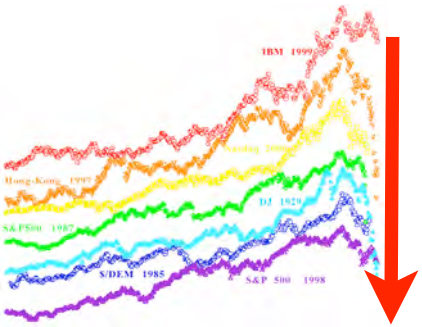
Commodity Bubbles, food security and the Financial Crisis Observatory

"The budget should be balanced, the Treasury should be refilled, public debt should be reduced, the arrogance of officialdom should be tempered and controlled, and the assistance to foreign lands should be curtailed lest Rome become bankrupt. People must again learn to work instead of living on public assistance."

Cicero - 55 BC



Didier SORNETTE
(with Dr. P. Cauwels and Dr. R. Woodard)

Chair of Entrepreneurial Risks

Department of Management, Technology and Economics, ETH Zurich, Switzerland

Member of the Swiss Finance Institute

co-founder of the Risk Center at ETH Zurich (June 2011) (www.riskcenter.ethz.ch)

Professor of Physics associated with the Department of Physics (D-PHYS), ETH Zurich

Professor of Geophysics associated with the Department of Earth Sciences (D-ERWD), ETH Zurich

www.er.ethz.ch

Key Propositions

- Crises are the “norm” rather than the exception
- Crises are often the consequence of excess leverage, i.e., bubbles
- Bubbles results from procyclical positive feedbacks
- Nonlinear stochastic finite-singular processes
- Possibility of developing probabilistic warning

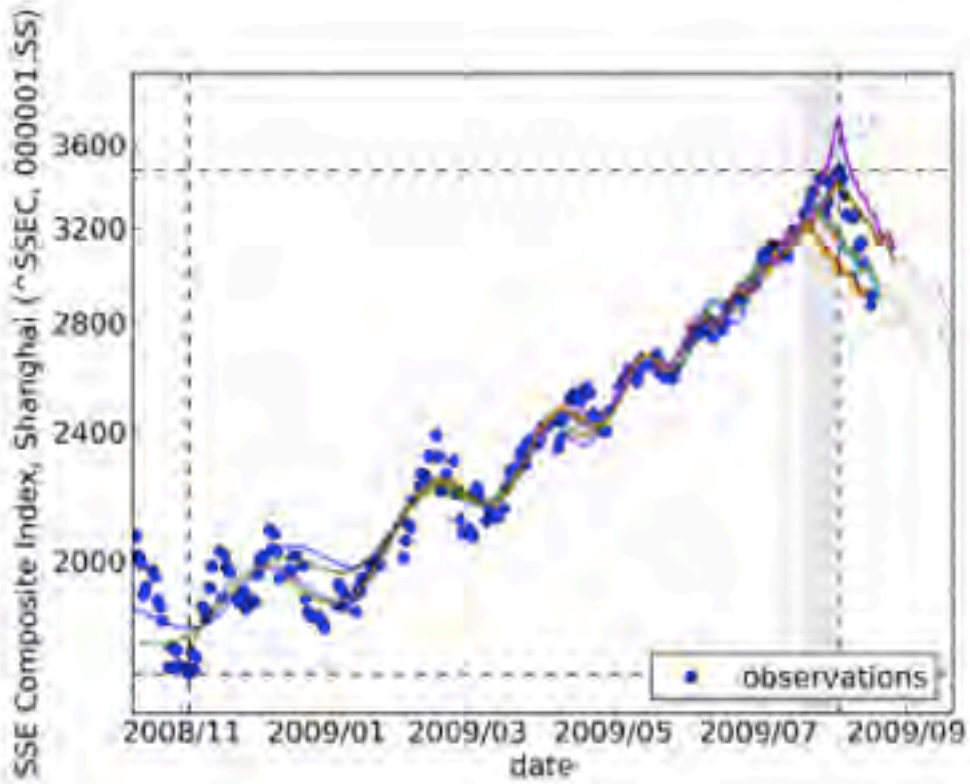
  1) diagnostic of bubbles

  2) forecast of change of regime (burst)

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



ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

D MTEC

Entrepreneurial Risks

The Financial Bubble Experiment
First Results (2 November 2009 - 3 May 2011)

D. Sornette, R. Woodard, M. Fedorovsky, S. Reimann, H. Woodard, W.-X. Zhou
(The Financial Crisis Observatory)
Department of Management, Technology and Economics,
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Swiss Federal Institute of Technology Zurich

D MTEC

Entrepreneurial Risks

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.**

Thursday, November 05, 2009

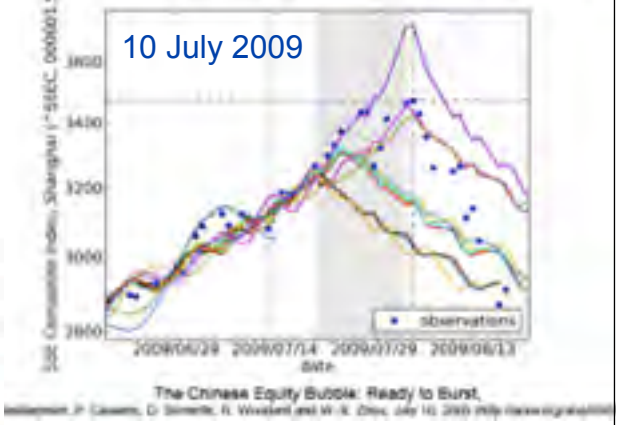
Forecasting financial crashes: the ultimate experiment begins

If a new technique for predicting crashes really works, a bold new experiment will measure how well.

Technology Review
PUBLISHED BY MIT

Massachusetts Institute of Technology

Successful forecast of end of Chinese Shanghai index bubble



The Chinese Equity Bubble: Ready to Burst,

Is it really possible to predict the end of financial bubbles? Didier Sornette at the Swiss Federal Institute of Technology in Zurich thinks so and has set up the Financial Crisis Observatory at ETH to study the idea.

We've looked at his extraordinary predictions before. Earlier this year, he identified a bubble in the Shanghai Composite Index and much to this blog's surprise, forecast its end with remarkable accuracy.

The Financial Bubble Experiment: Advanced Diagnostics and Forecasts of Bubble Terminations Volume III

R. Woodard, D. Sornette, J. Berninger
(The Financial Crisis Observatory)*
Department of Management, Technology and Economics, ETH Zurich, Kreuzplatz 5, CH-8032 Zurich, Switzerland
(Dated: 2 May 2011)

This is a summary of the third installment of the Financial Bubble Experiment (FBE), where we identified 27 asset bubbles in November 2010 and revealed their names on 2 May 2011. Here we provide the following original documents packaged as one in the following sequence:

1. the initial public summary document of the FBE Vol. III, uploaded on 12 November 2010 as v1 at `http://arxiv.org/abs/1011.2882` and which includes the digital fingerprint of the original *Master* document of the 27 assets (item 3 in this list);

2. the **names**, **forecast quantiles** and final analysis of the 27 bubbles released on 2 May 2011;

3. the original *Master* document identifying the 27 assets, created on 11 November 2010 and whose checksum (digital fingerprint) appears in the document of item 1).

For the purpose of verifying the checksums of the original *Master* document (item 3 in the above list), it and the rest of the contents of this summary document can be found individually online at `http://www.er.ethz.ch/fco/index`.

The checksums of the document in item 3 are:

Document name	
SHA256SUM	4994beab18293be021d751d513b6fec0776fde9cf74c0098f7da8657487d950d
SHA512SUM	[illegible]

TABLE I. Checksums of Financial Bubble Experiment Vol. III forecast document.

25 H1 and H2 Assets (identified bubble)							
Category	Asset	Ticker	t_c 20% - 80%	t_c 5% - 95%	H1	H2	C
Index	BSE SENSEX, Bombay	^BSESN (Y)	2010-11-03 - 2010-12-01	2010-10-27 - 2010-12-10	0	1	*
	Dow Jones-AIG Comm.	^DJC (Y)	2010-11-16 - 2010-12-04	2010-11-09 - 2010-12-10	1	1	*
	FTSE 100	^FTSE (Y)	2010-11-27 - 2010-12-26	2010-11-07 - 2011-01-03	1	1	*
	Hang Seng Index	^HSI (Y)	2010-11-09 - 2010-12-09	2010-11-07 - 2010-12-16	1	1	*
	Interactive Week Internet	^IIX (Y)	2010-11-12 - 2010-12-10	2010-11-04 - 2010-12-23	1	1	*
	NASDAQ Computer	^IXK (Y)	2010-11-13 - 2010-12-06	2010-11-07 - 2010-12-09	1	1	*
	Jakarta Composite	^JKSE (Y)	2010-11-06 - 2010-12-09	2010-10-23 - 2010-12-25	0	0	
	KOSPI Composite Index	^KS11 (Y)	2010-11-15 - 2010-12-26	2010-10-30 - 2011-01-07	1	0	*
	NASDAQ-100 (DRM)	^NDX (Y)	2010-11-05 - 2010-11-29	2010-11-03 - 2010-12-22	1	1	*
	Reuters/Jefferies CRB	CRY INDEX (B)	2010-11-11 - 2010-11-22	2010-11-07 - 2010-11-26	1	1	*
	TSEC weighted index	^TWII (Y)	2010-12-01 - 2011-01-03	2010-11-13 - 2011-01-08	1	-1	*
	Major Market Index	^XMI (Y)	2010-11-10 - 2010-11-25	2010-10-30 - 2010-12-04	1	1	*
Equity	Ishares Singapore Index	EWS (Y)	2010-11-14 - 2010-12-12	2010-11-06 - 2010-12-25	1	1	*
	Freeport McMoRan	FCX (Y)	2010-11-15 - 2010-12-17	2010-11-09 - 2010-12-27	1	1	*
	F5 NETWORKS	FFIV (Y)	2010-12-27 - 2011-03-09	2010-12-02 - 2011-04-08	1	1	
	INTUIT	INTU (Y)	2010-11-28 - 2011-01-15	2010-11-07 - 2011-02-11	0	0	*
	STARBUCKS	SBUX (Y)	2010-11-08 - 2010-11-18	2010-11-06 - 2010-11-25	1	-1	
	UNITED RENTALS INC	URI (Y)	2010-11-09 - 2010-12-13	2010-11-02 - 2011-01-08	1	-1	
Commodity	Copper future (USD)	HG1 COMB Comdty (B)	2010-11-09 - 2011-01-07	2010-10-31 - 2011-01-15	1	1	*
	Corn future (CHF)	C 1 COMB Comdty (B)	2010-11-18 - 2010-12-19	2010-11-08 - 2010-12-28	1	1	*
	Cotton future (USD)	CT1 COMB Comdty (B)	2010-11-12 - 2010-11-13	2010-11-08 - 2010-11-15	1	1	*
	Palladium future (USD)	PA1 COMB Comdty (B)	2010-11-12 - 2010-11-19	2010-11-10 - 2010-11-27	1	0	*
	Silver future (CHF)	SI1 COMB Comdty (B)	2010-11-13 - 2010-11-18	2010-11-08 - 2010-11-29	1	0	*
	Sugar future (CHF)	SB1 COMB Comdty (B)	2010-11-20 - 2010-12-09	2010-11-10 - 2010-12-17	1	1	*
Forex	AUDUSD	(B)	2010-11-12 - 2010-12-25	2010-10-30 - 2011-01-12	1	1	*

TABLE III. 25 H2 assets of the Financial Bubble Experiment as of 11 November 2010. All listed assets are candidates for H1 (identified bubble phase) and H2 (identification of end of bubble phase). Quantile windows of most likely dates of the end of the bubble phases are shown. Abbreviations (B), (Y), H1, H2 and C are described in caption of Table II.

