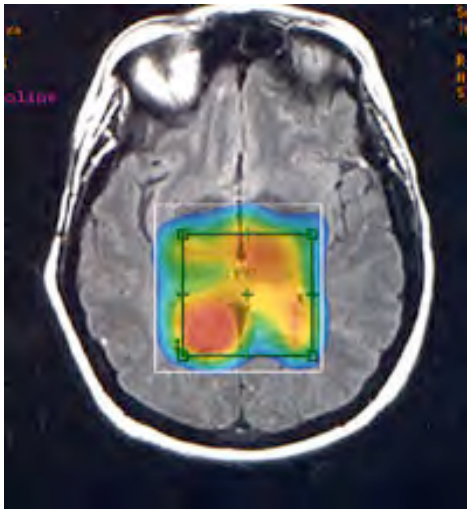
Fundamental economic and financial changes
and
the need for changes to long-term investment approaches



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www.er.ethz.ch

Statements I

- The financial system
  - = large number of heterogeneous agents without symmetry
  - → the mean-field model of the representative agent is completely wrong.
- Market Participants are
  - Not equally informed,
  - Not taking rational decisions,
  - Do not process available information in the same way

→ False belief that there are only small fluctuations about equilibrium, except for some significant exogenous impacts.

→ Instead, there are recurrent huge endogenous fluctuations.

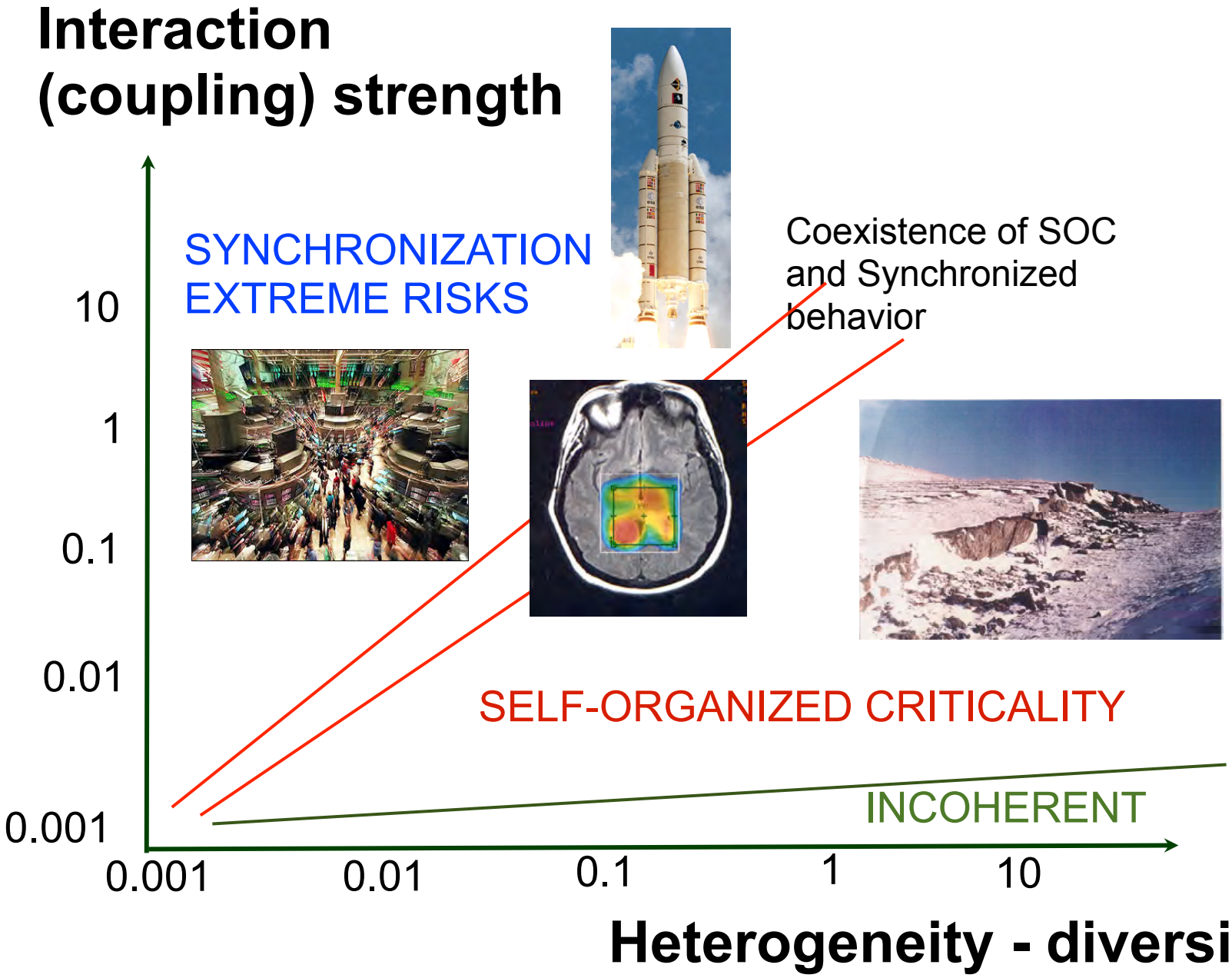
(E.g., Black Monday in 1987 was a 20+ sigma event!)

Statements II

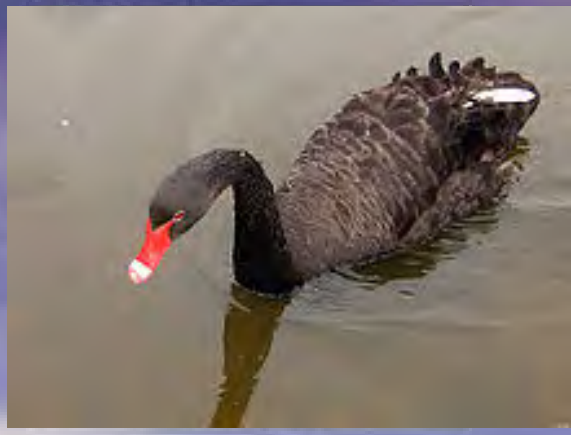
Finally, since 2007 a new understanding is starting to develop

- Collective effects such as Bubbles, herding, panics, exuberance:
  - are the consequence of strong complicated and yet to be fully understood interactions
- The system is
  - global,
  - cannot naturally be cut into parts,
  - It has a multi-attractor structure with several metastable states (various financial, economic, or political regimes)
  - It is sensitive to initial and boundary conditions, all kinds of control parameters, path dependence effects

Generic diagram for coupled agents with threshold dynamics

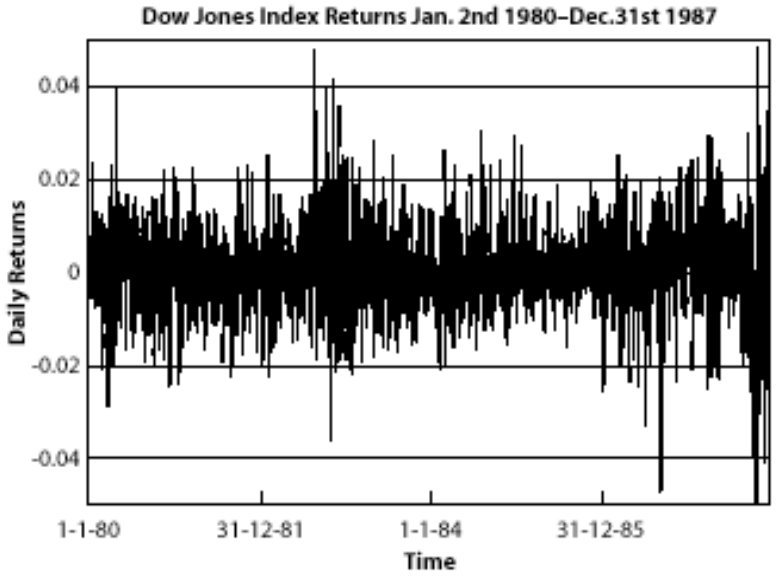


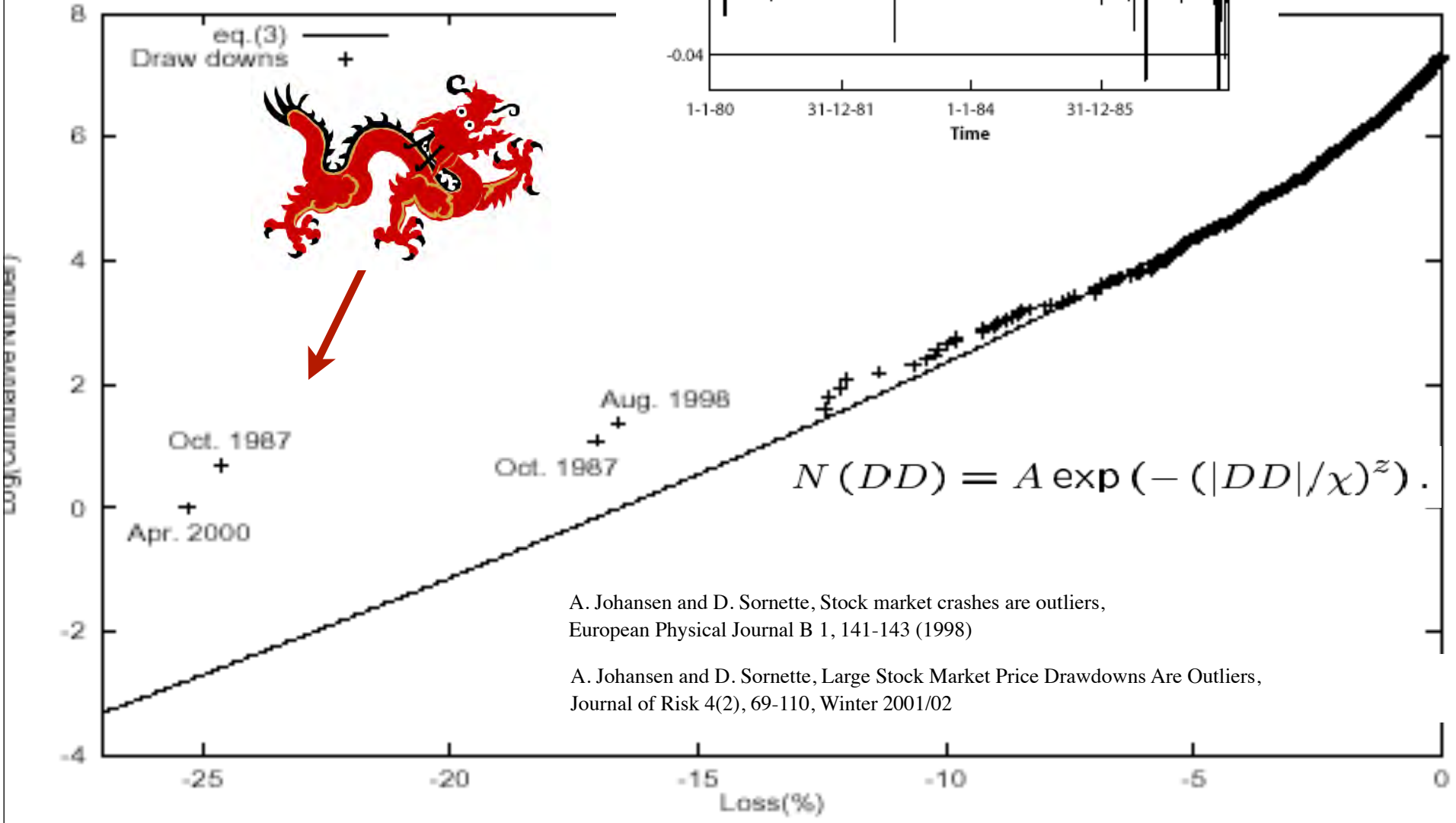
Crises are not black swans but "Dragon-kings"



Black Swan (*Cygnus atratus*)

"Dragon-kings" of financial risks





$$N(DD) = A \exp\left(-\left(|DD|/\chi\right)^{z}\right).$$

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

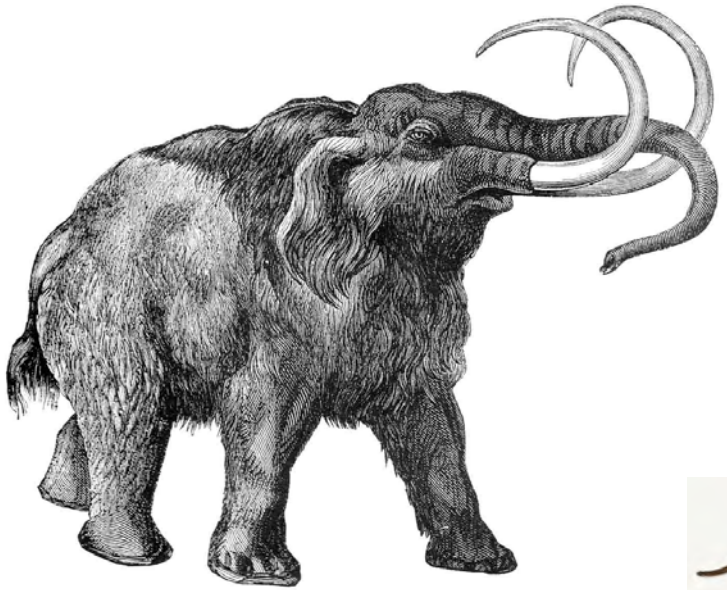
10% daily drop on Nasdaq : 1/1000 probability

1 in 1000 days => 1 day in 4 years

30% drop in three consecutive days?

(1/1000)*(1/1000)*(1/1000) = (1/1000’000’000)

=> one event in 4 millions years!



Dragon-king story

Dragon-king-outlier drawdowns

Require new different mechanism

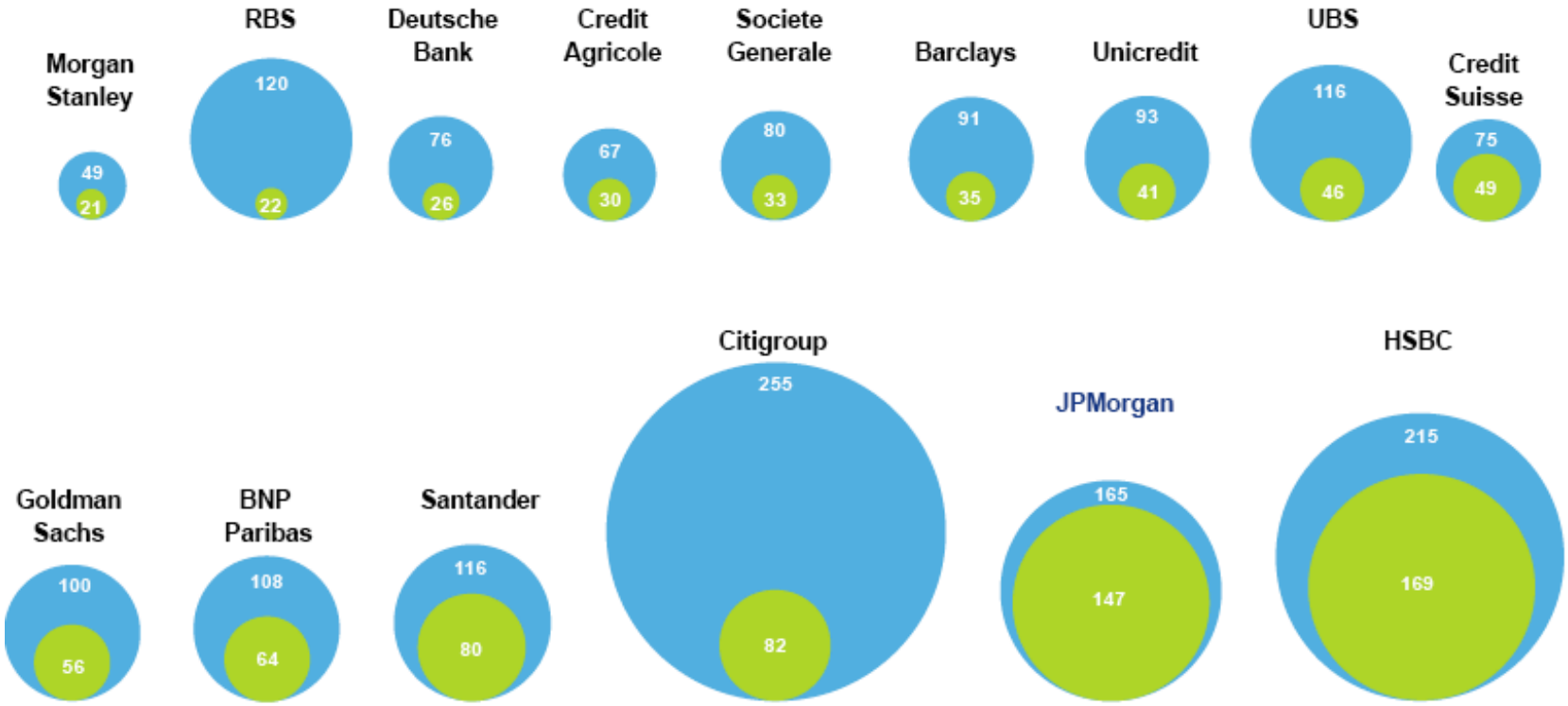
Follow excesses ("bubbles")

Bubbles are collective endogenous excesses
fueled by positive feedbacks

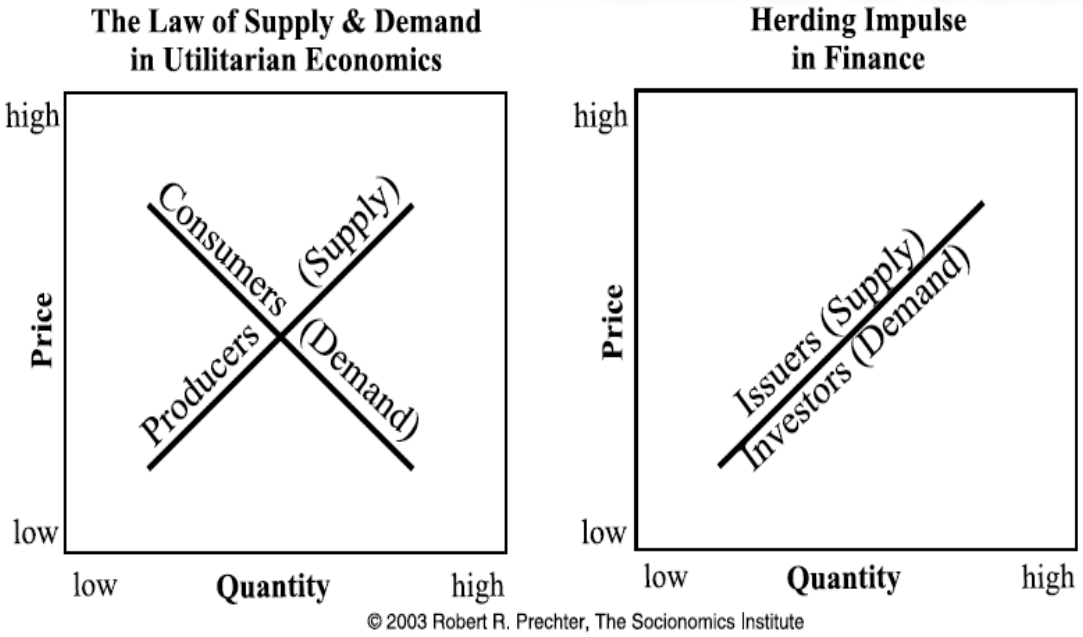
Most crises are "endogenous"

Possible diagnostic and predictions
via "coarse-grained" metrics (forest versus trees)

Crises are the bursts of “bubbles”



What is a bubble?

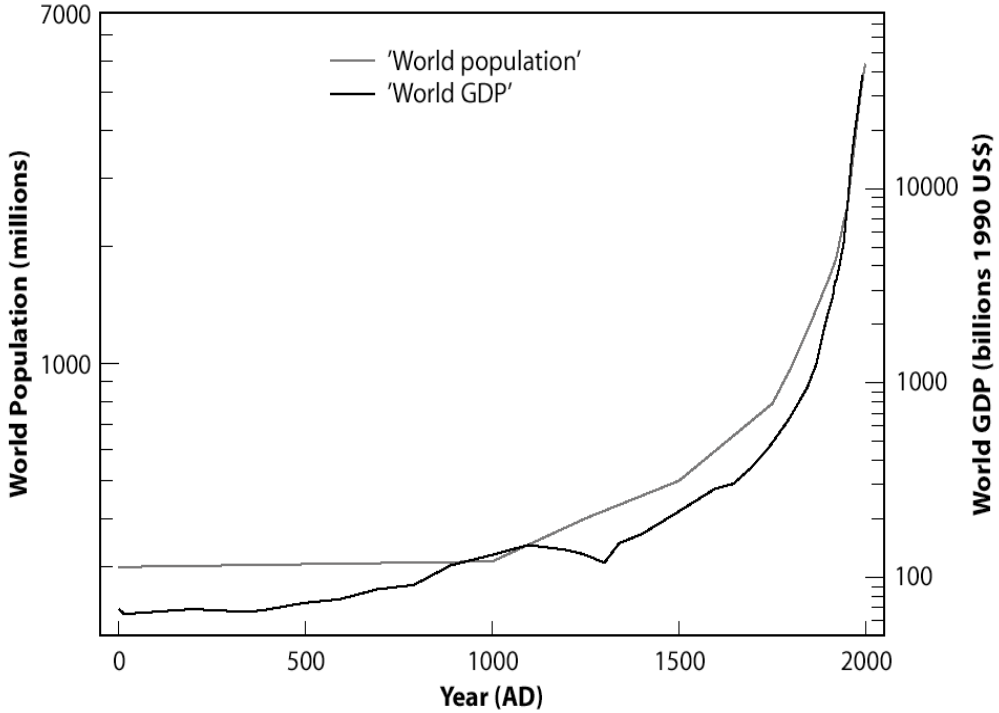


Positive feedbacks

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

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

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



Our proposition:
Faster than exponential
transient unsustainable
growth of price

Mathematics of Finite-time Singularities

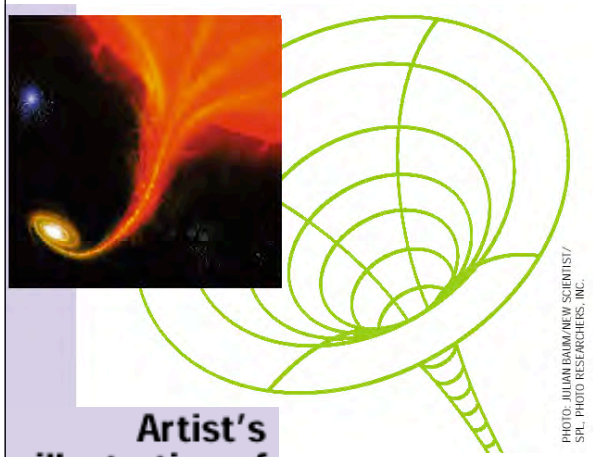


PHOTO: JULIAN BAUM/NEW SCIENTIST/ SPL, PHOTO RESEARCHERS, INC.

Artist's illustration of matter from a red giant star being pulled toward a black hole.

- Planet formation in solar system by run-away accretion of planetesimals
- PDE's: Euler equations of inviscid fluids and relationship with turbulence
- PDE's of General Relativity coupled to a mass field leading to the formation of black holes
- Zakharov-equation of beam-driven Langmuir turbulence in plasma
- rupture and material failure
- Earthquakes (ex: slip-velocity Ruina-Dieterich friction law and accelerating creep)
- Models of micro-organisms chemotaxis, aggregating to form fruiting bodies
- Surface instability spikes (Mullins-Sekerka), jets from a singular surface, fluid drop snap-off
- Euler's disk (rotating coin)
- Stock market crashes...

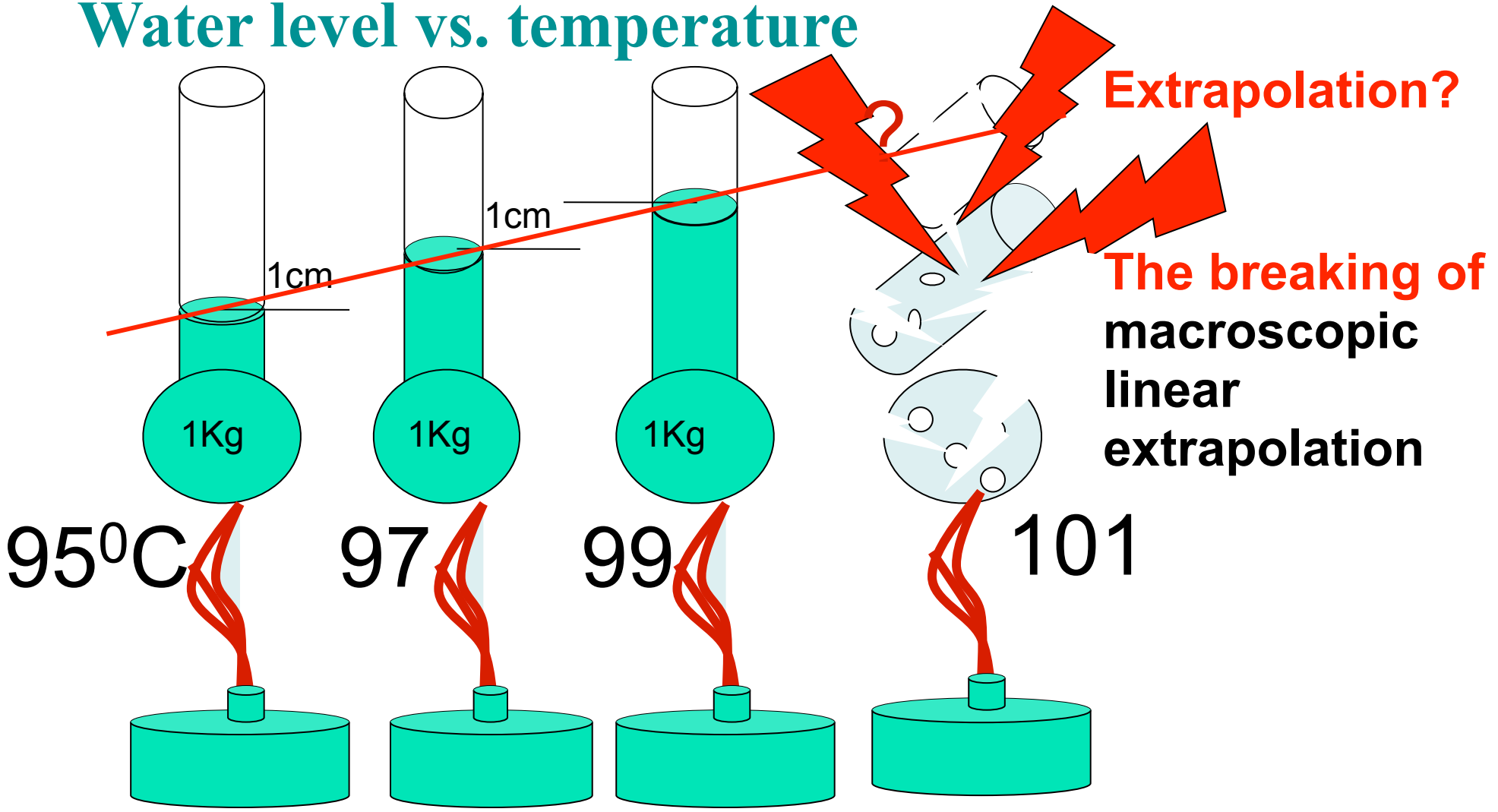
Mechanisms for positive feedbacks in the stock market

- 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. Trends are not stable (psychology of growth)
  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)

