 'Explosive' Financial Bubbles With Mean-Reversing Residuals

L. Lin, R. E. Ren and D. Sornette (2009)

$$\frac{dI}{I} = [\, r + \rho\Sigma + \kappa h(t)\,]dt - \alpha\rho_Y Y dt + (\sigma_Y + \sigma_W)dW$$
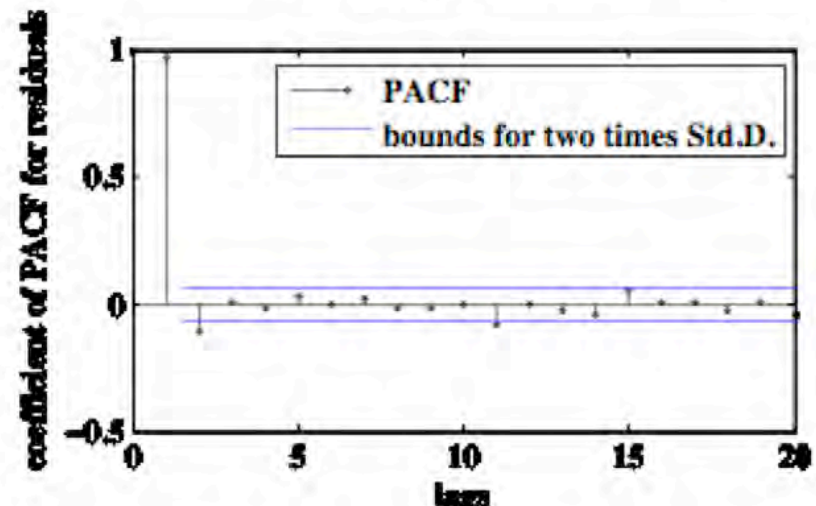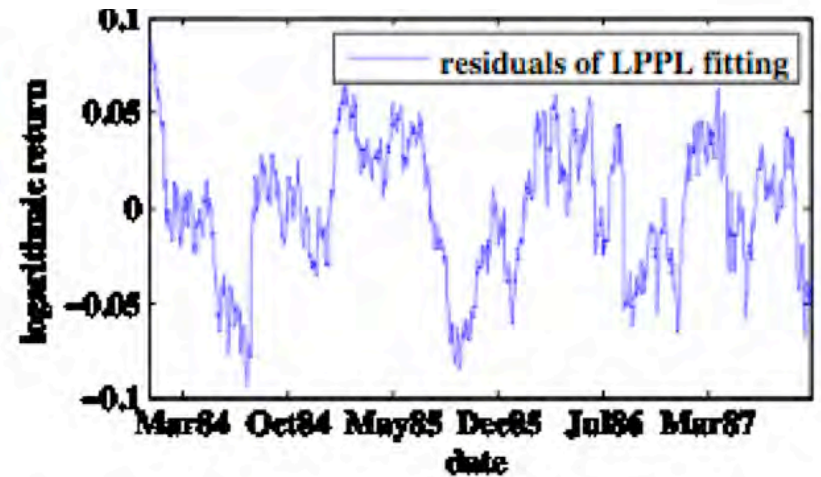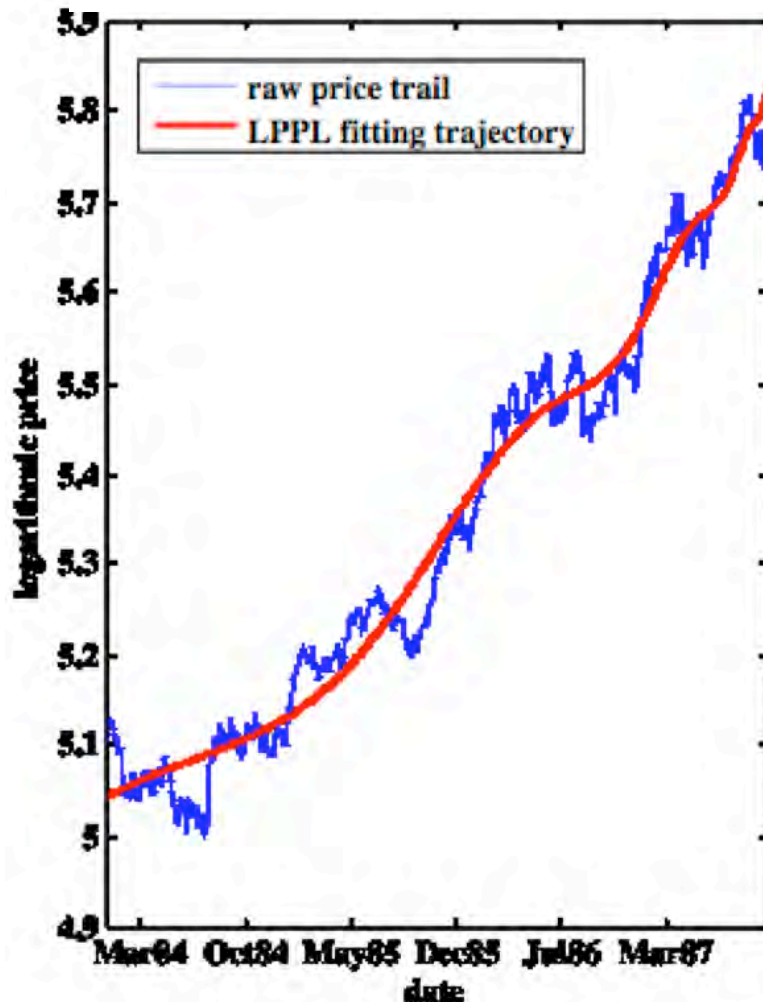
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Predictability of the 2007-XXXX crisis:
15y History of bubbles and Dragons

- The ITC "new economy" bubble (1995-2000)

- Slaving of the Fed monetary policy to the stock market descent (2000-2003)

- Real-estate bubbles (2003-2006)

- MBS, CDOs bubble (2004-2007) and stock market bubble (2004-2007)

- Commodities and Oil bubbles (2006-2008)

Didier Sornette and Ryan Woodard
Financial Bubbles, Real Estate bubbles, Derivative Bubbles, and the Financial and Economic Crisis (2009)
(http://arxiv.org/abs/0905.0220)

THE NASDAQ CRASH OF APRIL 2000

Internet stocks

The Internet stock index and non-Internet stock index the Nasdaq composite which are equally weighted.

1/2/1998-12/31/2002.

The two indexes are scaled to be 100 on 1/2/1998.

Non-Internet Stock Price Index

non-Internet stocks

Nasdaq value

Best fit
Third best fit

Log(Nasdaq Composite)

Date

Foreign capital inflow in the USA

Net capital inflow

Date

Growth of Money supply (M1)

No, Greenspan Was Not Right

How to create a disquilibria: drop real interest rates as productivity soars!

Y/Y Growth Rate of Nonfarm Business Productivity — Real Federal Funds Rate

http://macromarketmusings.blogspot.com/2009/02/no-greenspan-was-not-right.html   (Nick Rowe, 2009)
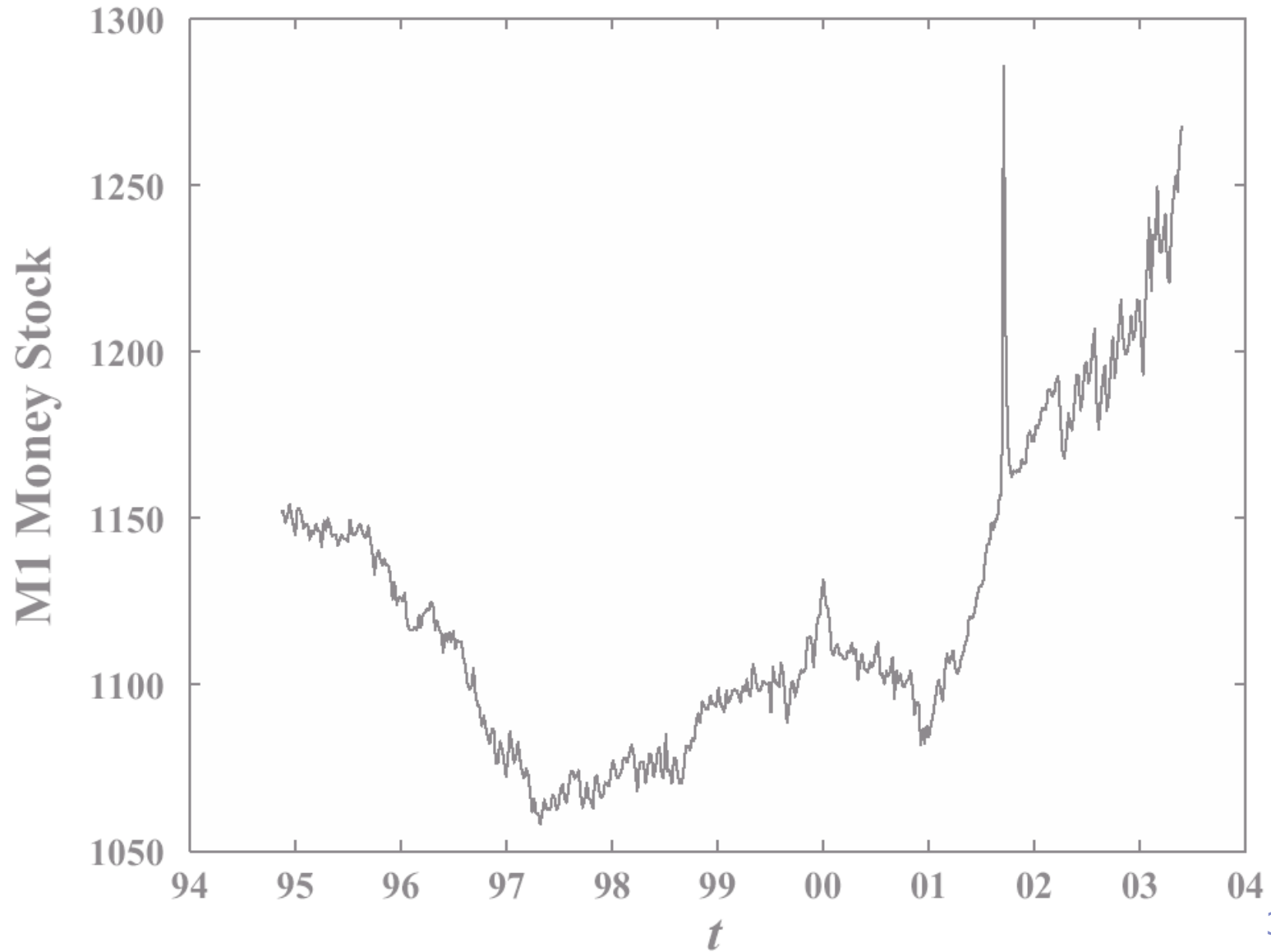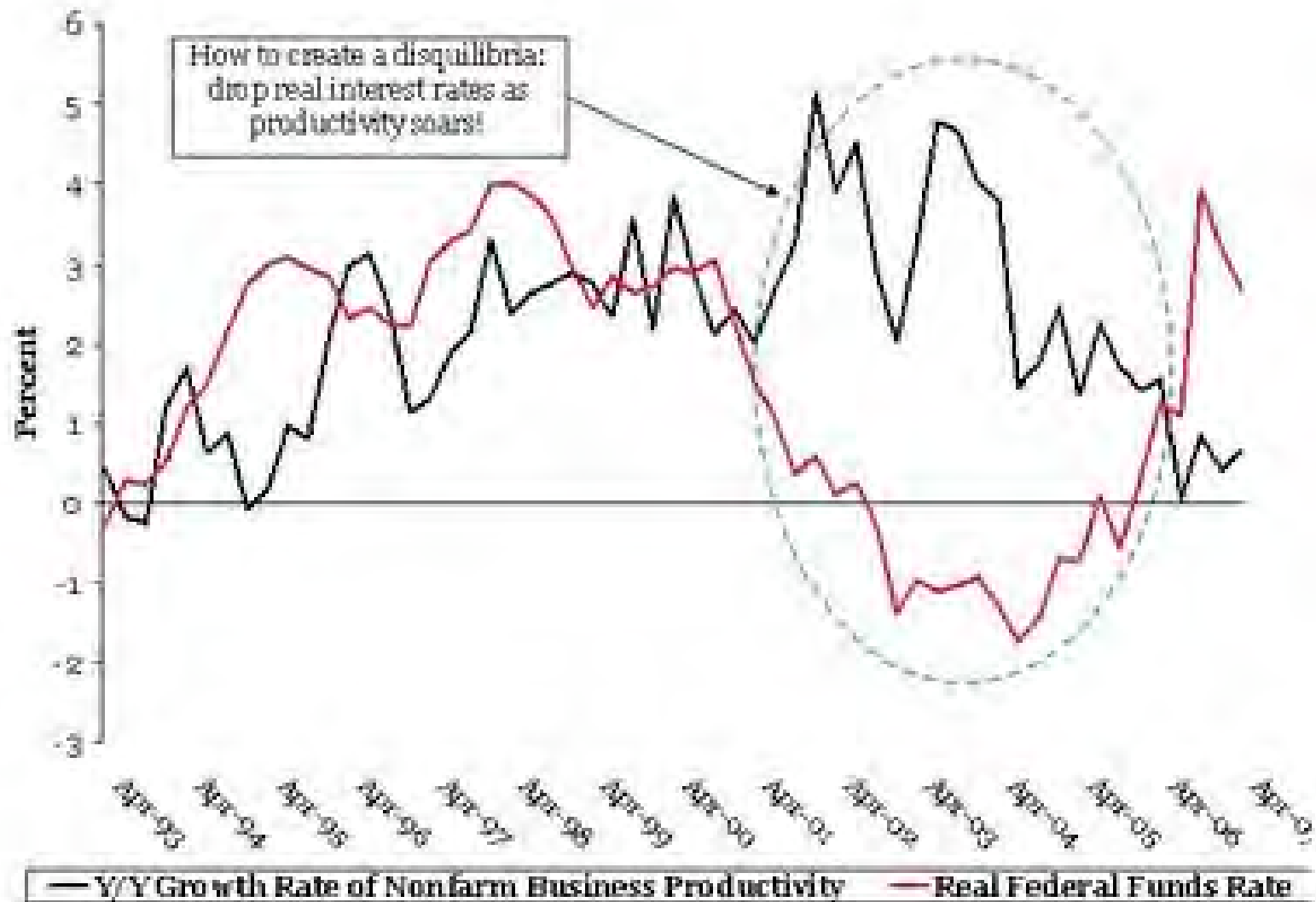
"SLAVING OF THE FED TO THE STOCK MARKET