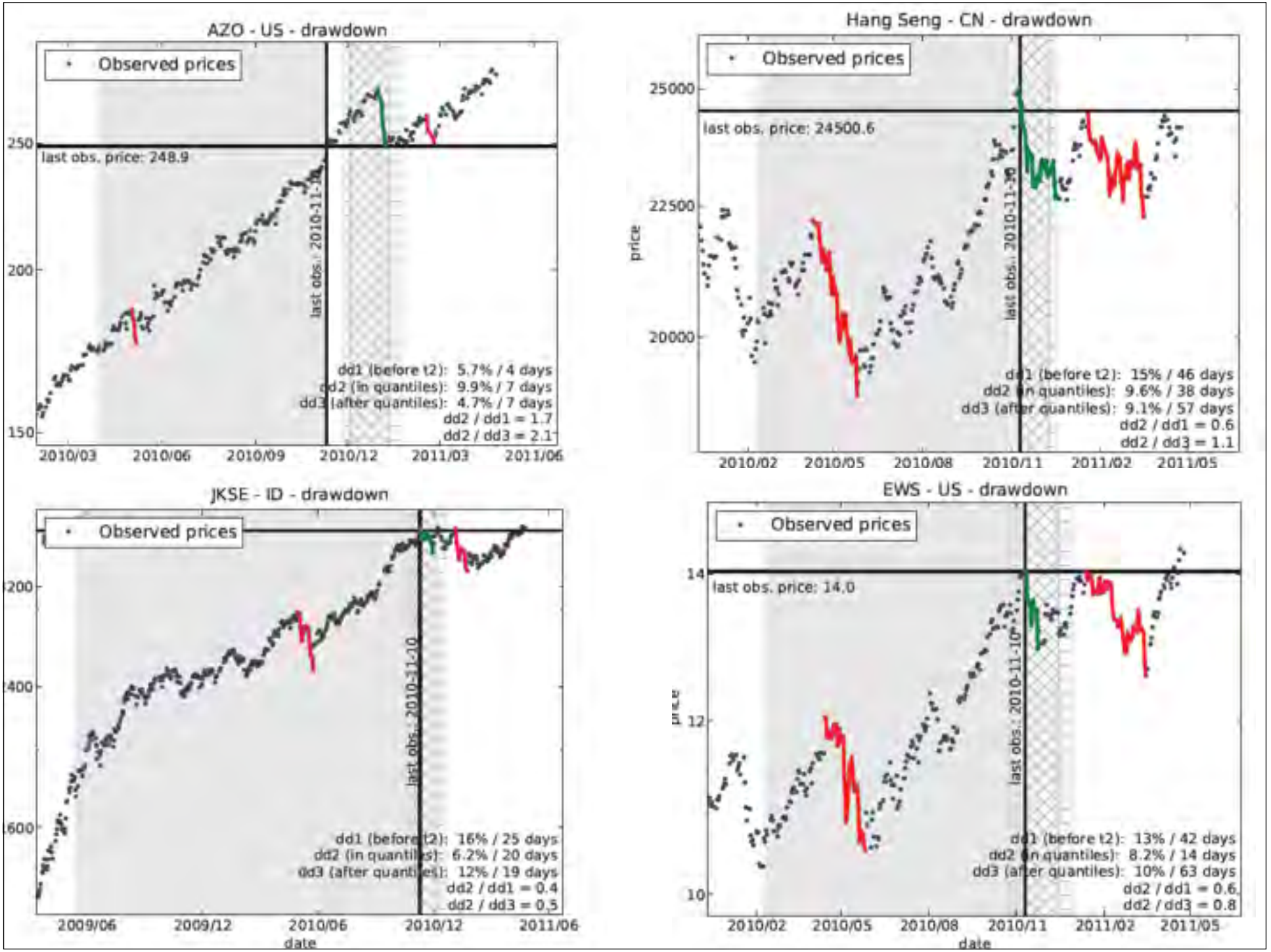
FBE ex-post analysis

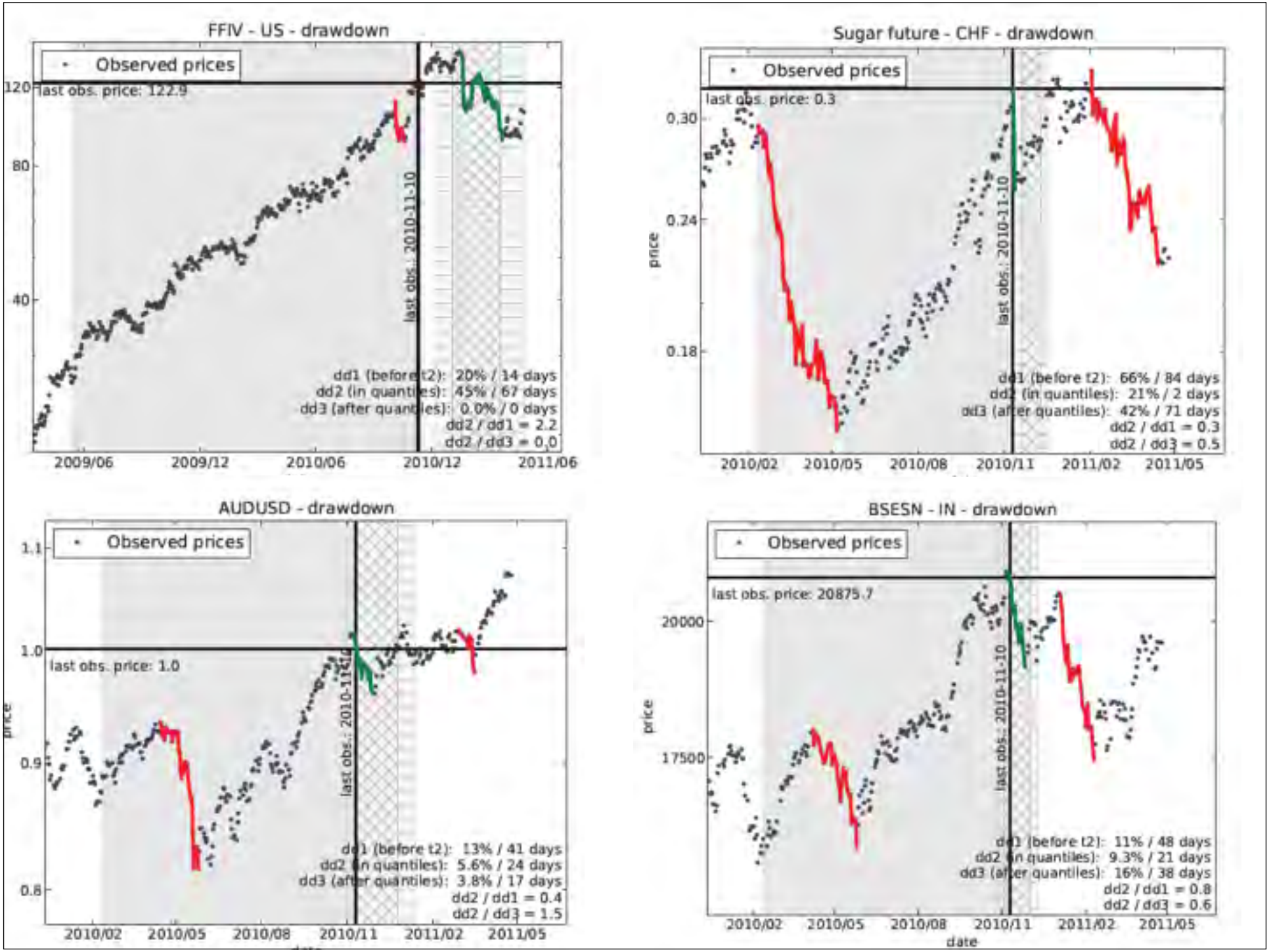
H1: Identification of a bubble

We support H1 by confirming that bubbles existed in 24 of the 27 assets at the time of the last observation of our forecasts, $t_2 = 10$ November 2010.

H2: Forecast of change of regime

We support H2 by confirming that 17 of the 25 H2 assets showed substantial corrections in the quantile windows that we forecast.


AZO - US - drawdown
Observed prices
last obs. price: 248.9
last obs.: 2010-11-10
dd1 (before t2): 5.7% / 4 days
dd2 (in quantiles): 9.9% / 7 days
dd3 (after quantiles): 4.7% / 7 days
dd2 / dd1 = 1.7
dd2 / dd3 = 2.1
250
200
150
2010/03
2010/06
2010/09
2010/12
2011/03
2011/06
Hang Seng - CN - drawdown
Observed prices
last obs. price: 24500.6
last obs.: 2010-11-10
dd1 (before t2): 15% / 46 days
dd2 (in quantiles): 9.6% / 38 days
dd3 (after quantiles): 9.1% / 57 days
dd2 / dd1 = 0.6
dd2 / dd3 = 1.1
price
25000
22500
20000
2010/02
2010/05
2010/08
2010/11
2011/02
2011/05
JKSE - ID - drawdown
Observed prices
last obs.: 2010-11-10
dd1 (before t2): 16% / 25 days
dd2 (in quantiles): 6.2% / 20 days
dd3 (after quantiles): 12% / 19 days
dd2 / dd1 = 0.4
dd2 / dd3 = 0.5
2009/06
2009/12
2010/06
2010/12
2011/06
date
EWS - US - drawdown
Observed prices
last obs. price: 14.0
last obs.: 2010-11-10
dd1 (before t2): 13% / 42 days
dd2 (in quantiles): 8.2% / 14 days
dd3 (after quantiles): 10% / 63 days
dd2 / dd1 = 0.6
dd2 / dd3 = 0.8
price
14
12
10
2010/02
2010/05
2010/08
2010/11
2011/02
2011/05
date


FFIV - US - drawdown
Observed prices
last obs. price: 122.9
120
80
40
last obs.: 2010-11-10
dd1 (before t2): 20% / 14 days
dd2 (in quantiles): 45% / 67 days
dd3 (after quantiles): 0.0% / 0 days
dd2 / dd1 = 2.2
dd2 / dd3 = 0.0
2009/06
2009/12
2010/06
2010/12
2011/06
Sugar future - CHF - drawdown
Observed prices
last obs. price: 0.3
price
0.30
0.24
0.18
last obs.: 2010-11-10
dd1 (before t2): 66% / 84 days
dd2 (in quantiles): 21% / 2 days
dd3 (after quantiles): 42% / 71 days
dd2 / dd1 = 0.3
dd2 / dd3 = 0.5
2010/02
2010/05
2010/08
2010/11
2011/02
2011/05
AUDUSD - drawdown
Observed prices
last obs. price: 1.0
price
1.1
1.0
0.9
0.8
dd1 (before t2): 13% / 41 days
dd2 (in quantiles): 5.6% / 24 days
dd3 (after quantiles): 3.8% / 17 days
dd2 / dd1 = 0.4
dd2 / dd3 = 1.5
2010/02
2010/05
2010/08
2010/11
2011/02
2011/05
BSESN - IN - drawdown
Observed prices
last obs. price: 20875.7
price
20000
17500
last obs.: 2010-11-10
dd1 (before t2): 11% / 48 days
dd2 (in quantiles): 9.3% / 21 days
dd3 (after quantiles): 16% / 38 days
dd2 / dd1 = 0.8
dd2 / dd3 = 0.6
2010/02
2010/05
2010/08
2010/11
2011/02
2011/05
date

What is a bubble?

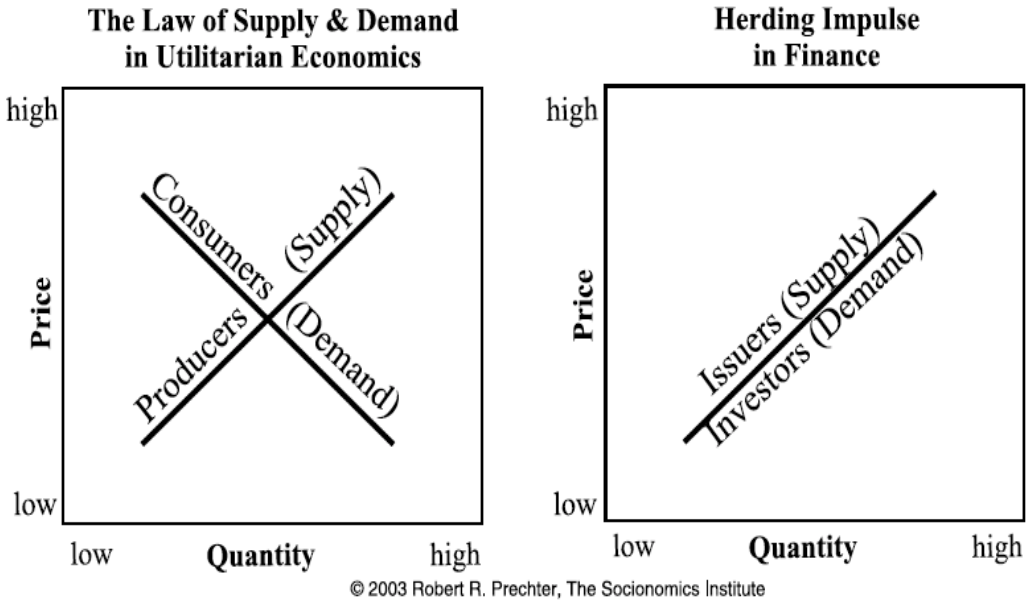
Academic Literature: No consensus on what is a bubble...

Ex: Refet S. Gürkaynak, Econometric Tests of Asset Price Bubbles: Taking Stock.
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?

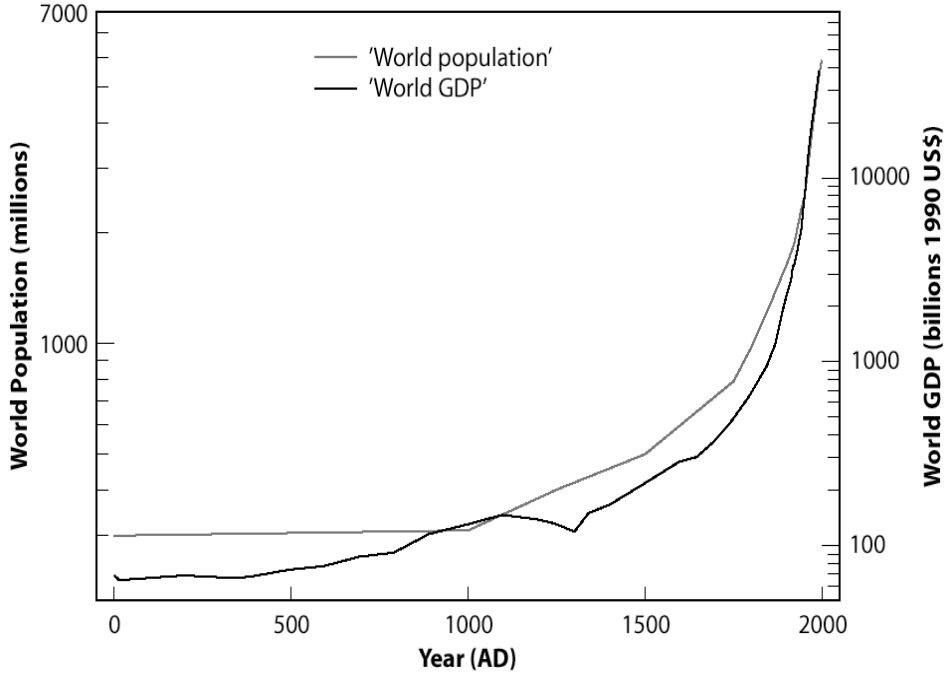


Positive feedbacks

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

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

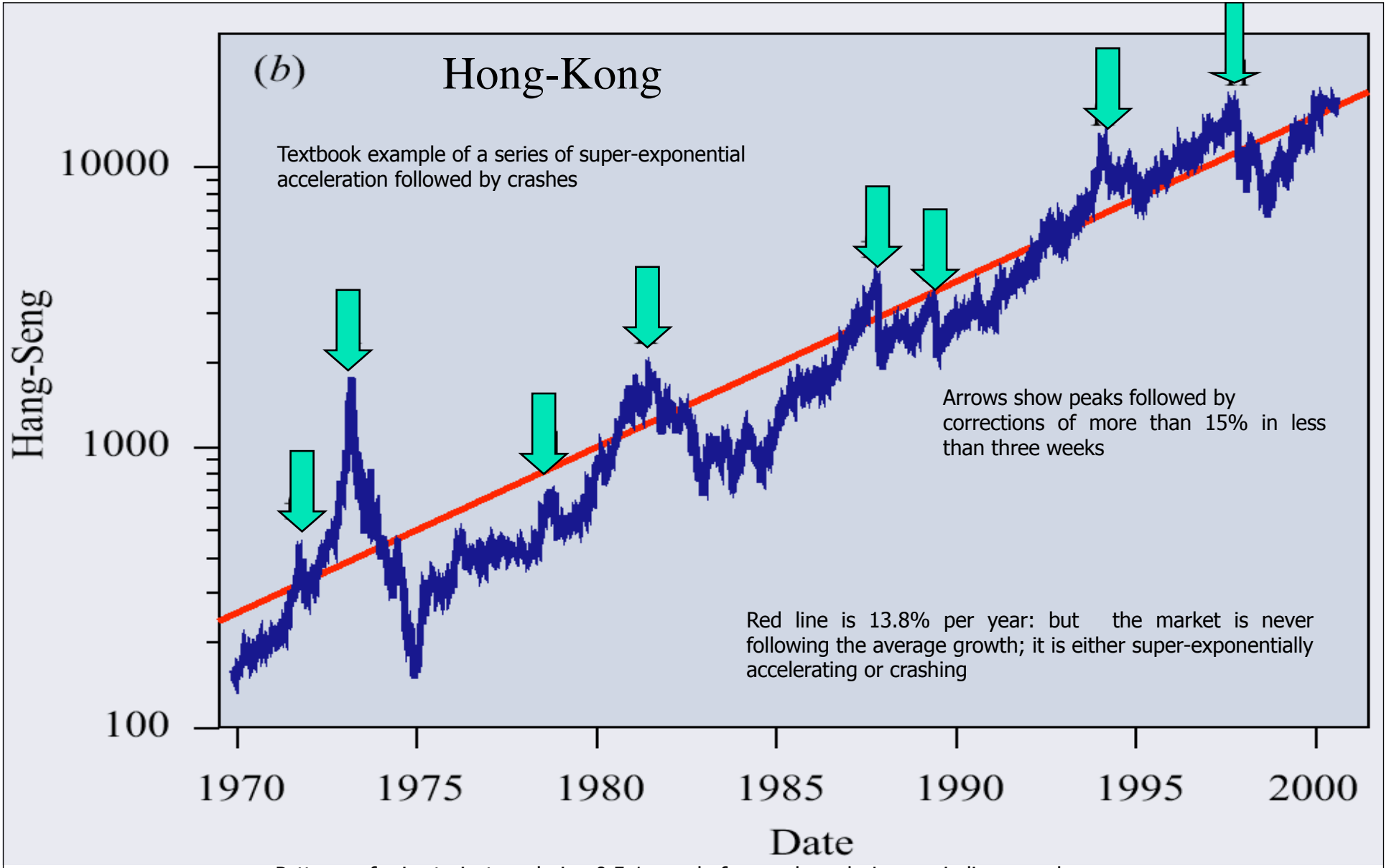
$$m = 1/(d-1) > 0 \text{ and } t_c = t_0 + mp_0^{1-d}/c.$$



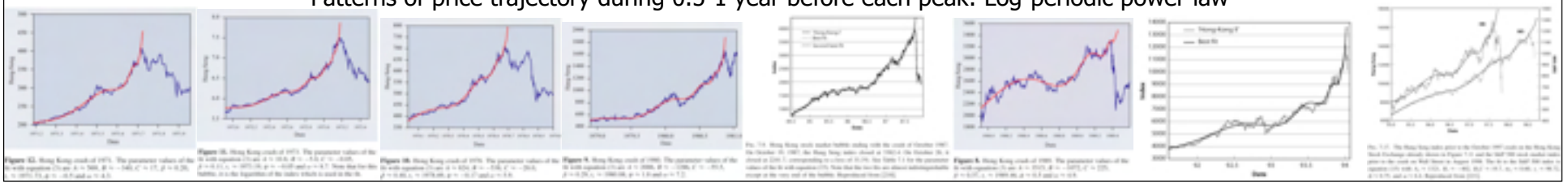
Our proposition:

Faster than exponential

transient unsustainable growth of price



Patterns of price trajectory during 0.5-1 year before each peak: Log-periodic power law



Rational expectation bubble models

- with crash hazard rate controlled by herding noise

- with rate of returns controlled by positive feedbacks
  - ✦from bubble price
  - ✦from bubble price in the presence of stochastic singularity time

- with crash hazard rate controlled
  - ★by herding noise traders in the presence of an (unknown) fundamental value
  - ★by herding noise traders in the presence of mean-reverting self-consistent residuals