Simplest Example of a "More is Different" Transition

Water level vs. temperature

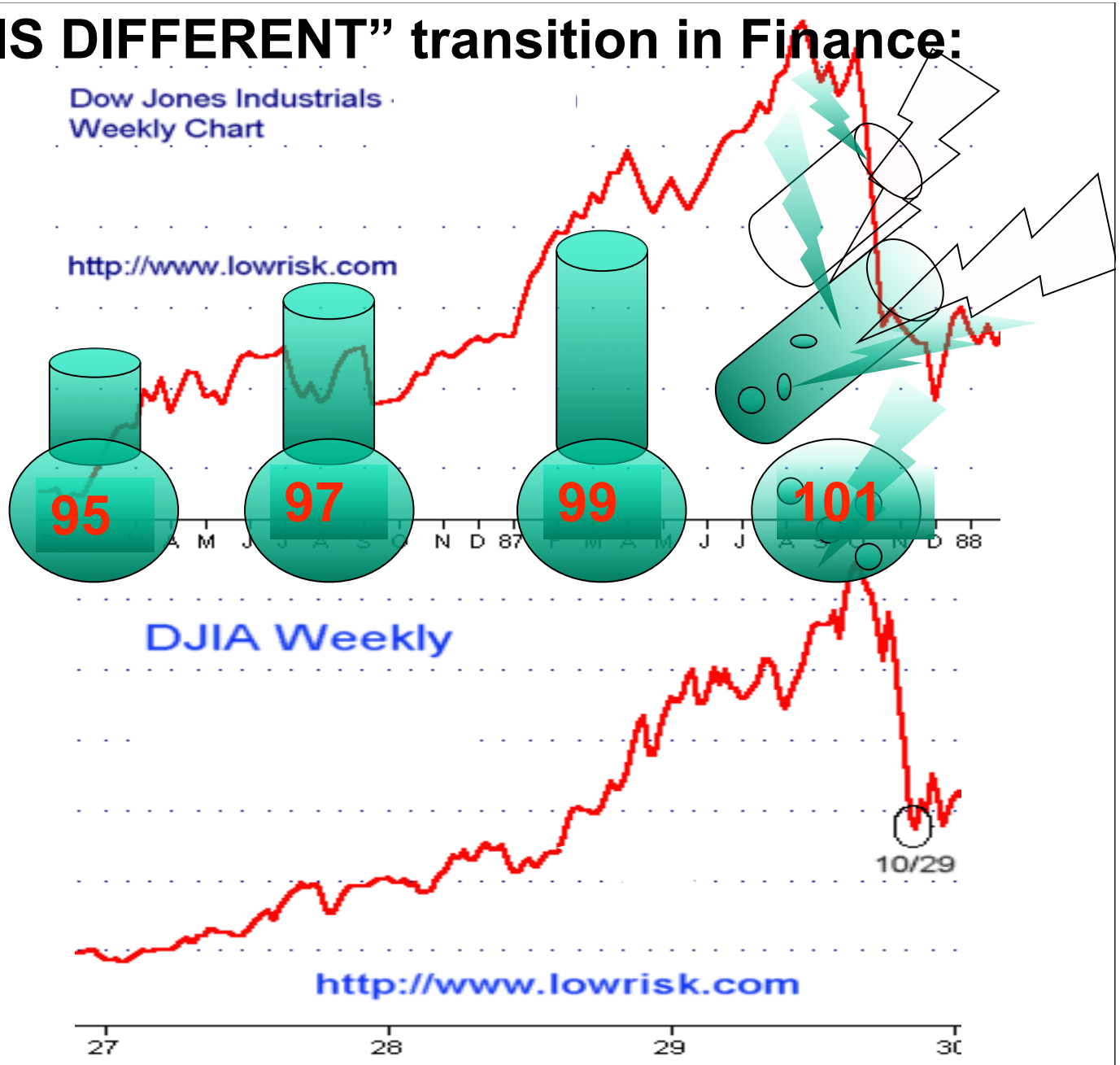


BOILING PHASE TRANSITION

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

Example of "MORE IS DIFFERENT" transition in Finance:

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



Crash = result of collective behavior of individual traders

(S. Solomon)

Current Status of the World Economy

Crisis not over

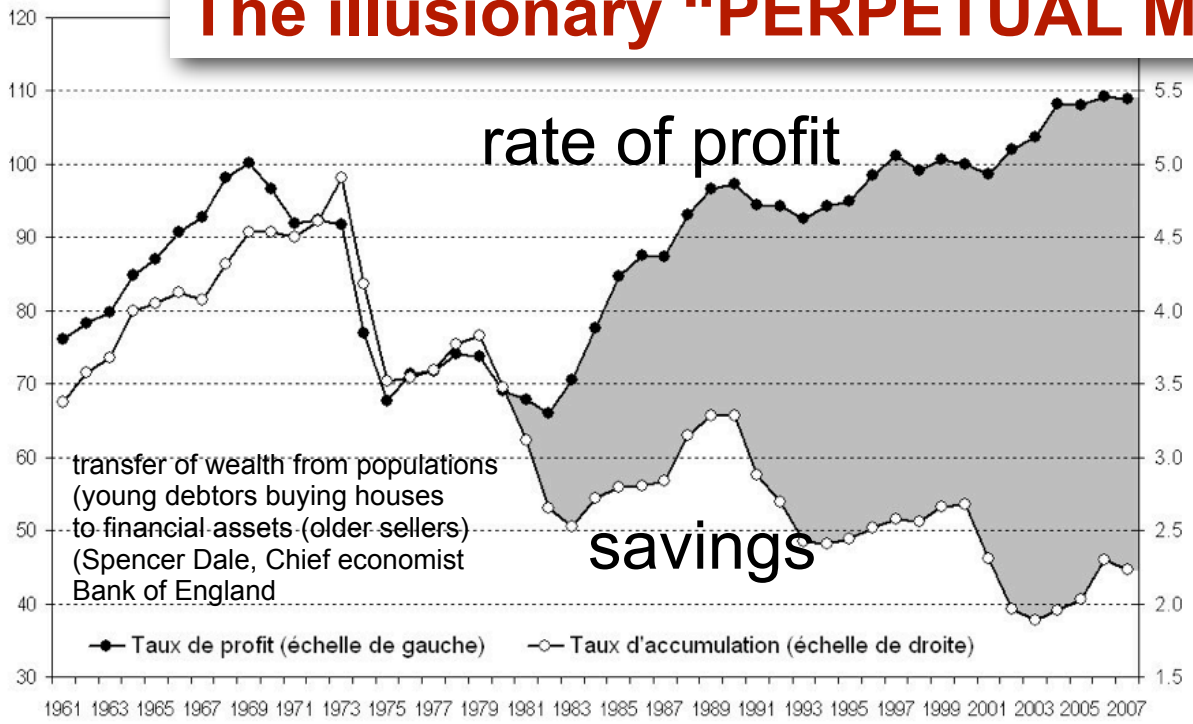
- World Trade slumps
- China Bubble risk
- US FED plans $ 5t Stimulus
- European debts

- Political Crisis emerges
- Banking Crisis returns
- Sovereign Debt crisis

Causes of the 2007-20XX crisis?

- Financial innovations
  - Real-estate loans and MBS as fraction of bank assets
  - Securitization of finance
  - Leverage
  - Under-estimating aggregate risks
- Outsourcing of risks
  - Deregulation and lack of oversight
  - Bad quantitative risk models in banks (Basel II)
  - Rating agency failures
  - Lowering of lending standards
  - Managers greed and poor corporate governance problem
- Facilitating factors
  - Loans to poor's
  - Freddy Mac and Fanny Mae...
  - Growth of over-capacity
  - Moral hazards

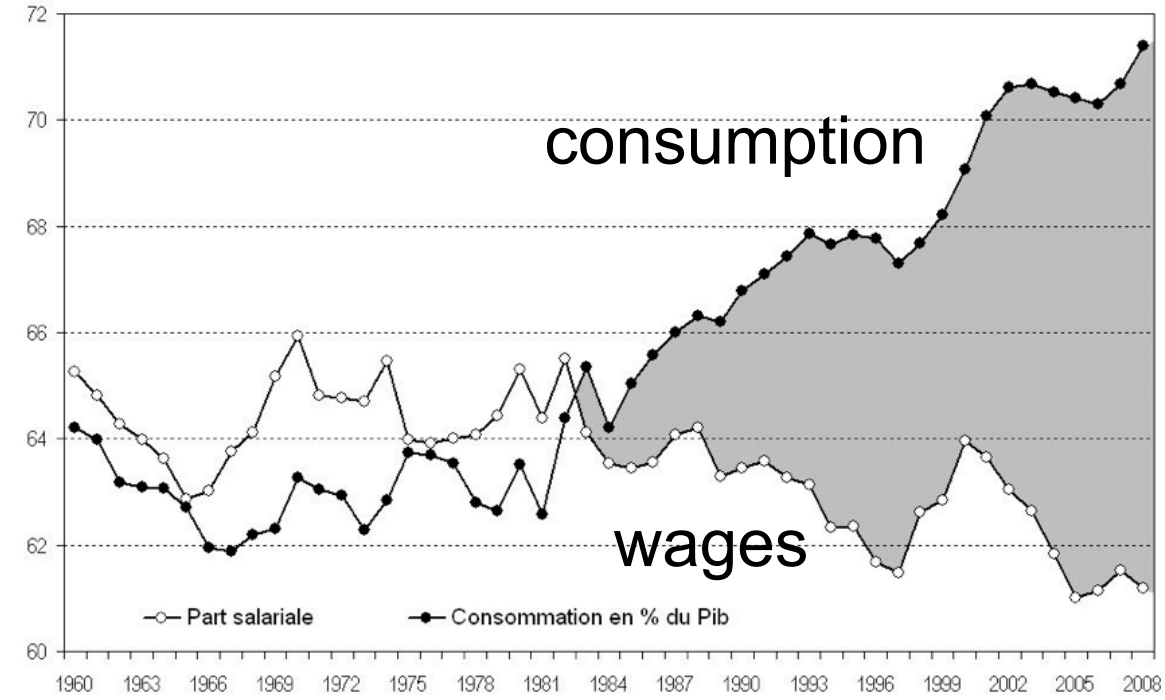
The illusionary "PERPETUAL MONEY MACHINE"



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



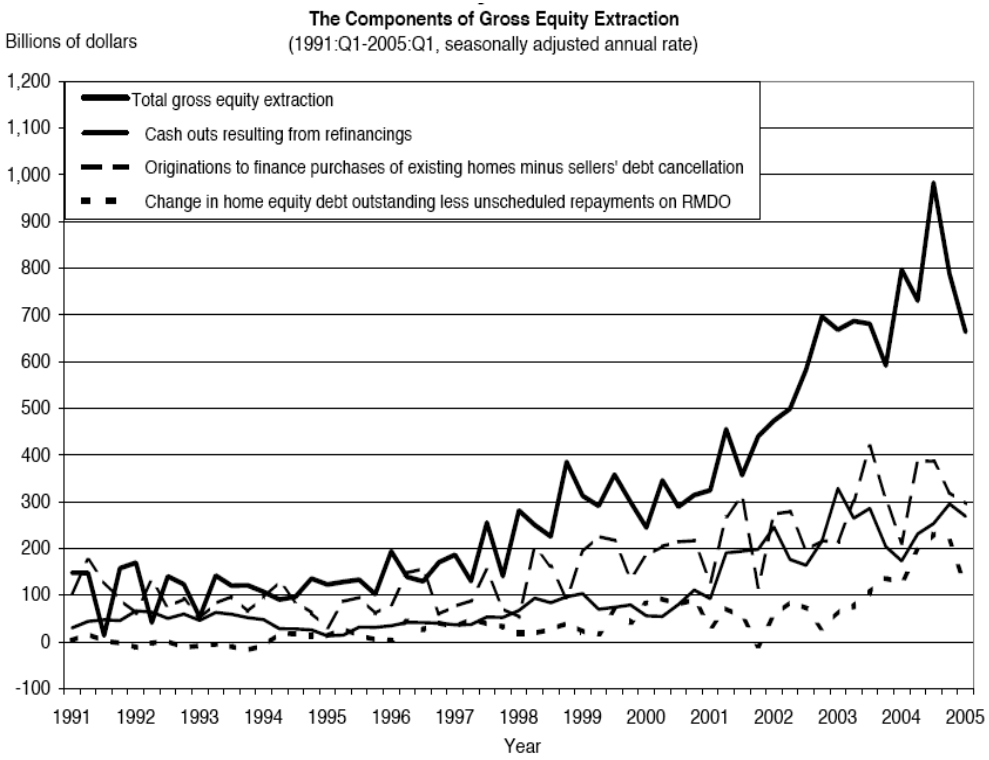
Thee gap widens between the share of wages and the share of consumption (gray zones), so as to compensate for the difference between profit and accumulation. FINANCE allows increasing debt and virtual wealth growh... which can only be transitory (even if very long).

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

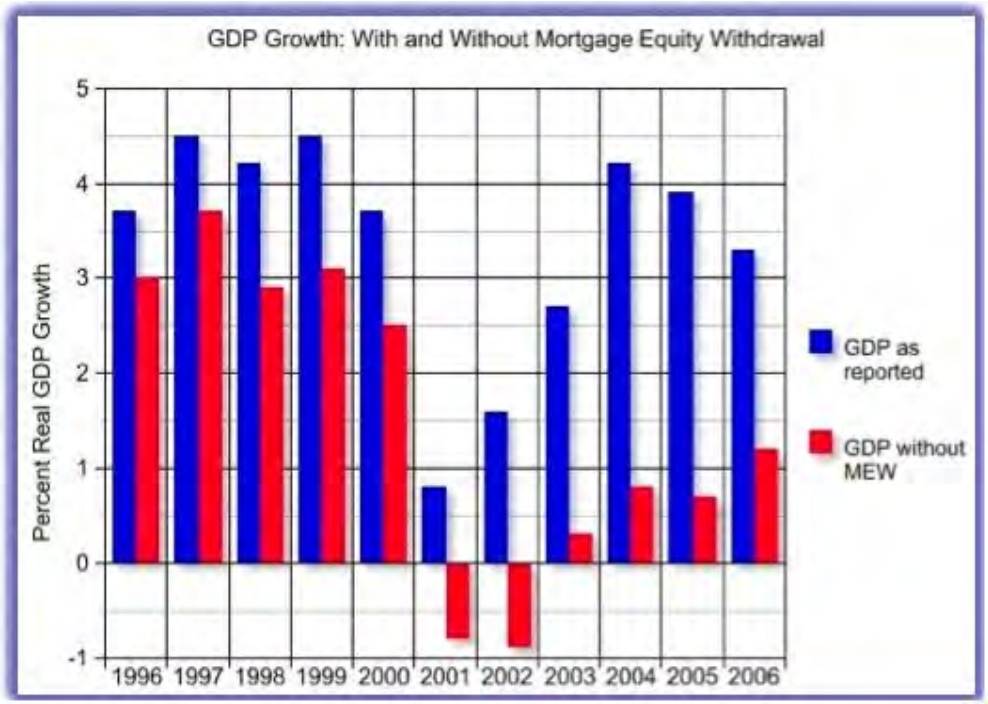
Wealth Extraction

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



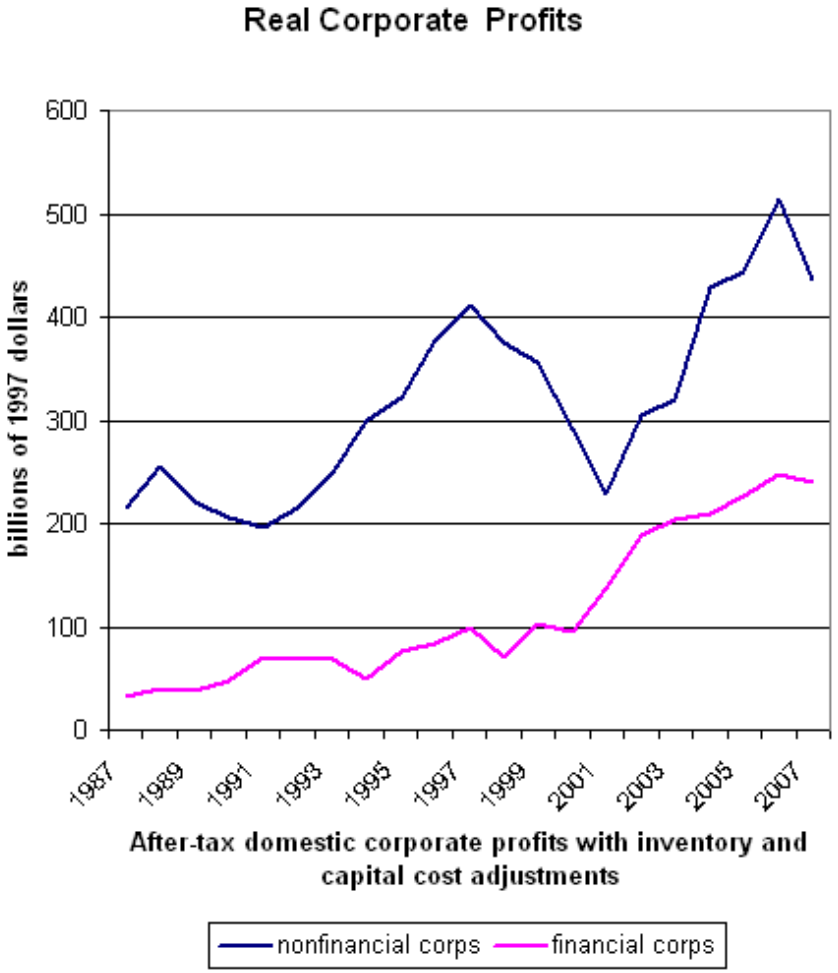
Alan Greenspan and James Kennedy (Nov. 2005)

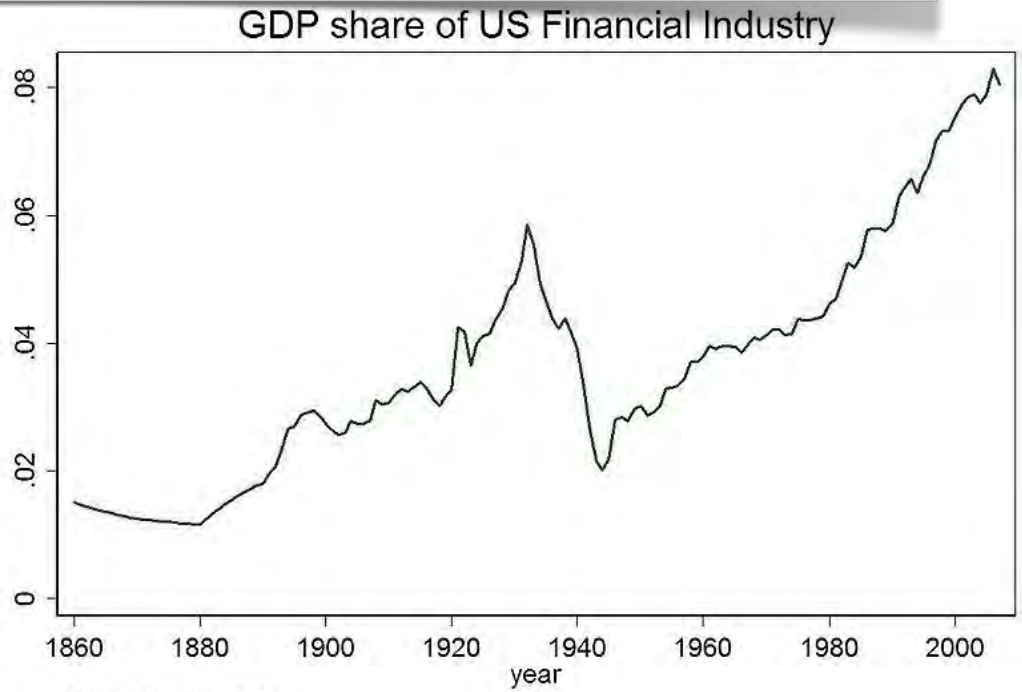
Mortgage Equity Withdrawal impact on GDP

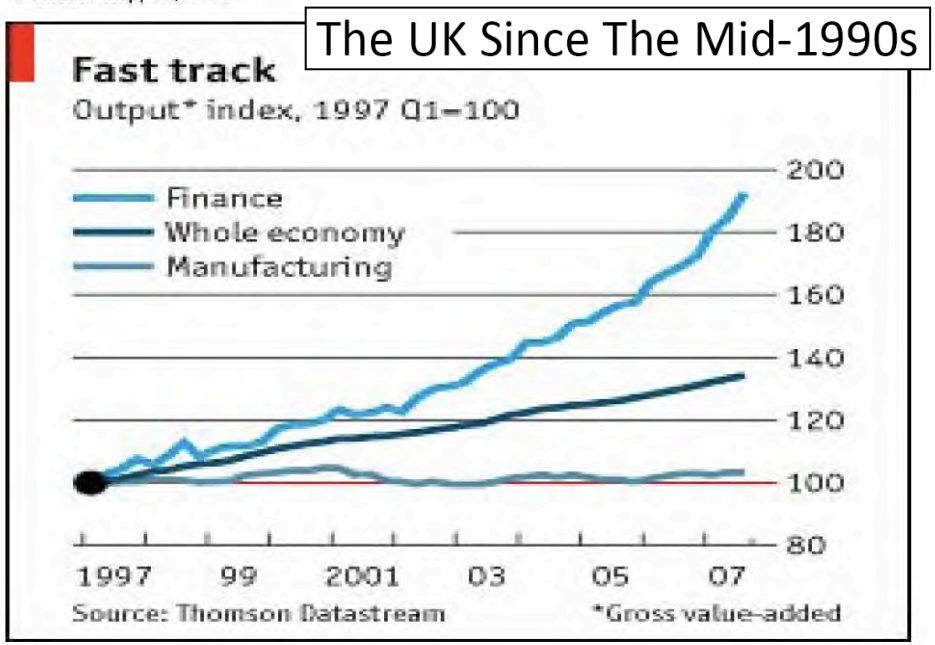


source: John Mauldin (April 09)

Financial investments accounted for >1/3 of corporate profits







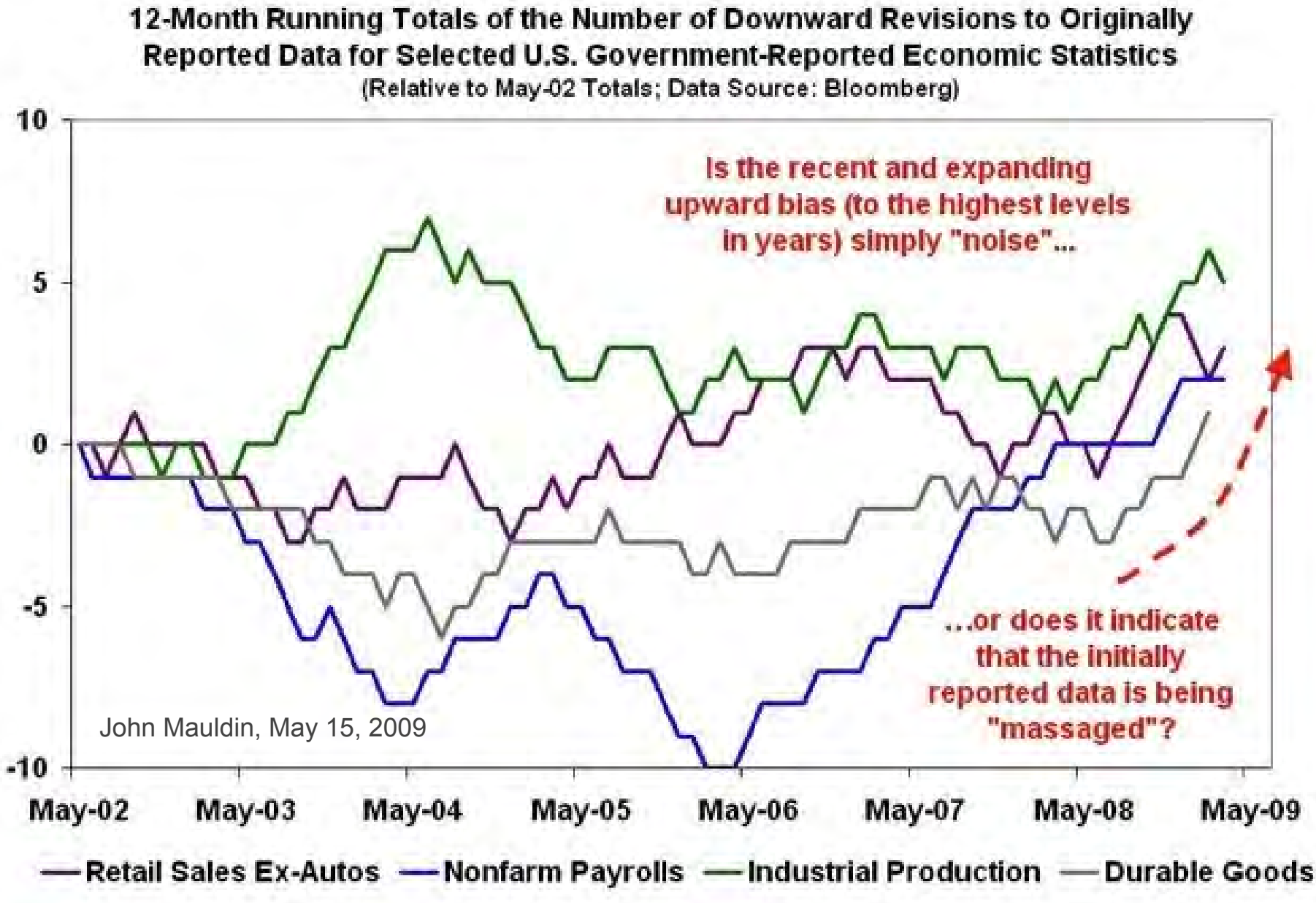
http://www.businessweek.com/the_thread/economicsunbound/archives/2009/03/a_bad_decade_fo.html

Michael Mandel

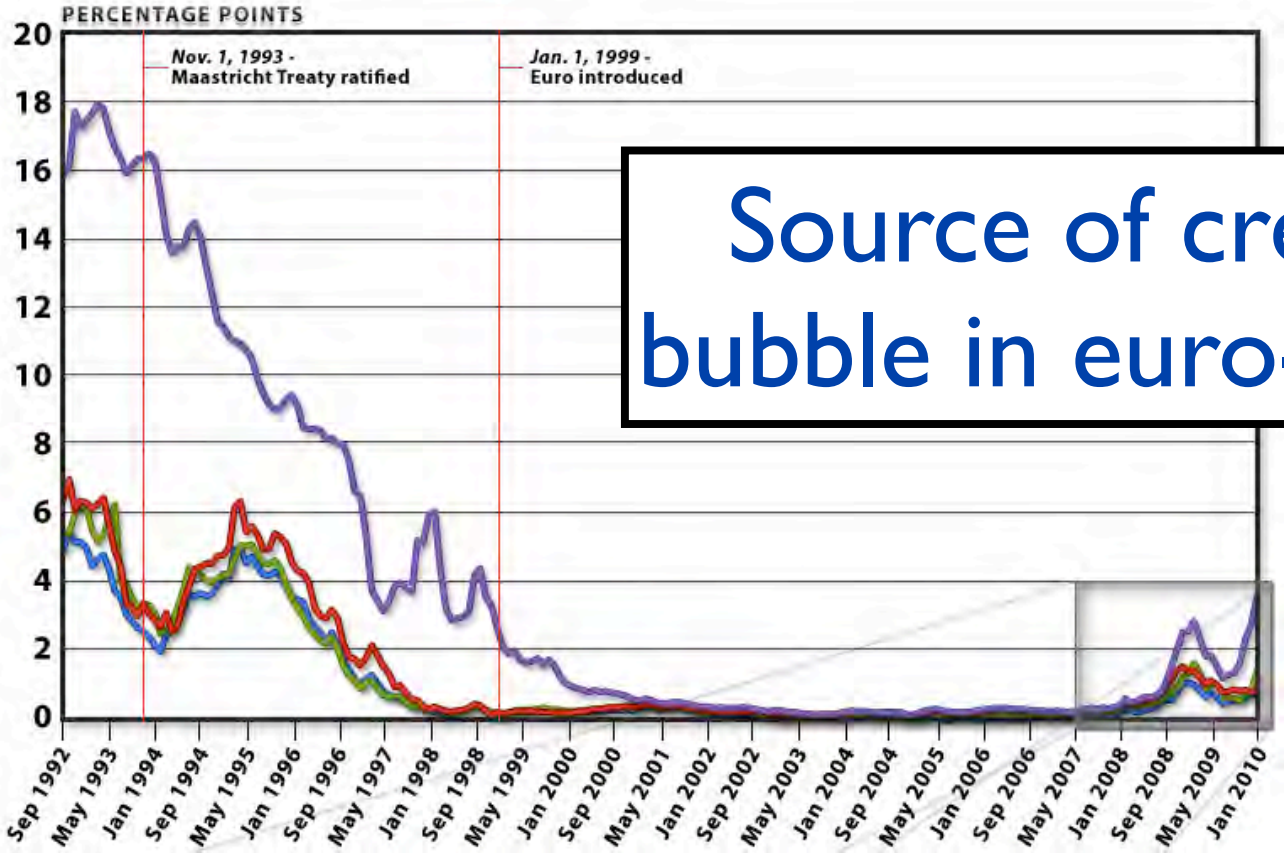
Source: The Econom

"Lies, damned lies and Gov. Statistics"