W.-X. Zhou and D. Sornette, Physica A 337, 586-608 (2004)
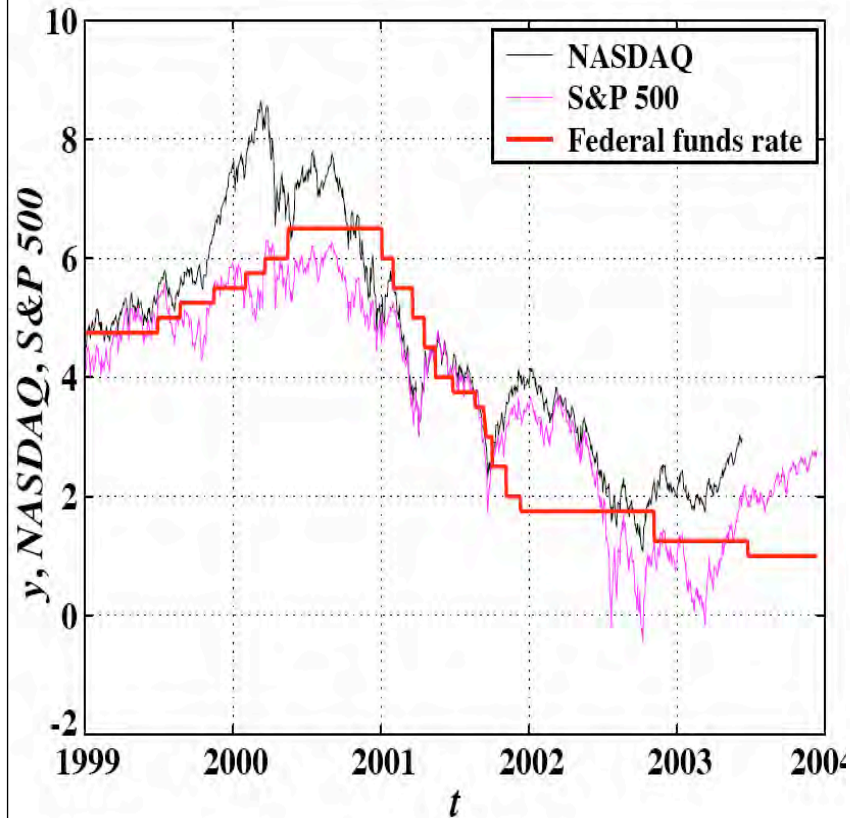
Comparison of the Federal funds rate, the S&P 500 Index x(t), and the NASDAQ composite z(t), from 1999 to mid-2003.

Causal Slaving of the U.S. Treasury Bond Yield by the Stock Market Antibubble of August 2000
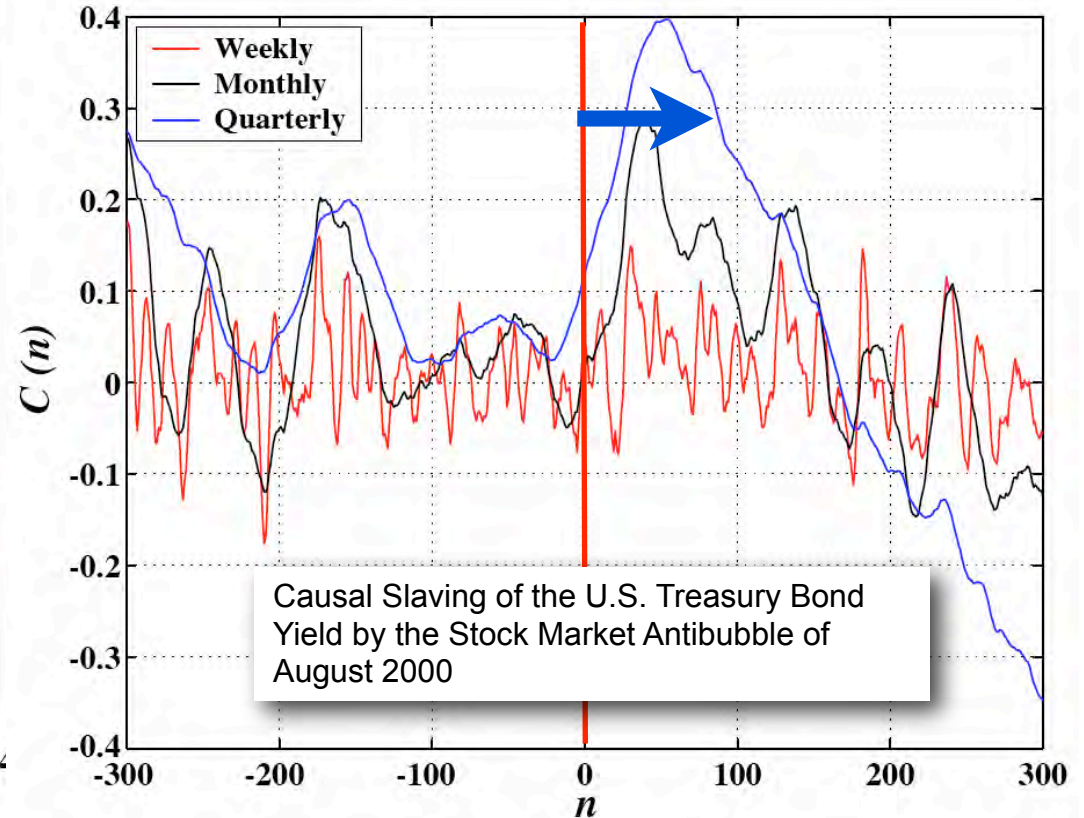
Cross-correlation coefficient C(n) between the increments of the logarithm of the S&P 500 Index and the increments of the Federal funds rate as a function of time lag n in days. The three curves corresponds to three different time steps used to calculate the increments: weekly, monthly and quarterly. A positive lag n corresponds to having the Federal funds rate posterior to the stock market.

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Real-estate bubbles

Percentage change in real housing prices 2002–2006

New Zealand, Spain, Denmark, France, U.S., Belgium, Ireland, Canada, Sweden, U.K., Finland, Australia, Norway, Italy, Netherlands, Switzerland, Germany, Japan

40

Real-estate in the UK
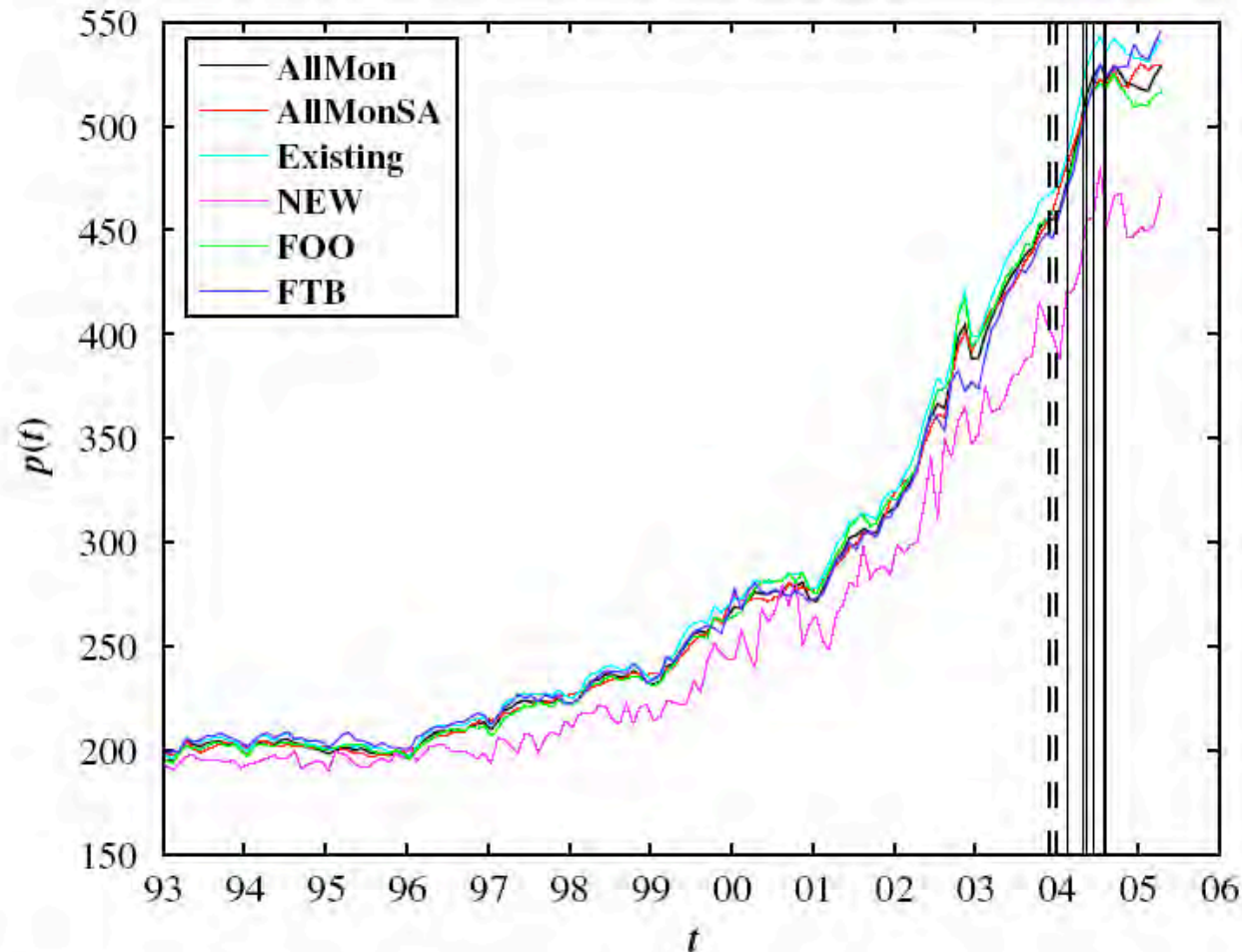
Fig. 1. (Color online) Plot of the UK Halifax house price indices from 1993 to April 2005 (the latest available quote at the time of writing). The two groups of vertical lines correspond to the two predicted turning points reported in Tables 2 and 3 of [1]: end of 2003 and mid-2004. The former (resp. later) was based on the use of formula (2) (resp. (3)). These predictions were performed in February 2003.

W.-X. Zhou, D. Sornette, 2000–2003 real estate bubble in the UK but not in the USA, Physica A 329 (2003) 249–263.