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

Methodology for diagnosing bubbles

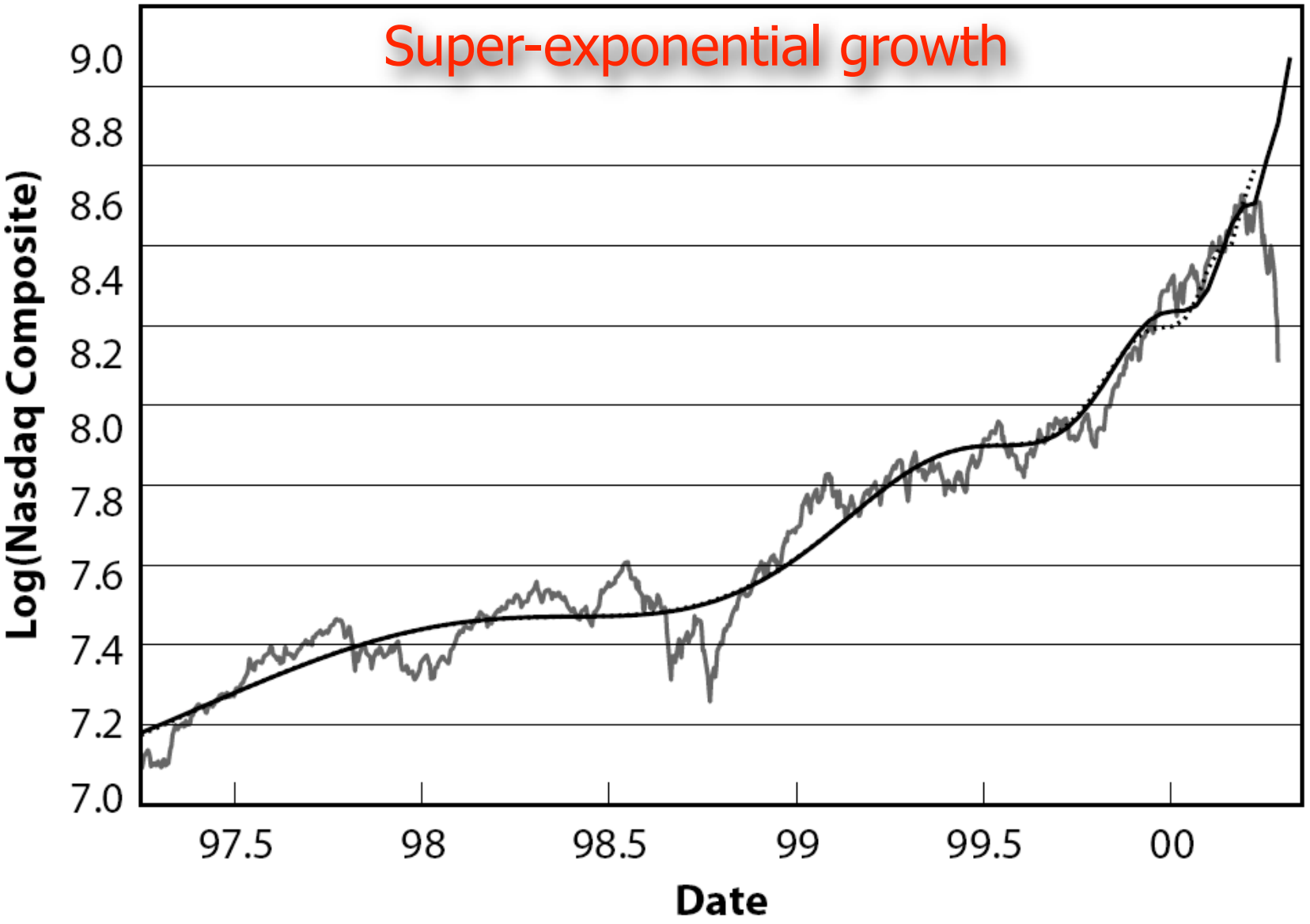
- Finite-time singular (FTS) models with Log-Periodic Power Law (LPPL) on price with self-consistent mean-reverting residuals
- Close-formed solutions of stochastic FTS
- Mutual entropy estimation methods for non-stationarity
- FTS-GARCH on return time series
- Renormalization Group and Generalized Weierstrass functions

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

- 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



Real-estate in the UK

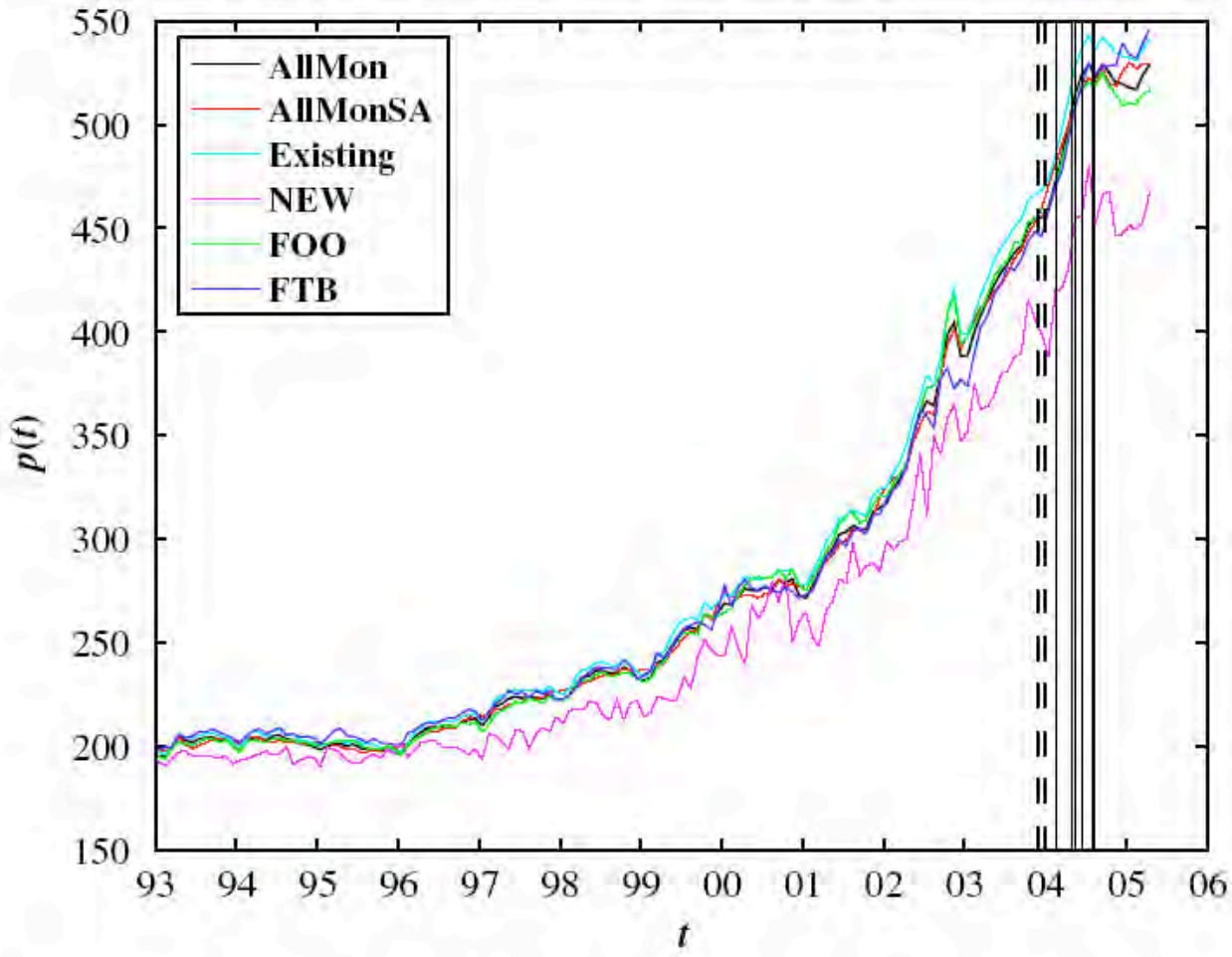


Fig. 1. (Color online) Plot of the UK Halifax house price indices from 1993 to April 2005 (the latest available quote at the time of writing). The two groups of vertical lines correspond to the two predicted turning points reported in Tables 2 and 3 of [1]: end of 2003 and mid-2004. The former (resp.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

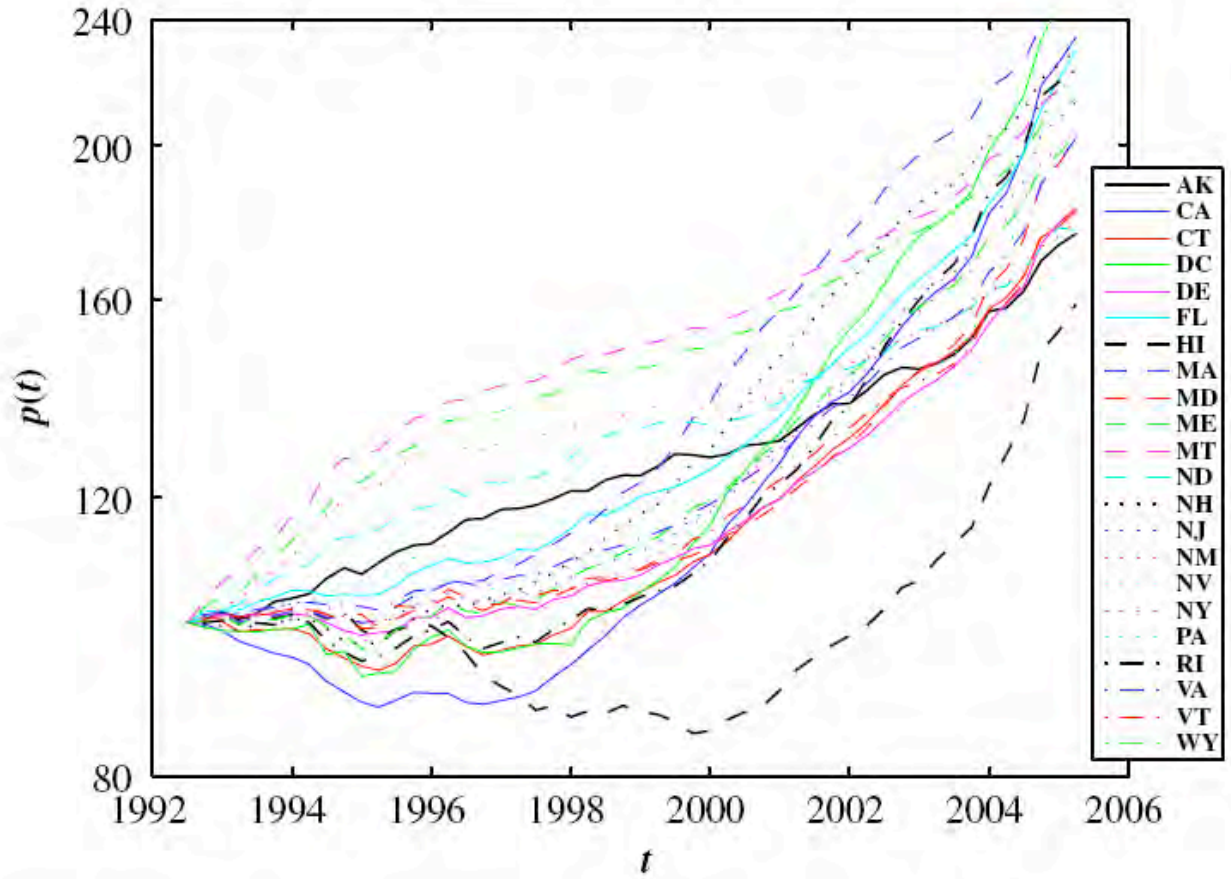
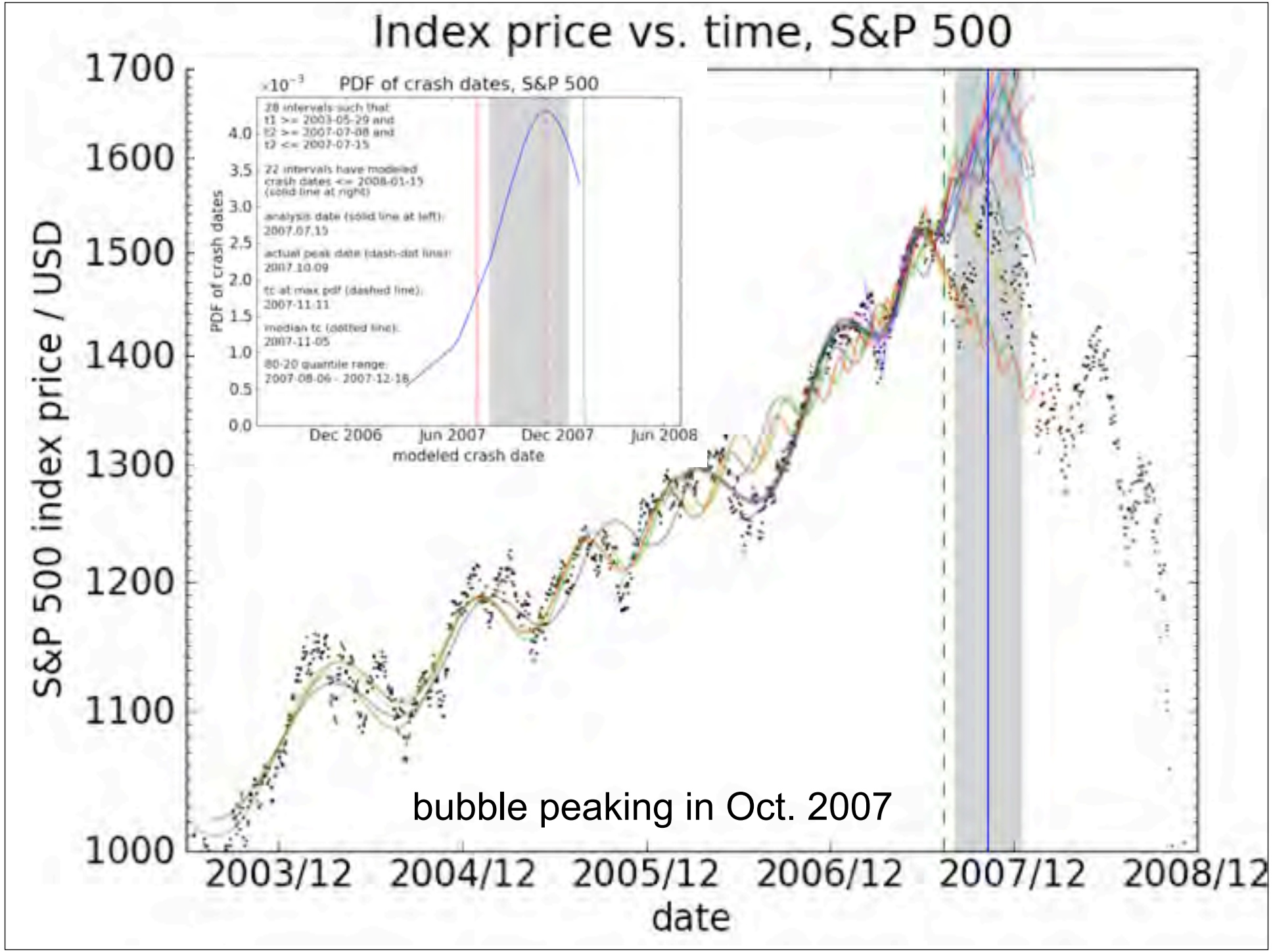