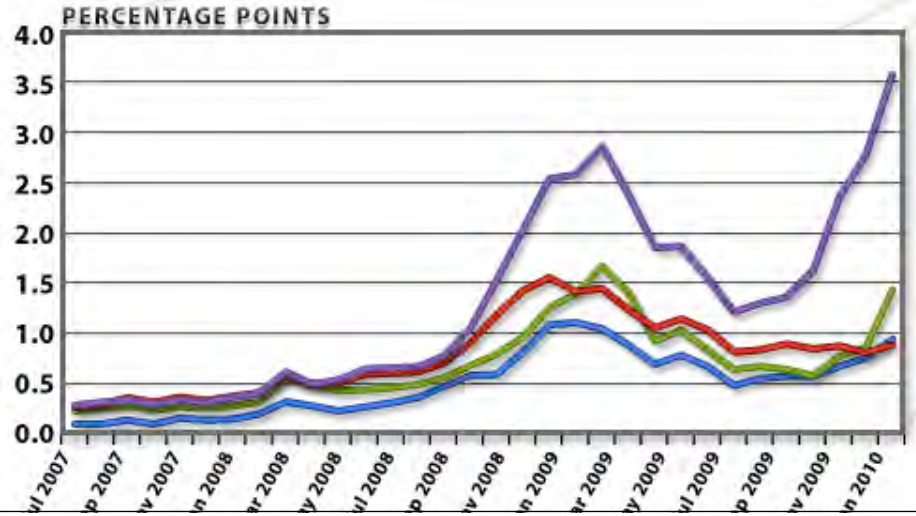
GDP downward revisions



CLUB-MED SPREAD:
government bonds - German bund yield



Source of credit bubble in euro-zone



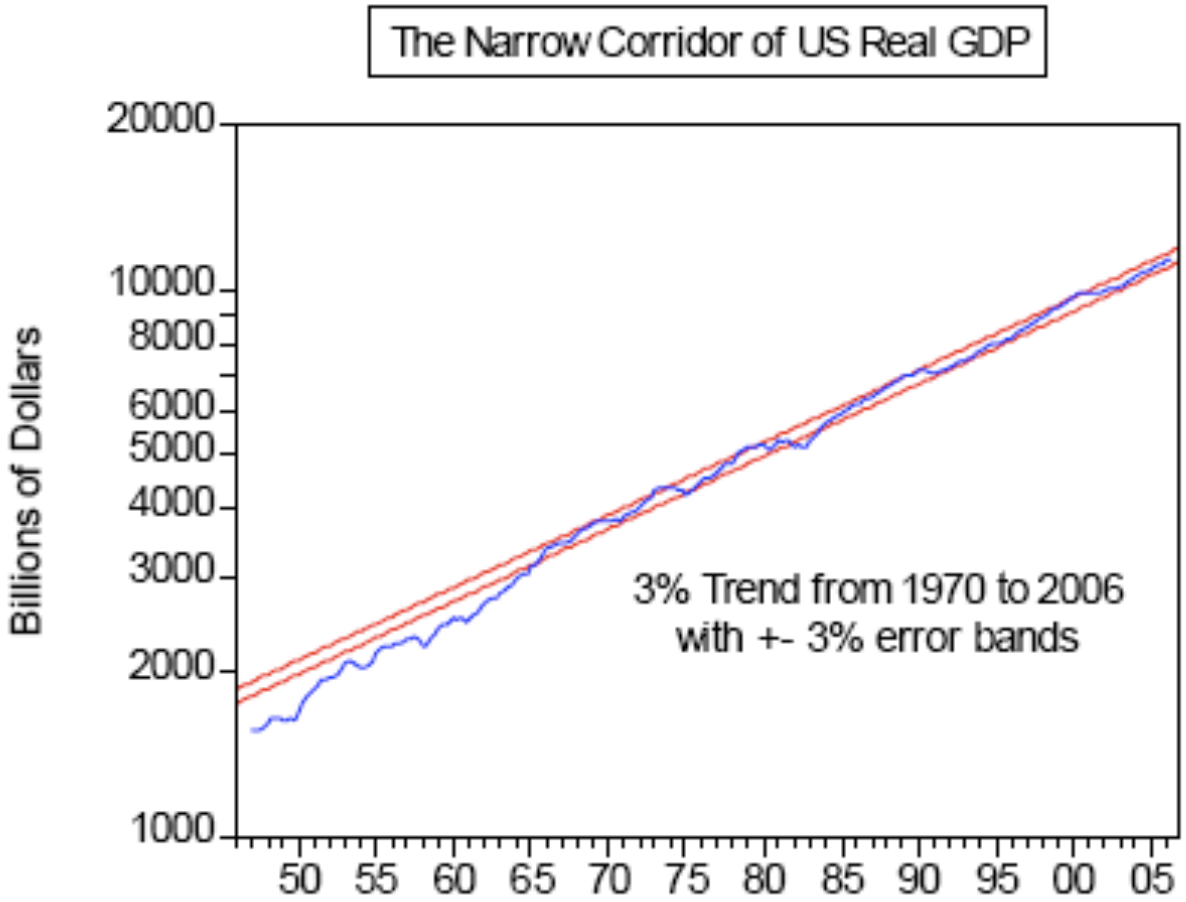
Spain
Portugal
Italy
Greece

SOURCE: International Monetary Fund

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.



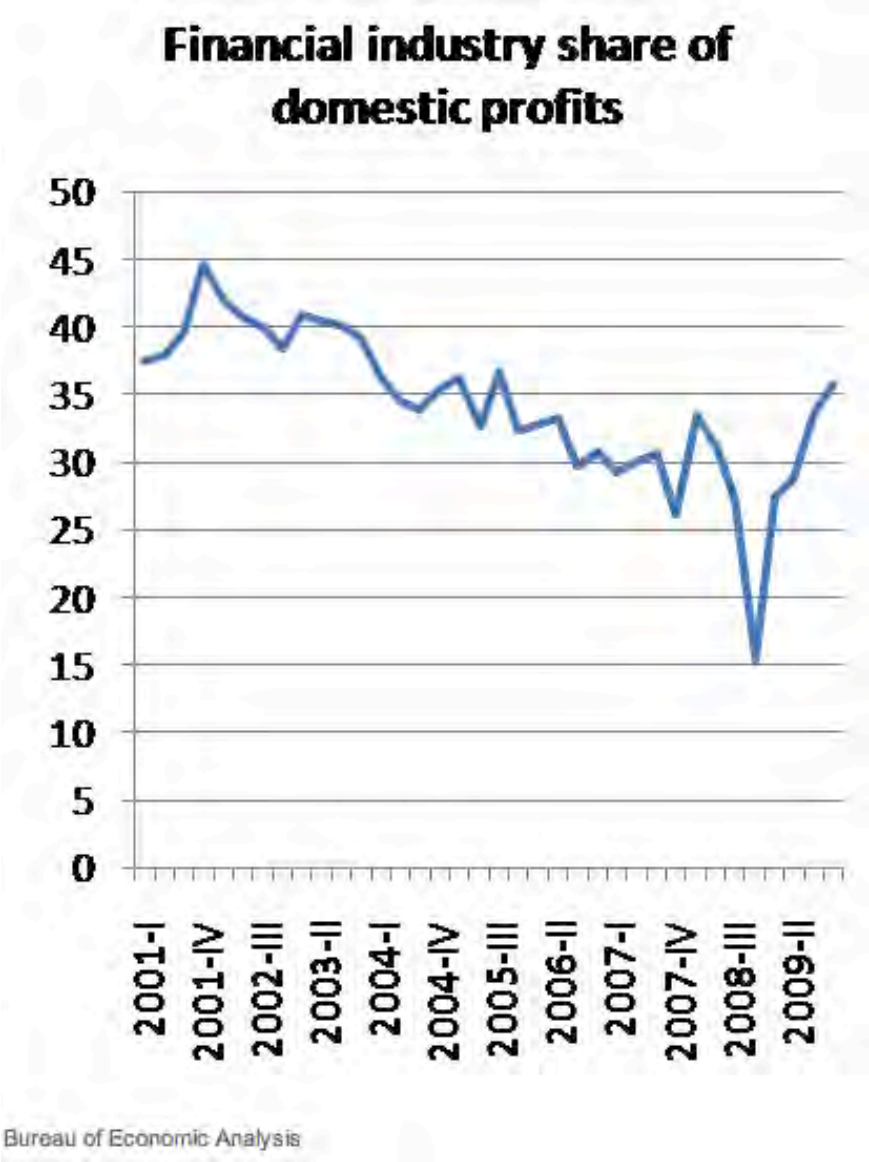
From 1982 until 2007, the U.S. only experienced two shallow recessions that each lasted just 8 months. This stretch of 25 years may be the best 25 years in the US economic history. But much of this prosperity was bought with debt, as the ratio of debt to GDP rose from $1.60 to $3.50 for each $1.00 of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

Absence of fundamental change

-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.



Still on-going logic of the "perpetual money machine"

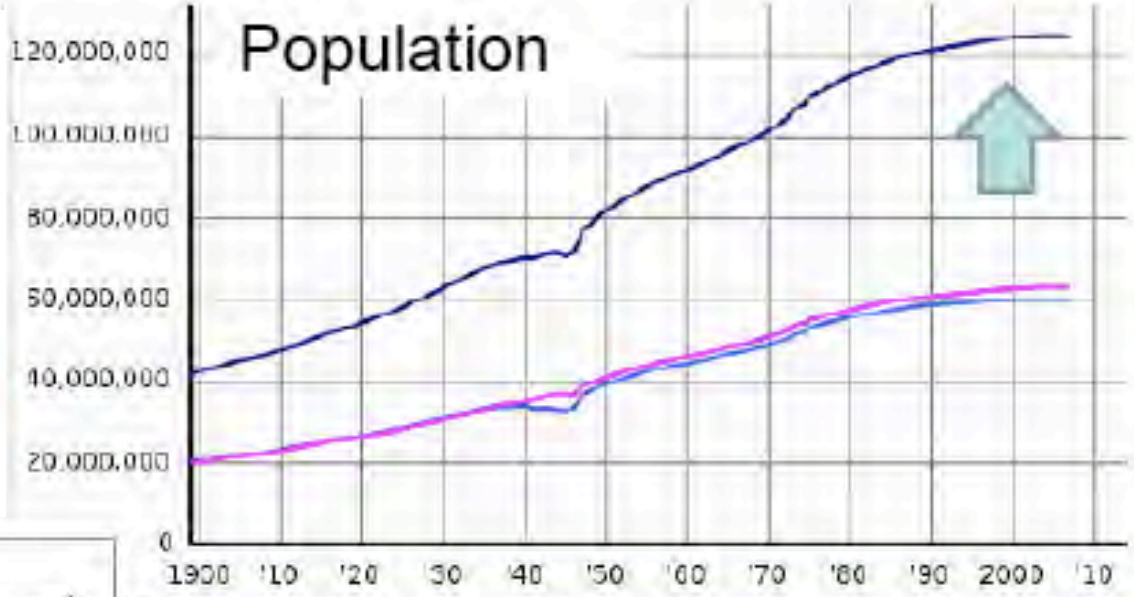
TARP: trouble asset release program
PPIP: public-private investment program

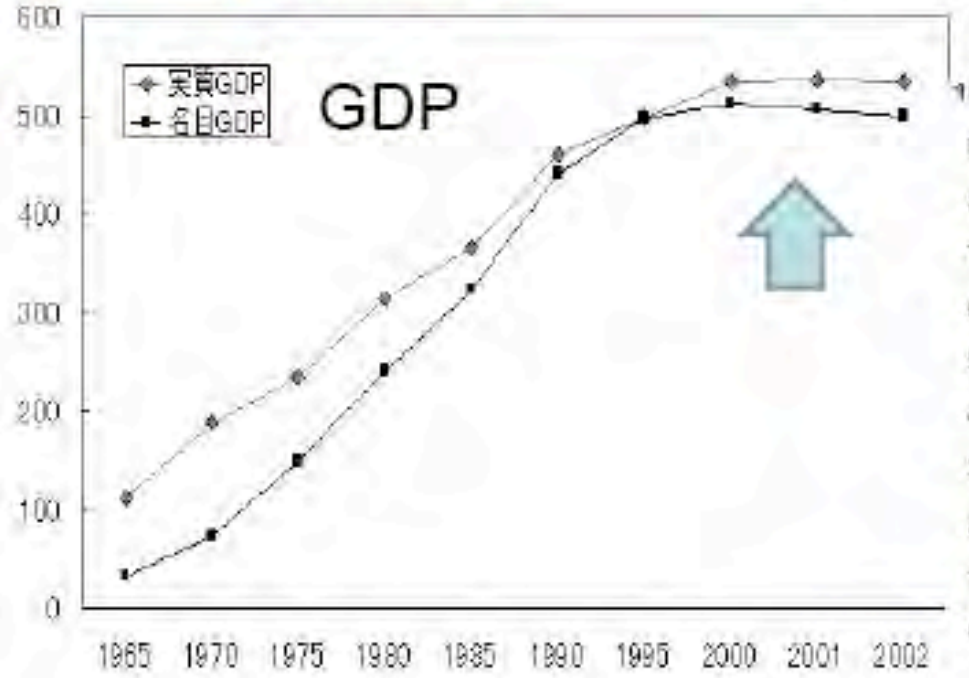
Future Scenarios

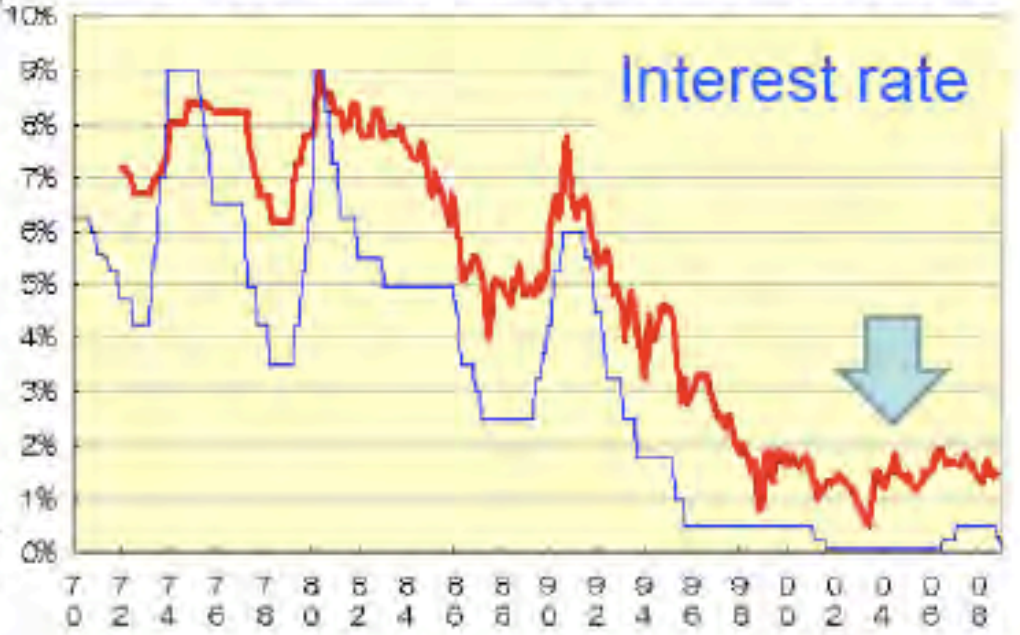
- “Best case” scenario: Japan “lost decade”... or tectonic regime shift

The next 15 years?

US and Japanese land prices



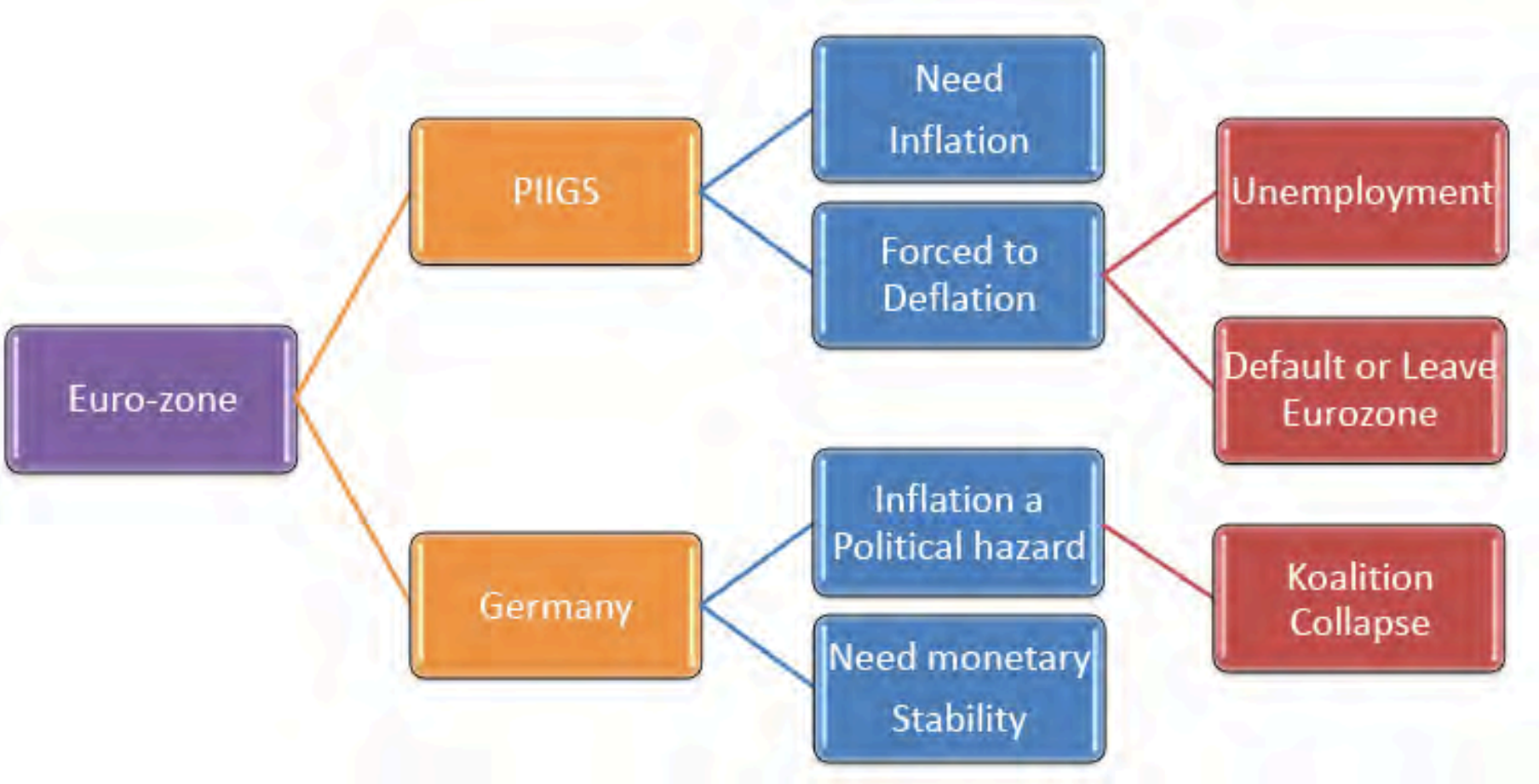




(Hideki Takayasu, APFA7)

Future Scenarios

- Best case scenario: Japan “lost decade”
- European scenarios:



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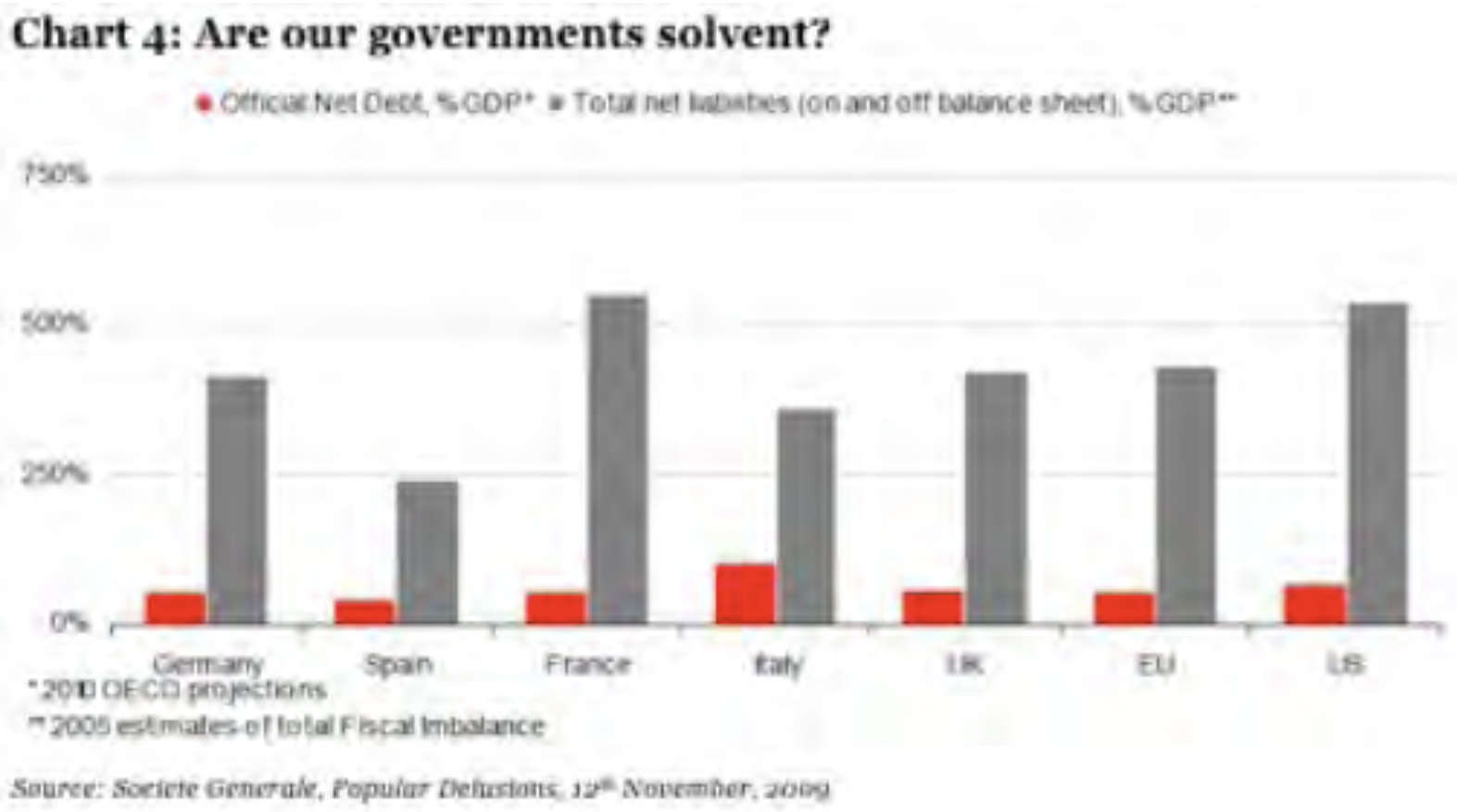


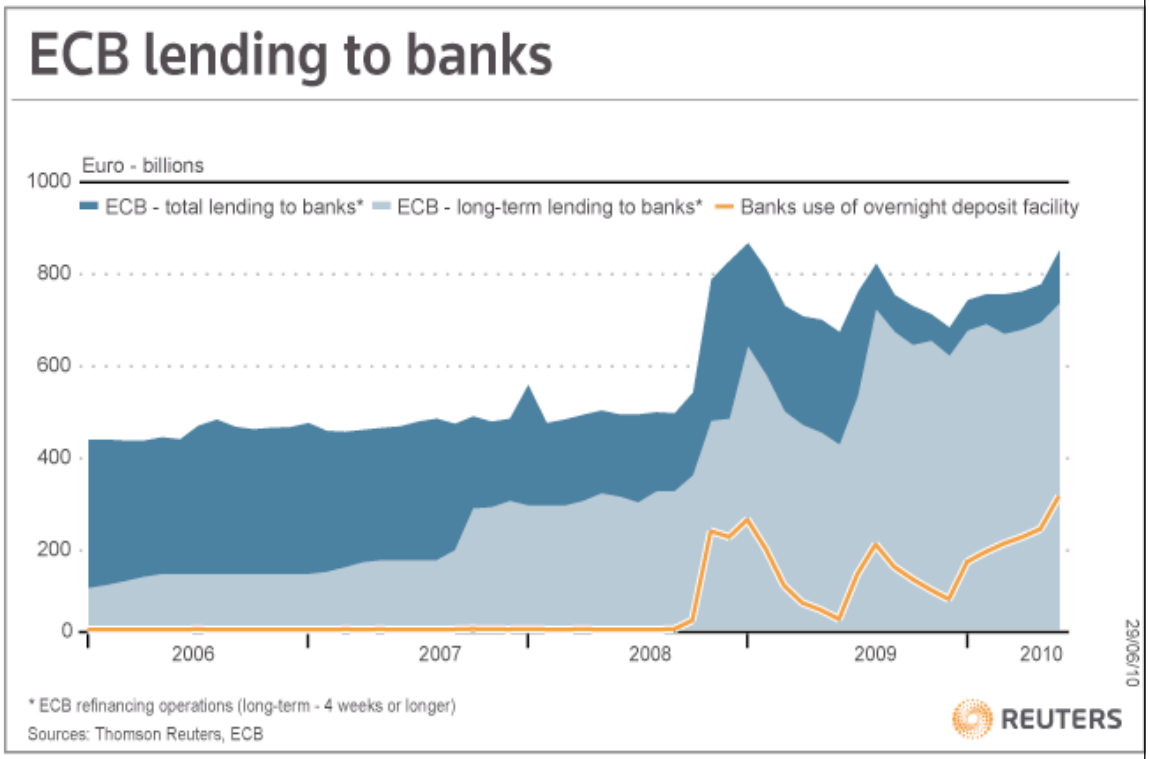
European scenarios

Banking crisis continues

- ECB still needs to inject money into banking system
- Spanish banks became partly illiquid in crisis
- Transparency in risk exposure is still missing (see discussion on stress test publishing)

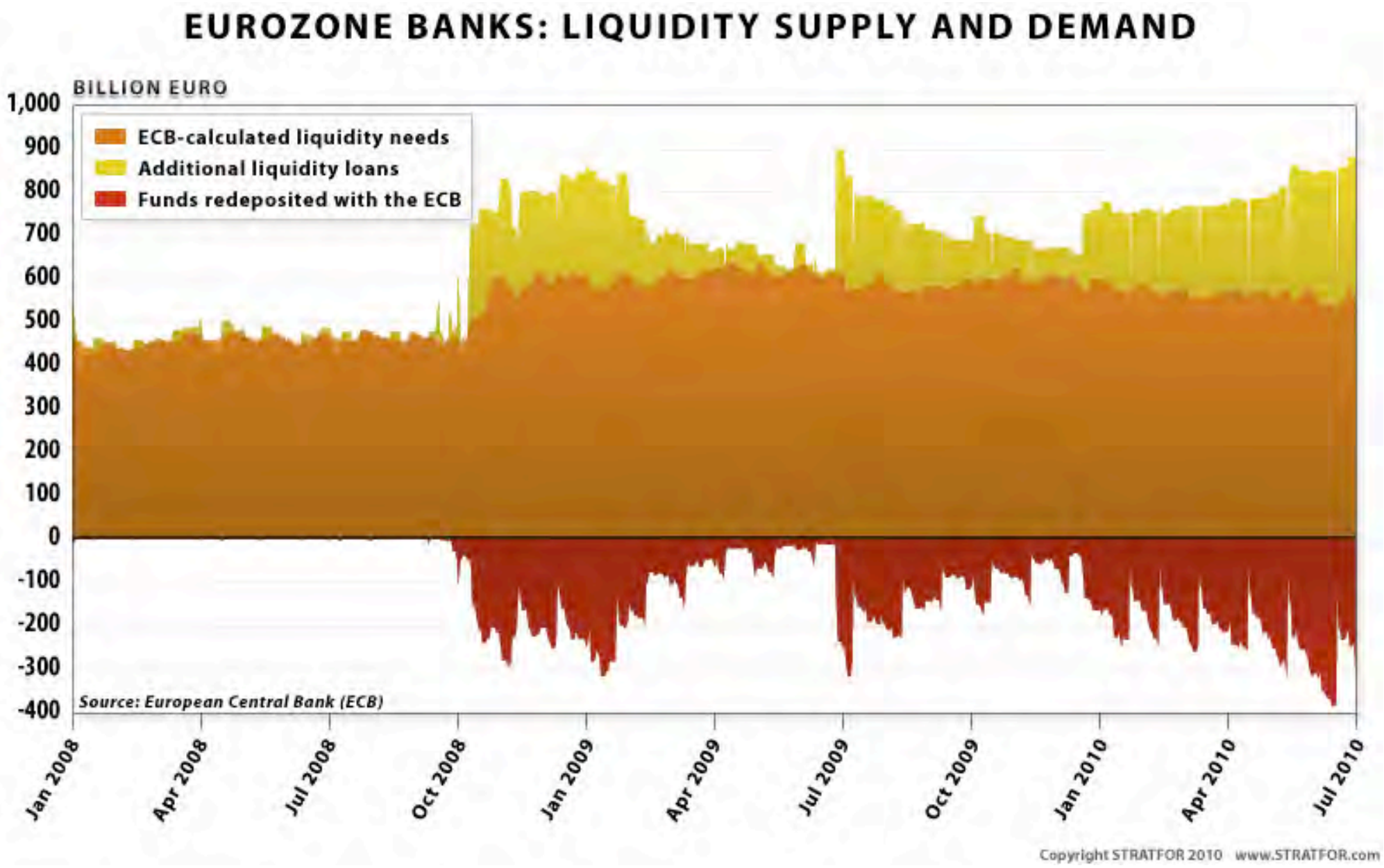
→ Risk of bank failures increases as investors have no data to make good decisions