Real-estate in the USA
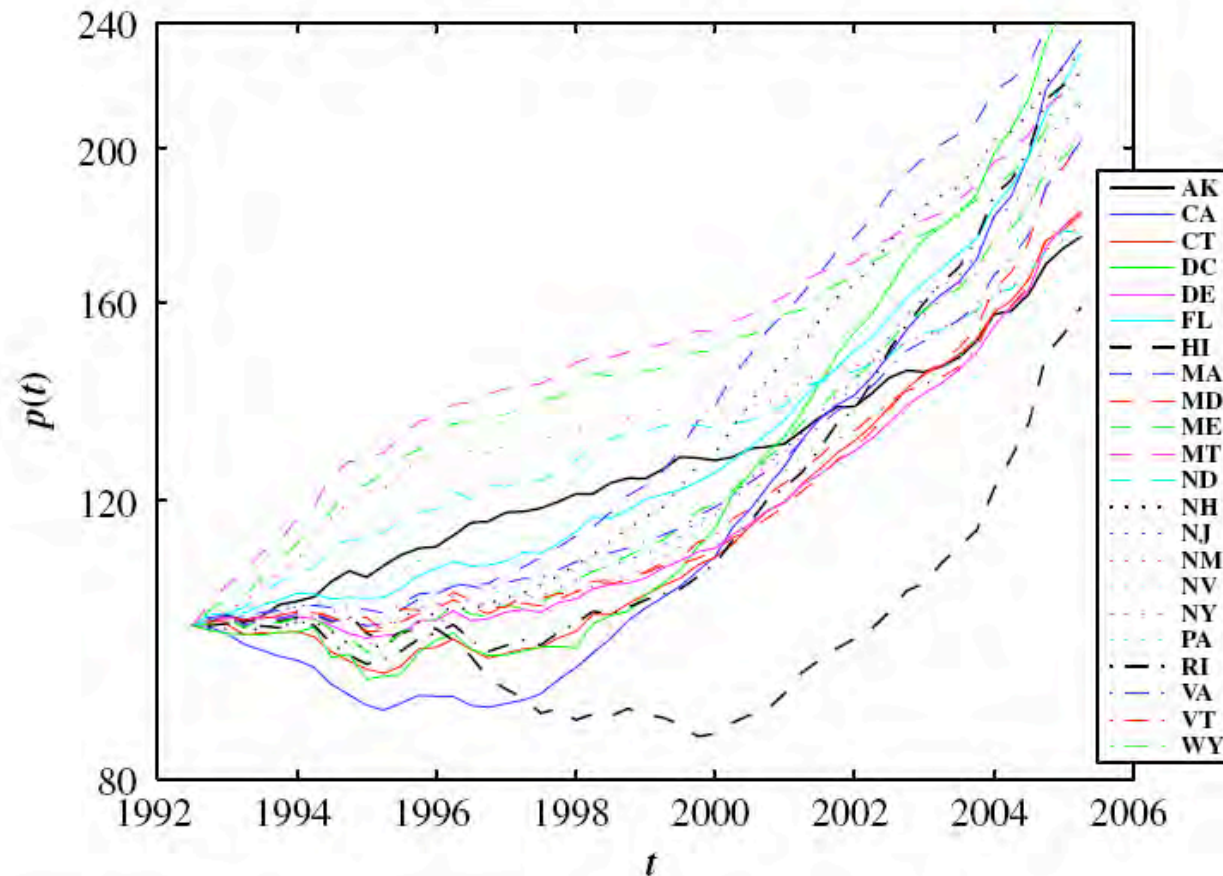
Fig. 5. (Color online) Quarterly average HPI in the 21 states and in the District of Columbia (DC) exhibiting a clear upward faster-than-exponential growth. For better representation, we have normalized the house price indices for the second quarter of 1992 to 100 in all 22 cases. The corresponding states are given in the legend.

W.-X. Zhou, D. Sornette / Physica A 361 (2006) 297–308

42

Our study in 2005 identifies the bubble states
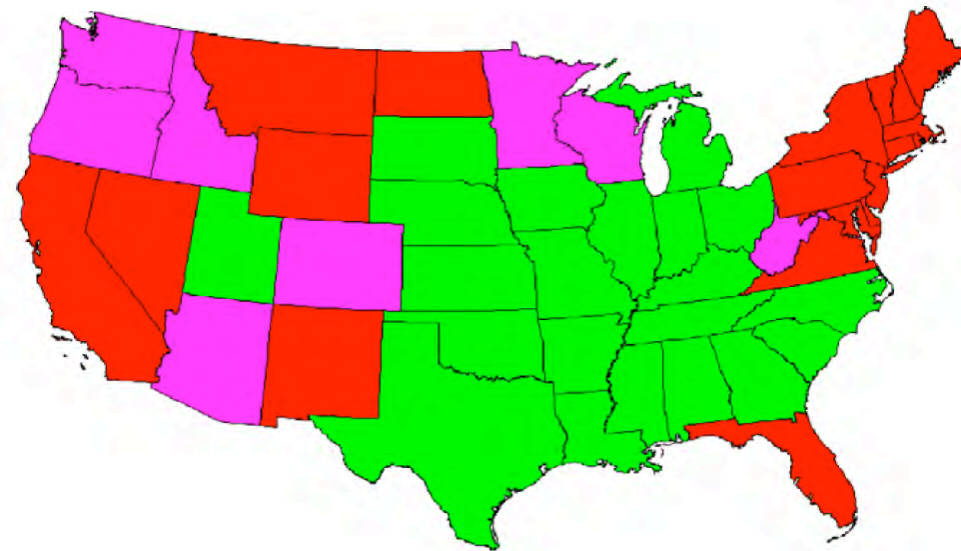
Local bubbles (Froths) of Housing Markets in US, 1998-2006

Inflation-Adjusted Home-Price Appreciation, 1998–2006
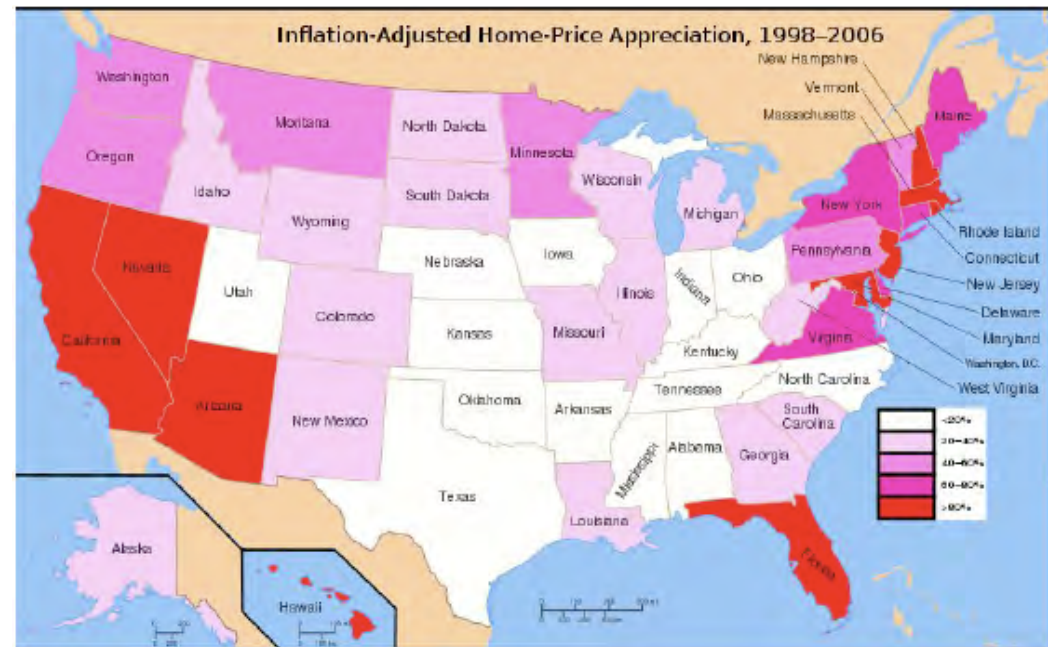
Securitization of non-financial assets (commodities, real-estate, credit)

One prominent financial figure held the greatest sway in debates about the regulation and use of derivatives — exotic contracts that promised to protect investors from losses, thereby stimulating riskier practices that led to the financial crisis. For more than a decade, the former Federal Reserve Chairman Alan Greenspan has fiercely objected whenever derivatives have come under scrutiny in Congress or on Wall Street. "What we have found over the years in the marketplace is that derivatives have been an extraordinarily useful vehicle to transfer risk from those who shouldn't be taking it to those who are willing to and are capable of doing so," Mr. Greenspan told the Senate Banking Committee in 2003. "We think it would be a mistake" to more deeply regulate the contracts, he added.

Estimated assets and market positions in the hedge-fund industry from 1990 to 2008

■ Estimated_Assets ■ Market_Positions

Subprime financial crisis
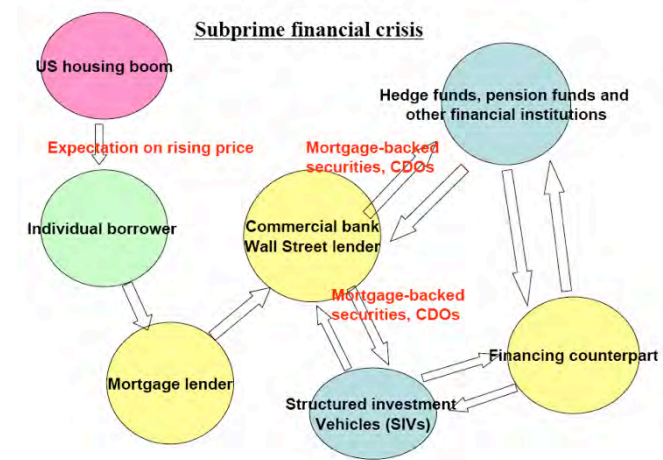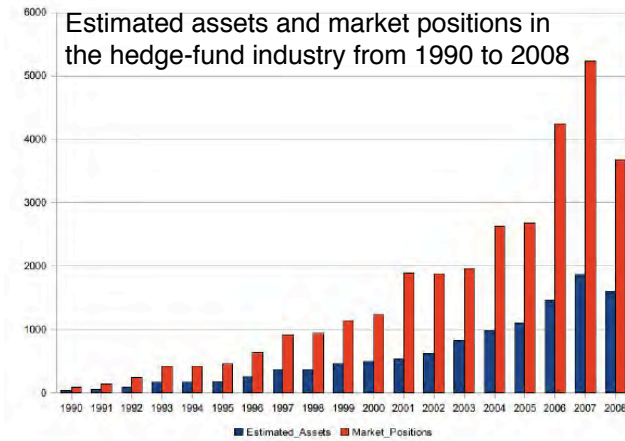
"Not only have individual financial institutions become less vulnerable to shocks from underlying risk factors, but also the financial system as a whole has become more resilient." — Alan Greenspan in 2004

THE GREAT MODERATION

Source: SIR JOHN GIEVE, Deputy Governor, Bank of England, Feb 2009

Variance of inflation

De jure gold standard
(1855-1913)

Floating of the pound to inflation targeting
(1972-1992)

Bretton Woods
(1948-1972)

Inter-war period
(1922-1939)

Inflation targeting
(1992-2004)