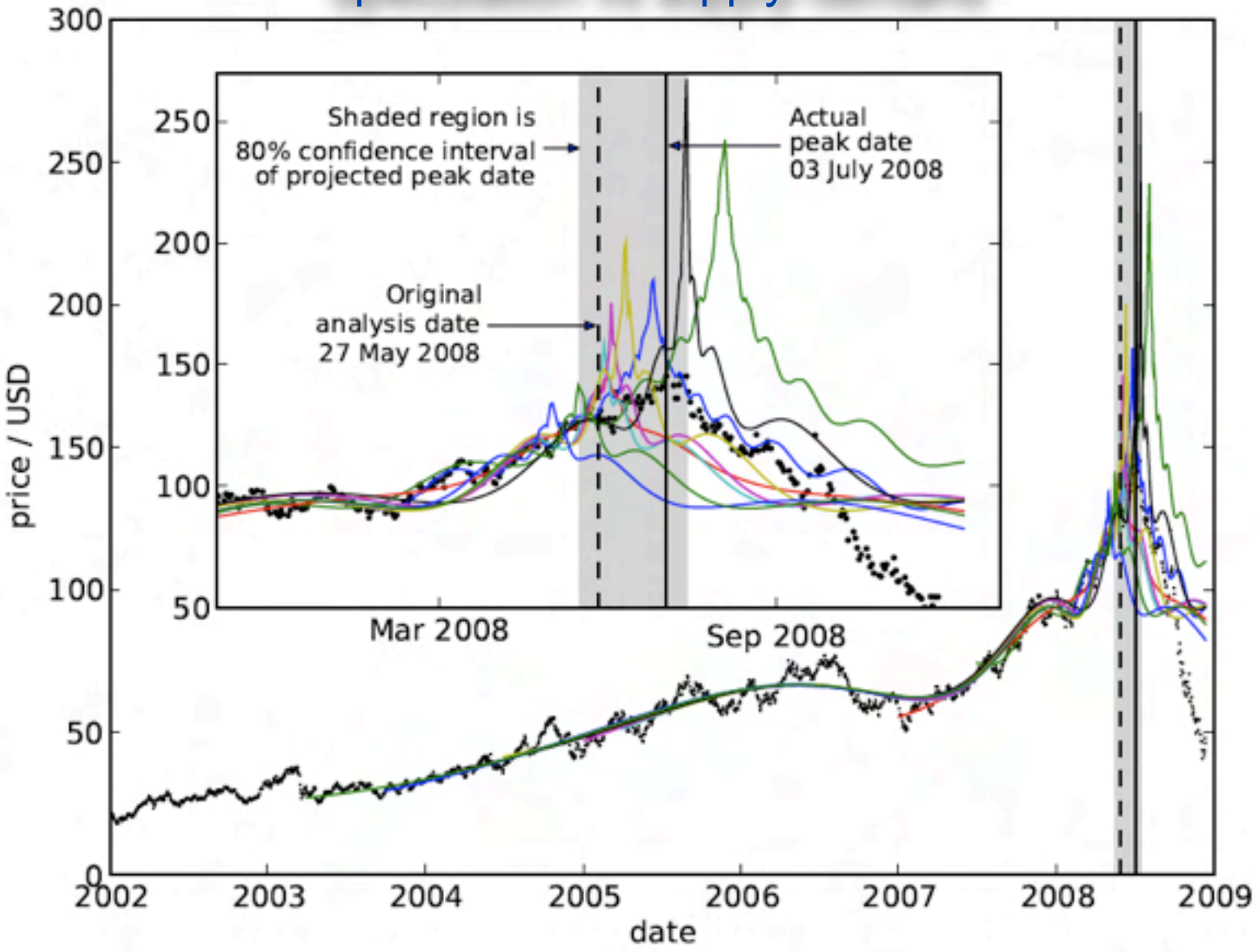
Fig. 5. (Color online) Quarterly average HPI in the 21 states and in the District of Columbia (DC) exhibiting a clear upward faster-than-exponential growth. For better representation, we have normalized the house price indices for the second quarter of 1992 to 100 in all 22 cases. The corresponding states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

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


Index price vs. time, S&P 500
S&P 500 index price / USD
1700
1600
1500
1400
1300
1200
1100
1000
2003/12
2004/12
2005/12
2006/12
2007/12
2008/12
date
PDF of crash dates, S&P 500
×10⁻³
PDF of crash dates
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Dec 2006
Jun 2007
Dec 2007
Jun 2008
modeled crash date
28 intervals such that:
t1 >= 2003-05-29 and
t2 >= 2007-07-08 and
t2 <= 2007-07-15
22 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):
2007.10.09
tc at max pdf (dashed line):
2007-11-11
median tc (dotted line):
2007-11-05
80-20 quantile range:
2007-08-06 - 2007-12-18
bubble peaking in Oct. 2007

2006-2008 Oil bubble

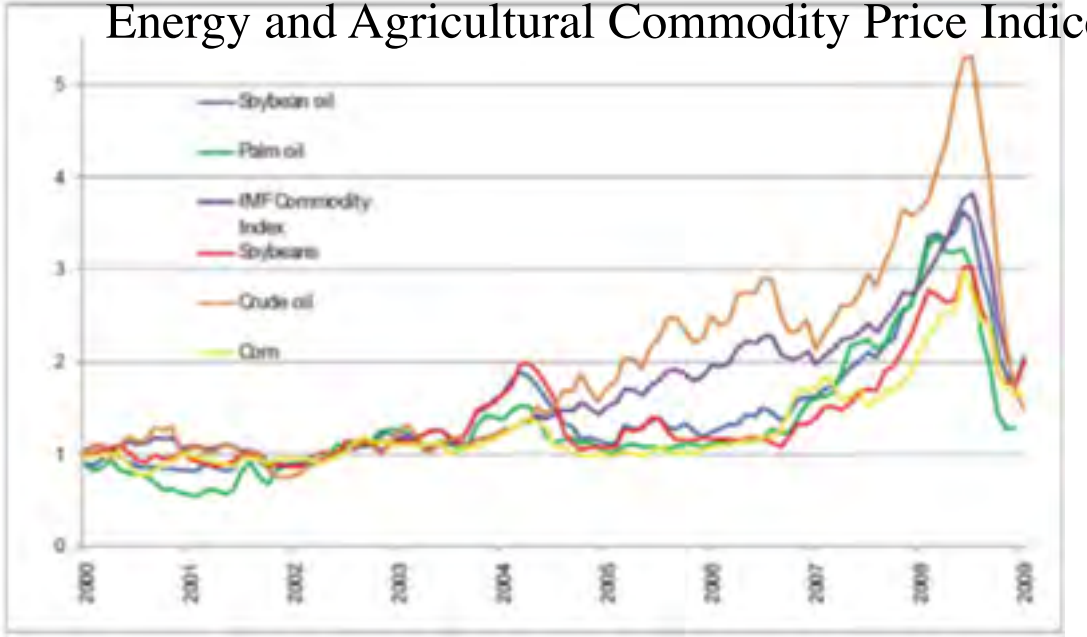
Speculation vs supply-demand

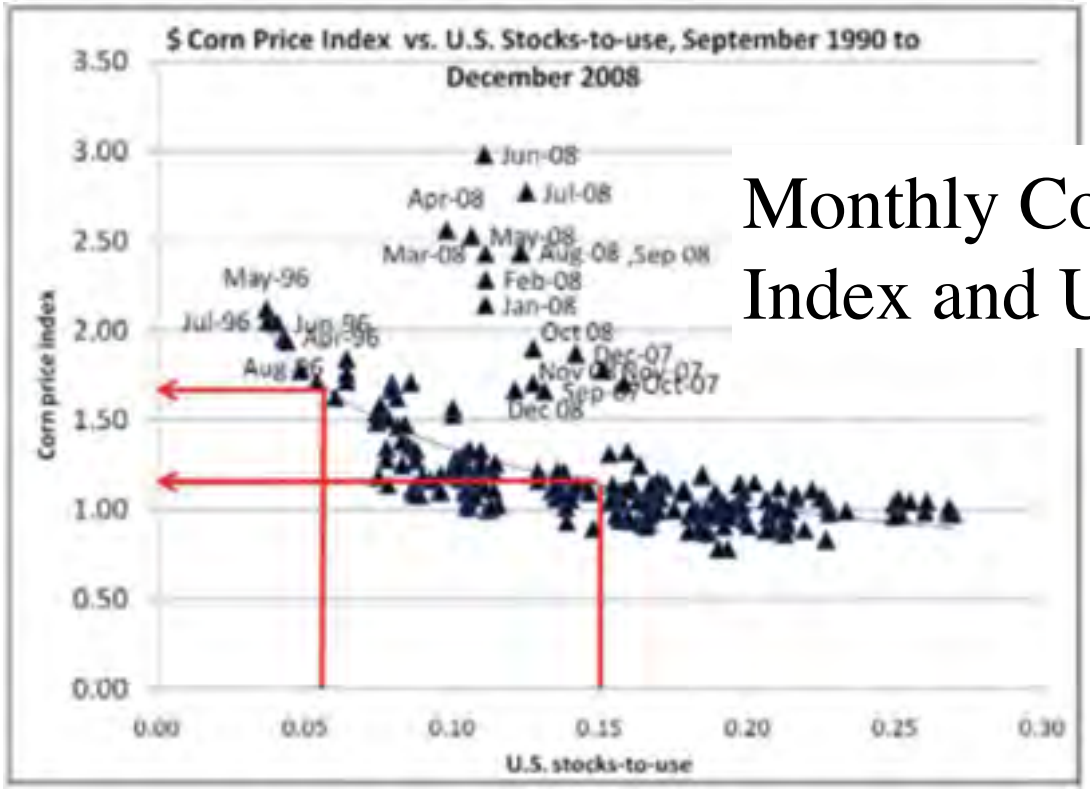


D. Sornette, R. Woodard and W.-X. Zhou, The 2006-2008 Oil Bubble and Beyond, Physica A 388, 1571-1576 (2009) (arXiv.org/abs/0806.1170)

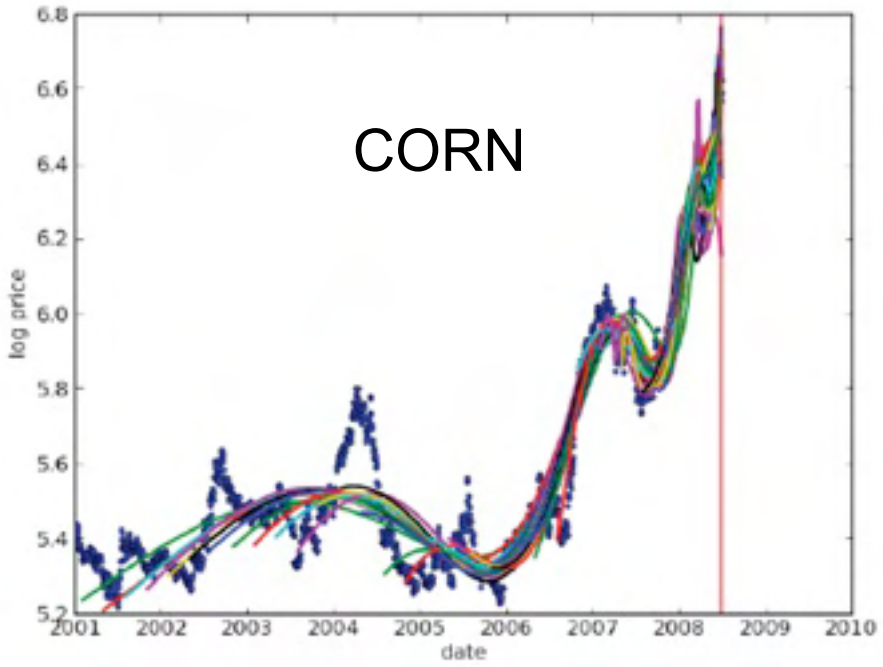
Typical result of the calibration of the simple LPPL model to the oil price in US$ in shrinking windows with starting dates t_{start} moving up towards the common last date t_{last} = May 27, 2008.

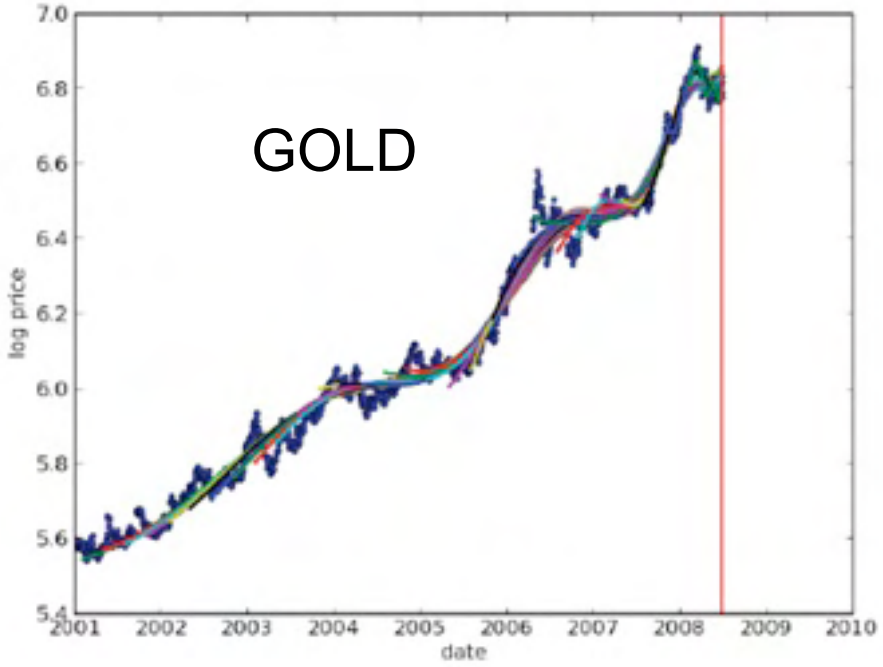
Energy and Agricultural Commodity Price Indices, 2000-2009



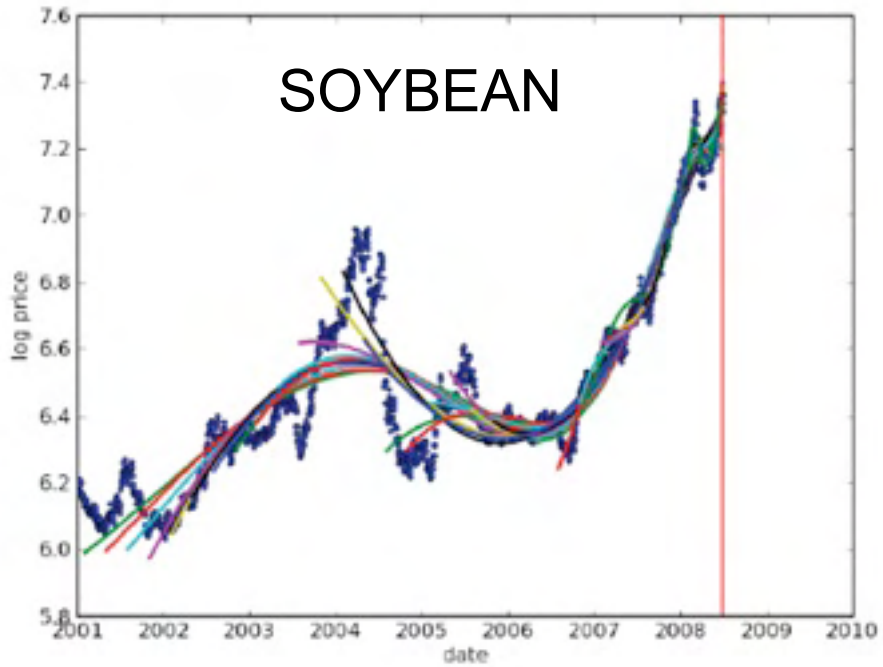


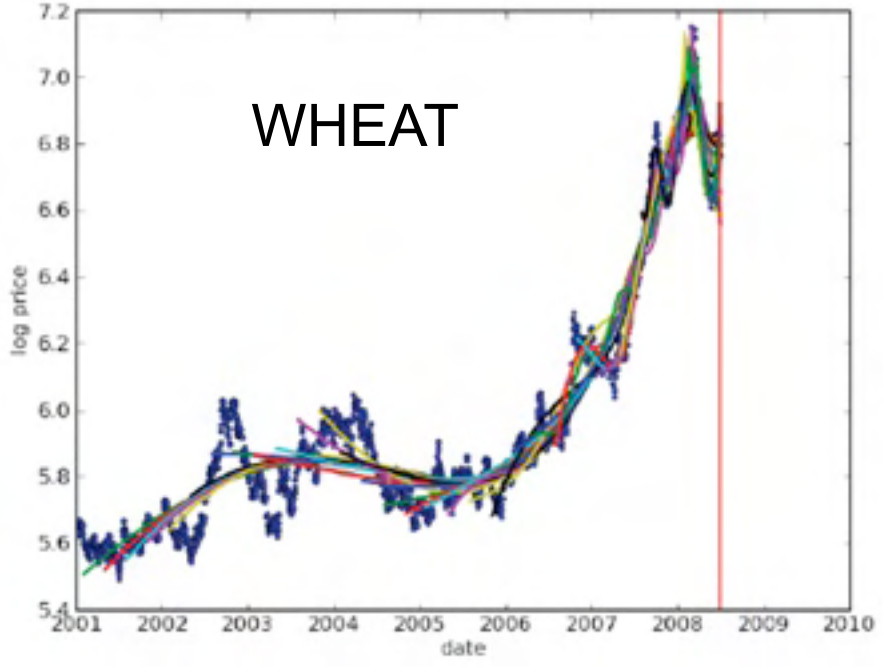
Monthly Corn Price Index and USDA Stocks