Disfunctional Money Markets



Reuters graphic/Scott Barber

Two Mammoth European problems: bank exposures and Sovereign debts



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  - *US consumers still the "big spenders" → Default risk is increasing → interest rates will have to rise at a certain point of time or US has to stop importing*
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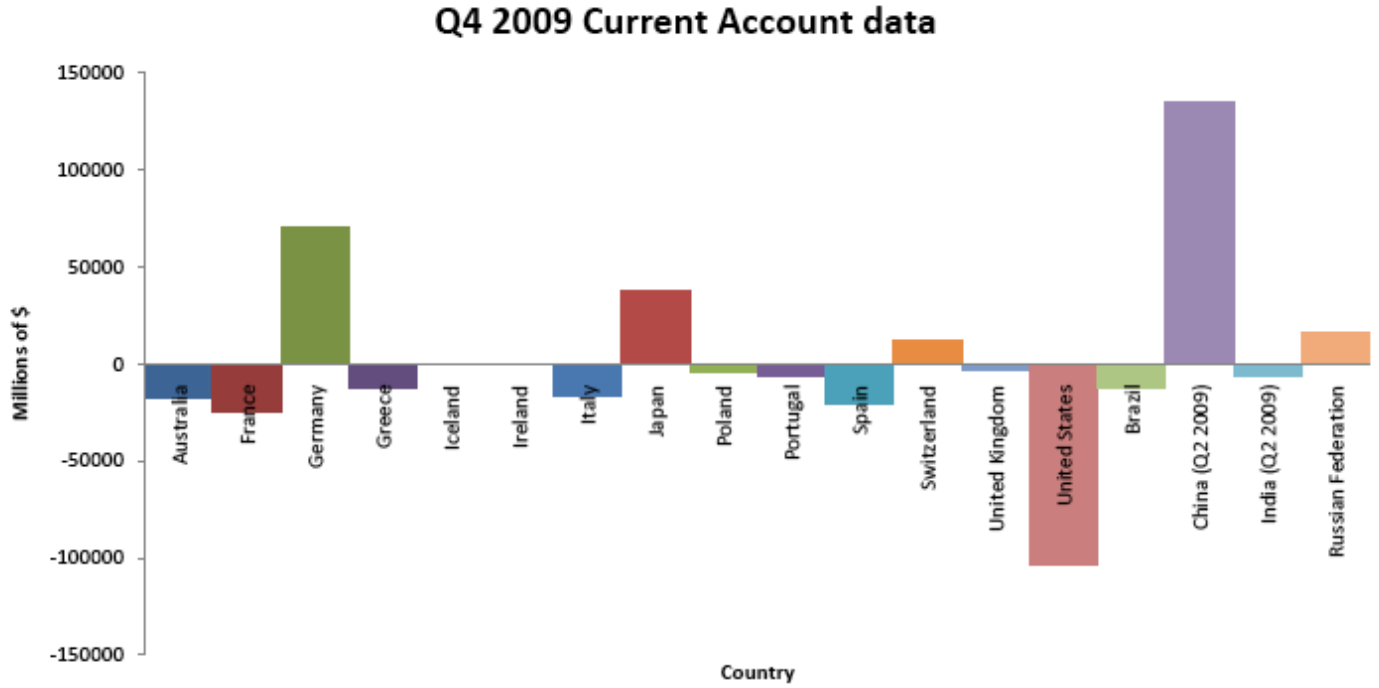


Inflation and Deflation Risks

Money Bubble is collapsing

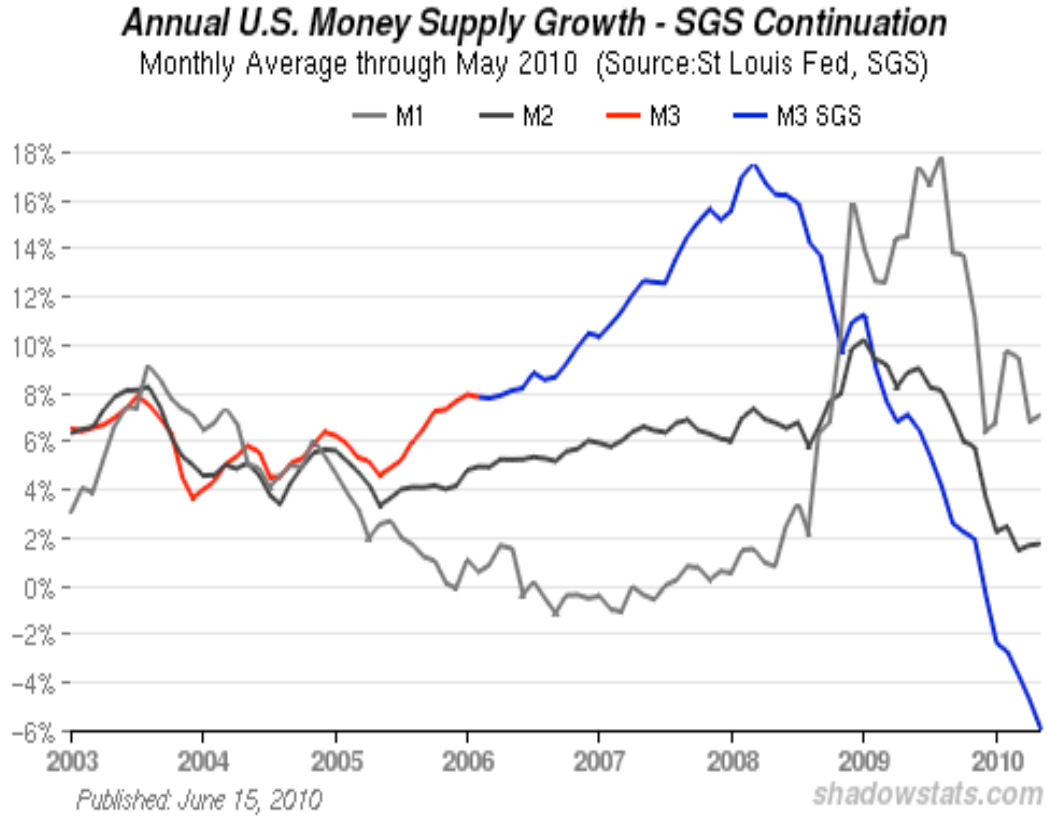
- US M3 is now decreasing for the first time in decades

→ Dollar appreciates

→ Deflation

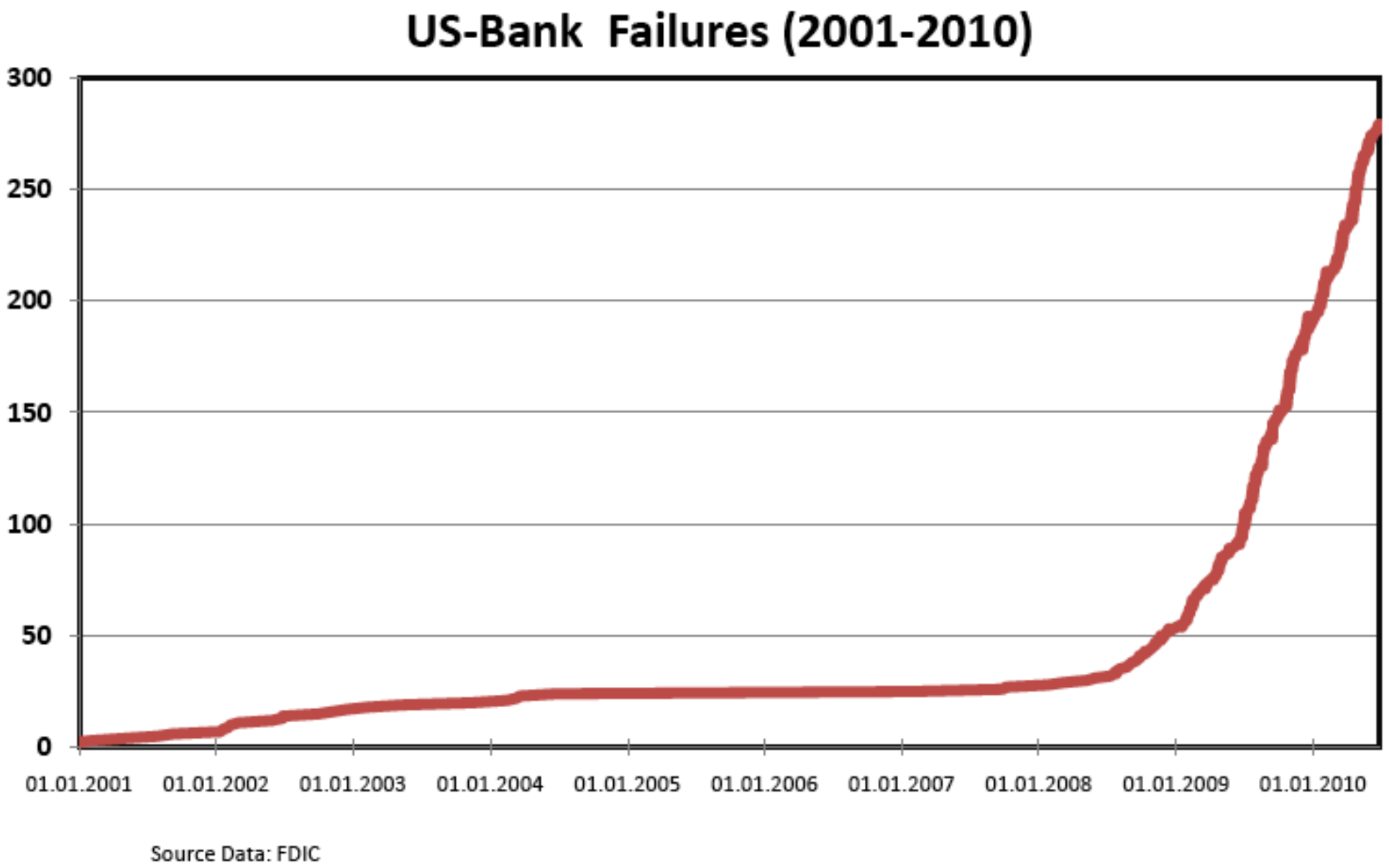
→ FED action still not effective in creating short term inflation

US Money Supply

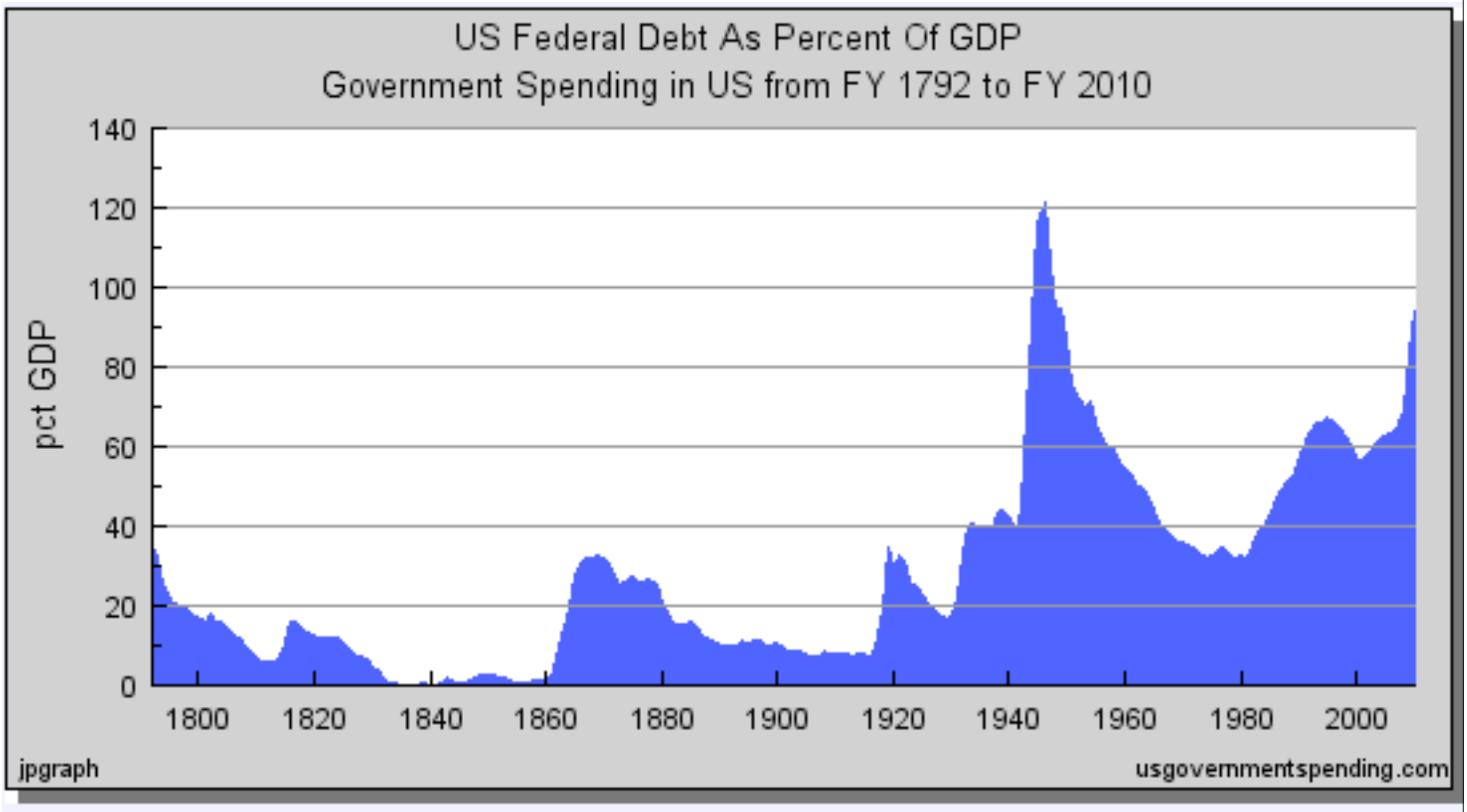


How will banks deal with this?

Failed Banks in the US



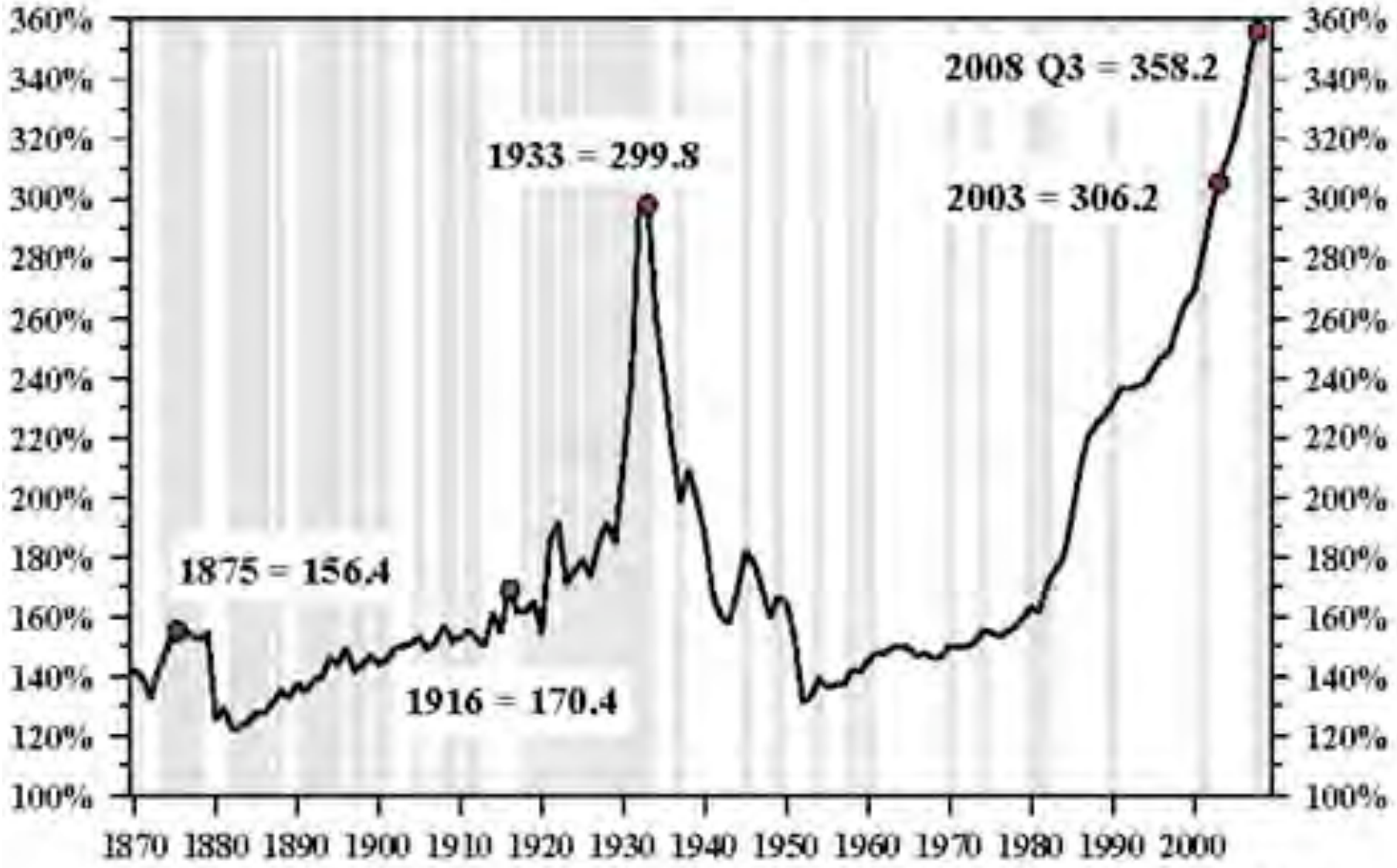
US Governnment Debt



Total U.S. Debt as a % of GDP

annual

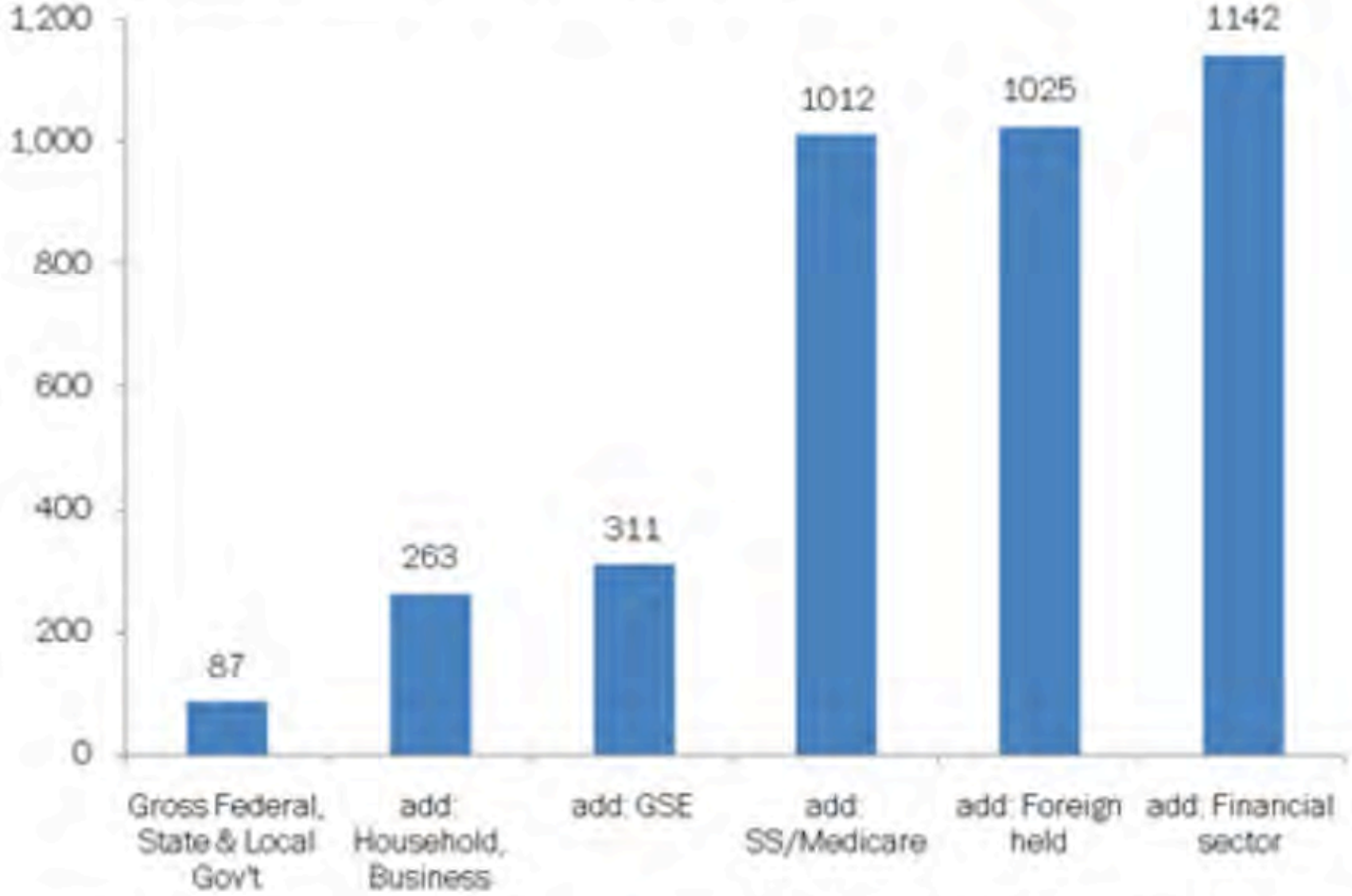
$ 50 trillions



Sources: Bureau of Economic Analysis, Federal Reserve, Census Bureau: Historical Statistics of the United States Colonial Times to 1970. Through Q3 2008.

Total U.S. Debt as Percent of GDP

Including GSEs, Social Security/Medicare Unfunded Liabilities



Source: Federal Reserve Z.1, FHFA GSE Report 2008/RGE Monitor, Richard W Fisher ("Storms on the Horizon", Dallas Fed 5/28/2008), Rather & Kittrell

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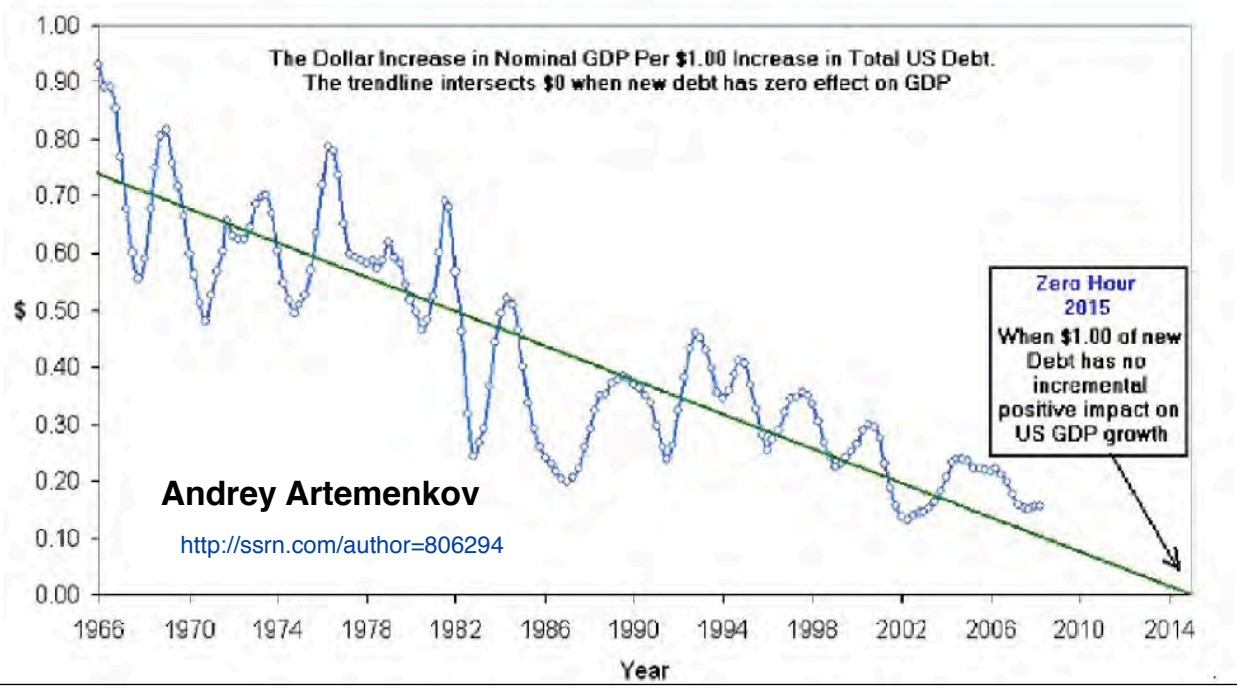

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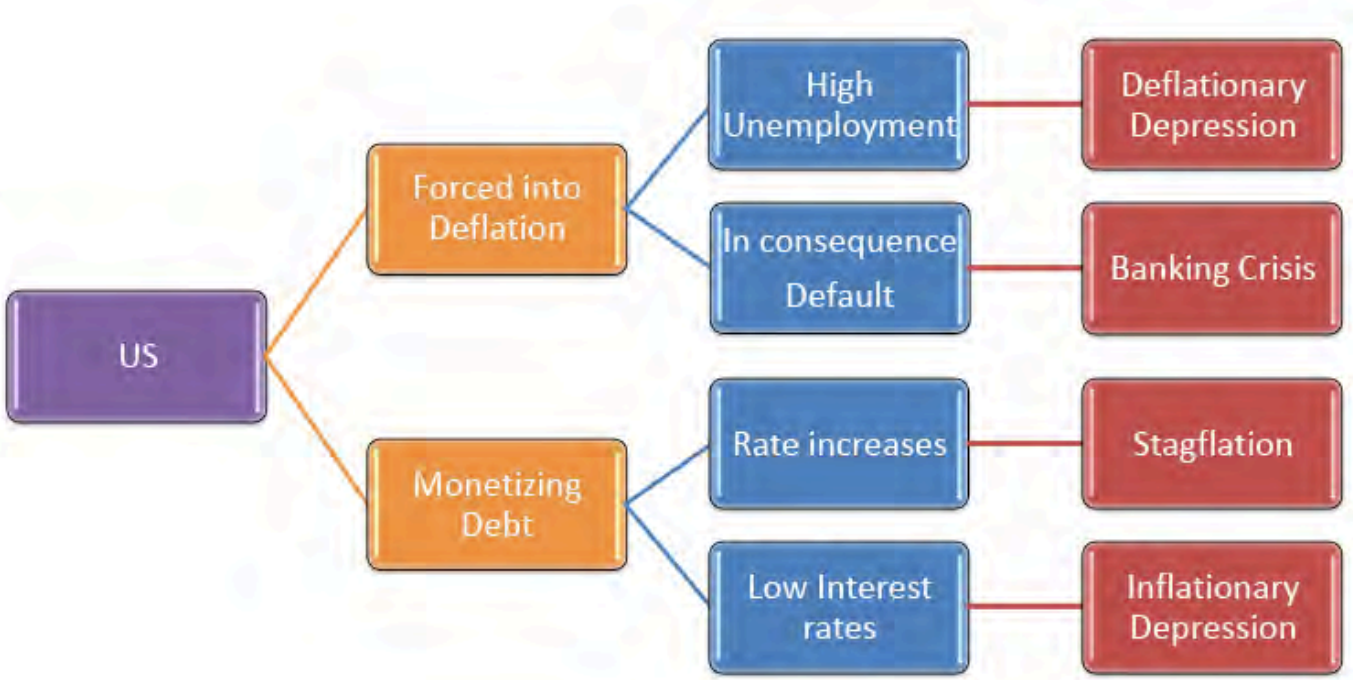