Variance of output

Density

— 150 years of data
— 10 years of data

Annual GDP Growth (%)
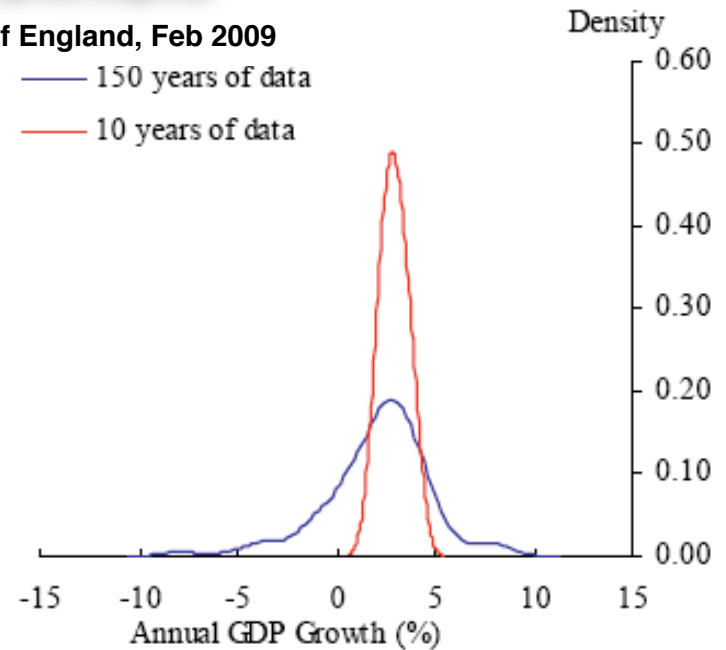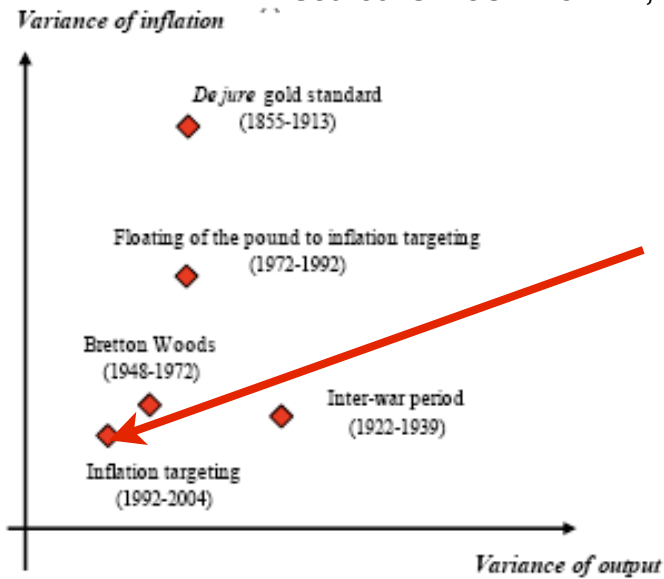
Notes: Shaded bars indicate recessions. The dashed red line indicates the onset of the current recession. Volatility is computed using deviations of the GDP growth rate from a constant mean and a GARCH (1,1) with a 0.729 first-order serial correlation.
Sources: Bureau of Economic Analysis; authors' calculations.
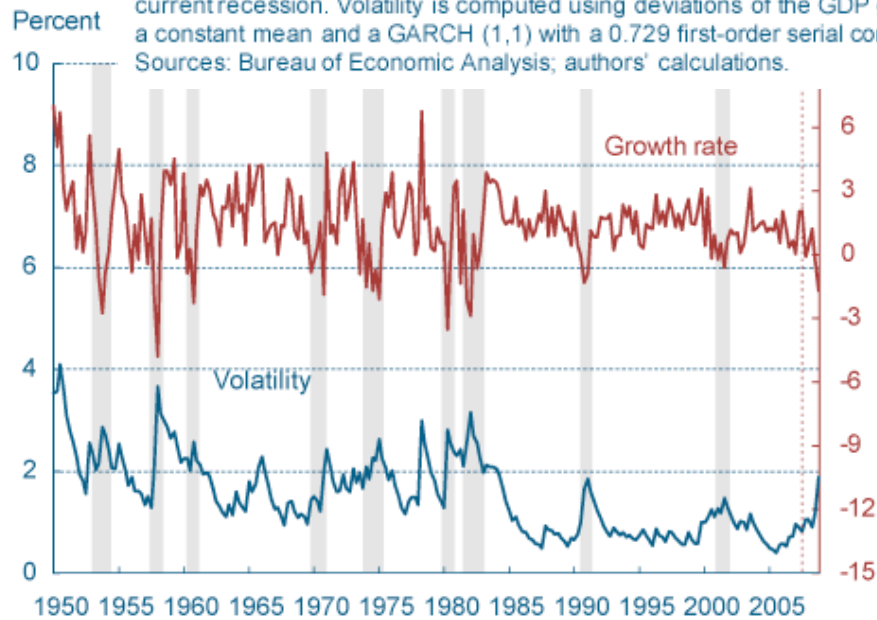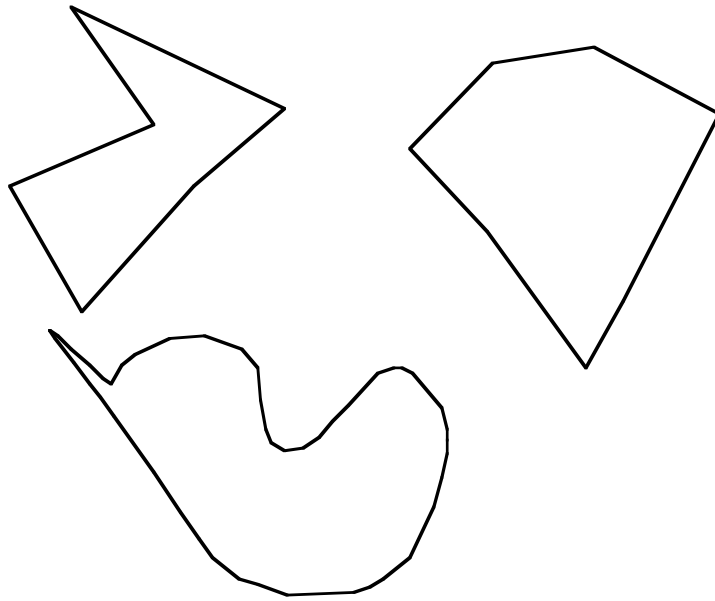
Percent

Growth rate

Volatility

The "Great Moderation"

Percent
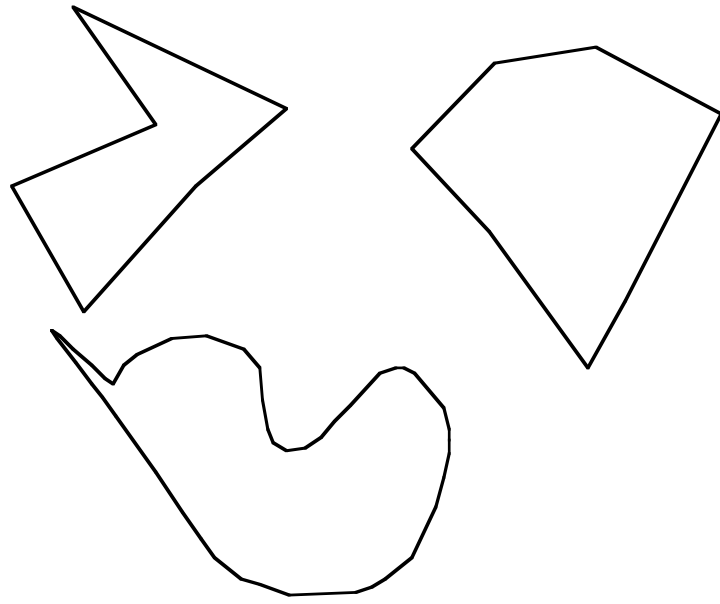
Separation of financial and credit risks

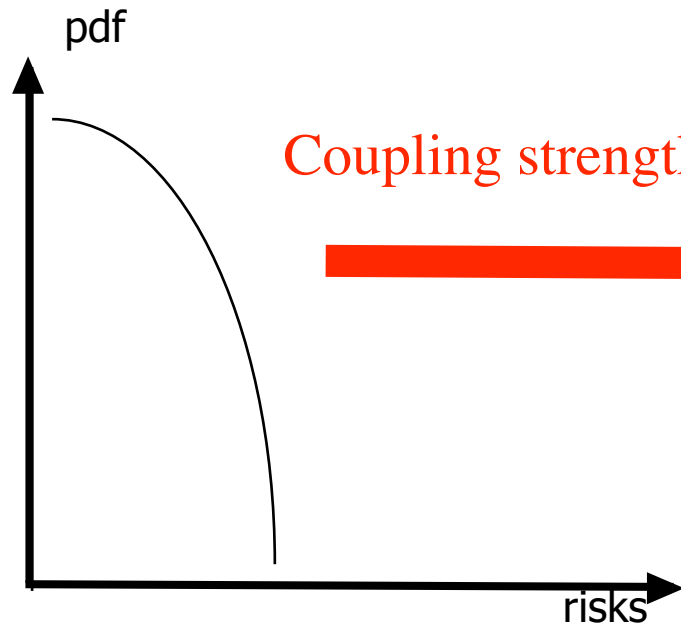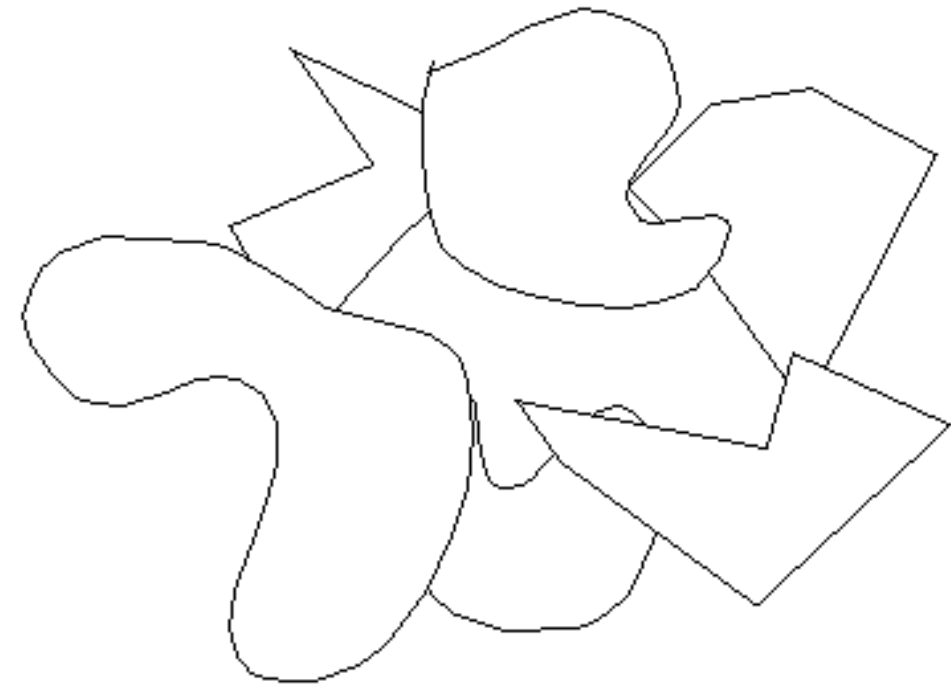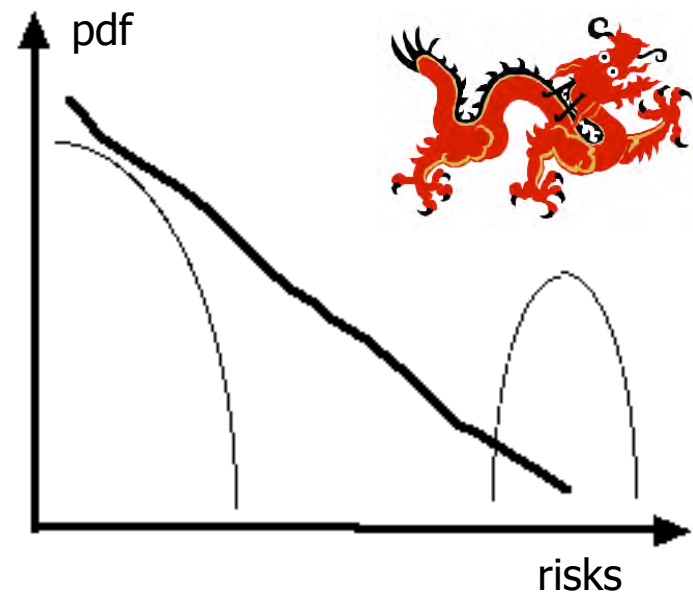Securitization leads to larger inter-connectivity

pdf

Coupling strength increases

risks

pdf
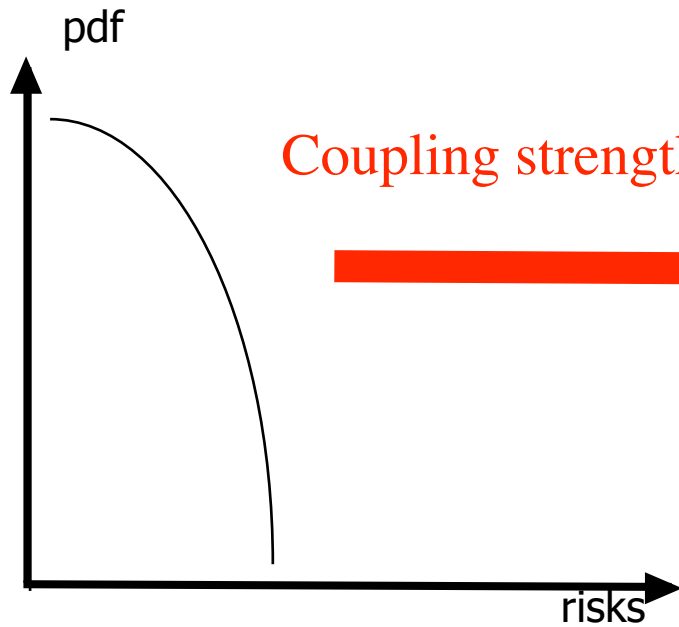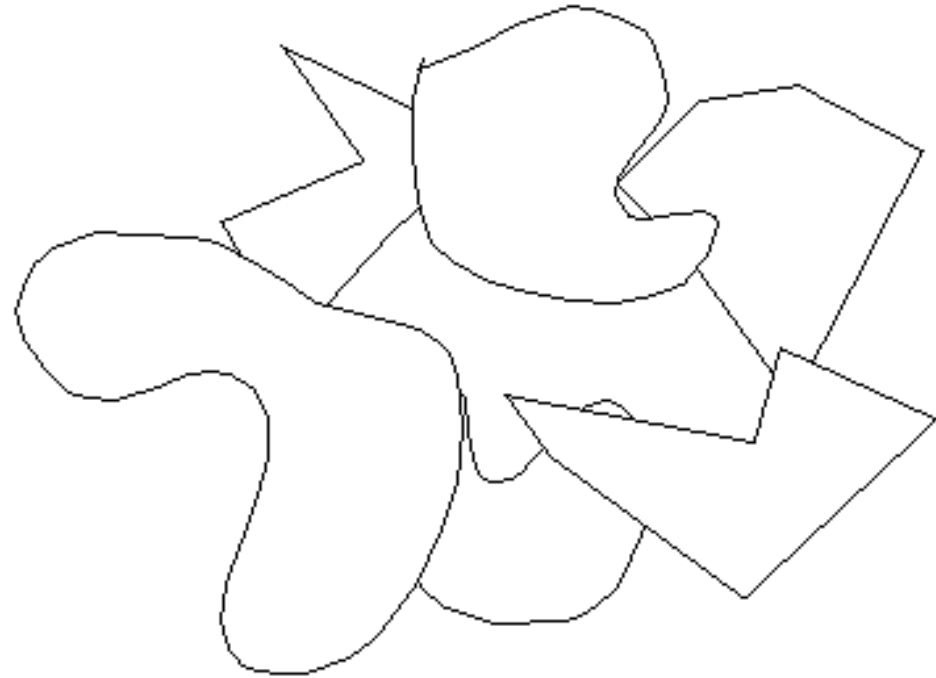
risks