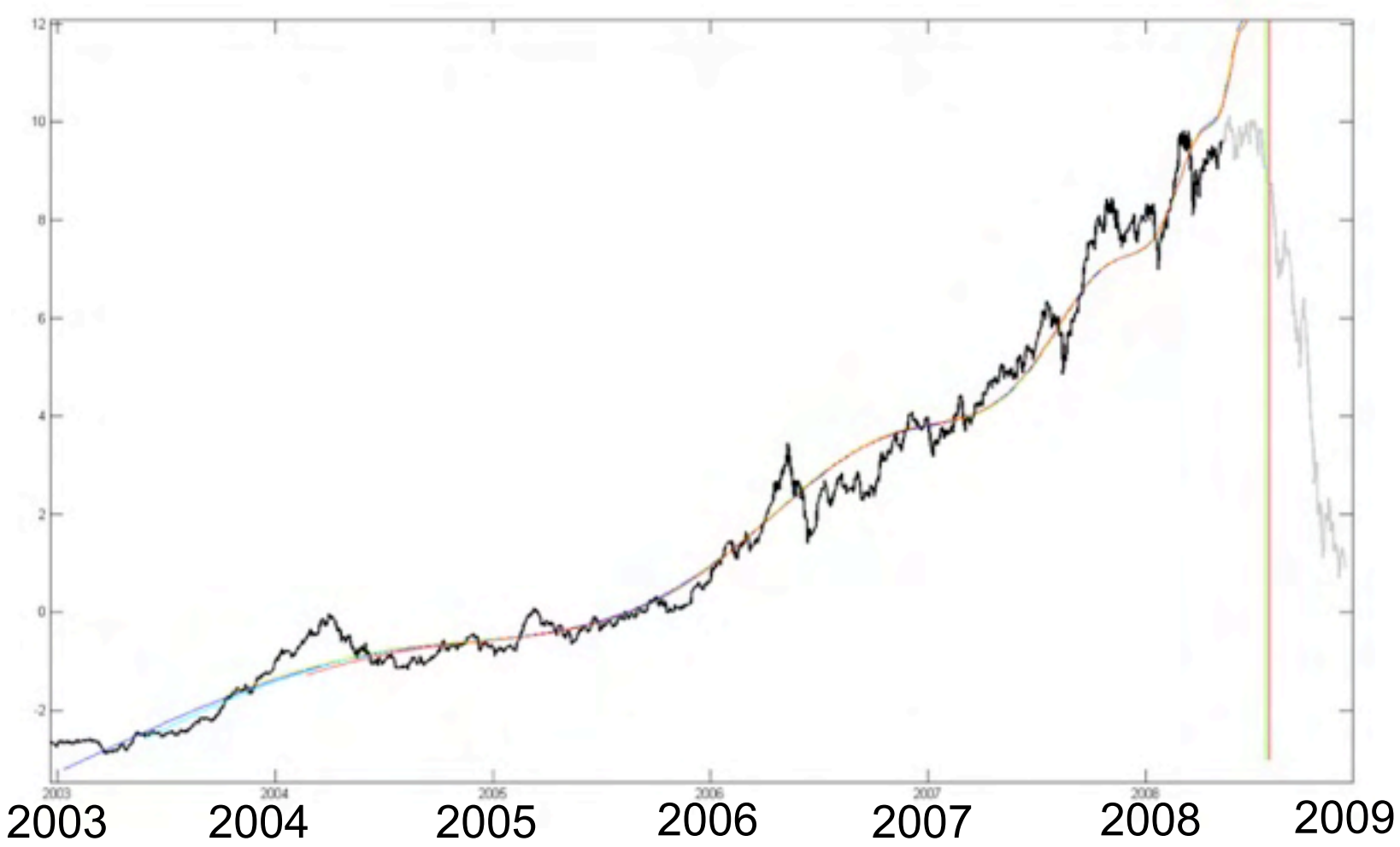


R.Woodard and D.Sornette (2008)





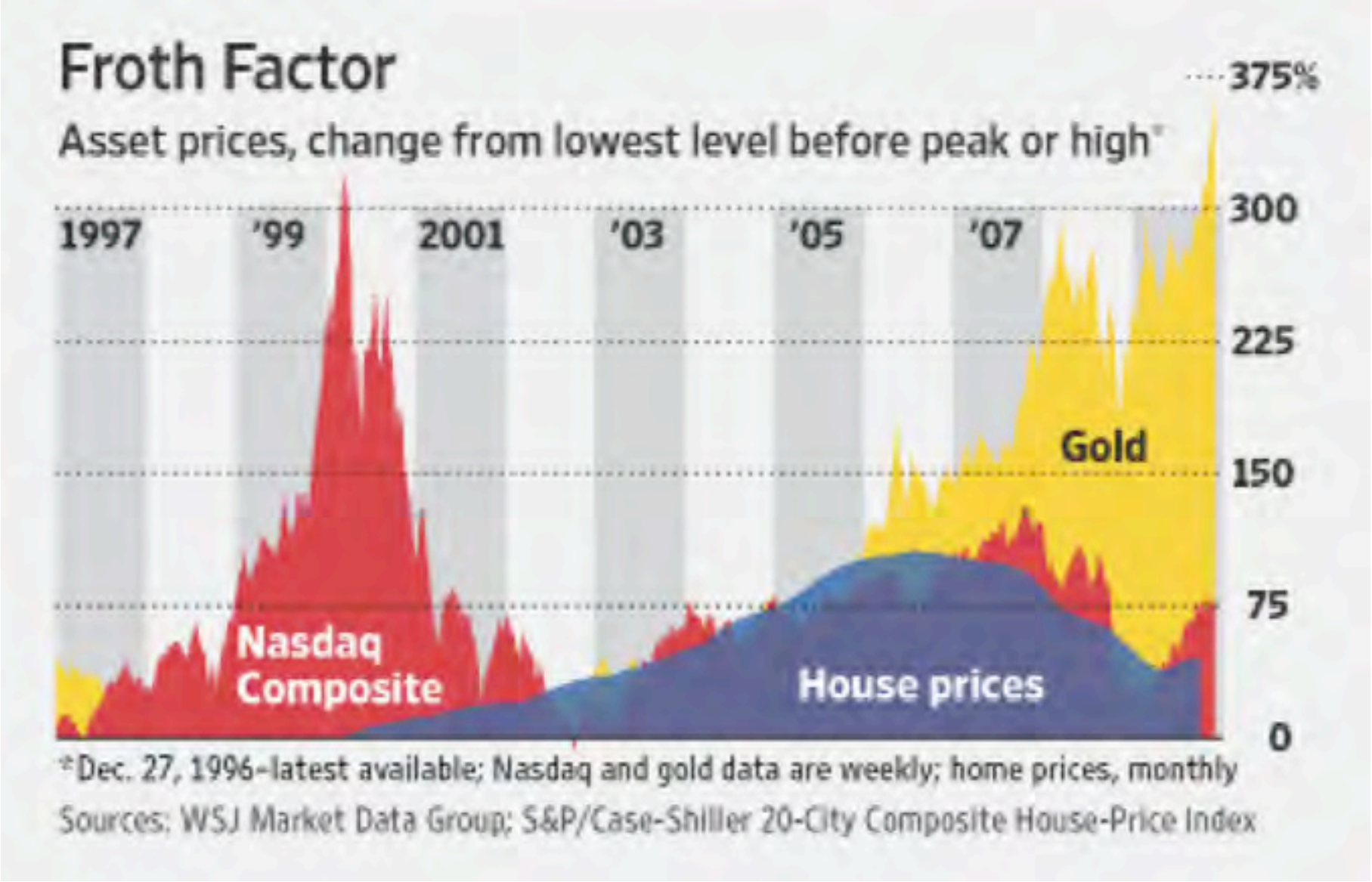
The Global BUBBLE



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)

Nov. 2009


Froth Factor
Asset prices, change from lowest level before peak or high*
375%
300
225
150
75
0
1997
'99
2001
'03
'05
'07
Gold
Nasdaq Composite
House prices
*Dec. 27, 1996–latest available; Nasdaq and gold data are weekly; home prices, monthly
Sources: WSJ Market Data Group; S&P/Case-Shiller 20-City Composite House-Price Index

How to avoid our own lost decade

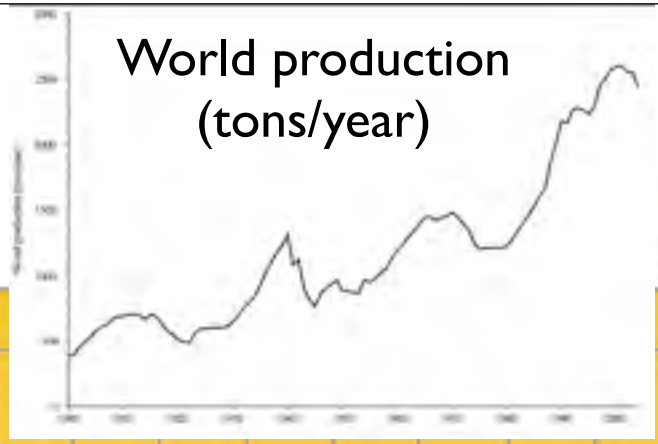
By Lawrence Summers
Financial Times June 12 2011

Even with the 2008-2009 policy effort that successfully prevented financial collapse, the US is now halfway to a lost economic decade. In the past five years, our economy's growth rate averaged less than one per cent a year, **similar to Japan when its bubble burst**. At the same time, the fraction of the population working has fallen from 63.1 per cent to 58.4 per cent, reducing the number of those in jobs by more than 10m. Reports suggest growth is slowing.

This is no time for fatalism or for traditional political agendas.

The central irony of financial crisis is that while it is caused by too much confidence, borrowing and lending, and spending, it is only resolved by increases in confidence, borrowing and lending, and spending.

Real Gold Price 1957-2009



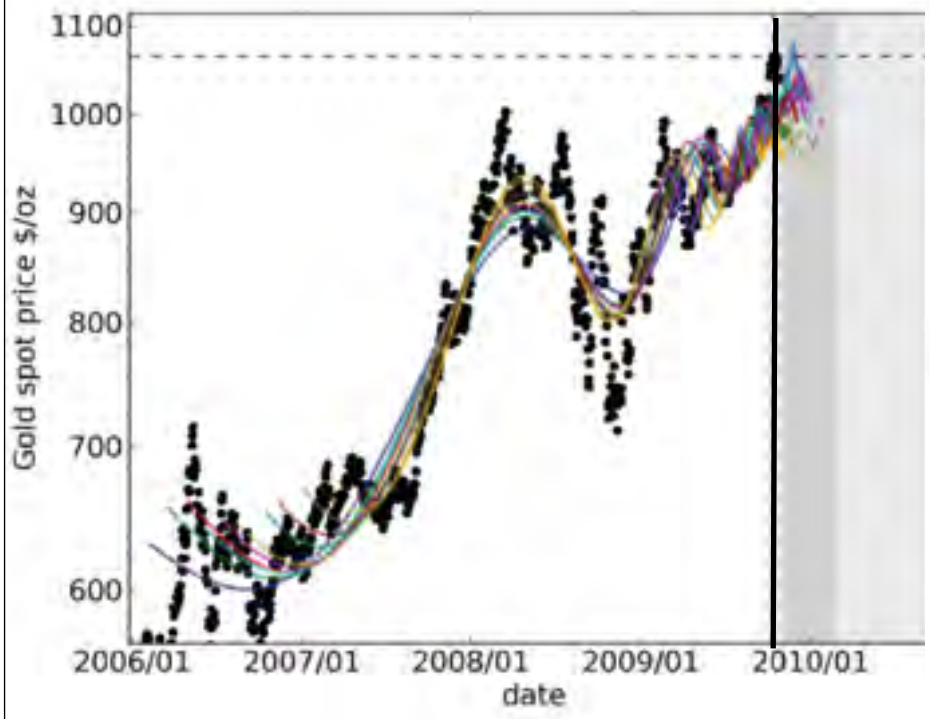
Source: St.Louis Fed, CRB, LBMA, BullionVault

From 11 December 2010:
"Gold falls as China tries to slow its economy"
http://www.nationalpost.com/scripts/Gold+falls+China+tries+slow+economy/3962279/story.html

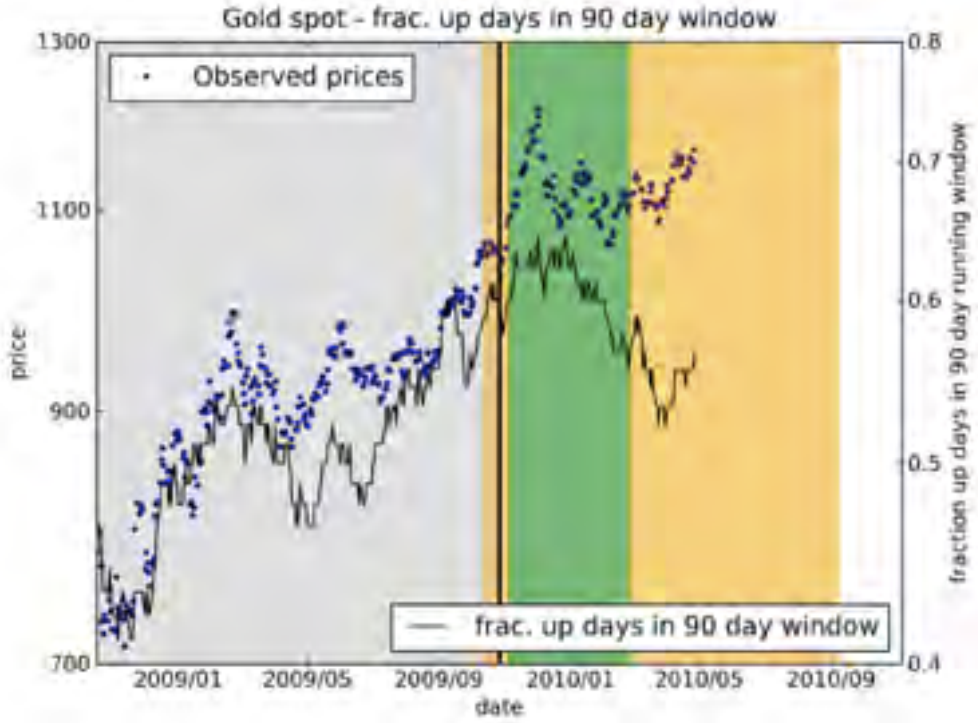
From 13 December 2010:
"Gold Prices Rise on China Inaction"
http://www.thestreet.com/story/10945057/1/gold-prices-rise-on-china-inaction.html?cm_ven=GOOGLEN

Gold spot price - USD

Forecast (2 Nov. 2009)