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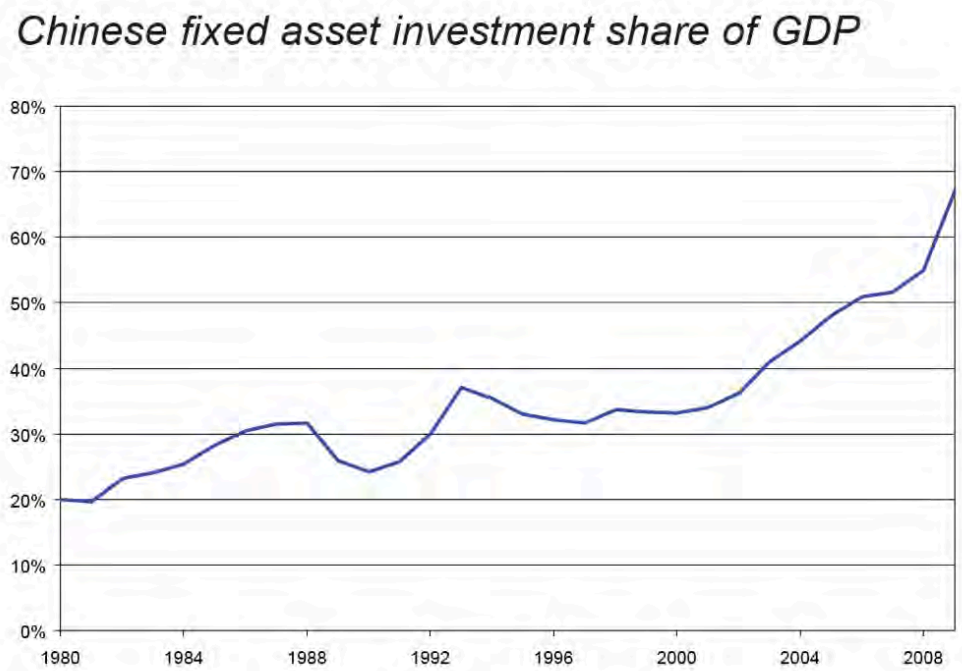
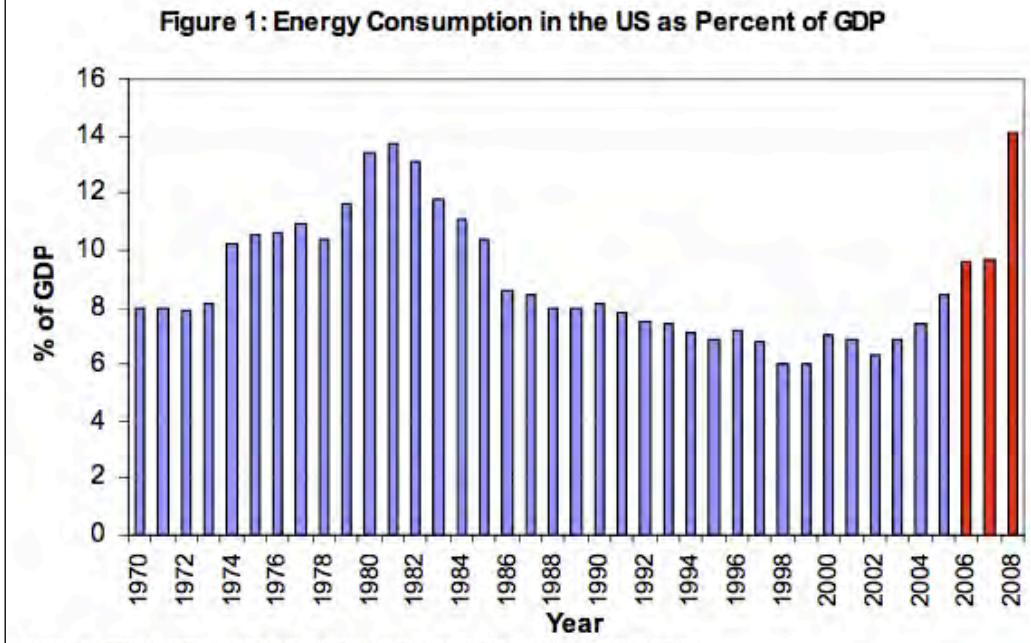
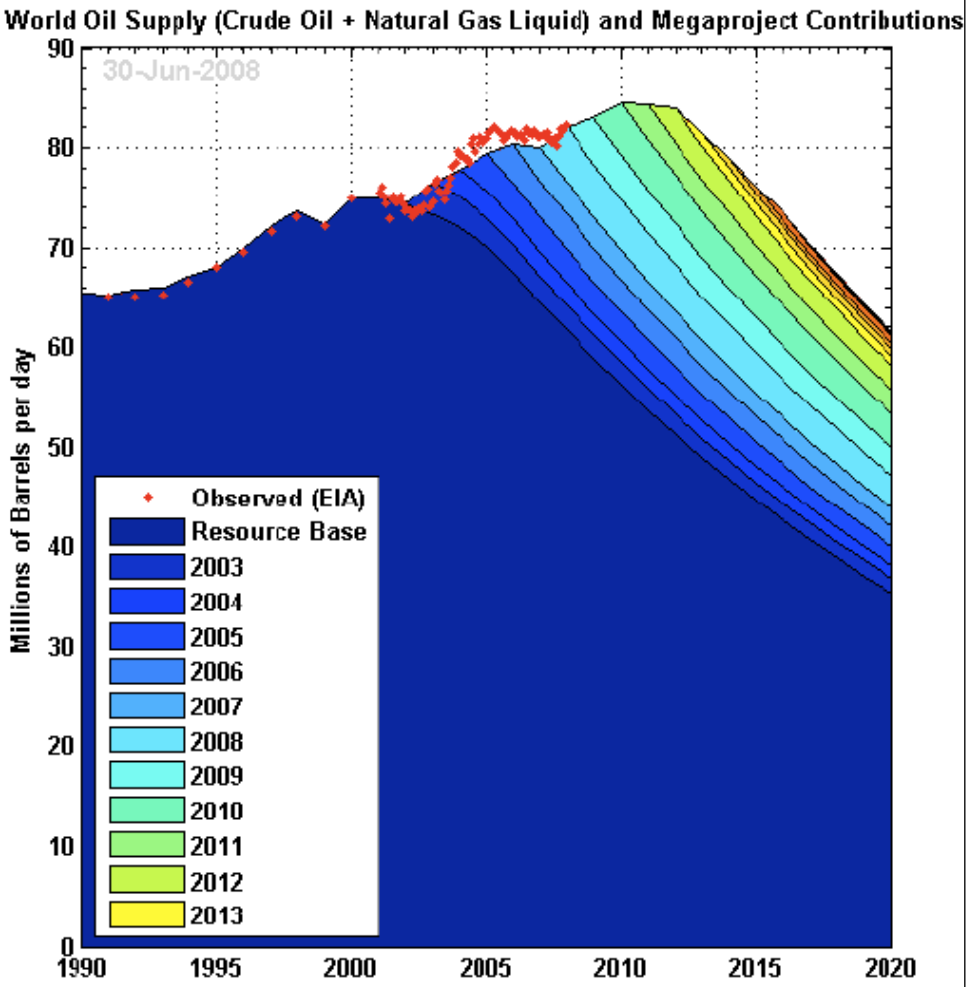
  - *Dollar risk versus Euro, Yen and Yuan risks*
- China scenarios...
  - *Enormous and motivated human capital*
  - *Enormous internal market*
  - *The country of bubbles*
  - *Huge dependence on energy*
  - *Environmental problems*



Future Scenarios: the energy problem



Source: Energy Information Administration and calculatedrisk.blogspot.com
Note: data for 2006-2008 is estimated



Economists rely on the always climbing remaining conventional oil reserves, when in reality every explorer knows that since 1980 more oil is produced than found and the remaining reserves should decline."

Source: J. Laherrere

Our view on Consequences for Investment Decisions

Global Macroeconomic Trends

- Countries monetary and fiscal policies show increasing differences
- Risk Premiums and spreads become highly volatile due to changes in fiscal policies
- Risk focus shifts from interest risk to default risk
- Our Prediction: Currency risk will be the next one to be considered

Investment Trends

→Investing splits into Deflationist and Inflationist views of the world

→Herding behavior is increasing

→No low-risk asset exist anymore

→Buy-and-hold strategy will no more be a winner

(So far the adjustments in currency risk premiums we have seen are just “appetizers”)

New risks to consider

- Inflation and Deflation
- Bank failures
- “Government risks”
- Economic Slowdown (China)

•Financial instabilities are developing everywhere and will develop even more than in the past.

•Systemic risks are rising planet-wise, with entangling of many risk components (everything is linked).

Impact on risk allocation in portfolios and portfolio optimization

- Standard asset allocation and risk management does NOT work when we need it most

- We need several levels of risk assessment and management:
  - Fat tail, copula dependence, expected shortfall bootstraps...
  - Financial crises

Towards new pension fund strategy and asset allocation

A) Need to use financial instability diagnostics

B) Need to re-examine "low risk" investments (such as fixed-income...) => interest risks vs default risks


TOP-NEWS | BÖRSEN-TICKER | GURU | INSIDER | KOLUMNE | KOMMENTAR

FRONT RSS › News

Pensionskassen liquidieren Griechen-Bonds

01.07.2010 07:18

Viele Kassen sind zum Verkauf unter pari gezwungen. Die Verluste halten sich aber in Grenzen. Bei weiter stotternden Finanzmärkten schliessen Exponenten aber neue Sanierungsmassnahmen nicht aus.

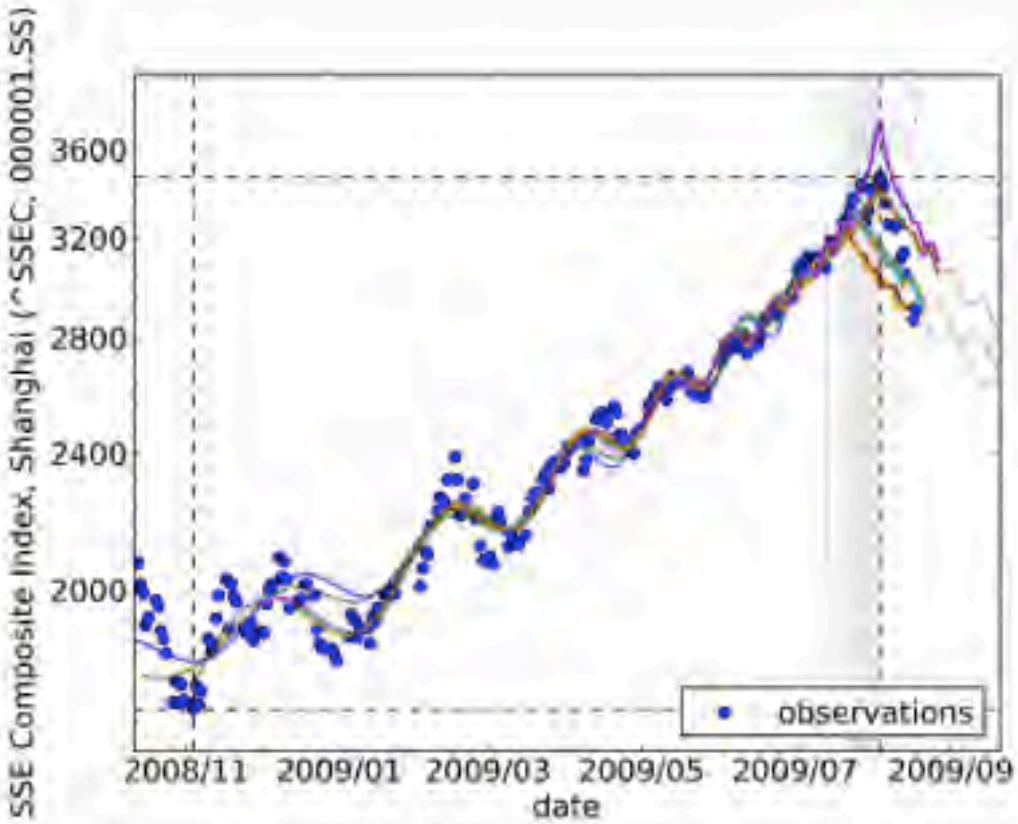
Anfällige Altersvorsorge: Schweizer Pensionskassen haben nur ein dünnes Polster.
Bild: Keystone

C) Need to combine strategic with tactical asset allocations (including need for timing because buy-and-hold will not be anymore a winning strategy)

FCO@ETH: Towards operational science of financial instabilities

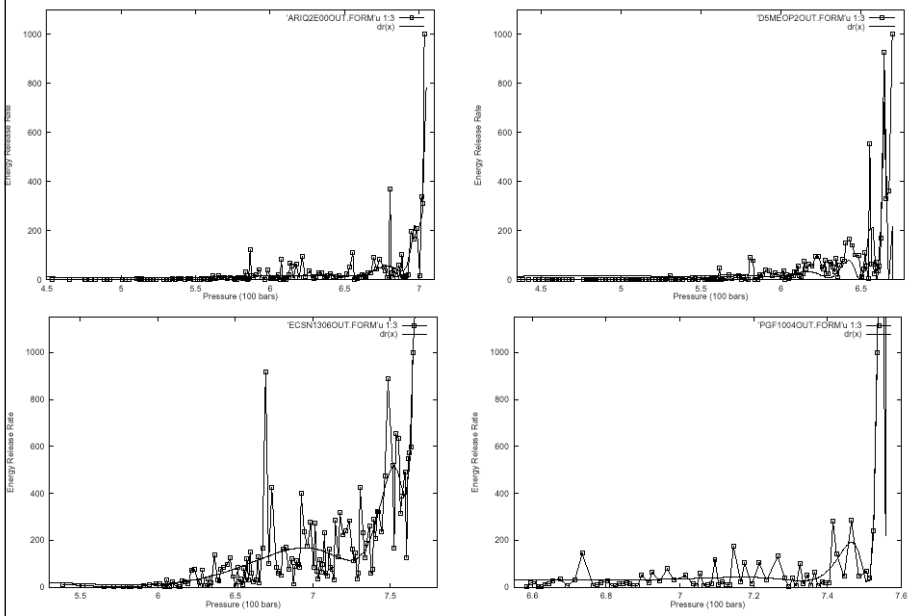
Didier Sornette, Maxim Fedorovsky, Stefan Riemann, Hilary Woodard, Ryan Woodard, Wanfeng Yan, Wei-Xing Zhou

- Main mission:
  - Identify bubbles
- Theory:
  - Positive feedback
- Deliverables
  - Weekly global bubble scan
  - Research, papers
  - Public forecasts
  - Digital timestamps



Methodology for predictability of crises

Strategy: look at the forest rather than at the tree



Our prediction system is now used in the industrial phase as the standard testing procedure.

EADS LAUNCH VEHICLES

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)

Methodology for diagnosing bubbles

Inputs:

-prices

-factors (interest rates, interest spread, historical and implied volatility, exchange rates)

Methods:

-Self-consistent calibration of prices (not returns)

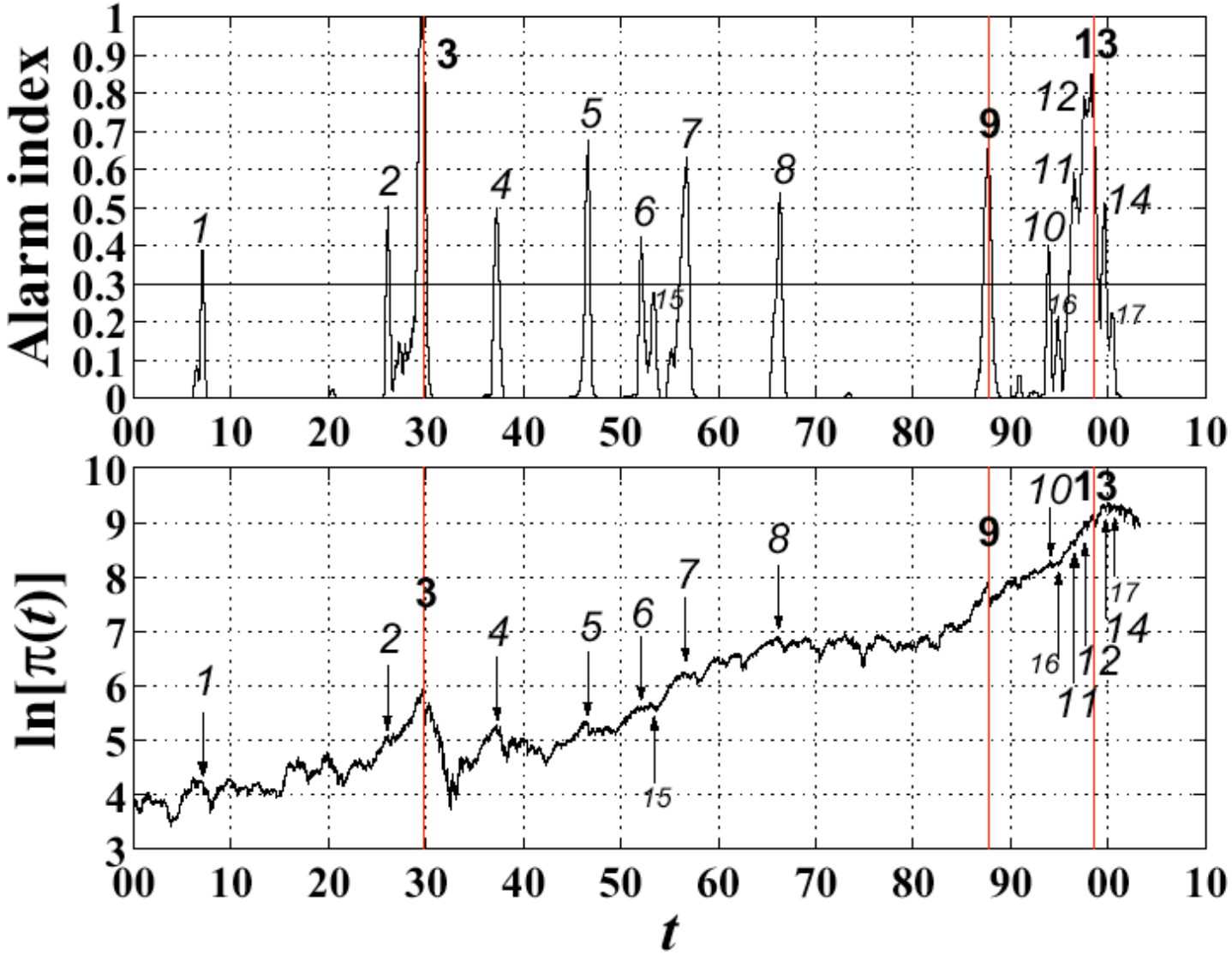
-Portolio of methods to identify transient bubble regimes (entropy, hierarchical analysis, reverse engineering with ABM...)

Methodology for diagnosing bubbles

- Positive feedbacks of higher return anticipation
  - Super exponential price
  - Power law “Finite-time singularity”

- Negative feedback spirals of crash expectation
  - Accelerating large-scale financial volatility
  - Log-periodic discrete scale-invariant patterns

BUBBLE-CRASH ALARM INDEX



Multiscale Pattern Recognition Method

D. Sornette and W.-X. Zhou, Predictability of Large Future Changes in major financial indices, International Journal of Forecasting 22, 153-168 (2006)

Extension to a multi-scale LPPL analysis with Gelfand's method of pattern recognition to predict

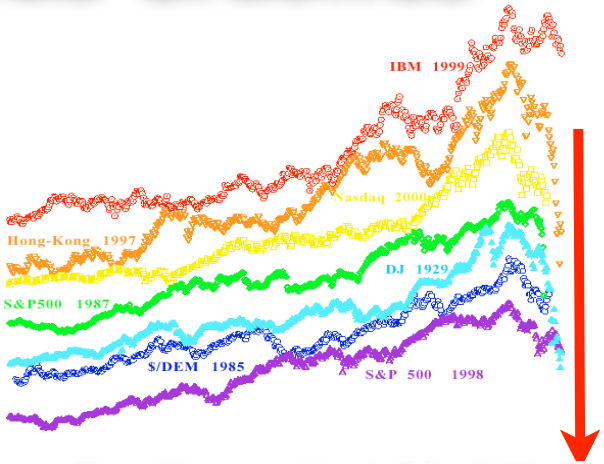
Figure 3: (Color online) Alarm index $AI(t)$ (upper panel) and the DJIA index from 1900 to 2003 (lower panel). The peaks of the alarm index occur at times indicated by arrows in the bottom panel.

Ex-post validation step:
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**

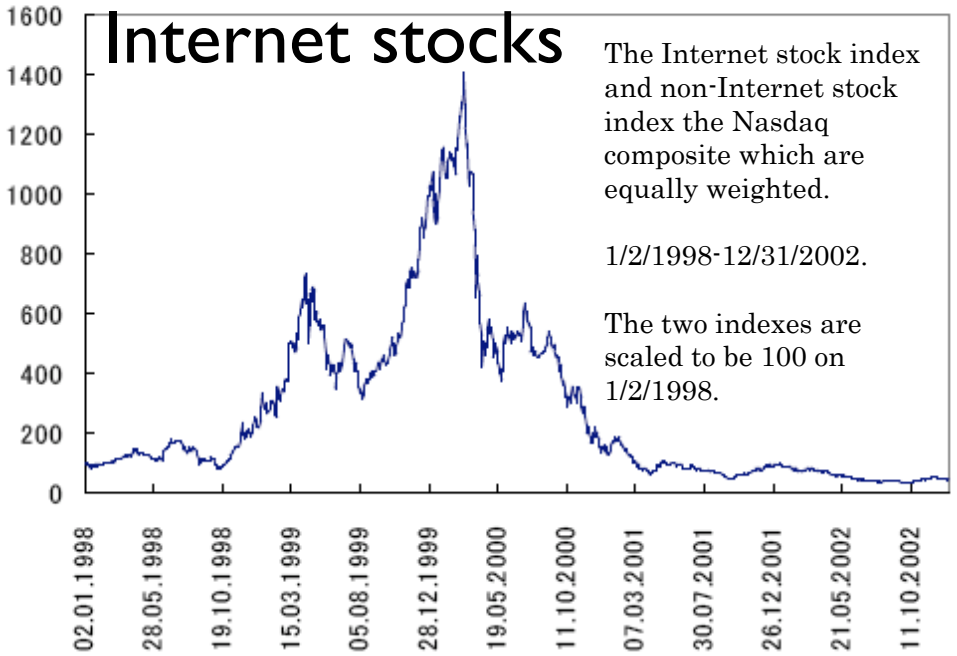
A. Johansen and D. Sornette, Endogenous versus Exogenous Crashes in Financial Markets, (http://arXiv.org/abs/cond-mat/0210509)

Predictability of the 2007-XXXX crisis: 15y History of bubbles and Dragons

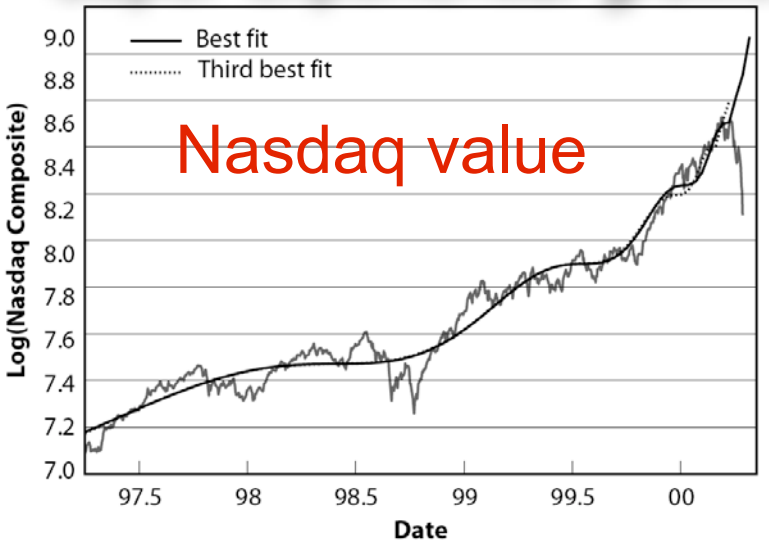
- The ITC “new economy” bubble (1995-2000)
- Slaving of the Fed monetary policy to the stock market descent (2000-2003)
- Real-estate bubbles (2003-2006)
- MBS, CDOs bubble (2004-2007) and stock market bubble (2004-2007)
- Commodities and Oil bubbles (2006-2008)

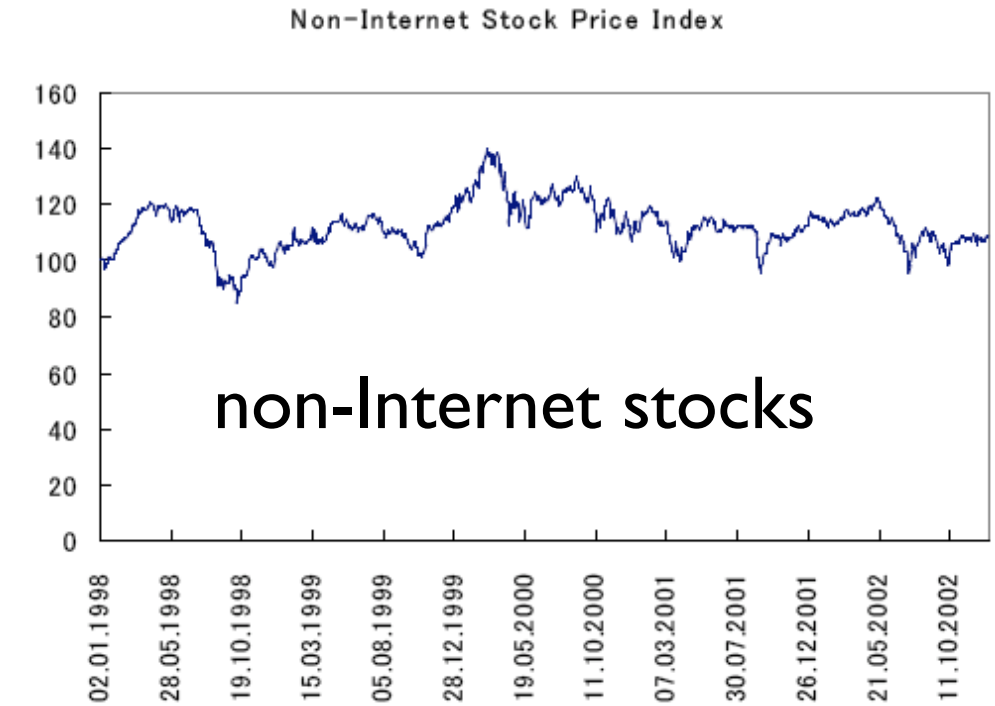
Didier Sornette and Ryan Woodard
Financial Bubbles, Real Estate bubbles, Derivative Bubbles, and the Financial and Economic Crisis (2009)
(http://arxiv.org/abs/0905.0220)