Separation of financial and credit risks

Securitization leads to larger inter-connectivity

pdf

Coupling strength increases

pdf
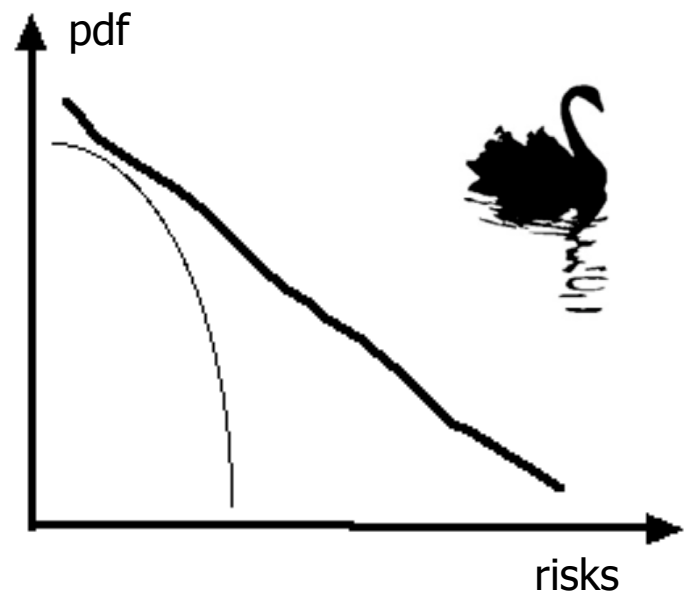
risks

risks

- W. Brock, C. Hommes and F. Wagener (2006) More hedging instruments may destabilize markets (Need for learning to invest optimally increases without bound with market completeness)

- M. Marsili (2008) Spiraling toward complete markets and financial instability (General Equilibrium framework with heterogeneous portfolios with utility maximization: global instability from "soft-modes" associated with global symmetry appearing due to completeness (=replication))

- S. Battiston, Gatti, D. D., Gallegati, M., Greenwald, B. C. N. & Stiglitz, J. E. (2009) Liaisons Dangereuses: Increasing Connectivity, Risk Sharing and Systemic Risk (network of firms and cascades of defaults)
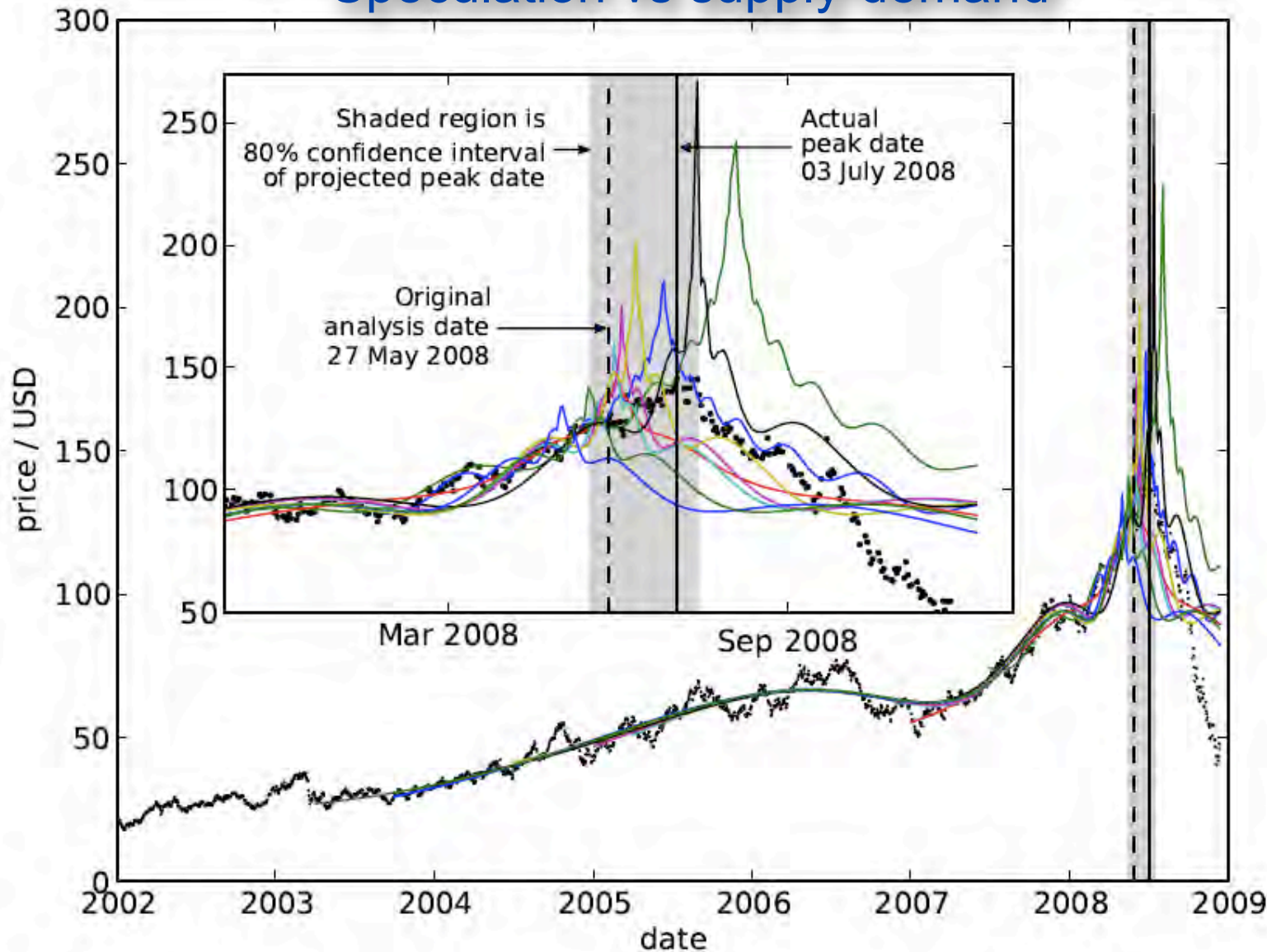
source: FCO, ETH Zurich
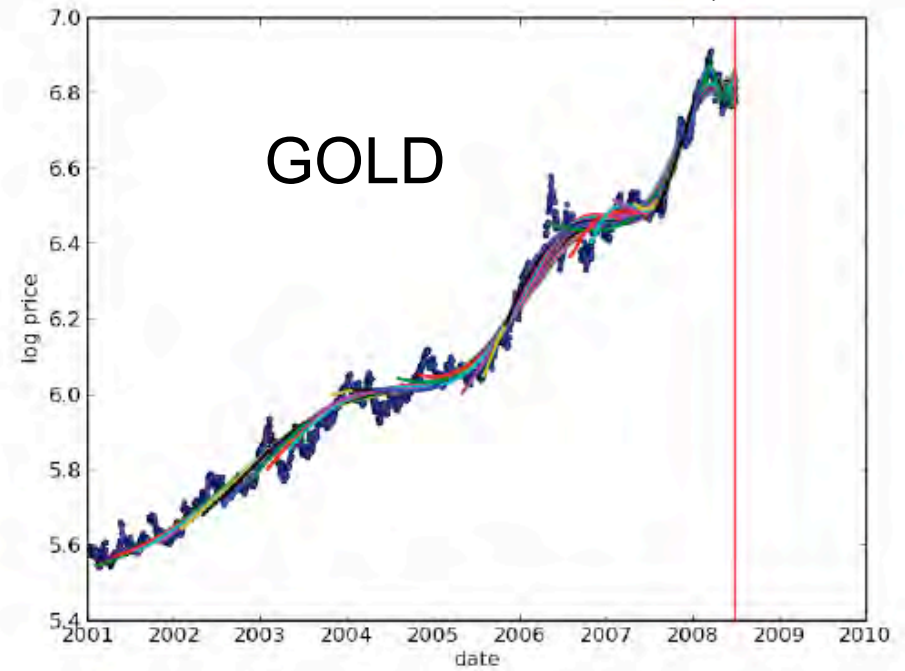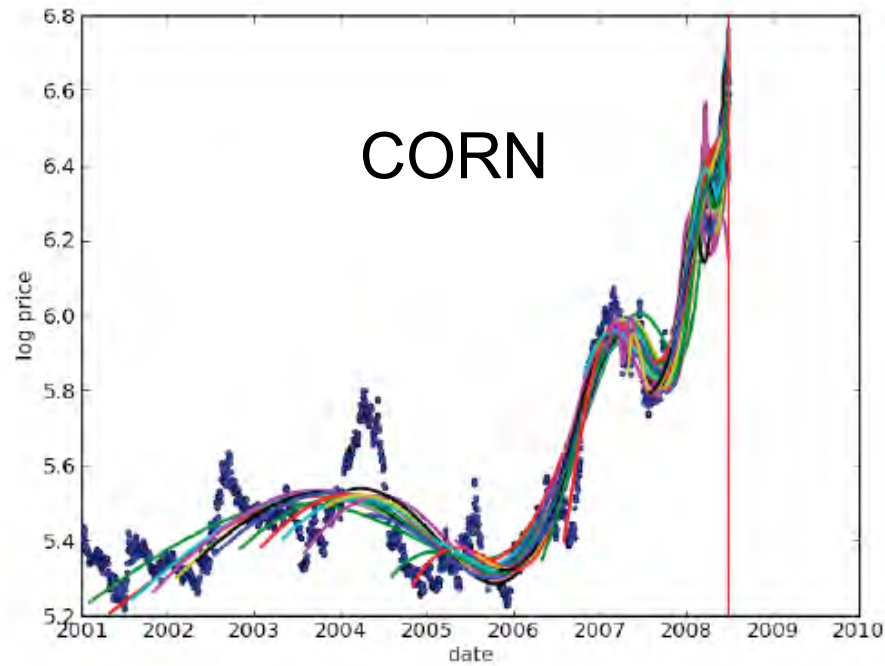
R.Woodard and D.Sornette (2008)
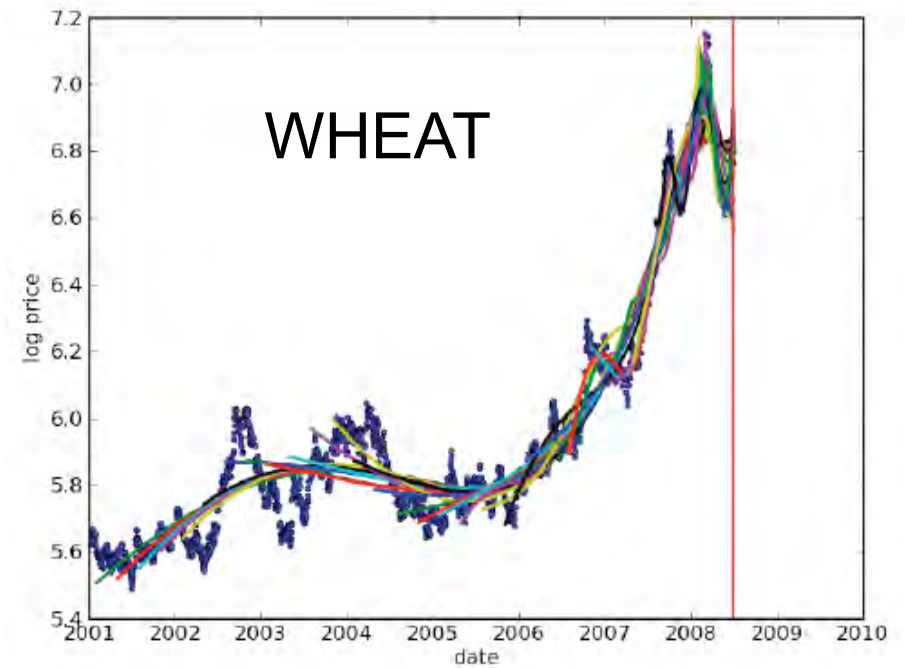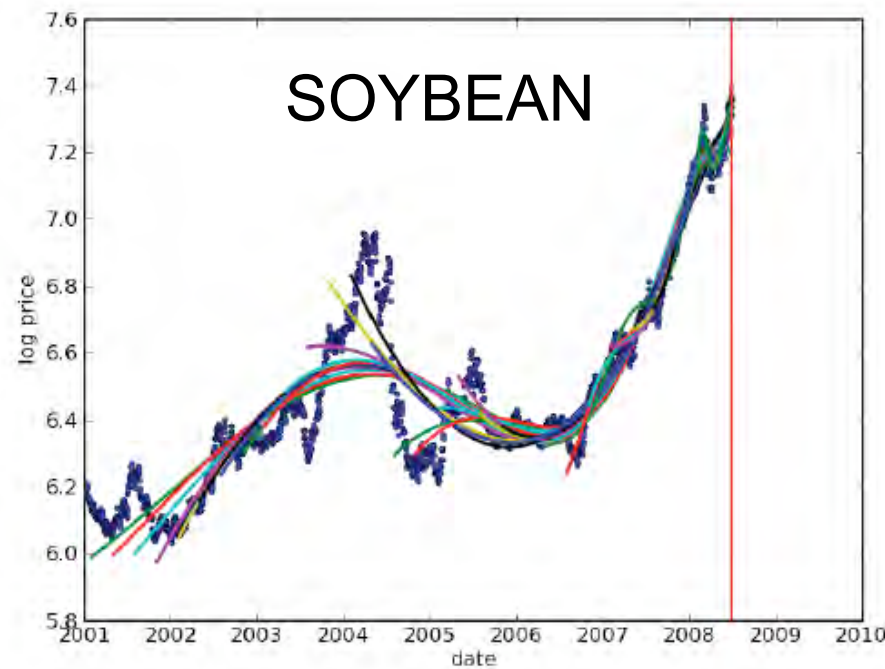
2006-2008 Oil bubble
Speculation vs supply-demand