Realized

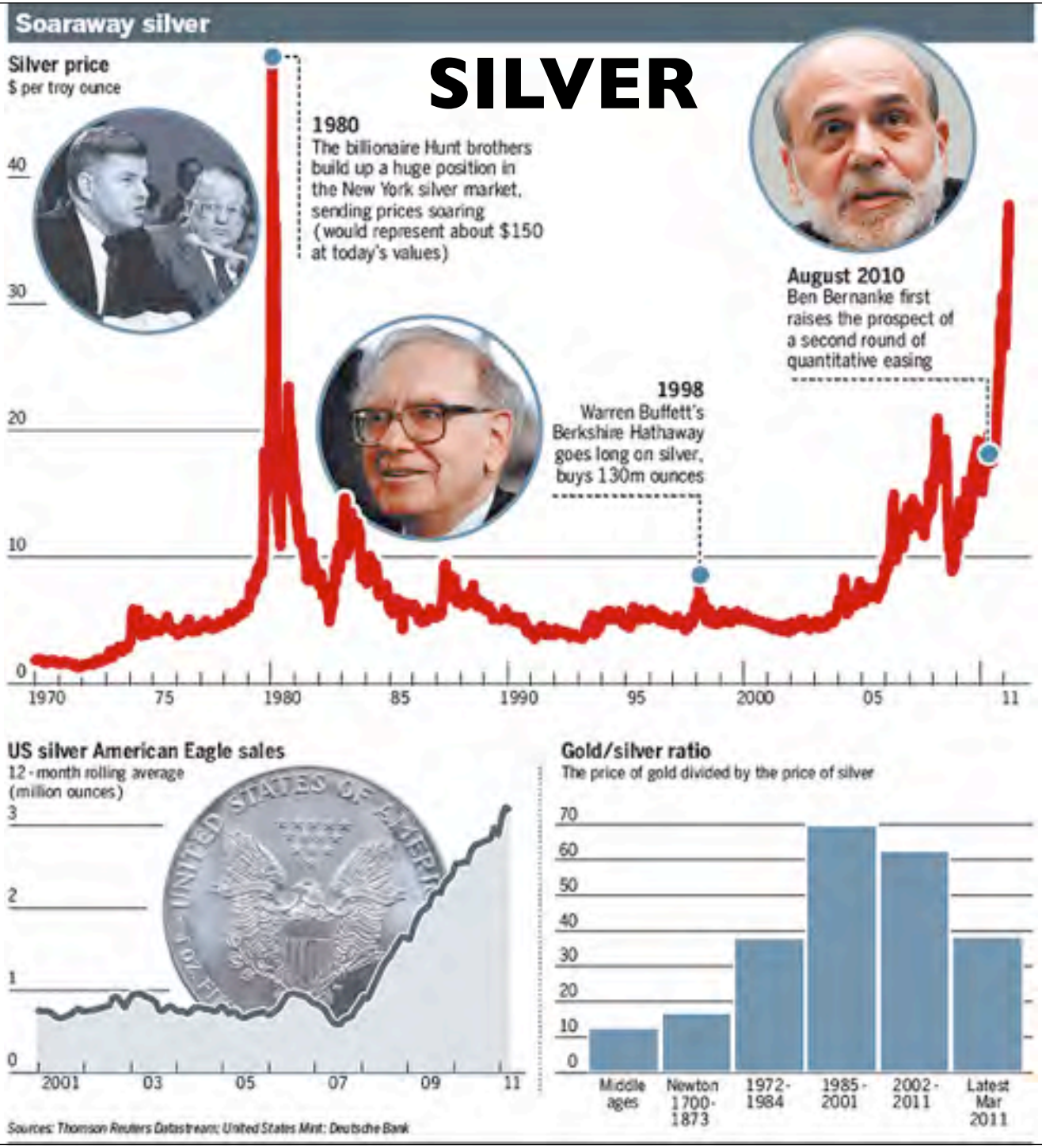


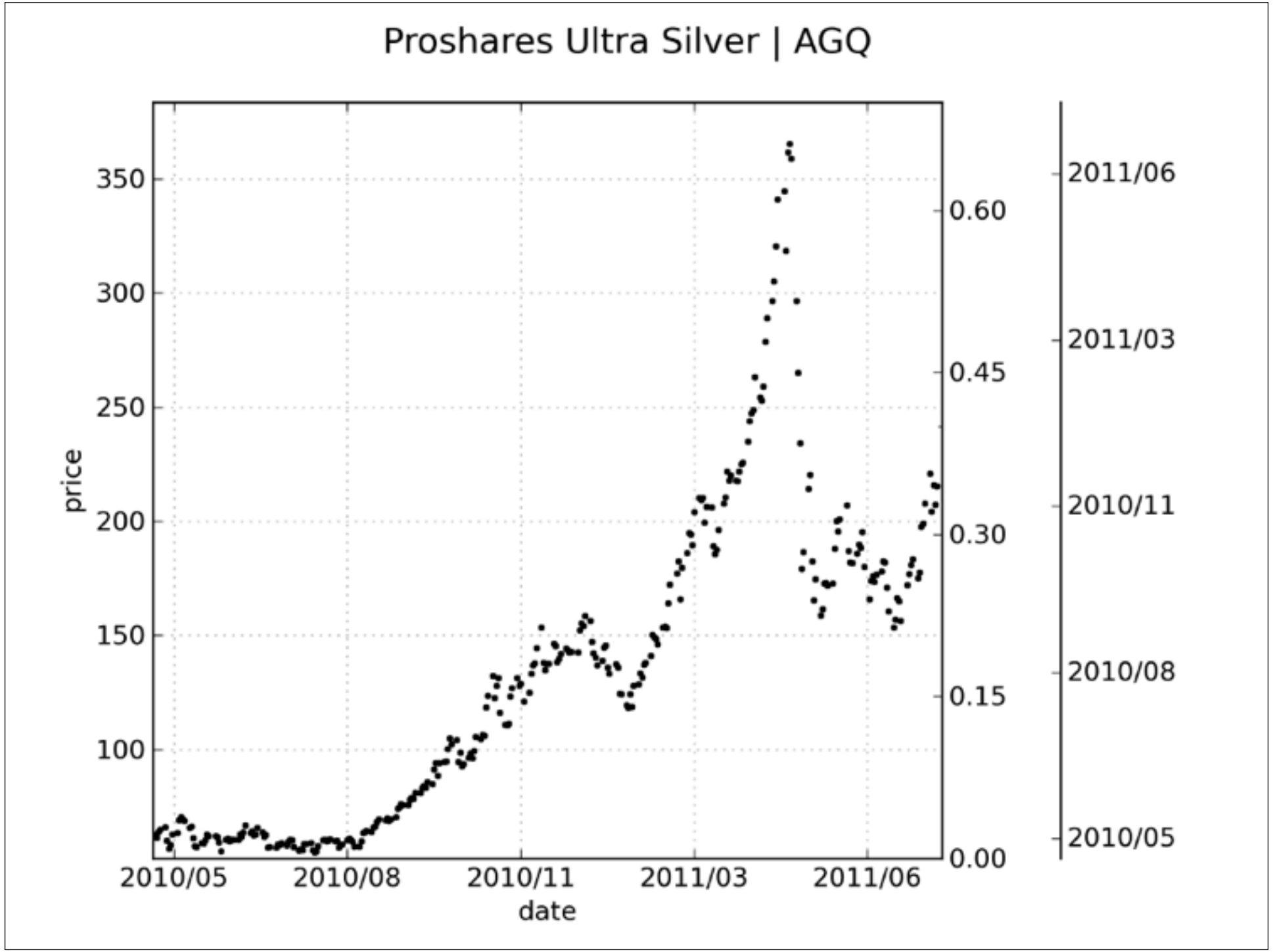
Prediction and analysis released 3rd May 2010

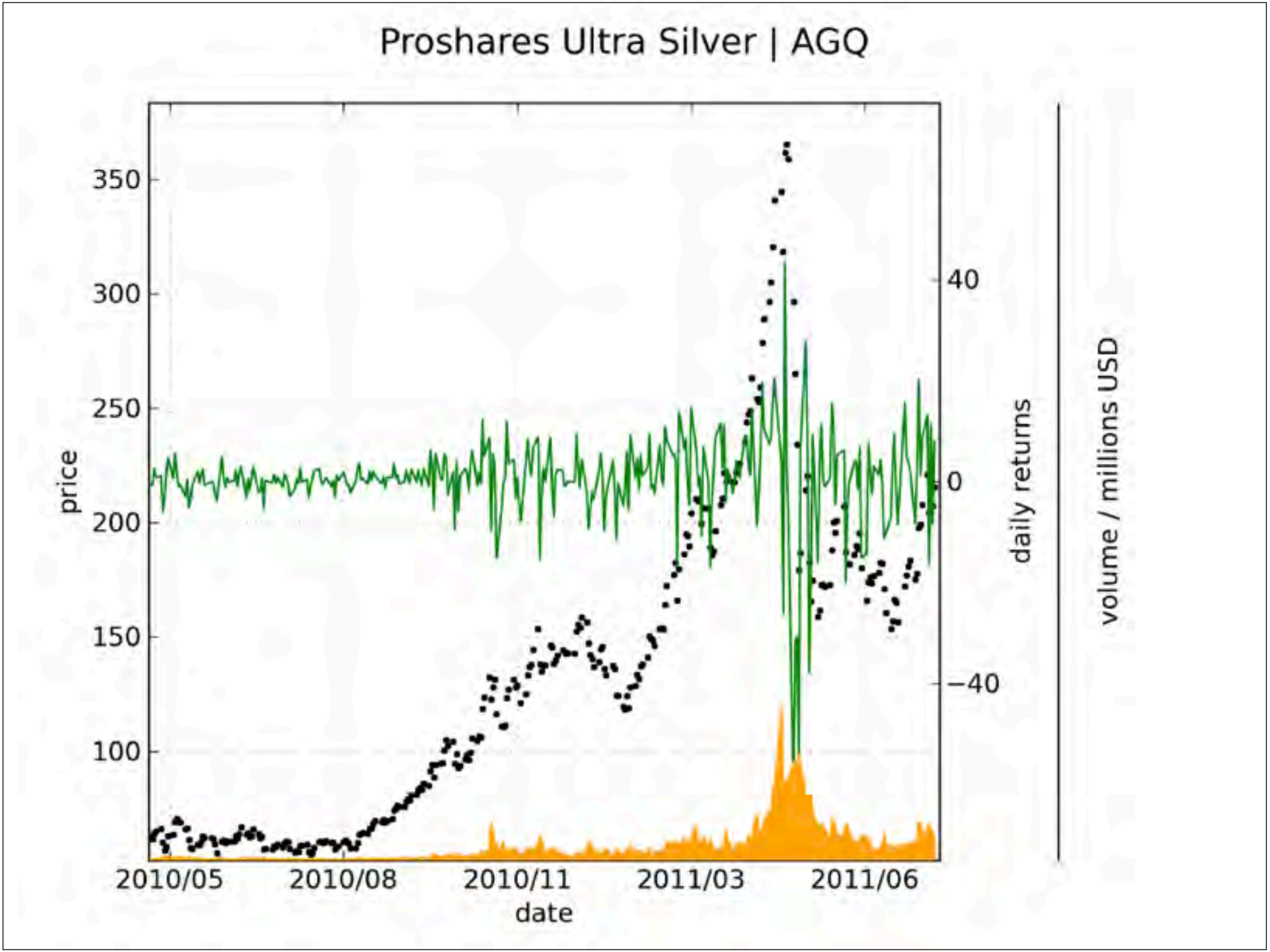
GOLD

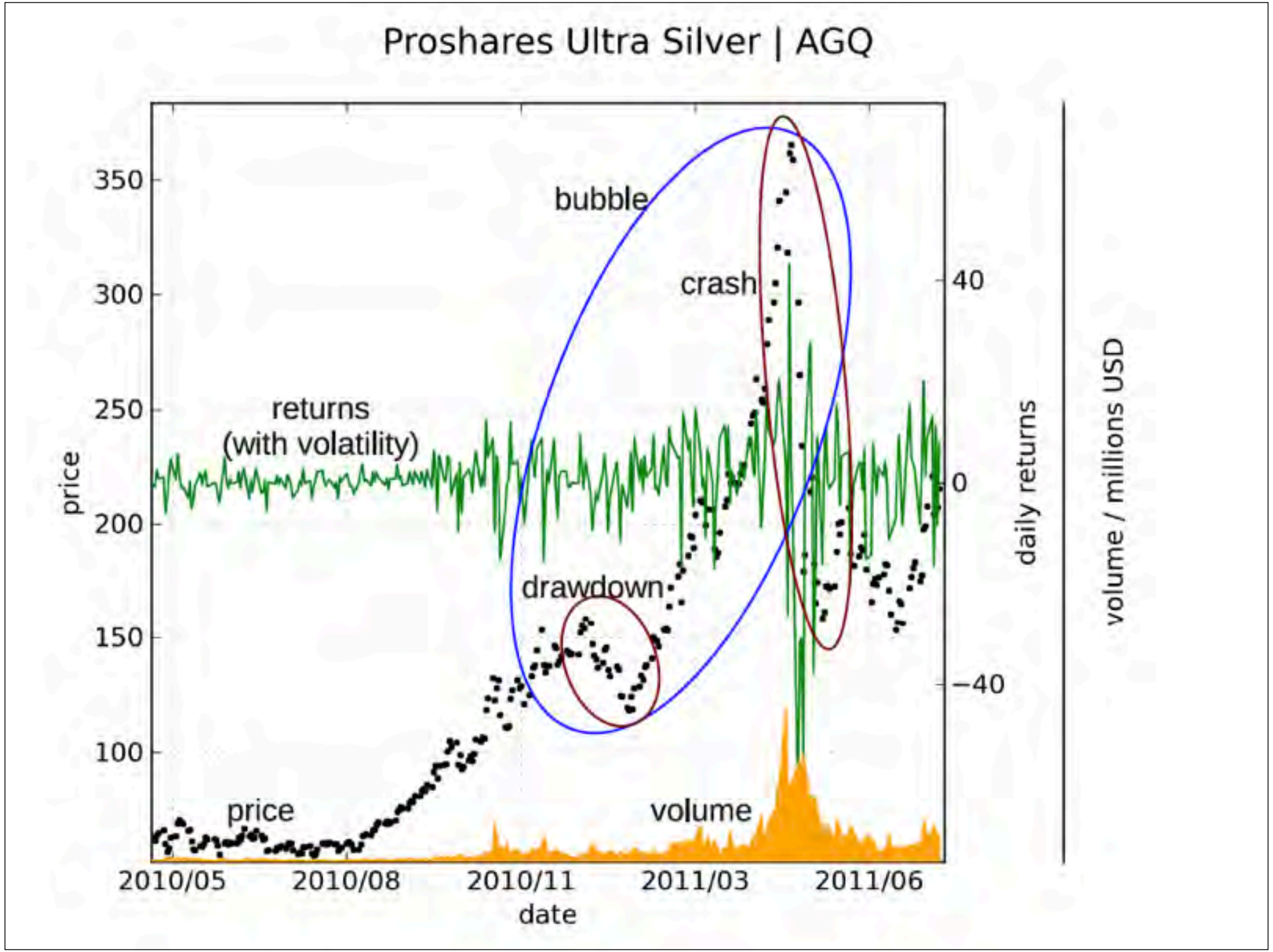

26 August 2011
L: C177.47
Price
185.00
182.50
180.00
177.50
175.00
172.50
170.00
167.50
165.00
162.50
160.00
157.50
155.00
152.50
150.00
147.50
145.00
142.50
140.00
137.50
135.00
03/14
03/28
04/11
04/25
05/09
05/23
06/06
06/20
07/04
07/18
08/01
08/15
GLD@SMART
Prior Close