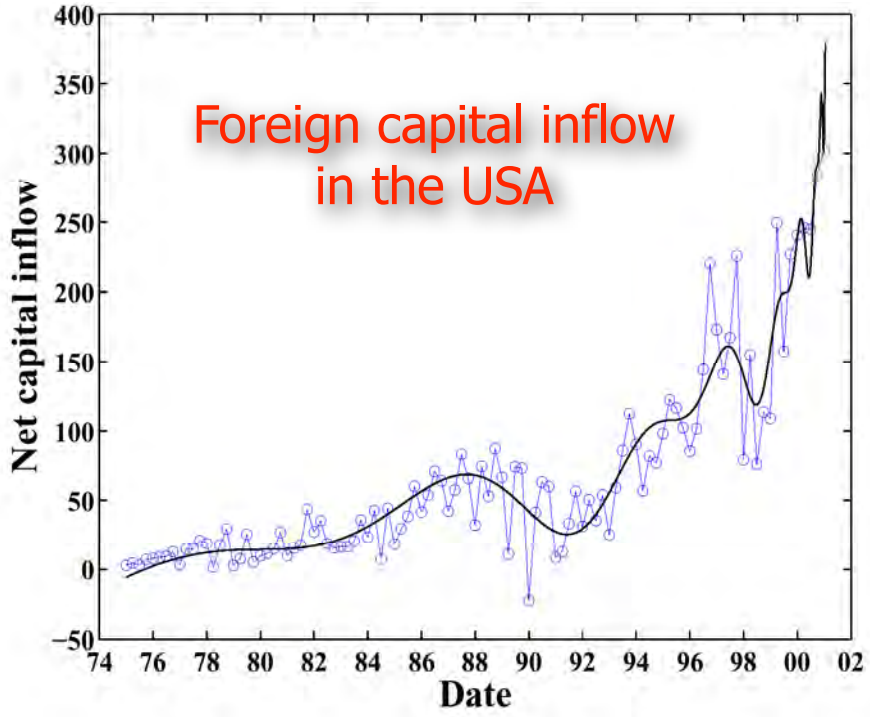
THE NASDAQ CRASH OF APRIL 2000



Super-exponential growth







Real-estate in the UK

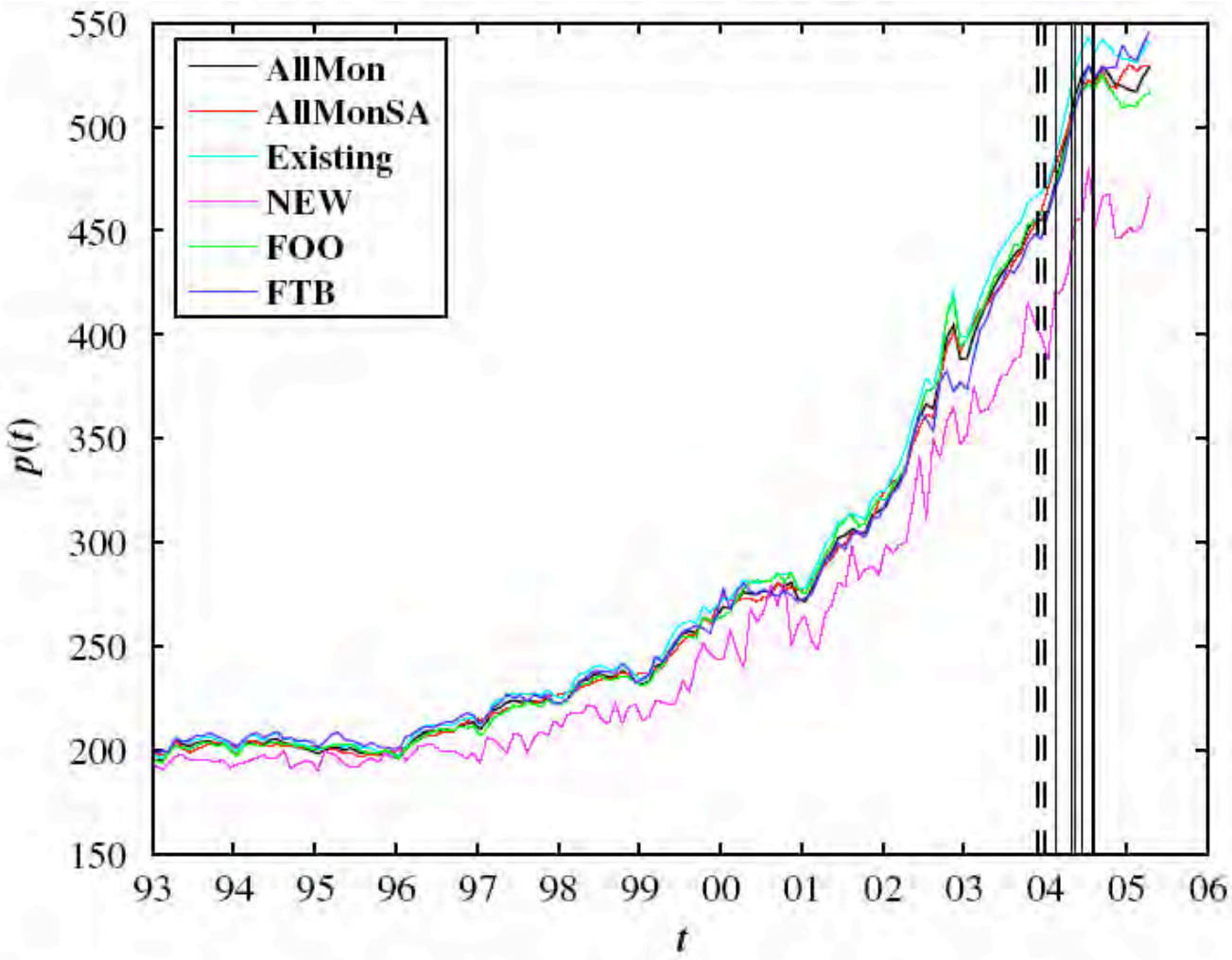


Fig. 1. (Color online) Plot of the UK Halifax house price indices from 1993 to April 2005 (the latest available quote at the time of writing). The two groups of vertical lines correspond to the two predicted turning points reported in Tables 2 and 3 of [1]: end of 2003 and mid-2004. The former (resp. 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

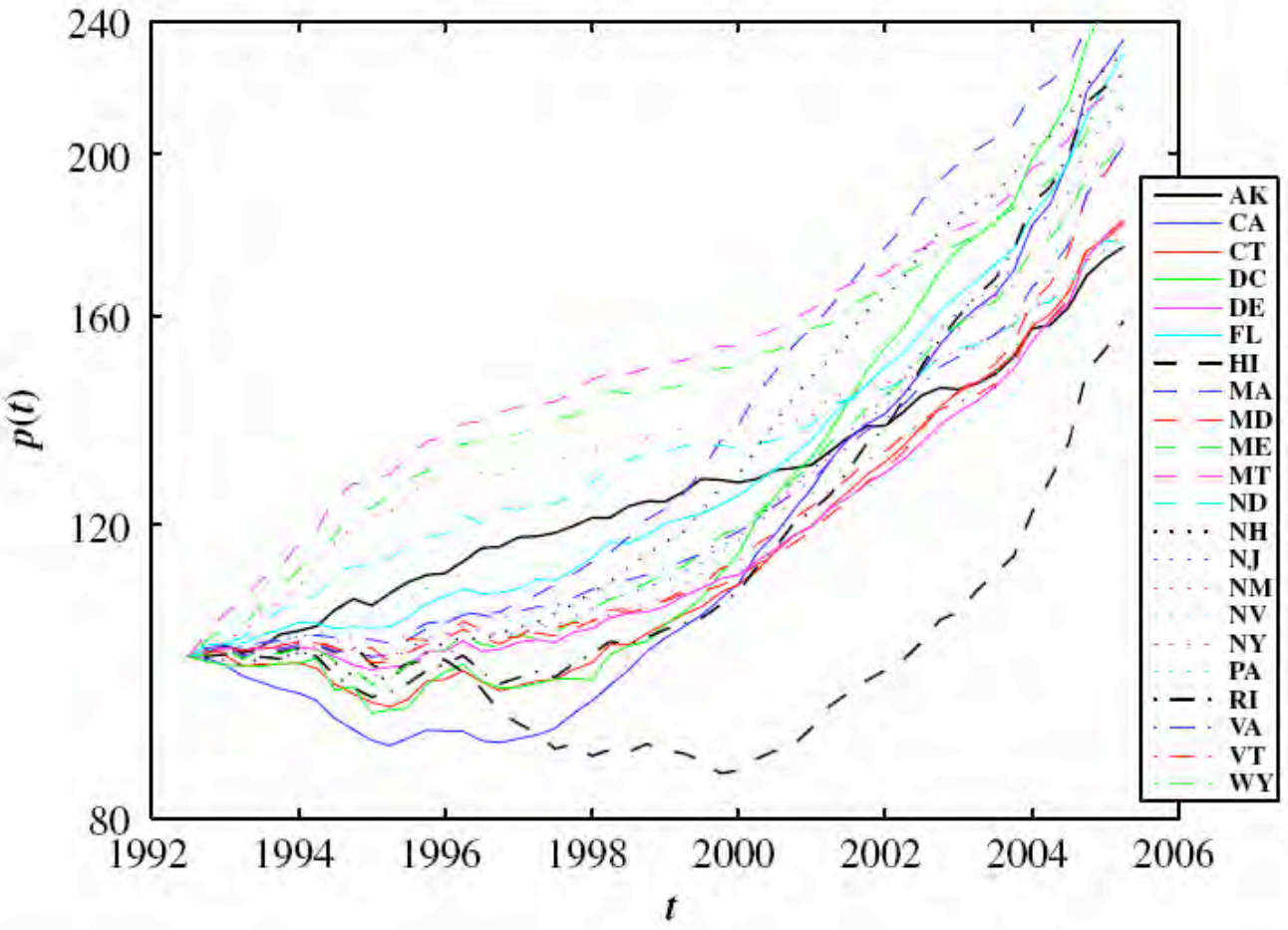
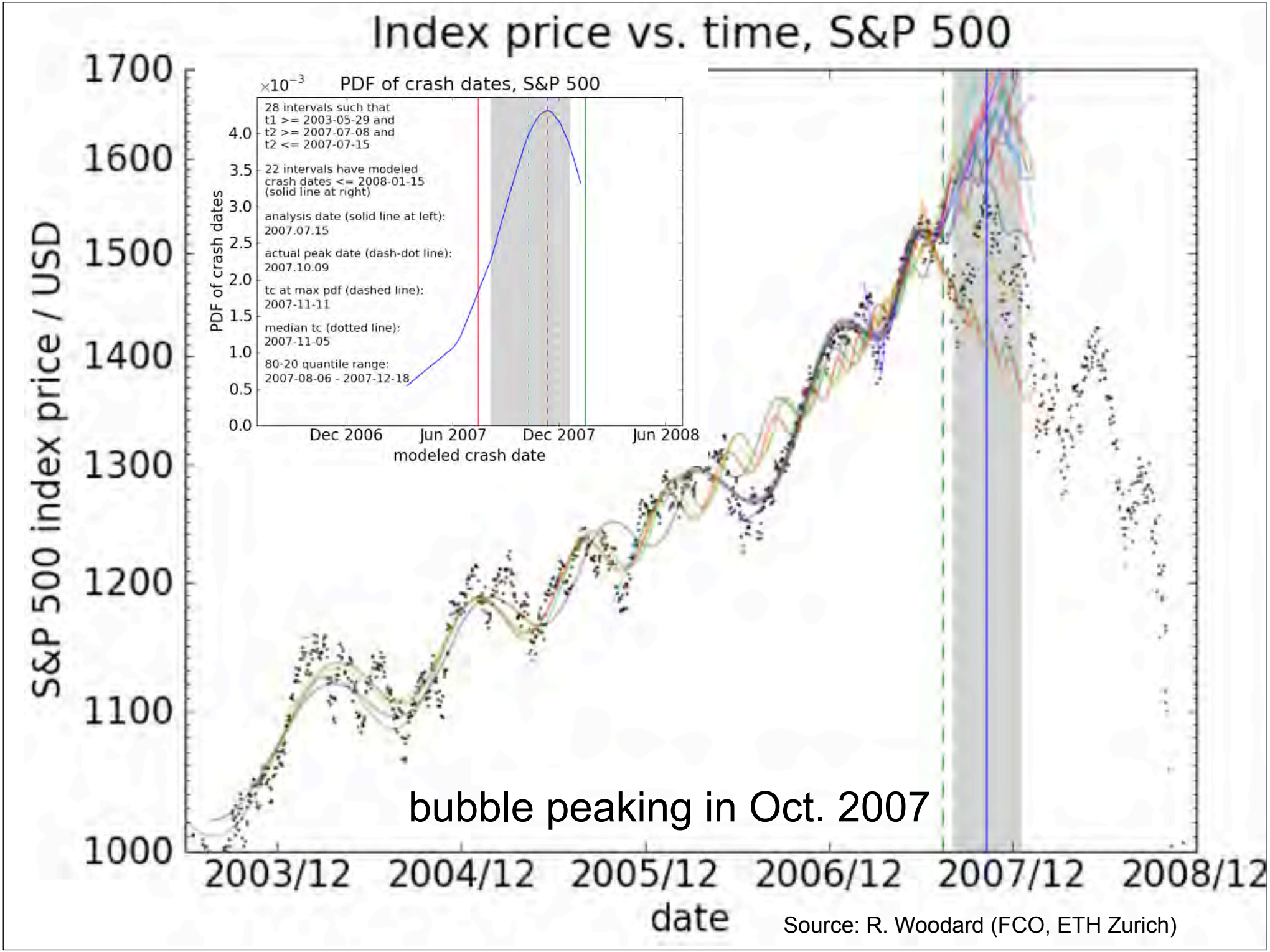


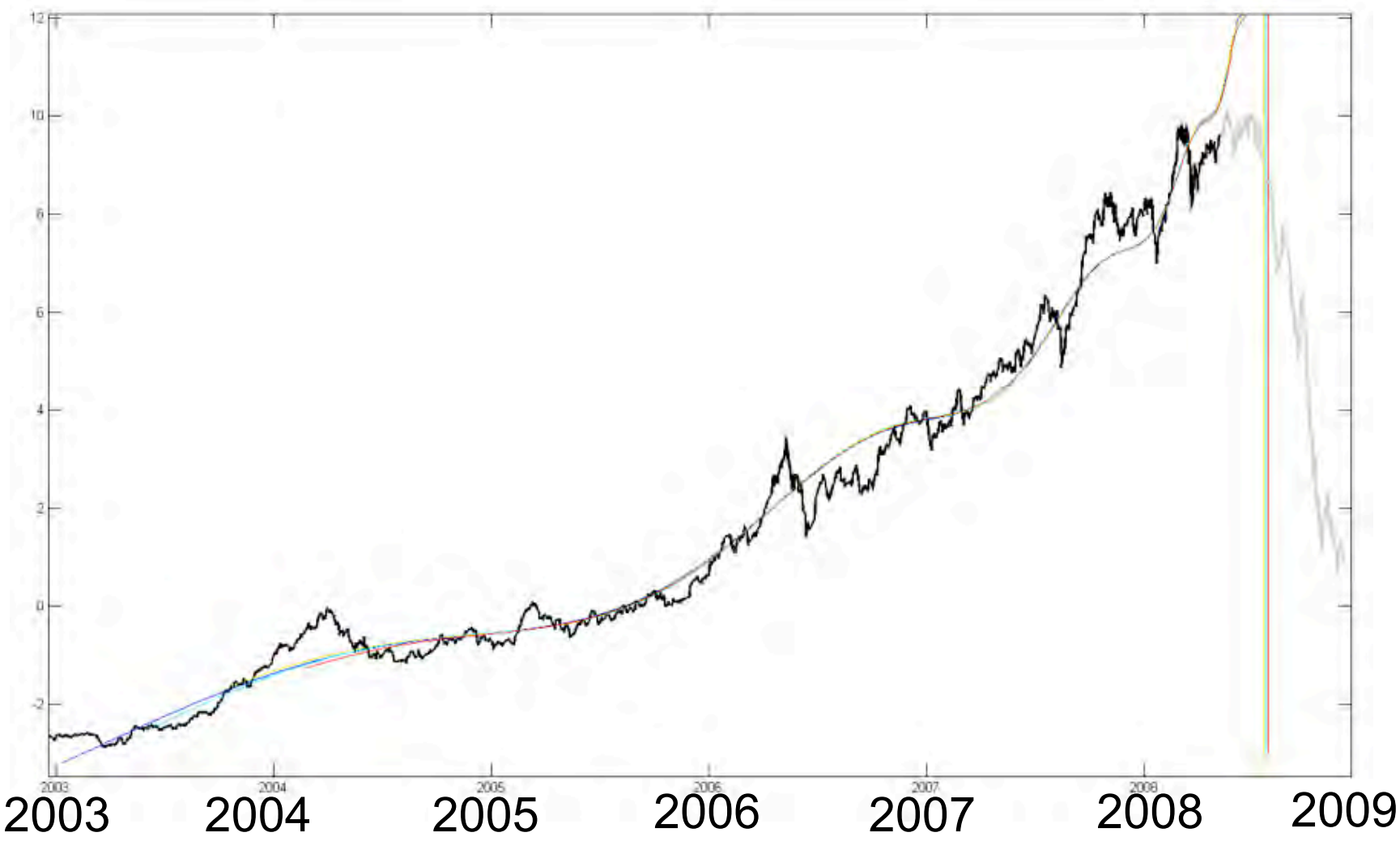
Fig. 5. (Color online) Quarterly average HPI in the 21 states and in the District of Columbia (DC) exhibiting a clear upward faster-than-exponential growth. For better representation, we have normalized the house price indices for the second quarter of 1992 to 100 in all 22 cases. The corresponding states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

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



Source: R. Woodard (FCO, ETH Zurich)

The Global BUBBLE

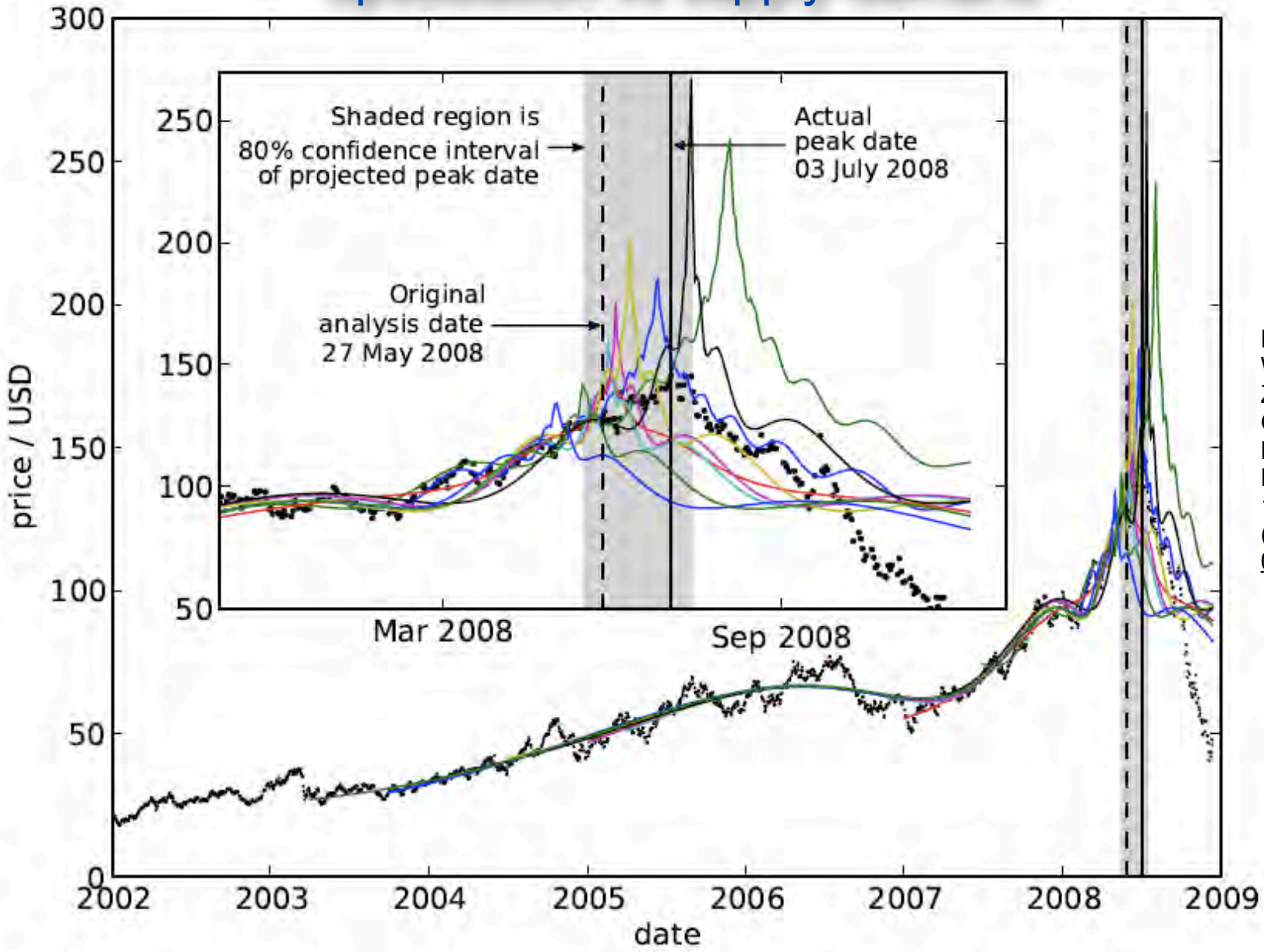


PCA first component on a data set containing, emerging markets equity indices, freight indices, soft commodities, base and precious metals, energy, currencies...

(Peter Cauwels FORTIS BANK - Global Markets)

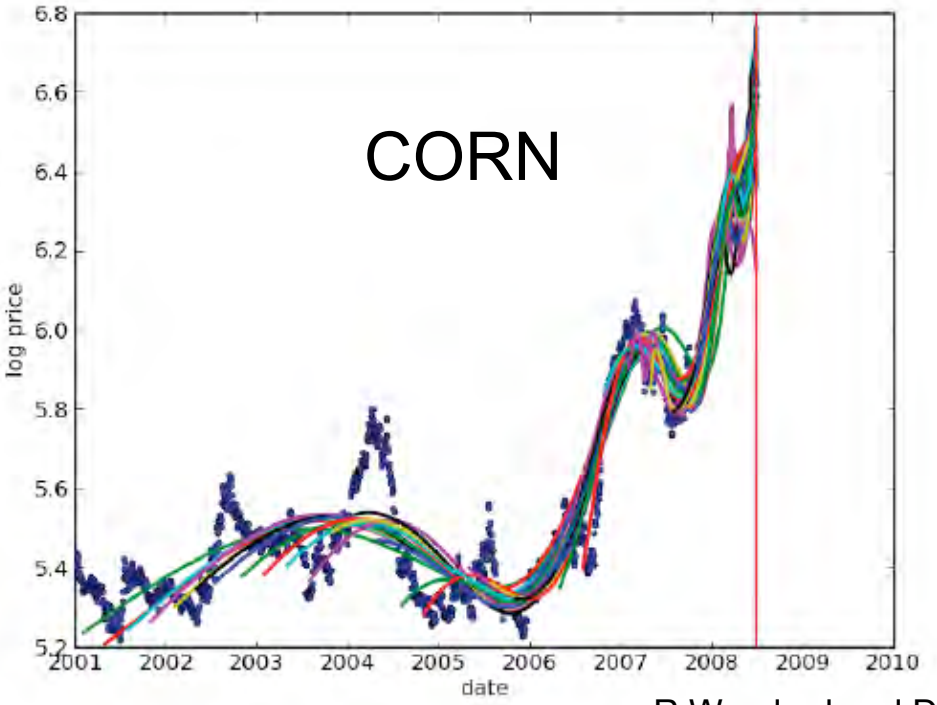
2006-2008 Oil bubble

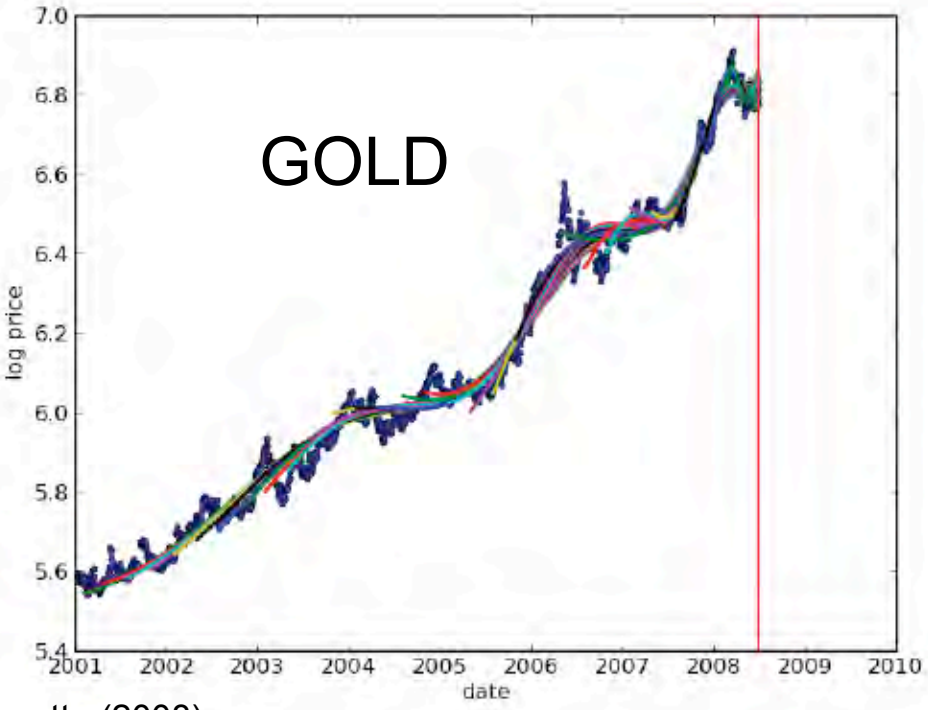
Speculation vs supply-demand



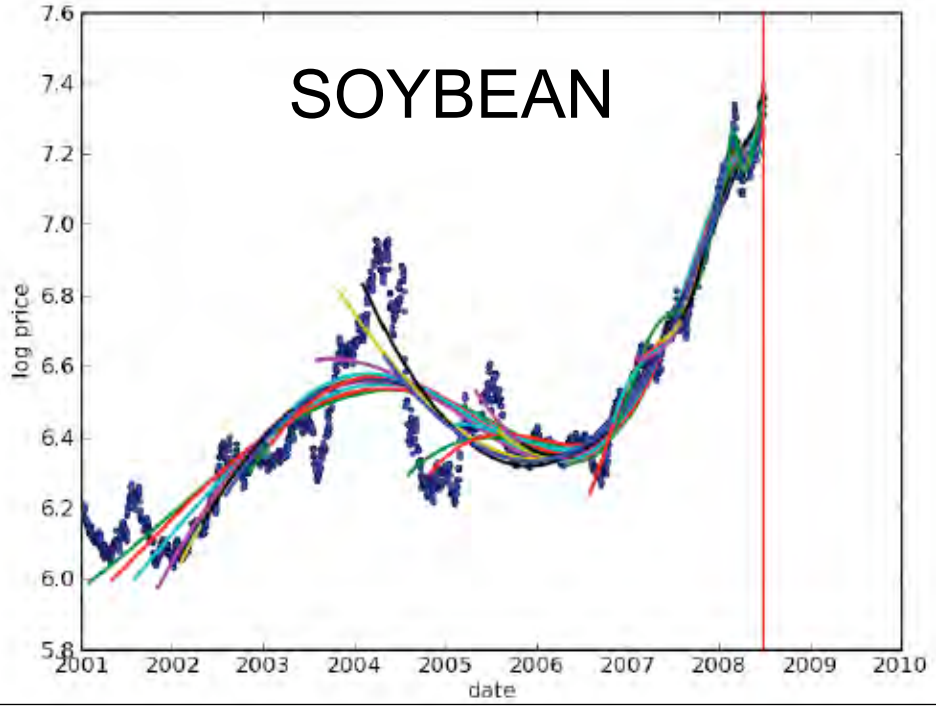
D. Sornette, R. Woodard and W.-X. Zhou, The 2006-2008 Oil Bubble and Beyond, Physica A 388, 1571-1576 (2009) (arXiv.org/abs/0806.1170)

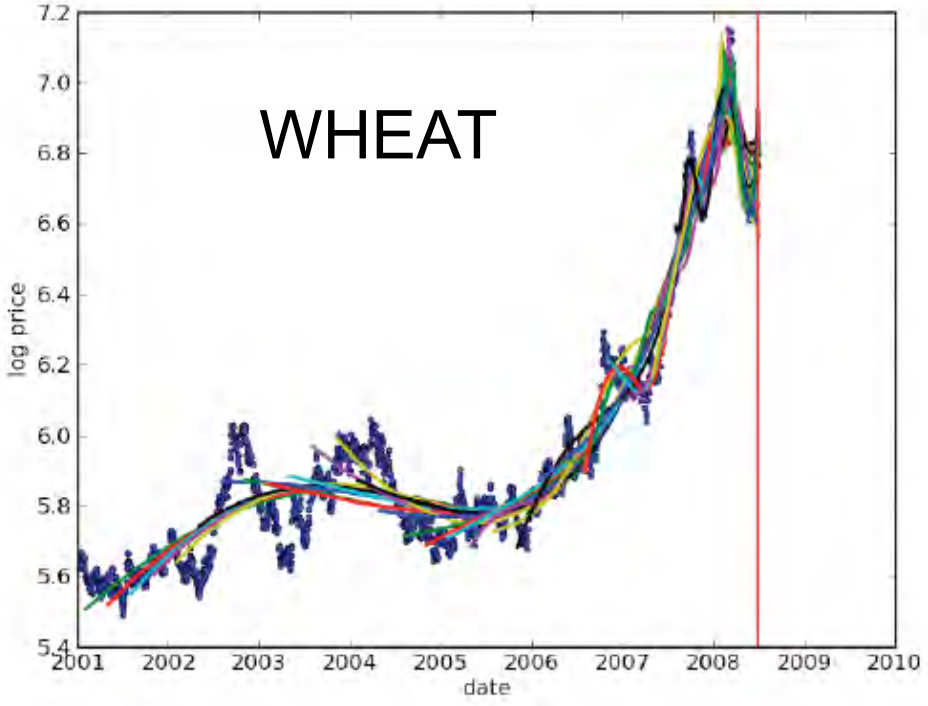
Typical result of the calibration of the simple LPPL model to the oil price in US$ in shrinking windows with starting dates t_{start} moving up towards the common last date t_{last} = May 27, 2008.