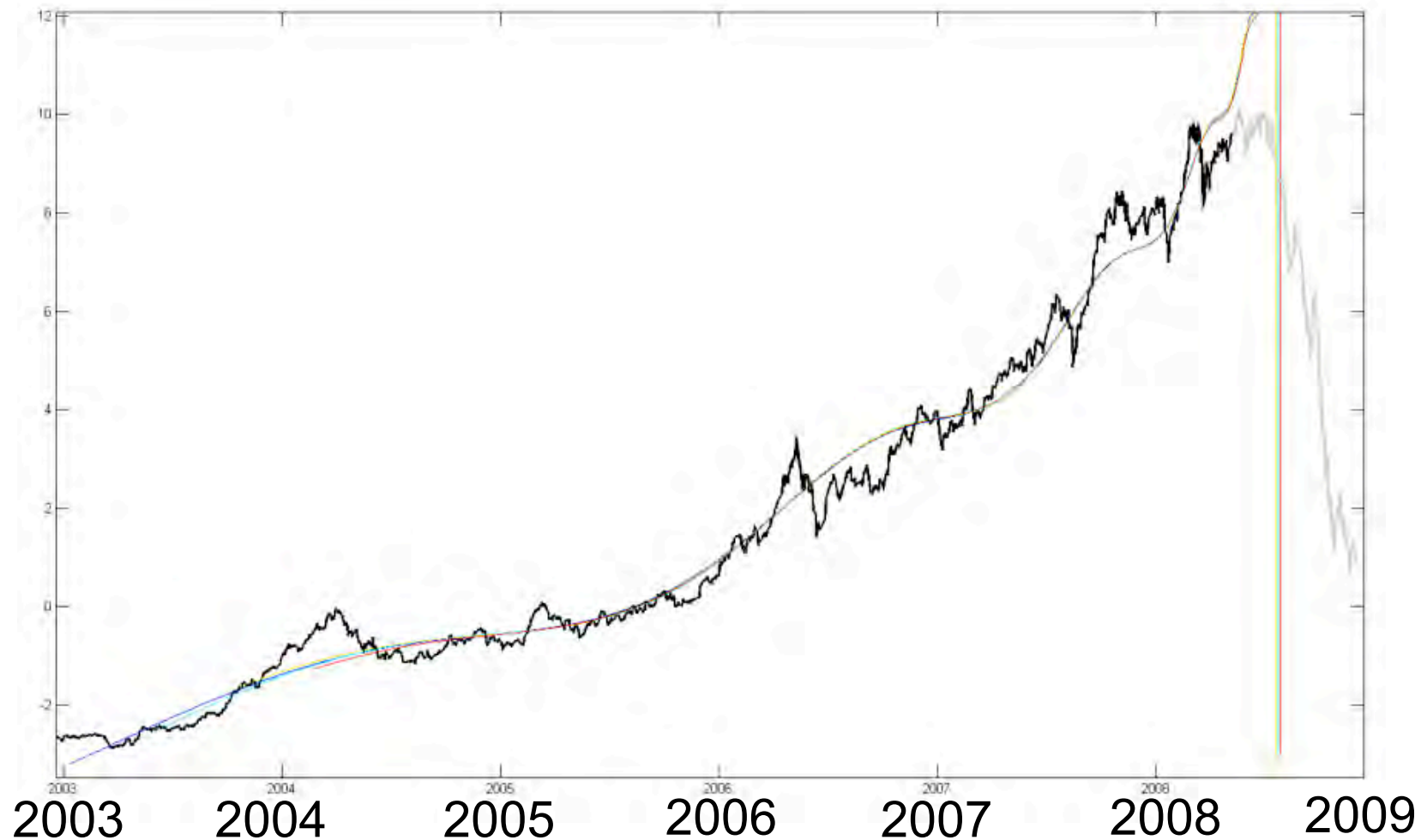D. Sornette, R. Woodard and W.-X. Zhou, The 2006-2008 Oil Bubble and Beyond, Physica A 388, 1571-1576 (2009) (arXiv.org/abs/0806.1170)

Typical result of the calibration of the simple LPPL model to the oil price in US$ in shrinking windows with starting dates t_{start} moving up towards the common last date t_{last} = May 27, 2008.

Index price vs. time, S&P 500

bubble peaking in Oct. 2007

Source: R. Woodard (FCO, ETH Zurich)

The Global BUBBLE

2003   2004   2005   2006   2007   2008   2009
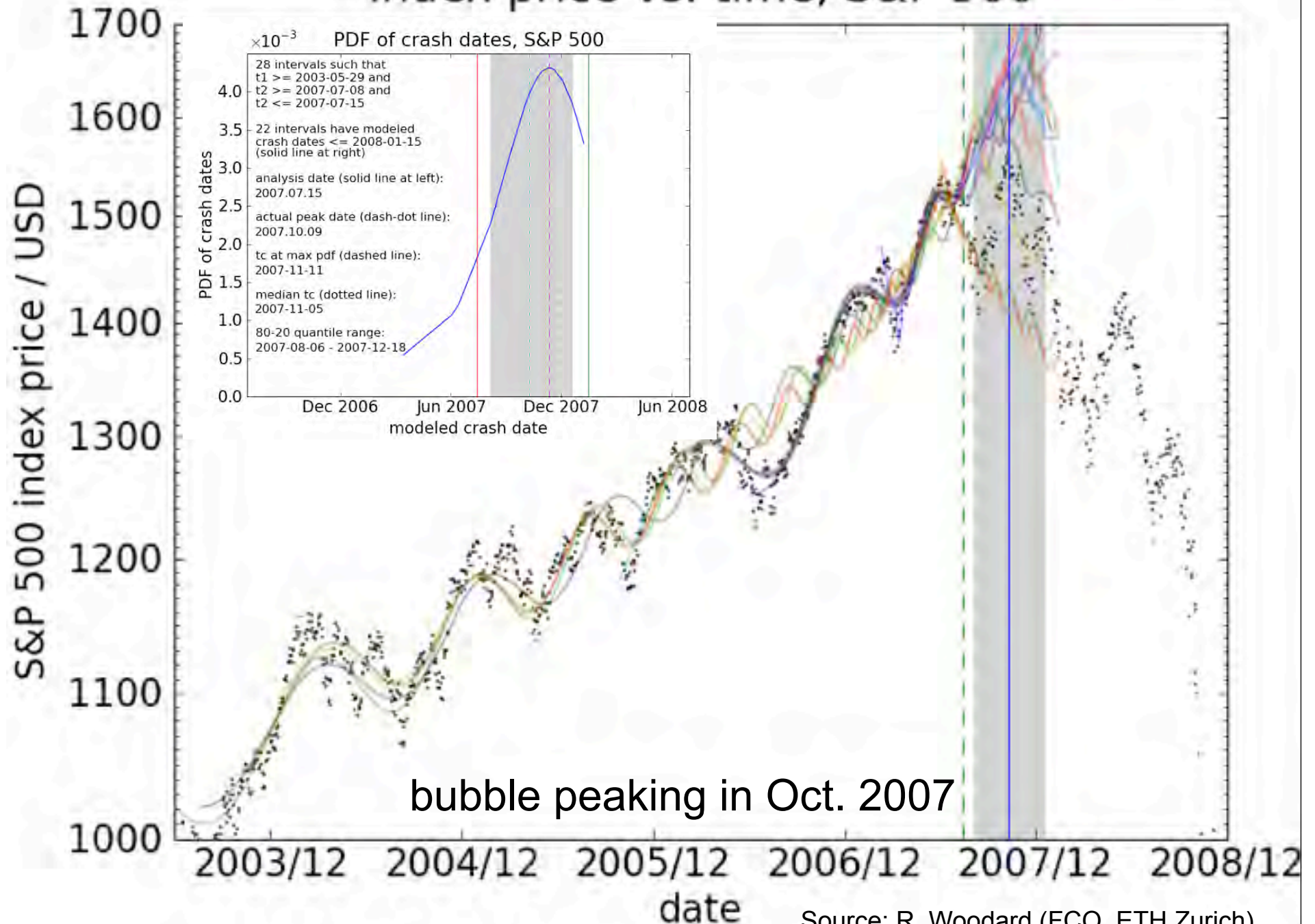
PCA first component on a data set containing, emerging markets equity indices, freight indices, soft commodities, base and precious metals, energy, currencies...

(Peter Cauwels FORTIS BANK - Global Markets)

In summary

Each excess is partially "solved" by the subsequent excess... leading to a succession of
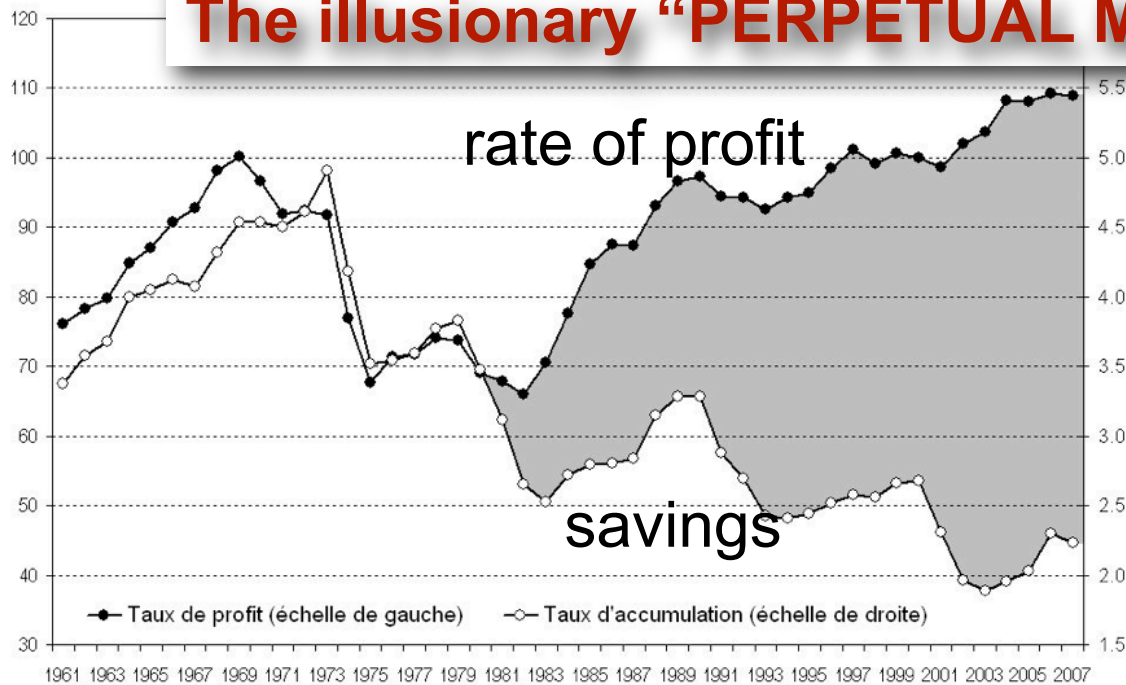-unsustainable wealth growth
-instabilities

The present crisis+recession is the consolidation after this series of unsustainable excesses.

One could conclude that the extraordinary severity of this crisis is not going to be solved by the same of implicit or explicit "bubble thinking".