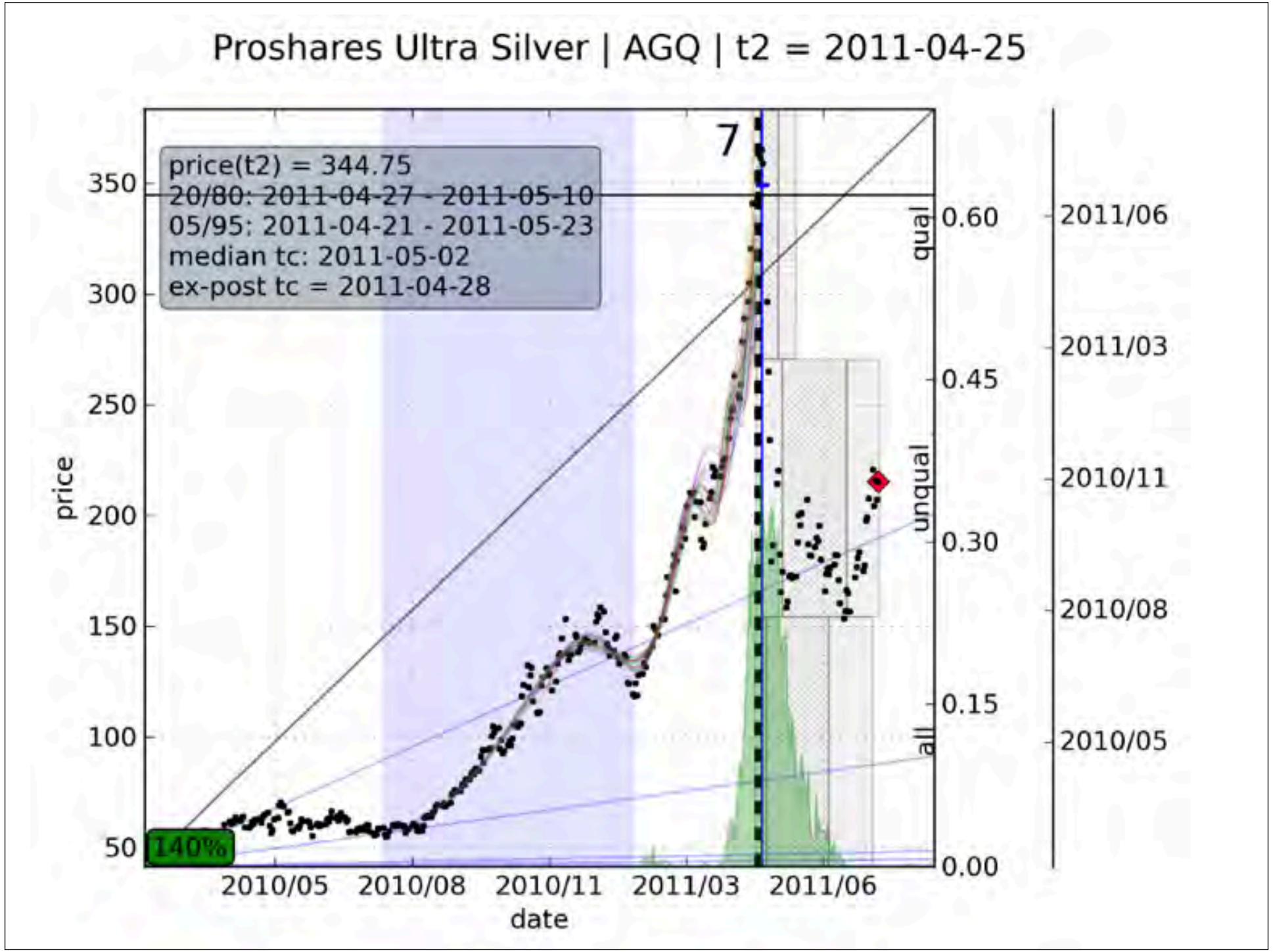
SILVER


Soaraway silver
Silver price
$ per troy ounce
40
30
20
10
0
1980
The billionaire Hunt brothers build up a huge position in the New York silver market, sending prices soaring (would represent about $150 at today's values)
1998
Warren Buffett's Berkshire Hathaway goes long on silver, buys 130m ounces
August 2010
Ben Bernanke first raises the prospect of a second round of quantitative easing
1970
75
1980
85
1990
95
2000
05
11
US silver American Eagle sales
12-month rolling average
(million ounces)
3
2
1
0
2001
03
05
07
09
11
Gold/silver ratio
The price of gold divided by the price of silver
70
60
50
40
30
20
10
0
Middle ages
Newton 1700-1873
1972-1984
1985-2001
2002-2011
Latest Mar 2011
Sources: Thomson Reuters Datastream; United States Mint; Deutsche Bank

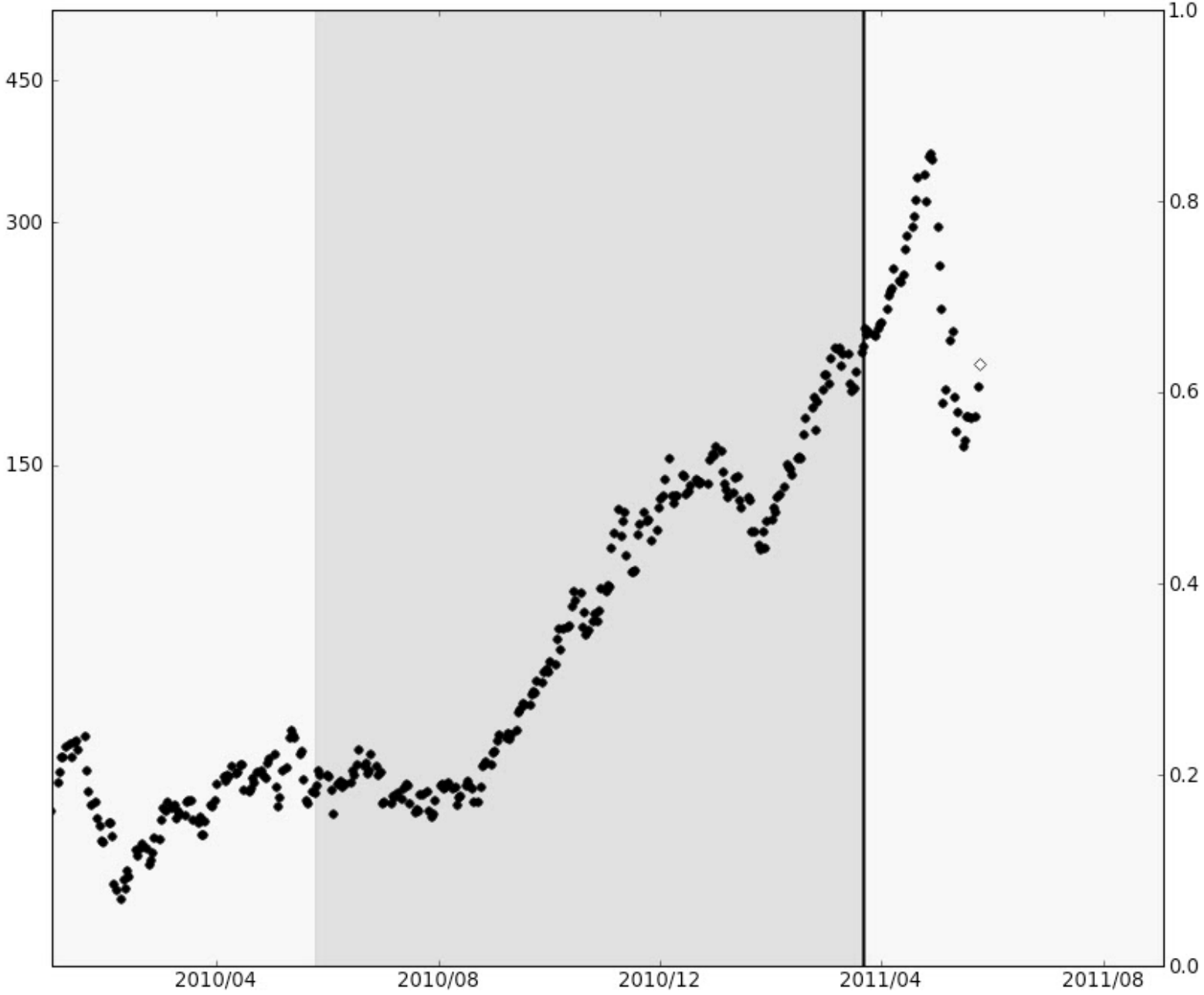

Proshares Ultra Silver | AGQ
price
350
300
250
200
150
100
0.60
0.45
0.30
0.15
0.00
2011/06
2011/03
2010/11
2010/08
2010/05
2010/05
2010/08
2010/11
2011/03
2011/06
date

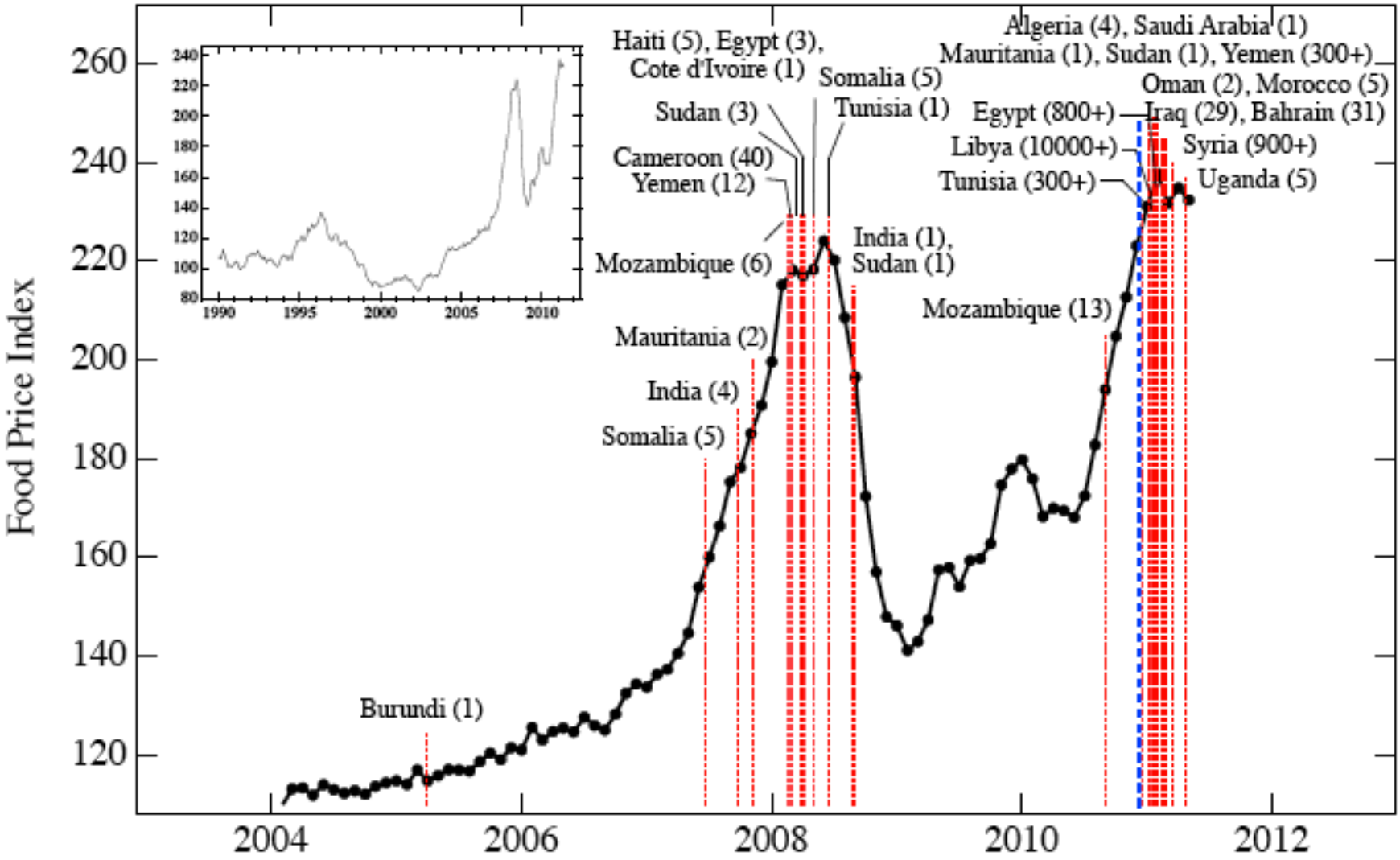

Proshares Ultra Silver | AGQ
price
350
300
250
200
150
100
40
0
−40
daily returns
volume / millions USD
2010/05
2010/08
2010/11
2011/03
2011/06
date


Proshares Ultra Silver | AGQ
bubble
crash
drawdown
returns
(with volatility)
price
volume
350
300
250
200
150
100
40
0
−40
price
daily returns
volume / millions USD
2010/05
2010/08
2010/11
2011/03
2011/06
date


Proshares Ultra Silver | AGQ | t2 = 2011-04-25
price(t2) = 344.75
20/80: 2011-04-27 - 2011-05-10
05/95: 2011-04-21 - 2011-05-23
median tc: 2011-05-02
ex-post tc = 2011-04-28
7
140%
price
350
300
250
200
150
100
50
2010/05
2010/08
2010/11
2011/03
2011/06
date
qual
unqual
all
0.60
0.45
0.30
0.15
0.00
2011/06
2011/03
2010/11
2010/08
2010/05

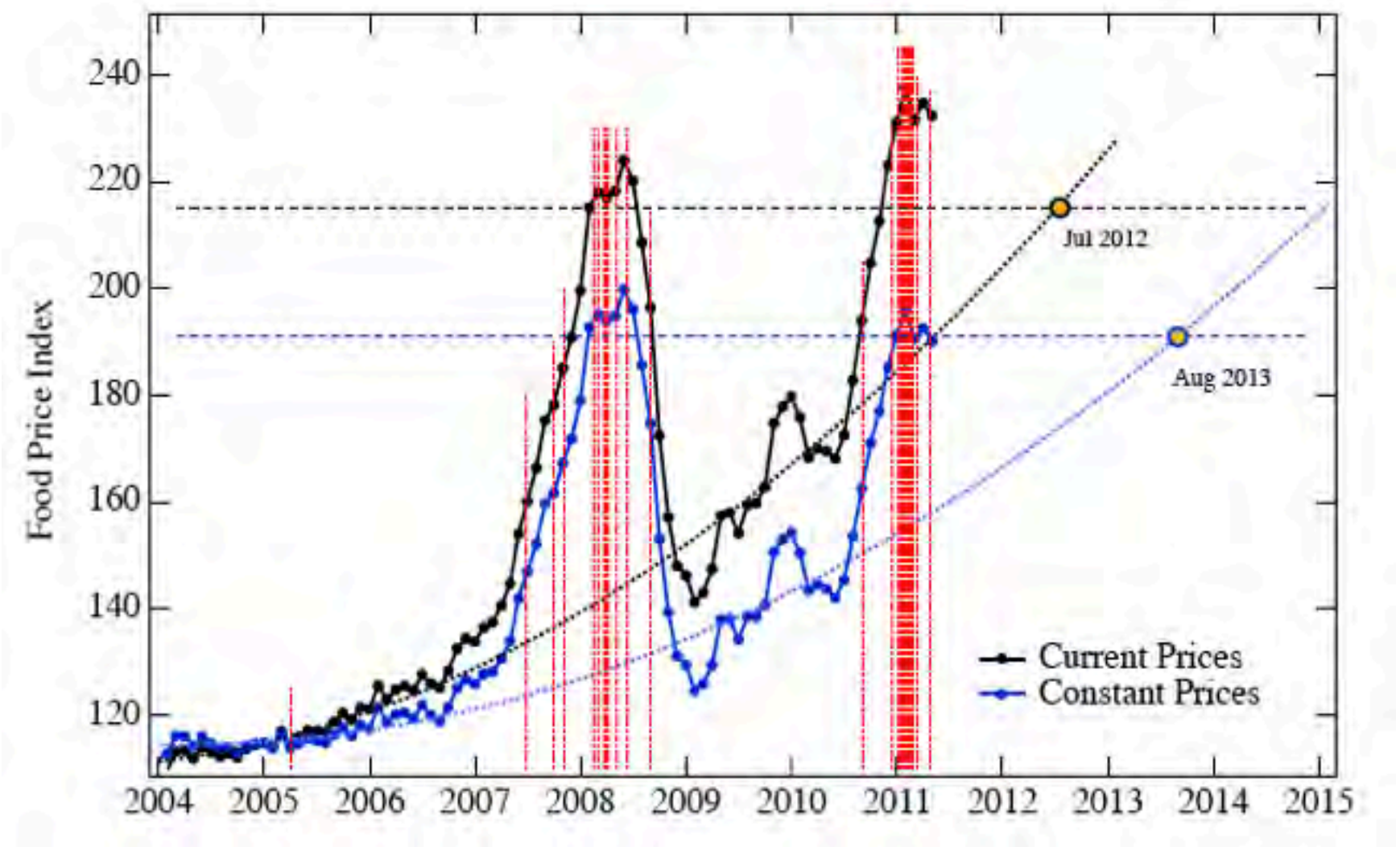
Silver


450
300
150
1.0
0.8
0.6
0.4
0.2
0.0
2010/04
2010/08
2010/12
2011/04
2011/08



Time dependence of FAO Food Price Index from January 2004 to May 2011. Red dashed vertical lines correspond to beginning dates of “food riots” and protests associated with the major recent unrest in North Africa and the Middle East. The overall death toll is reported in parentheses [26–55]. Inset shows FAO Food Price Index from 1990 to 2011.