R.Woodard and D.Sornette (2008)





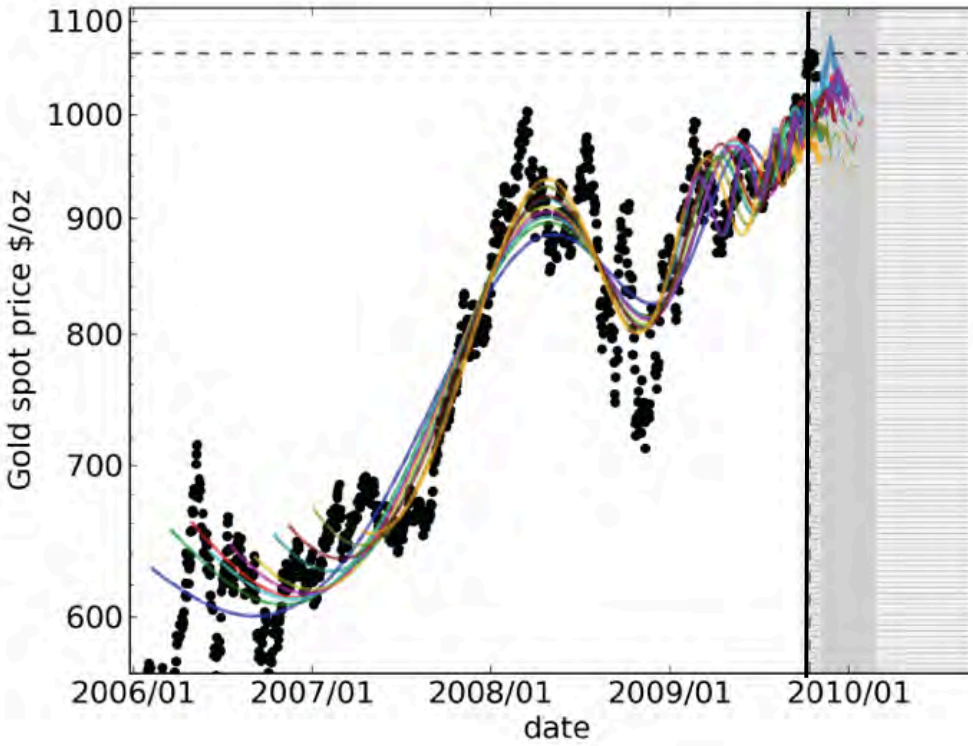
THE FINANCIAL BUBBLE EXPERIMENT
advanced diagnostics and forecasts of bubble ends

- ***Hypothesis H1*: financial (and other) bubbles can be diagnosed in real-time before they end.**

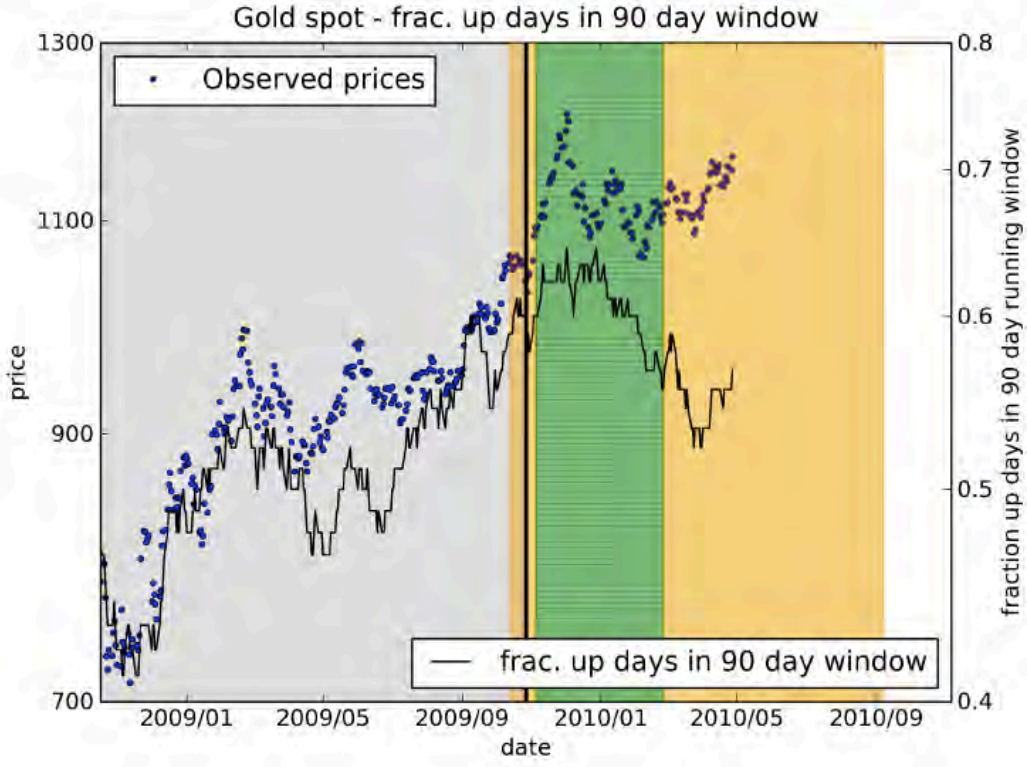
- ***Hypothesis H2*: The termination *(regime change)* of financial (and other) bubbles can be bracketed using probabilistic forecasts, with a reliability better than chance.**

Gold spot price - USD

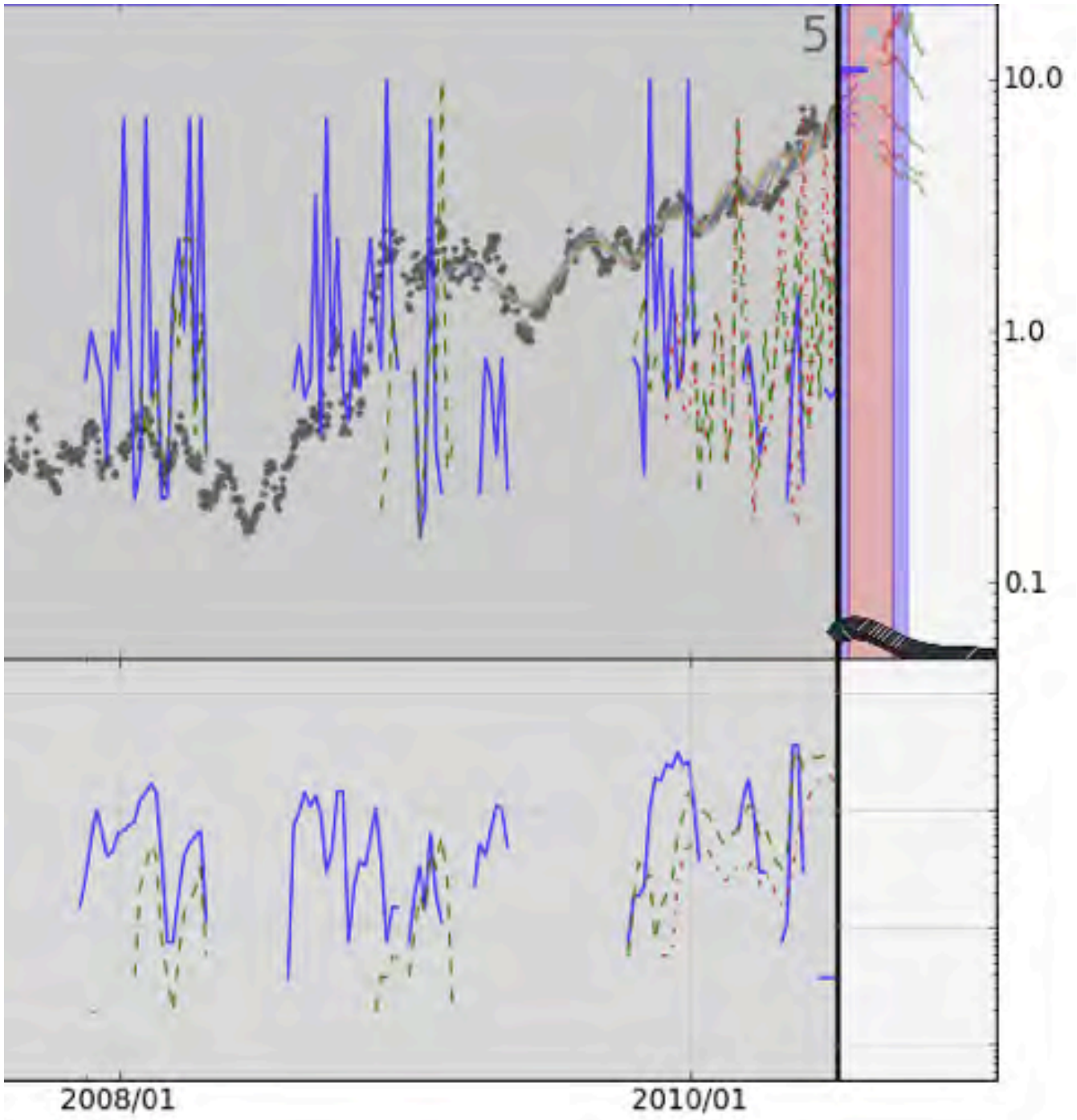
Forecast



Realized



ChF 10yr Govn Bond



6 July 2010

Towards new pension fund strategy and asset allocation

1- Fundamental allocation

-strategic allocation in energy, environment, commodities...

2- Tactical allocation

-Bubble diagnostic (targeted, scanning, global...)

-Global and local crash alarm indices

-Improved timing

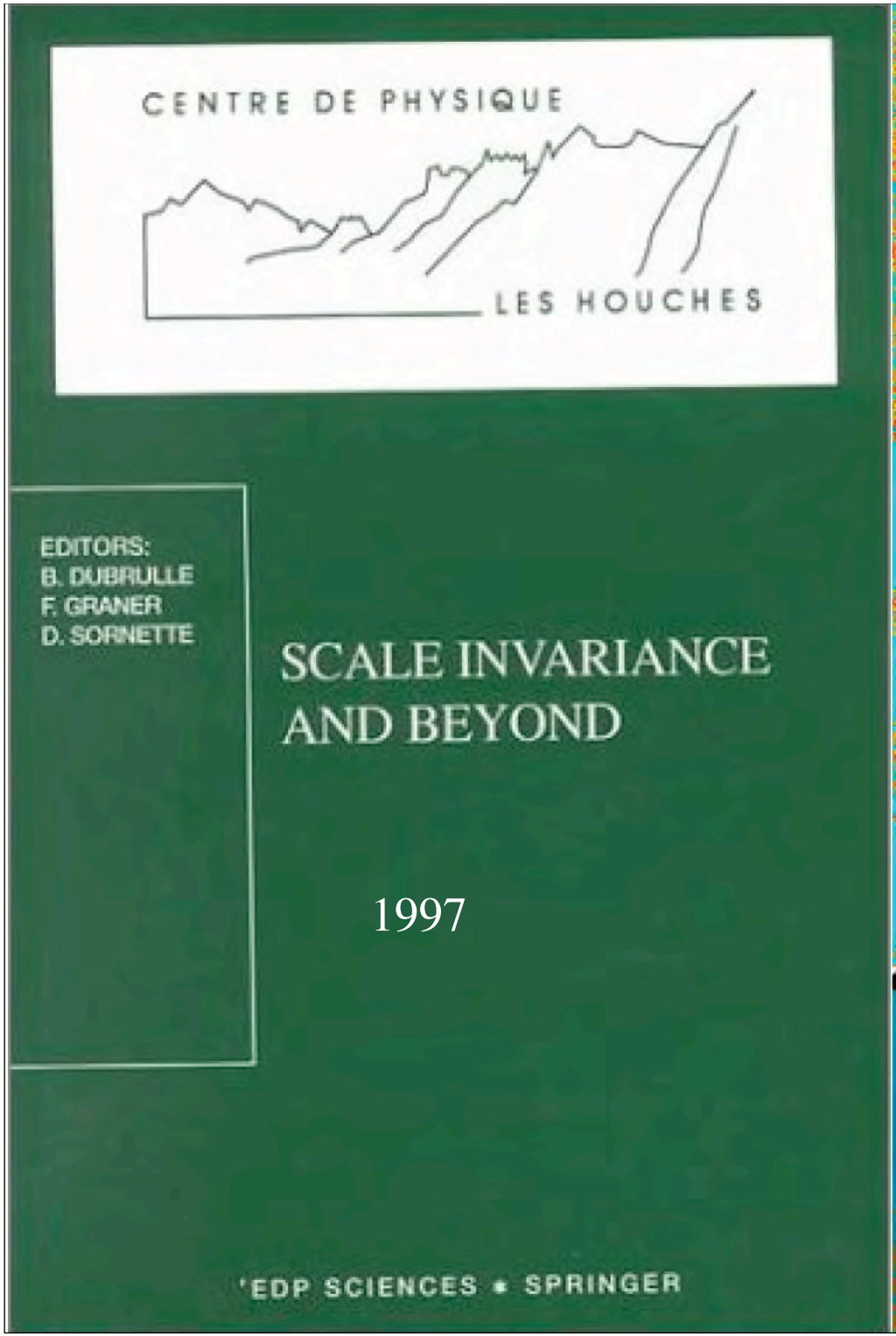
Support slides

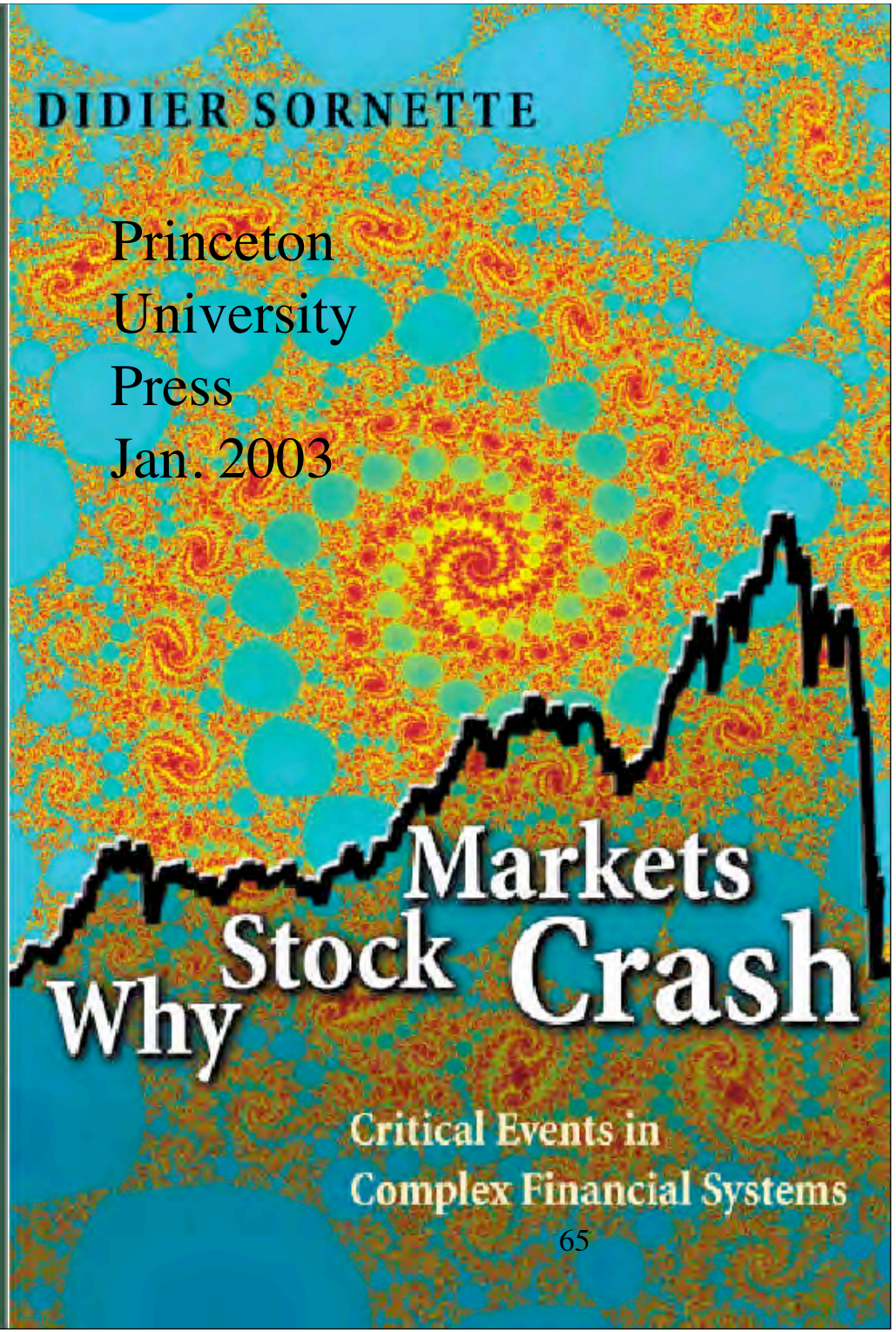
Why bubbles are not arbitraged away?

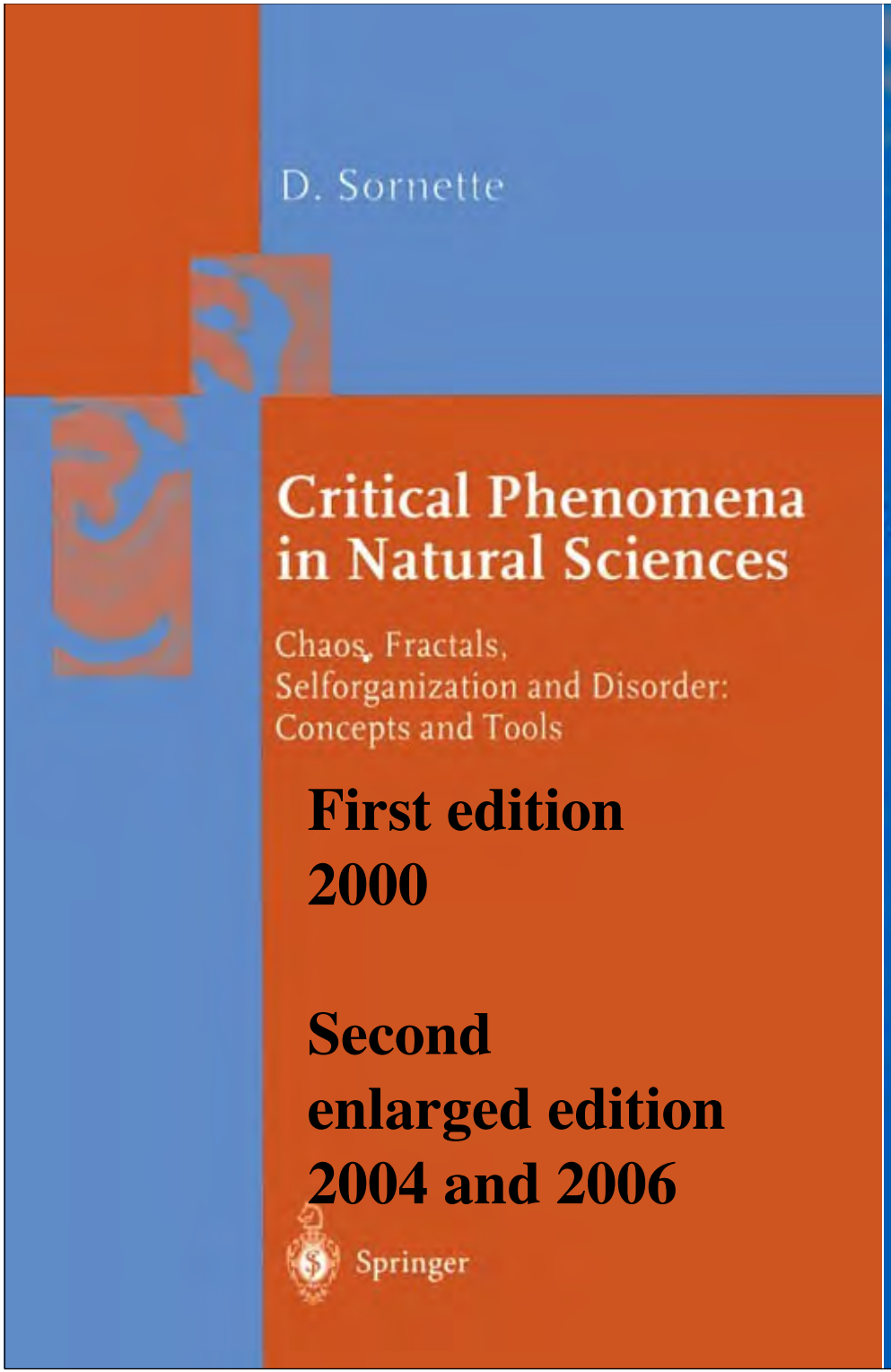
1. limits to arbitrage caused by noise traders (DeLong et, 1990)
2. limits to arbitrage caused by synchronization risk (Abreu and Brunnermeier, 2002 and 2003)
3. short-sale constraints (many papers)
4. lack of close substitutes for hedging (many papers)
5. heterogenous beliefs (many papers)
6. lack of higher-order mutual knowledge (Allen, Morris and Postlewaite, 1993)
7. delegated investments (Allen and Gorton, 1993)
8. psychological biases (observed in many experiments)
9. positive feedback bubbles

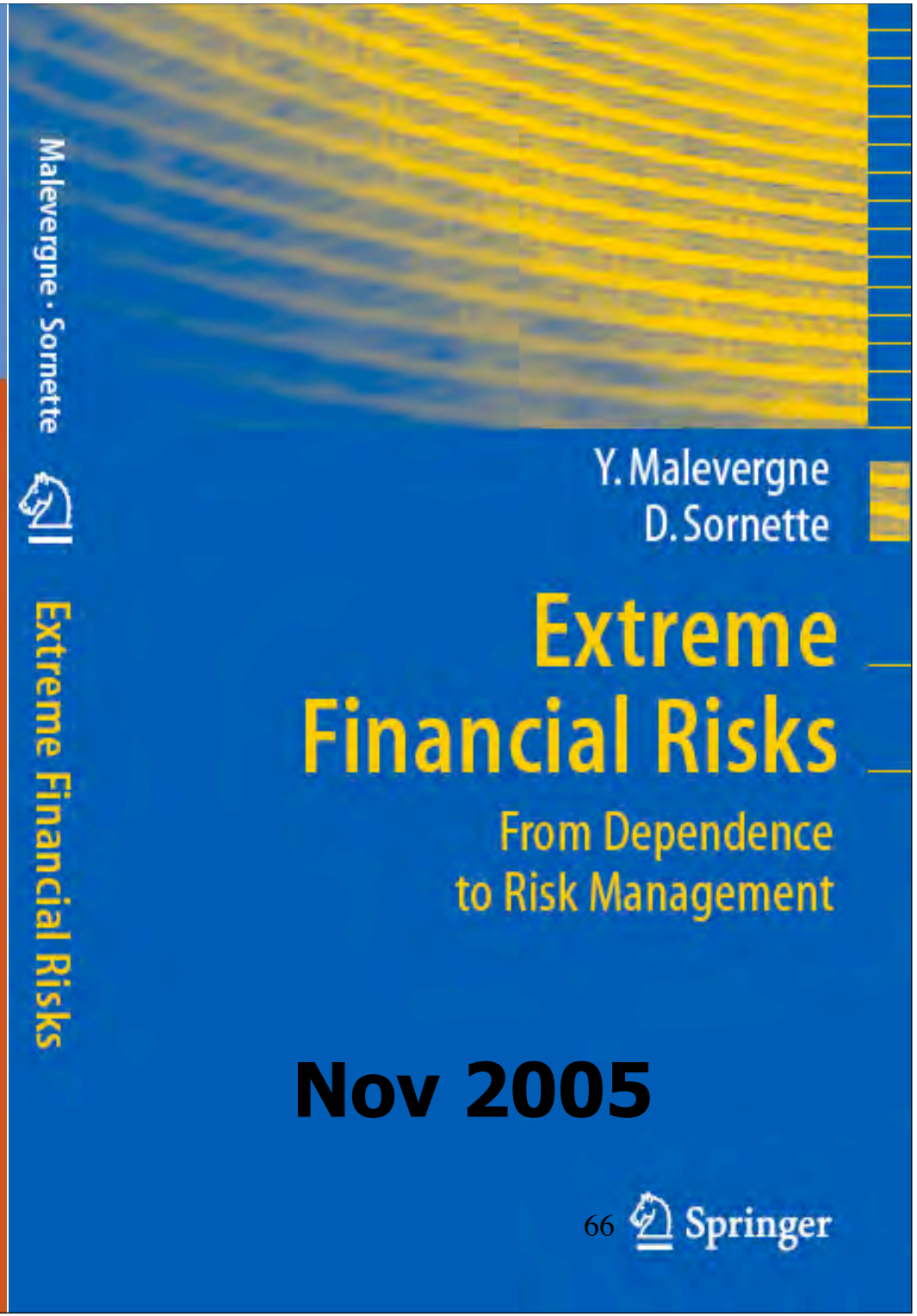
14 factors to propel a market bubble

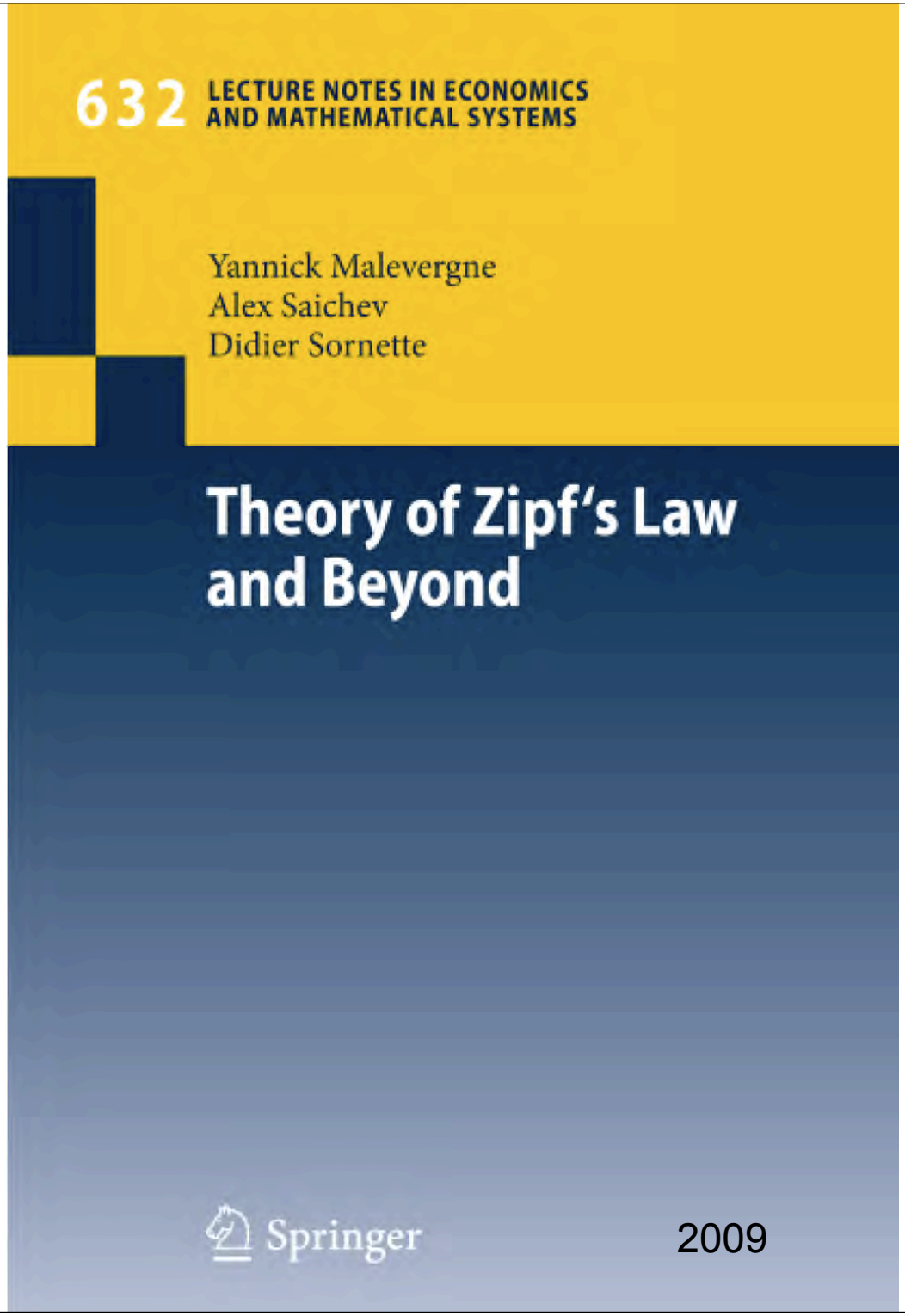
1. the capitalist explosion and the ownership society,
2. cultural and political changes favoring business success,
3. new information technology,
4. supportive monetary policy and the Greenspan put,
5. the baby boom and their perceived effects on the markets,
6. an expansion in media reporting of business news,
7. analysts' optimistic forecasts,
8. the expansion of defined contribution pension plans,
9. the growth of mutual funds,
10. the decline of inflation and the effects of money illusion,
11. the expansion of the volume of trade due to discount brokers,
12. day traders,
13. twenty-four-hour trading,
14. the rise of gambling opportunities.