"The problems that we have created cannot be solved at the level of thinking that created them." Albert Einstein

The illusionary "PERPETUAL MONEY MACHINE"

rate of profit

savings

— Taux de profit (échelle de gauche)   —○— Taux d'accumulation (échelle de droite)

Rate of profit and rate of accumulation: The United States + European Union + Japan
* Rate of accumulation = rate of growth rate of the net volume of capital * Rate of profit = profit/capital (base: 100 in 2000)

Sources and data of the graphs: http://hussonet.free.fr/toxicap.xls
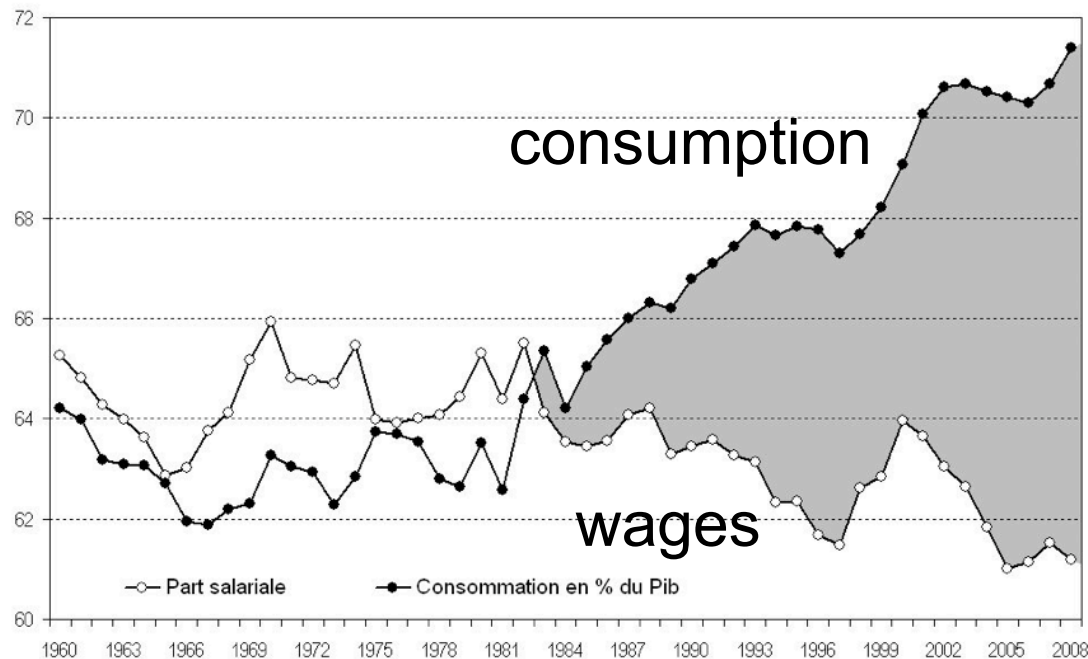
Thee gap widens between the share of wages and the share of consumption (gray zones), so as to compensate for the difference between profit and accumulation. FINANCE allows increasing debt and virtual wealth growh... which can only be transitory (even if very long).

consumption

wages

—○— Part salariale   —●— Consommation en % du Pib

United States Share of wages and of private consumption in Gross Domestic Product (GDP)
Source of data and graphics: http://hussonet.free.fr/toxicap.xls

Wealth Extraction

Over the past decade and a half, (B - F) has been closely correlated with realized capital gains on the sale of homes. B-F=change in home equity debt outstanding less unscheduled repayment on RMDO

Mortgage Equity Withdrawal impact on GDP
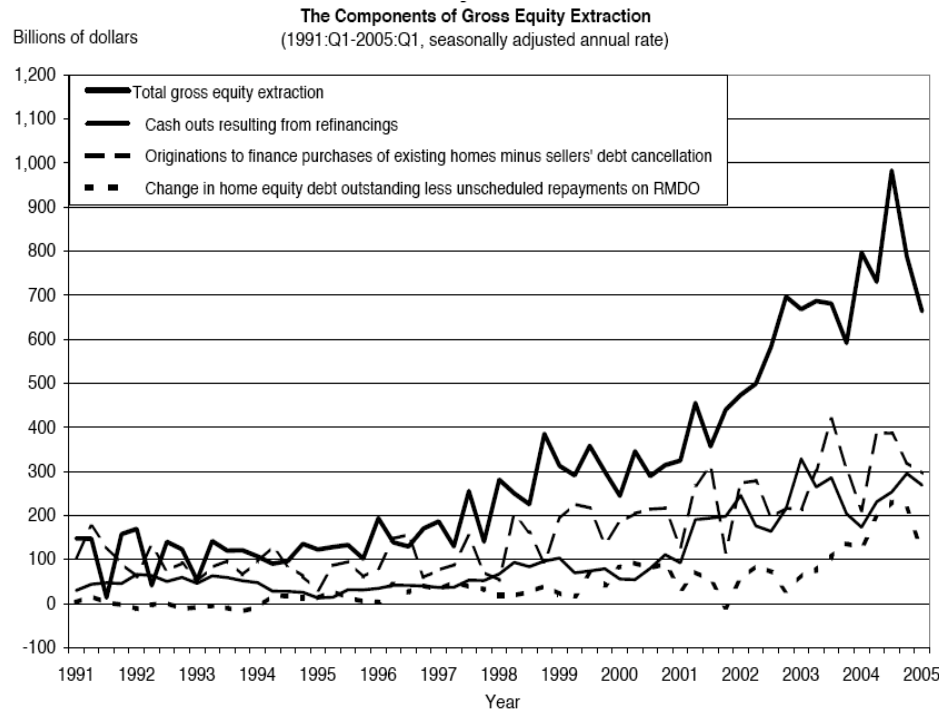
Alan Greenspan and James Kennedy (Nov. 2005)
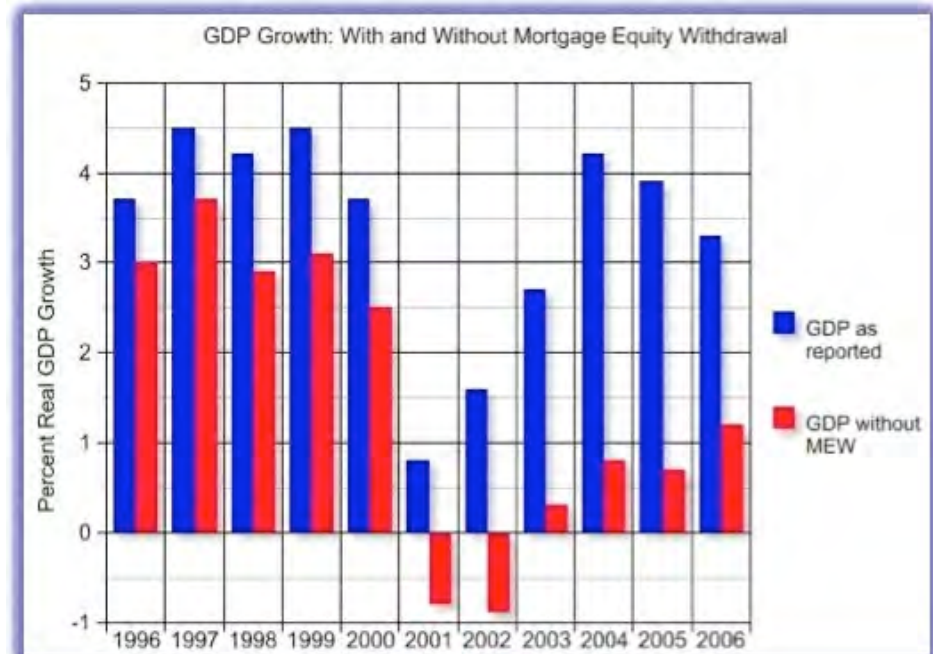
source: John Mauldin (April 09)

Financial investments accounted for >1/3 of corporate profits

Real Corporate Profits

After-tax domestic corporate profits with inventory and capital cost adjustments

— nonfinancial corps   — financial corps
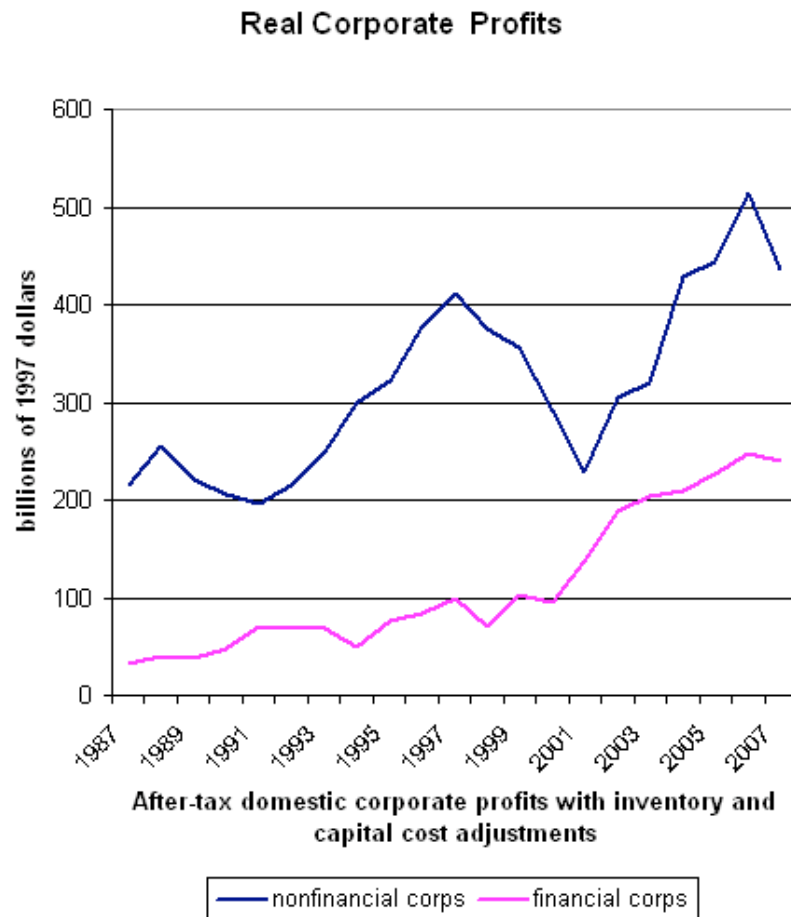
Source: Philippon, 2008

Michael Mandel

The illusionary "PERPETUAL MONEY MACHINE"

- An economy which grows at 2 or 3 per cent cannot provide a universal profit of 15 per cent, as some managers of equities claim and many investors dream of.

- Financial assets represent the right to a share of the surplus value that is produced. As long as this right is not exercised, it remains virtual. But as soon as anyone exercises it, they discover that it is subject to the law of value, which means, quite simply, that you cannot distribute more real wealth than is produced.

The Narrow Corridor of US Real GDP

3% Trend from 1970 to 2006
with +- 3% error bands
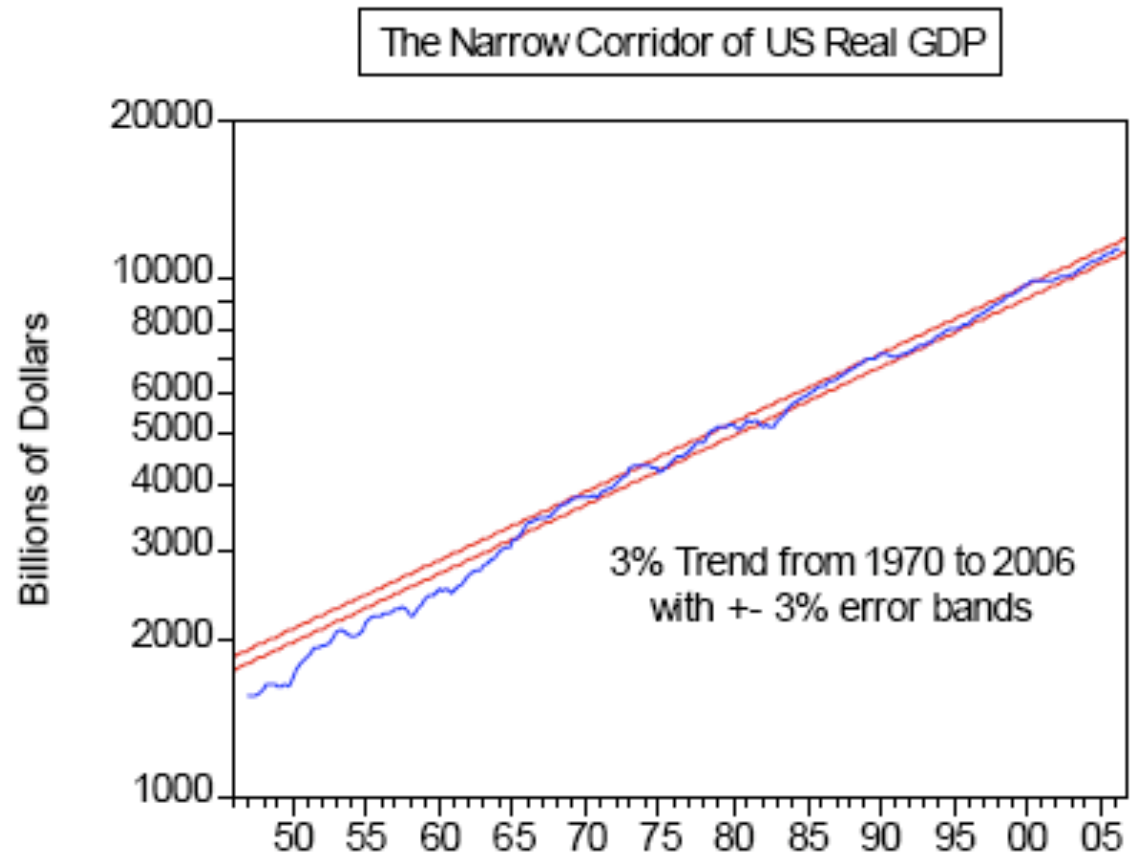
From 1982 until 2007, the U.S. only experienced two shallow recessions that each lasted just 8 months. This stretch of 25 years may be the best 25 years in the US economic history. But much of this prosperity was bought with debt, as the ratio of debt to GDP rose from $1.60 to $3.50 for each $1.00 of GDP.