Marco Lagi, Karla Z. Bertrand and Yaneer Bar-Yam (2011)



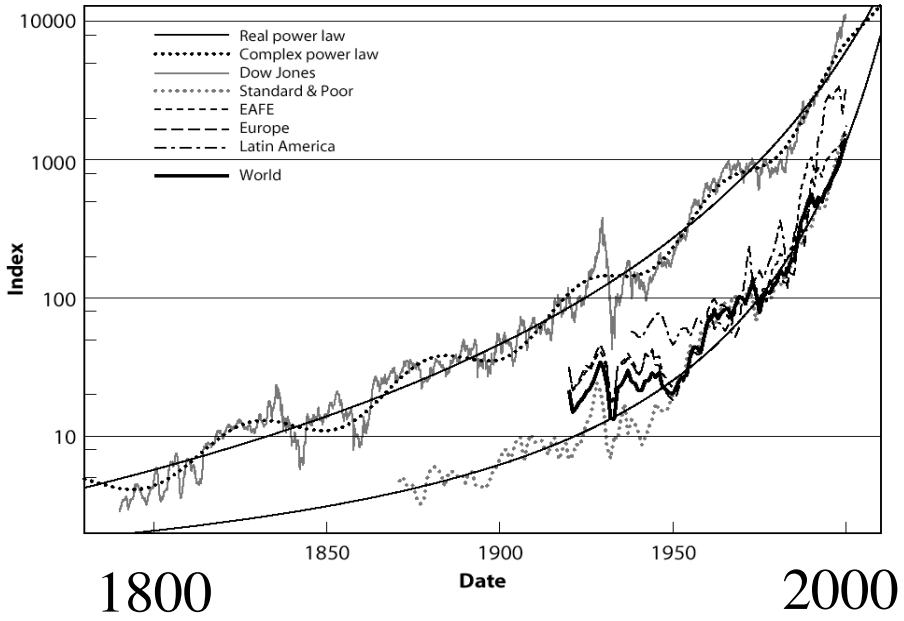
Time dependence of FAO Price Index at current prices (upper black curve) and constant prices (corrected for inflation, lower blue curve) from January 2004 to May 2011. Red dashed vertical lines correspond to beginning dates of food riots and events associated with the major recent unrest in North Africa and the Middle East. Black and blue horizontal lines represent the price threshold above which riots are ignited in current and constant prices respectively. Index backgrounds are fitted with a third-order polynomial; intersection with the threshold (July 2012 at current prices, August 2013 at prices corrected for world inflation, [65]) represents the point of instability.

Marco Lagi, Karla Z. Bertrand and Yaneer Bar-Yam (2011)

IMMENSE PROGRESS and INNOVATION

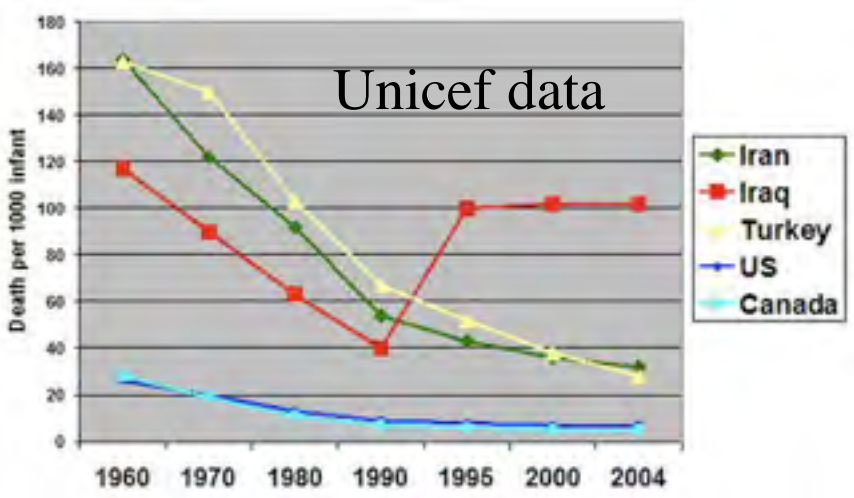
FINANCIAL SYSTEM

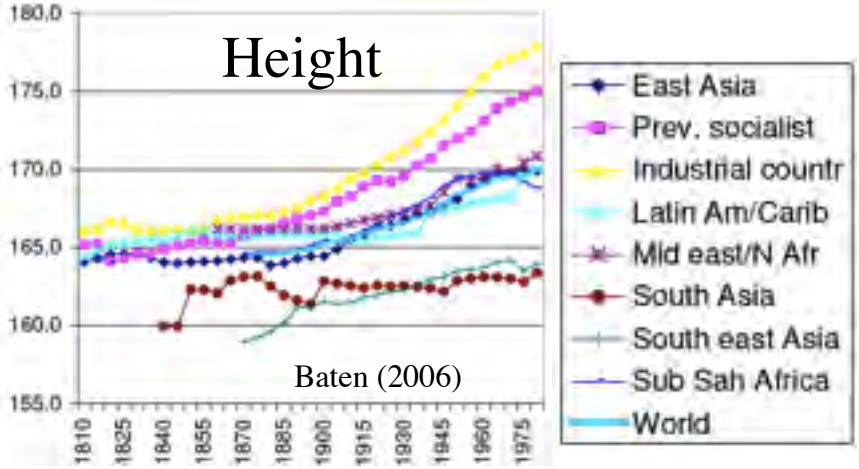
Financial innovations have fostered the use of capital for
- economic development,
- welfare,
- education...



FOOD AND HEALTHCARE

- Decrease of newborn and infant mortality
- Height as a proxy for health

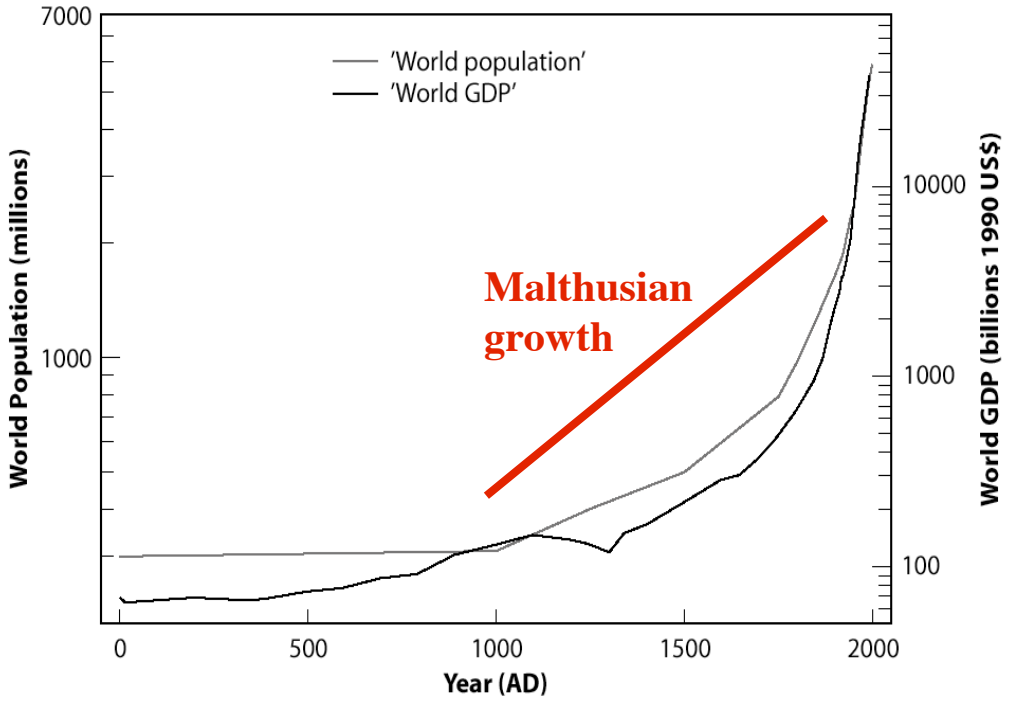




IMMENSE PROGRESS and INNOVATION

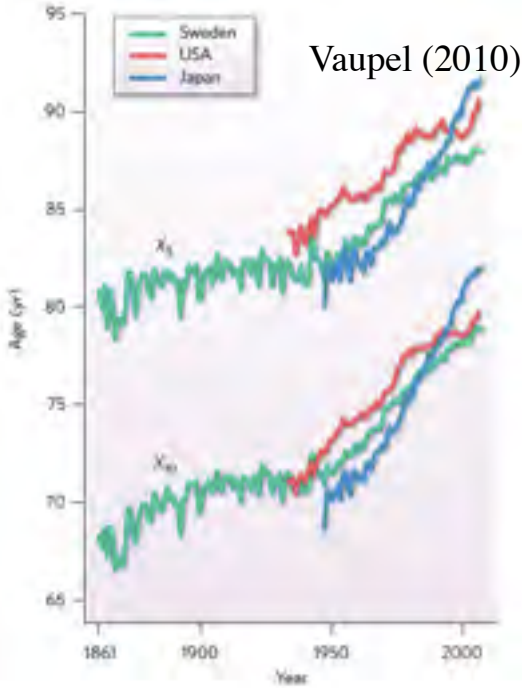
FINANCIAL SYSTEM

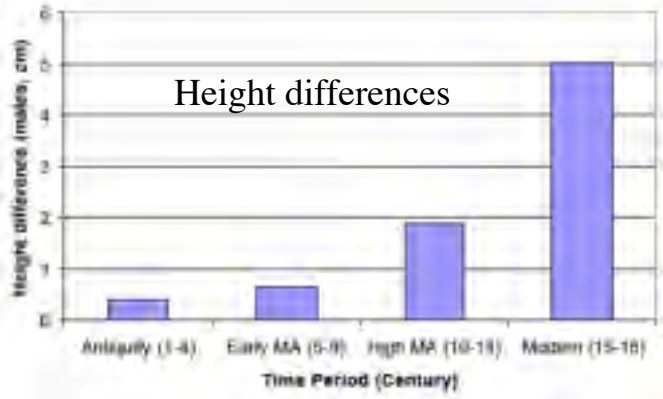
Financial innovations have fostered the use of capital for economic development, welfare, education...



FOOD AND HEALTHCARE

Increase of longevity
... and inequality





CONFLICTS OF INTERESTS

FINANCIAL SYSTEM

Loss of "Fiduciary Principle"

'*no man can serve two masters*'
(J. Bogle, former CEO Vanguard group, JPM 2009)

Loss of "Legal relationship of confidence or trust between two parties"

The issue of "moral relativism"

Moral hazard

Misaligned Incentives

FOOD AND HEALTHCARE

Loss of "Hippocratic oath"

'*nil nocere*'

Fundamental conflict of interest to keep us "marginally ill"

Maximizing share-holder value is different from improving health

Rational focus on short-term in the presence of large risks and uncertainties

Fundamental Origin of the Crises

FINANCIAL SYSTEM

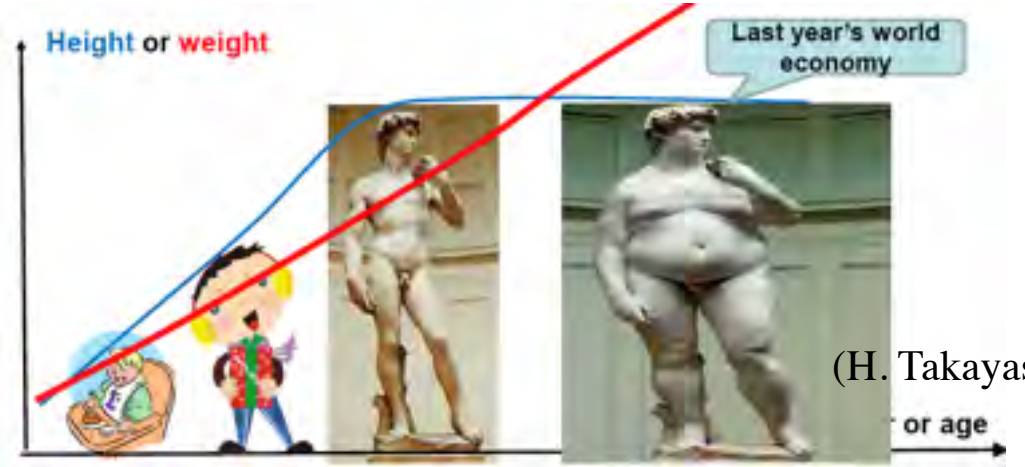
- The illusionary quest of society-at-large, pensions funds, mutual funds... to gain more than 2% return in real terms (above inflation)
- The "gambling society" (stardom culture, emphasis on "luck") vs work and risk management

The root cause of the crisis is our illusion on financial solution to growth (high returns above GDP growth).

FOOD AND HEALTHCARE

- The illusionary syndrome for "blue pills and red pills"...
- Principle of least effort (Zipf, 1949)
- Principle of immediate or short-term gratification (large "discount rate")

The root cause of the coming healthcare crisis is our illusion in simple top-down control technical solutions as opposed to account for systemic network of networks.



(H. Takayasu)

HUMAN INTRINSIC WEAKNESSES

Fundamental failure to grasp the SYSTEM nature of the problems:
Instead, one problem => one proximate solution: THIS IS WRONG!

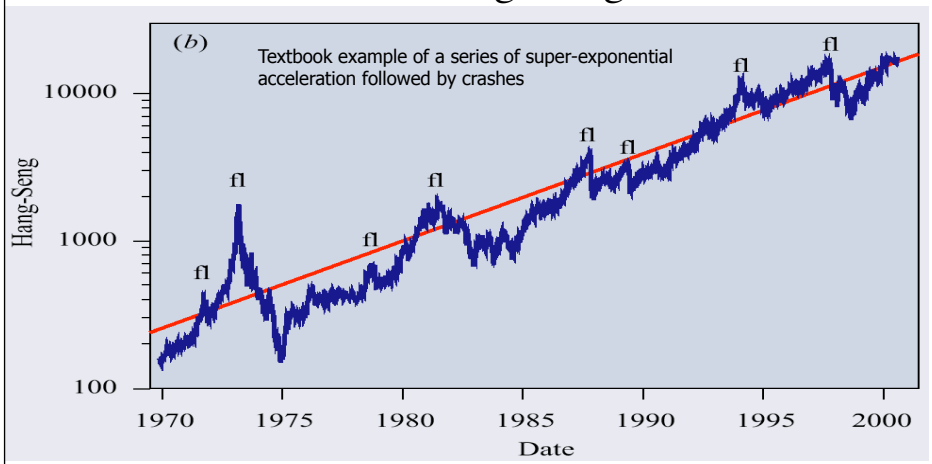
FINANCIAL SYSTEM

- The banking industry is a seller of dreams.
- The banking industry exploits our illusions and cognitive limitations... like casinos and lotteries...

FOOD AND HEALTHCARE

- The food industry exploits our weaknesses (addictive and/or compensatory nature of some foods).
- The pharmaceutical industry exploits our illusions for simple solutions to health problems.

Hong-Kong



Solutions for Financial and biological Health?

The problem of institutional and academic memory loss

- Regulation and system design (Glass-Steagall act (1933); Sarbanes-Oxley act (2002); Dodd-Frank act (2010)...)

- Credit creation by banks (R. Werner)

The key question: is there evidence that the new financial innovations and a much expanded bank system has brought any real gain for innovations, economic development, employment?

As Krugman suggested, is “boring banking” sufficient?

The check-list approach

Solutions for Financial and biological Health?

Solutions have to go very deep to the roots to develop a culture of ethics, morality and respecting the fiduciary principle.

Social capital includes reciprocal effects, fairness, altruism and other-regarding behavior rule the world.

Self-sustaining incentive to foster "social capital" of a culture / society / communities / group.

Field studies and lab experiments in close combination with complex system theory (ABM) can considerably contribute to improve the understanding of cooperation in order to promote and spread a sustainable behavior.

Living examples of "social capital in action"

- Microfinance (Yunus and Grameen bank): Losses and defaults of micro credits are almost negligible. The implementation of joint liabilities, social collateral and peer pressure mechanisms ensures a sustainable, effective and efficient way for self-help without spending money. Lending micro credits is less risky and more profitable than standard investments.

- eBay uses a simple version of cross-reporting schemes. Buyers and sellers can publicly rate each other to prevent abuse. This rating opportunity implements an additional feedback mechanism that takes the advantage of sustaining cooperation by punishing norm violators/defectors.

- Dimension Fund Advisors (Investment firm in Santa Monica, 1981): cultivating a culture of Trust (full disclosure, "penalty box", full disclosure preventing asymmetric information)

- Switzerland, Singapore...

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...
  - **Critical bifurcation** approach with advanced warning methods for control and risk management => **TIME-AT-RISK**

Final remarks

1-All proposals to control financial instabilities 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

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)

D. Sornette, Dragon-Kings, Black Swans and the Prediction of Crises,
in press in the International Journal of Terraspace Science and Engineering (2009)
(http://arXiv.org/abs/0907.4290)

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).