CENTRE DE PHYSIQUE
LES HOUCHES
EDITORS:
B. DUBRULLE
F. GRANER
D. SORNETTE
SCALE INVARIANCE
AND BEYOND
1997
EDP SCIENCES • SPRINGER


DIDIER SORNETTE
Princeton
University
Press
Jan. 2003
Why Stock Markets Crash
Critical Events in
Complex Financial Systems


D. Sornette
Critical Phenomena in Natural Sciences
Chaos, Fractals, Selforganization and Disorder: Concepts and Tools
First edition 2000
Second enlarged edition 2004 and 2006
Springer


Malevergne · Sornette
Extreme Financial Risks
Y. Malevergne
D. Sornette
Extreme Financial Risks
From Dependence to Risk Management
Nov 2005
Springer


632 LECTURE NOTES IN ECONOMICS AND MATHEMATICAL SYSTEMS
Yannick Malevergne
Alex Saichev
Didier Sornette
Theory of Zipf's Law and Beyond
Springer
2009

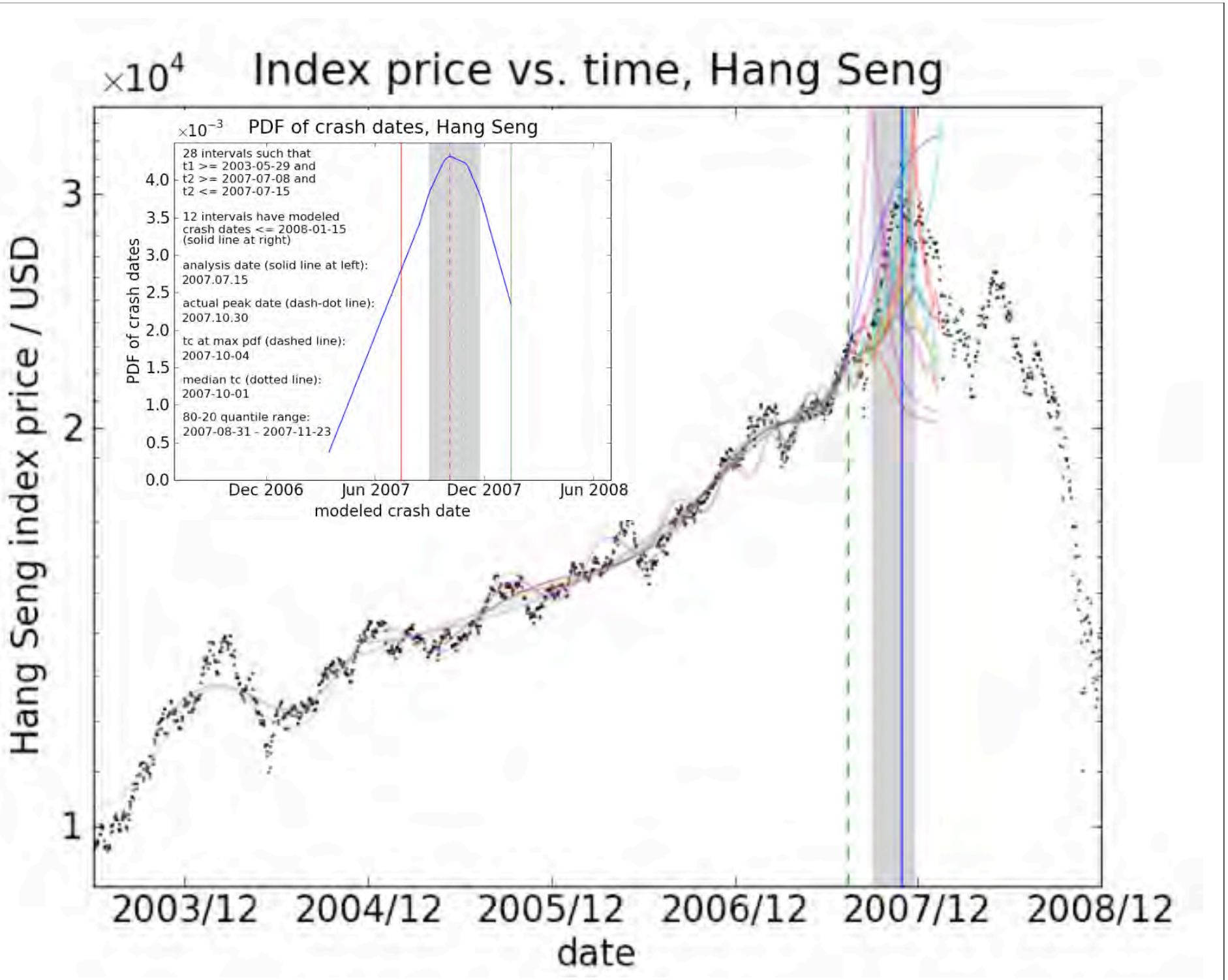
Further Reading

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)

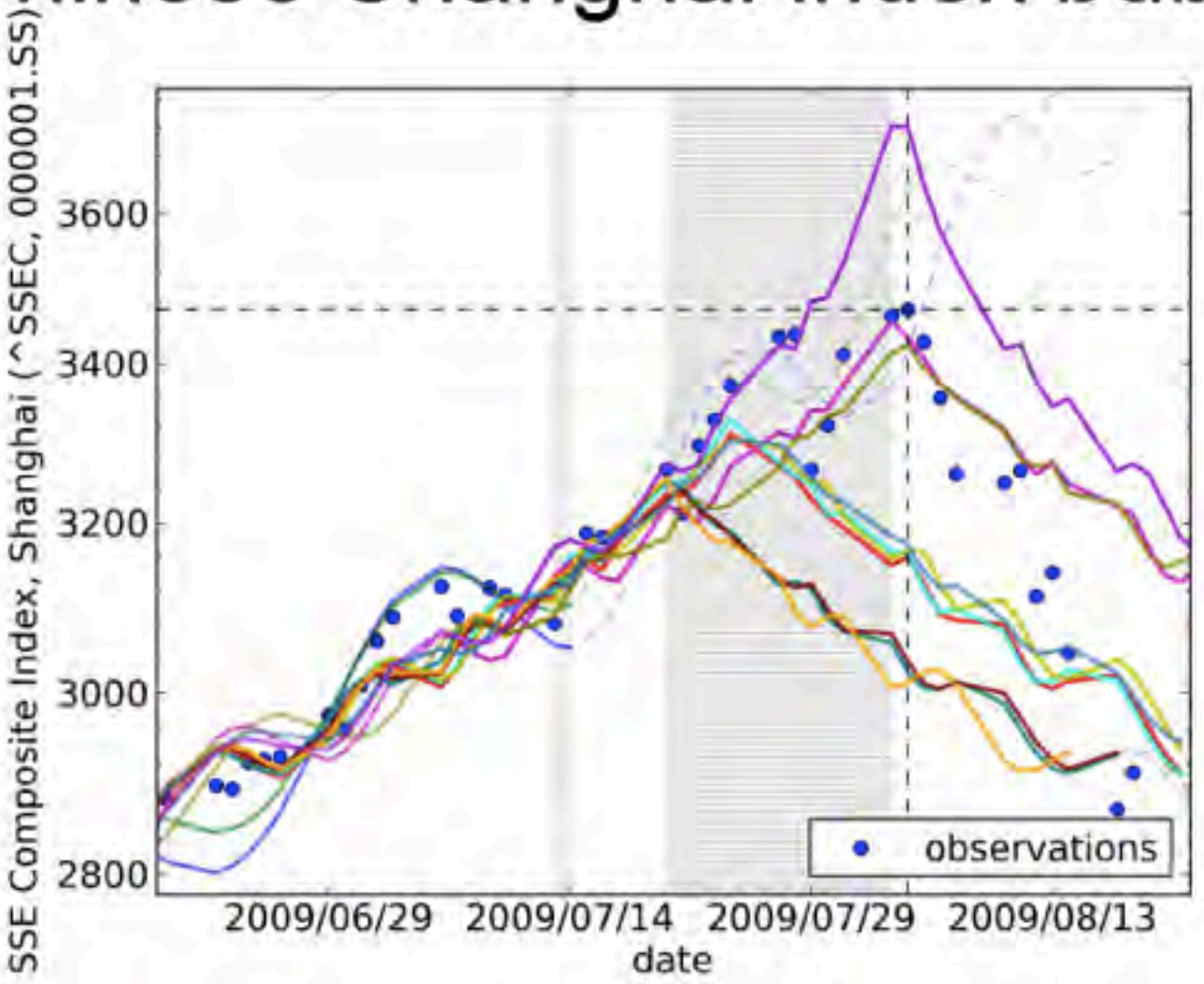
Didier Sornette, Why Stock Markets Crash
(Critical Events in Complex Financial Systems)
Princeton University Press, January 2003

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


Index price vs. time, Hang Seng
×10^4
Hang Seng index price / USD
1
2
3
2003/12
2004/12
2005/12
2006/12
2007/12
2008/12
date
PDF of crash dates, Hang Seng
×10^−3
PDF of crash dates
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
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
Dec 2006
Jun 2007
Dec 2007
Jun 2008
modeled crash date

10 July 2009

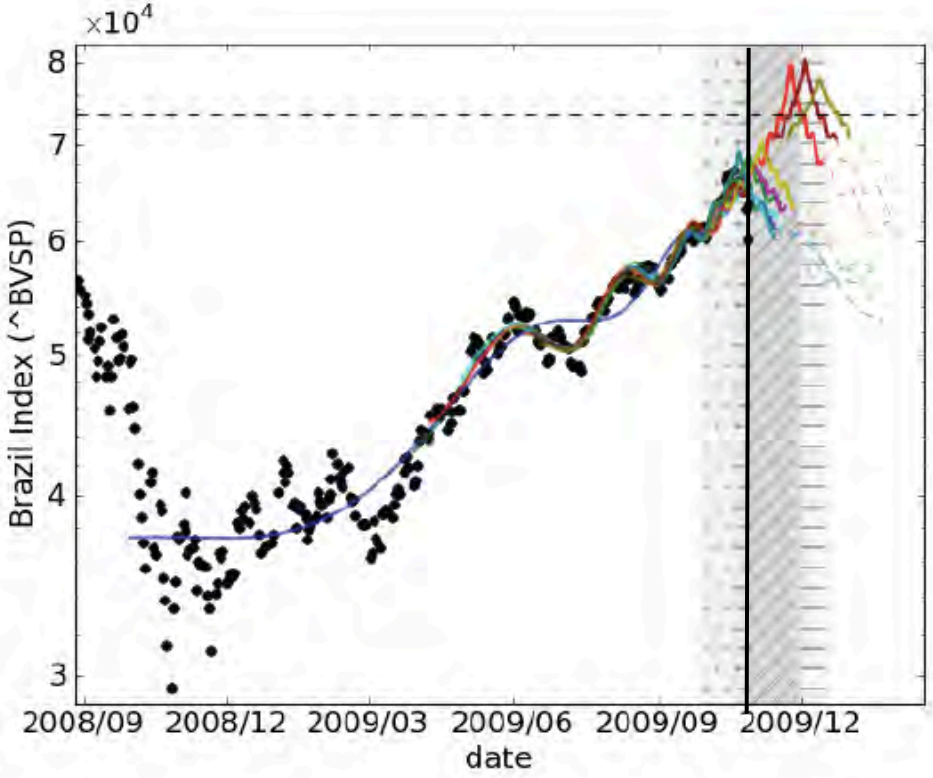
Successful forecast of end of Chinese Shanghai index bubble



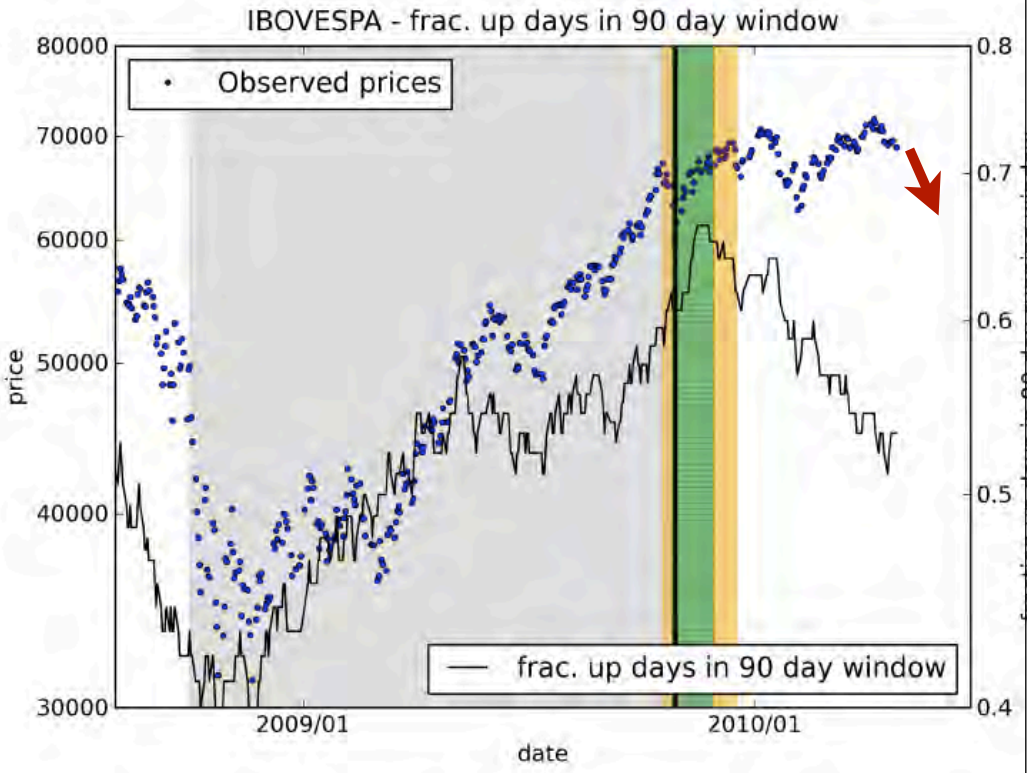
The Chinese Equity Bubble: Ready to Burst,
K. Bastiaensen, P. Cauwels, D. Sornette, R. Woodard and W.-X. Zhou, July 10, 2009 (http://arxiv.org/abs/0907.1827)

Brazil IBOVESPA

Forecast

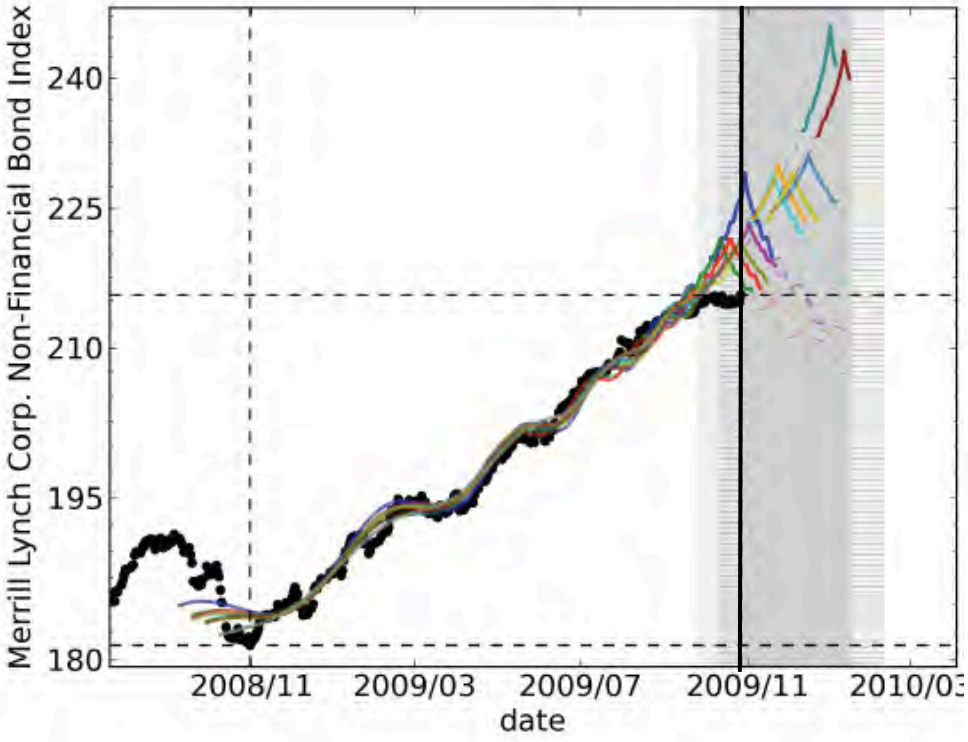


Realized

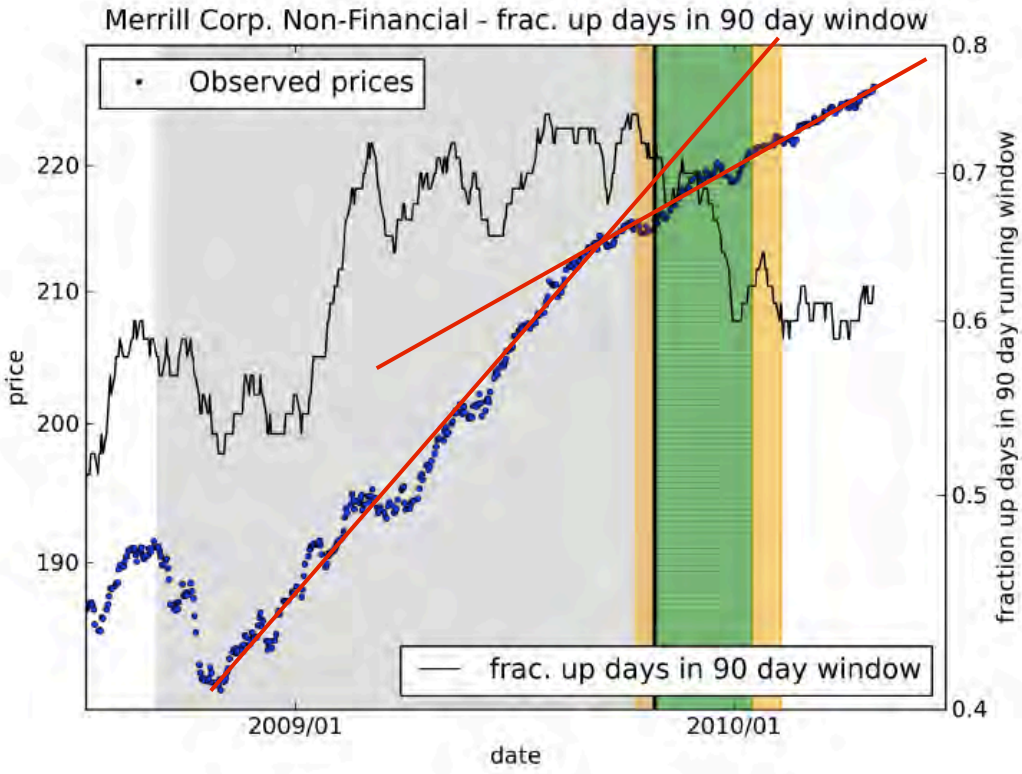


Merrill Lynch European Bond Index

Forecast

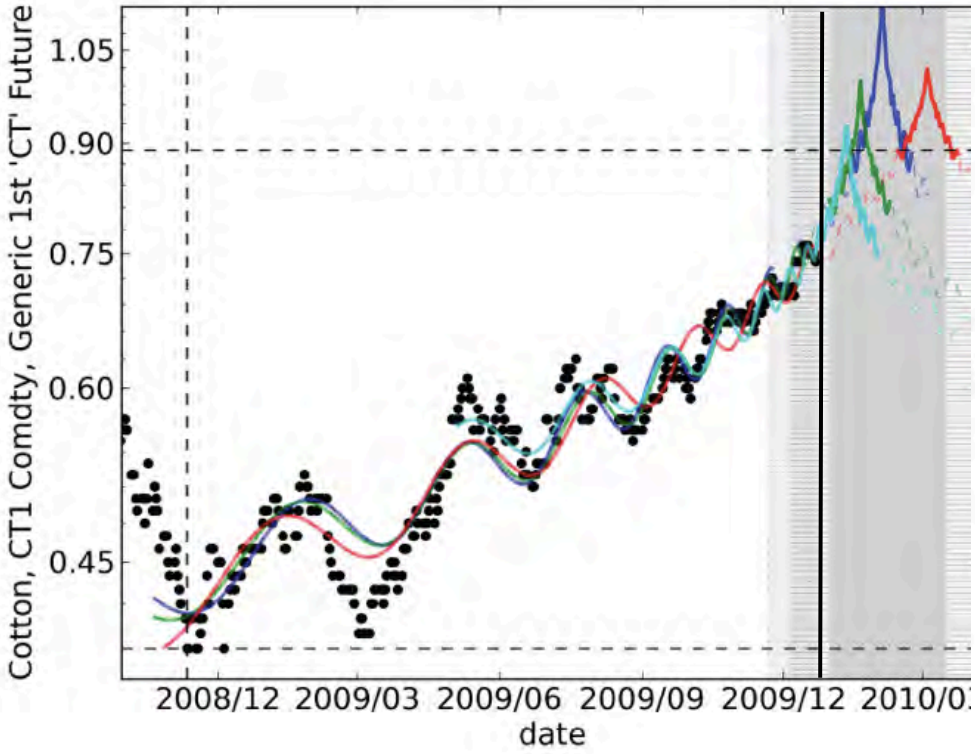


Realized

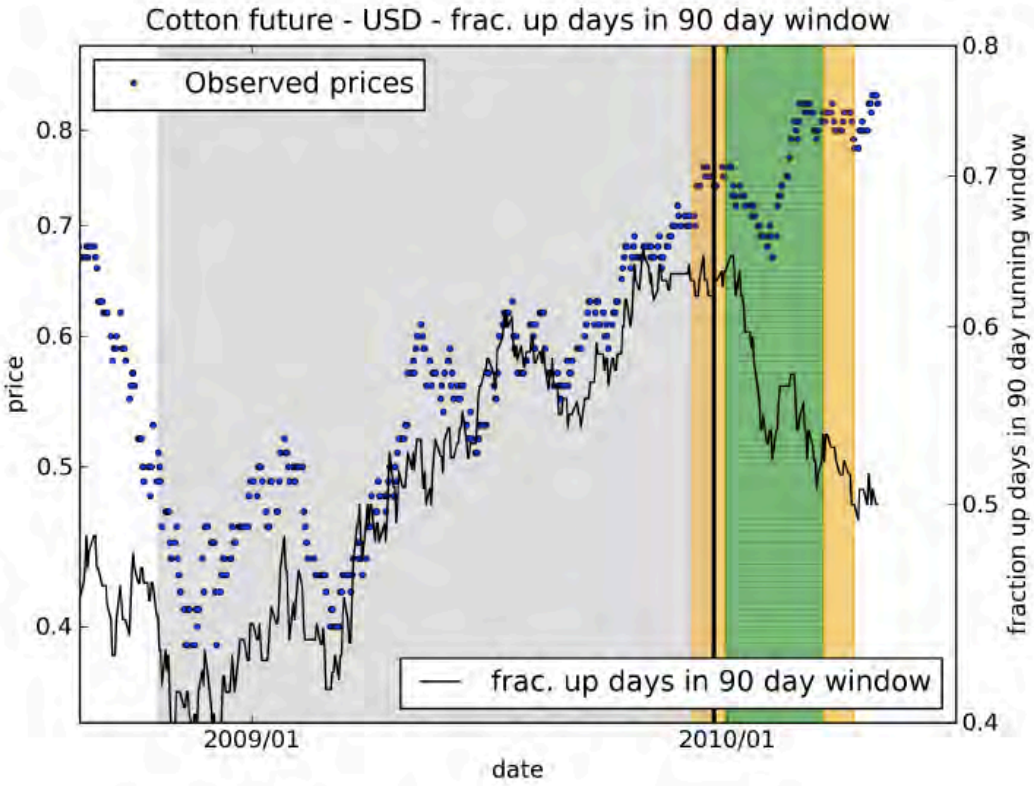


Cotton future - USD

Forecast



Realized



Final remarks I

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

Final remarks

1-All proposals will fail if we do not have better science and better metrics to monitor and diagnose (ex: biology, medicine, astronomy, chemistry, physics, evolution, and so on)

2-Leverage as a system variable versus the illusion of control by monetary policy, risk management, and all that

3-Need to make endogenous policy makers and regulators ("creationist" view of government role, illusion of control and law of unintended consequences of regulations)

4-Fundamental interplay between system instability and growth; the positive side of (some) bubbles

5-Time to reassess goals (growth vs sustainability vs happiness). In the end, endogenous co-evolution of culture, society and economy

KEY CHALLENGE: genuine trans-disciplinarity by

TRAINING in 2-3 disciplines + CHANGE OF CULTURE

William C. Dudley (President and Chief Executive Officer of the Federal Reserve Bank of New York), April 2010; Remarks at The Economic Club of New York, New York City. "Asset Bubbles and the Implications for Central Bank Policy"

- Turning to the first issue of whether there are asset bubbles, I am going to be a bit of a heretic and argue that there is little doubt that asset bubbles exist and that they occur fairly frequently.
- In conclusion, let me underscore the challenge that central bankers face in combating asset price bubbles. Doing so effectively requires us to be successful in both identifying the incipient bubble and in developing and implementing a response that will limit bubble growth and avert a destructive asset price crash. This is not easy because asset bubbles are hard to recognize in real time and each asset bubble is different. However, these challenges cannot be an excuse for inaction. Recent experience strongly suggests that asset bubbles exist and that their collapse can be very damaging to the financial system and the macroeconomy."

Mr Jean-Claude Trichet, President of the European Central Bank, on the occasion of the Susan Bies Lecture, Kellogg Distinguished Lecture Series, Evanston, Illinois, 27 April 2010.
"What can central banks do in a financial crisis?"

- First, I will argue that financial crises share some commonalities. In particular, crises are associated with the emergence of euphoria and complacency in financial markets, typically supported by rapid credit growth and a growing belief that new concepts like financial innovation or technological advances have rendered old limits on economic performance obsolete. The existence of such commonalities in the anatomy of financial crisis gives rise to a number of hopes. They suggest that it is possible to develop warnings of nascent crises at an early stage. They imply that policy-makers could design and implement policies that contain or avoid such crises."
- Such commonalities offer hope that policy-makers can detect, at an early stage, a nascent financial crisis. On the basis of inductive logic, we can exploit historical regularities to help predict the future. Being able to identify financial tensions would allow appropriate policy actions to be taken in a timely manner."