- Putting financial and economic crises in context: a brief history of instabilities in financial and global markets

- Dragon-kings versus black swans

- Mechanism(s) at the origin of financial crises

- Precursors and predictability of financial instabilities

- Applications to the 5 successive bubbles leading to the 2007-2009 global crisis; CDS swap bubbles, Shanghai SSE composite bubble, and so on

- **Investment opportunities, (strategic + tactical) time varying risks**

Absence of fundamental change

-March-August 09 equities rally esp. based on financials that have reported excellent Q1 figures based on trading (root of the actual problem), there is a lot to be told about that...

- financial institutions accounting is more opaque and creative as ever, just look at the recent changes, launched, actually in order to solve the problem (which roots again in creativity of frying air).

- TARP and PPIP are launched in order to artificially pump up asset prices based on leverage and asymmetric upside downside risk taking (investors vs tax payers) - again the roots of the current crisis.

TARP: trouble asset release program
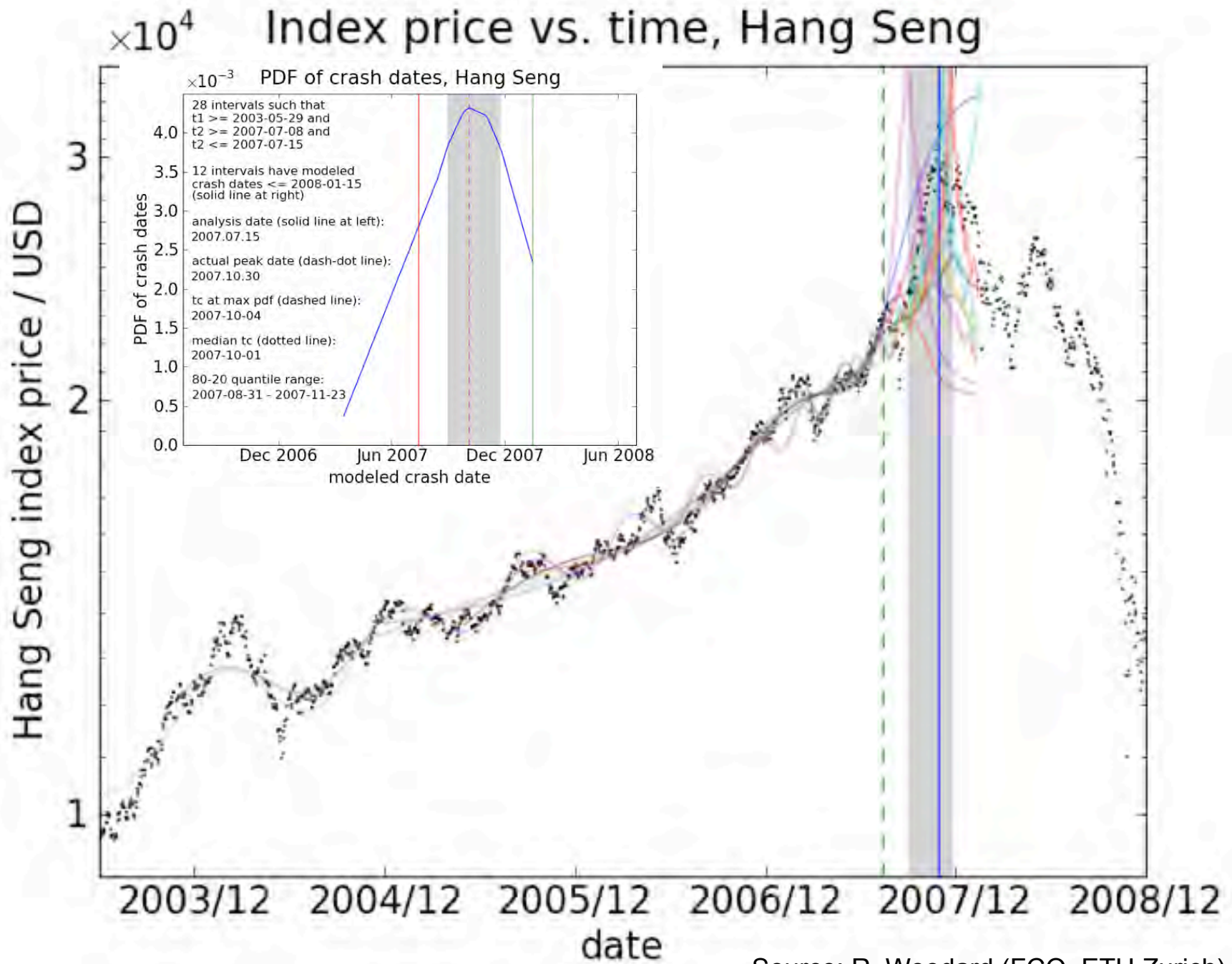PPIP: public-private investment program

August 2009

Impact on risk allocation in portfolios and portfolio optimization (II)

- ## Diagnostic of Dragons
  (out of equities in Dec. 2007)

  Diagnostic of impending crisis is <u>possible</u>

Need to combine

strategic + tactical + time-varying risk analysis

Index price vs. time, Hang Seng

×10⁴

3

2

1

2003/12   2004/12   2005/12   2006/12   2007/12   2008/12

Hang Seng index price / USD

date

PDF of crash dates, Hang Seng

×10⁻³

28 intervals such that
t1 >= 2003-05-29 and
t2 >= 2007-07-08 and
t2 <= 2007-07-15

12 intervals have modeled
crash dates <= 2008-01-15
(solid line at right)

analysis date (solid line at left):
2007.07.15

actual peak date (dash-dot line):
2007.10.30

tc at max pdf (dashed line):
2007-10-04

median tc (dotted line):
2007-10-01

80-20 quantile range:
2007-08-31 – 2007-11-23

4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0

PDF of crash dates

Dec 2006   Jun 2007   Dec 2007   Jun 2008

modeled crash date

Source: R. Woodard (FCO, ETH Zurich)

The Chinese Equity Bubble: Ready to Burst

K. Bastiaensen, P. Cauwels, D. Sornette, R. Woodard and W.-X. Zhou

July 10, 2009   (http://arxiv.org/abs/0907.1827)

t1_min: 2008-10-15
t2_min: 2009-07-08
t2_max: 2009-07-09
peak date: 2009-07-06
20/80 q: 2009-7-17/2009-7-27
All 10 fits: 2009-7-10/2009-8-10
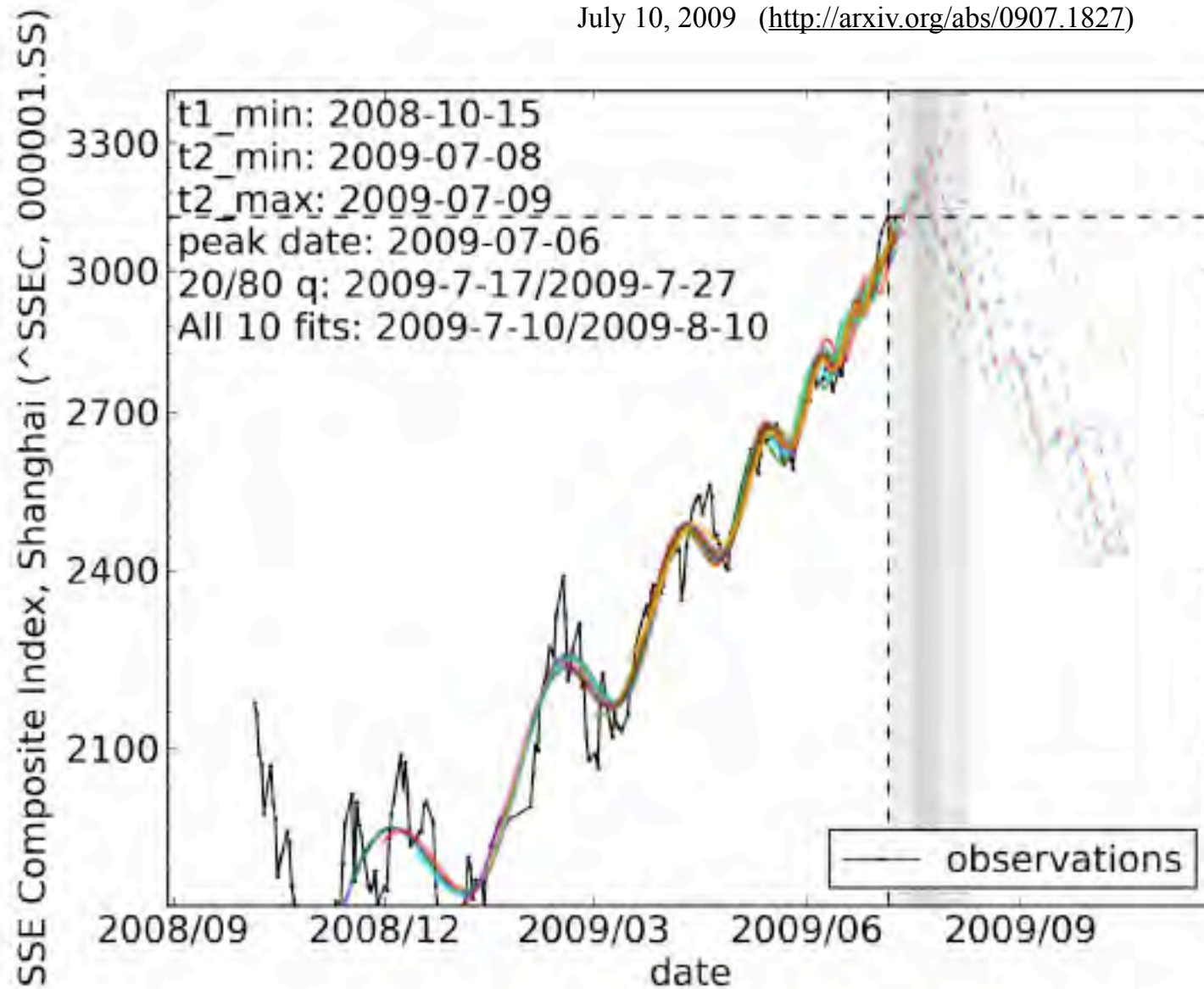
Figure 1: Shanghai Composite Index with LPPL result.

Jun 02, 2009 – Sep 01, 2009   -37.56 (-1.38%)

3400

3200

3000

2800

Jun 2009   Jul 2009   Aug 2009

a Financial Crisis Observatory

www.er.ethz.ch/fco

ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

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Financial Crisis Observatory

Financial Crisis Observatory
Description
Highlights
Is there an oil bubble?
Pertinent articles
Websites and Blogs
Market Anxiety Measures

The Financial Crisis Observatory (FCO) is a scientific platform aimed at testing and quantifying rigorously, in a systematic way and on a large scale the hypothesis that financial markets exhibit a degree of inefficiency and a potential for predictability, especially during regimes when bubbles develop.

Current analysis and forecasts
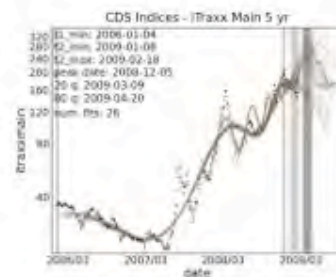
CDS (19 February 2009)
Our analysis has been performed on data kindly provided by Amjed Younis of Fortis on 19 February 2009. It consists of 3 data sets: credit default swaps (CDS); German bond futures prices; and spread evolution of several key euro zone sovereigns. The date range of the data is between 4 January 2006 and 18 February 2009. Our log-periodic power law (LPPL) analysis shows that credit default swaps appear bubbly, with a projected crash window of March-May, depending on the index used. German bond futures and European sovereign spreads do not appear bubbly. (See report for more information.)

OIL (27 May 2008)
Oil prices exhibited a record rise followed by a spectacular crash in 2008. The peak of $145.29 per barrel was set on 3 July 2008 and a recent low of $40.81 was scraped on 5 December, a level

Questions?

- How to measure risks? Illusion of low risks...

- Moral hazard and conflict of interest

- Development of culture of integrity and ethical behavior (informed by behavioral psychology)

- Melting the cash-flow freeze (ex: WIR direct network banking in Switzerland (www.wir.ch))

- Preventing other financial bubbles: a new definition of inflation for macro and monetary policies (Financial Ratio Index (FRI), total fixed assets + working capital, excess supply of money...)

- Regulations: illusion of control and law of unintended consequences

- How to preserve innovations/creativity while mastering instabilities?

Further Reading

T. Kaizoji and D. Sornette, Market Bubbles and Crashes, in press in the Encyclopedia of Quantitative Finance (Wiley, 2008)
(preprint at http://arxiv.org/abs/0812.2449)

D. Sornette and R. Woodard Financial Bubbles, Real Estate bubbles, Derivative Bubbles, and the Financial and Economic Crisis
(preprint at http://arxiv.org/abs/0905.0220) will appear in the Proceedings of APFA7 (Applications of Physics in Financial Analysis, http://www.thic-apfa7.com/en/htm/index.html)

Didier Sornette, Why Stock Markets Crash
(Critical Events in Complex Financial Systems)
Princeton University Press, January 2003

Y. Malevergne and D. Sornette, Extreme Financial Risks (From Dependence to Risk Management) (Springer, Heidelberg, 2006).