The Financial Bubble Experiment: Advanced Diagnostics and Forecasts of Bubble Terminations Volume II–Assets Document

D. Sornette, R. Woodard, M. Fedorovsky, S. Reimann, H. Woodard, W.-X. Zhou
(The Financial Crisis Observatory)*
Department of Management, Technology and Economics,
ETH Zurich, Kreuzplatz 5, CH-8032 Zurich, Switzerland
(Dated: 12 May 2010)

This is the second installment of the Financial Bubble Experiment. We identify 7 bubbles in 7 different global assets; for 4 of these assets, we present windows of dates of the most likely ending time of each bubble. This current document, which will be made public on 1 November 2010, is the one whose digital fingerprint is provided in the accompanying master document [1], made public on 12 May 2010.

I. INTRODUCTION

The Financial Bubble Experiment (FBE) aims at testing the following two hypotheses:

- **Hypothesis H1:** Financial (and other) bubbles can be diagnosed in real-time before they end.
- **Hypothesis H2:** The termination of financial (and other) bubbles can be bracketed using probabilistic forecasts, with a reliability better than chance.

In a medical context, H1 corresponds to the diagnostic of cancer and H2 to the forecast of remaining life expectancy.

These are embedded hypotheses, in that H1 includes H2 and we test them here separately. The “end of a bubble” is interpreted in terms of dynamical systems as a “change of regime” or “turning point”. This qualitative terminology is supported by quantitative measures [2].

We began this experiment in November 2009 with the publication of diagnoses of three distinct bubbles in three distinct assets. This was followed in December 2004 with a fourth. We only published the digital fingerprints of electronic documents containing our forecasts in November and December 2009. On 3 May 2010 we revealed the four assets and published the original documents. In each of the four original documents, we presented a range of dates of the most likely end of the bubbles. In the follow-up report in May 2010, we presented quantitative analysis measuring the quality of our forecasts. The background theory and methodology, as well as these previous results—the original documents, the digital fingerprints and the follow-up analysis—are publicly available online at the URL given in [2].

This report is a continuation of the FBE in that we offer the digital fingerprint of an electronic document containing 7 assets that we find to be in bubbles at the time of writing. We will publish the original document itself on 1 November 2010. This is a slight break from the previous work in two ways. First, we create only a single document containing the information on the 7 assets. More importantly, we better define the scientific problem by testing separately H1 by itself and H1 in combination with H2.

We present a collection of 7 assets that our methods indicate support H1 (Sections II-III, Tables I-II). For 4 of these assets, we also provide forecast windows of the most likely ending of the bubbles, which would support H2 (Section III, Table II).

*dsornette@ethz.ch

H1 asset
Cotton future (CHF)
Gold future (CHF)
Oil future (CHF)

TABLE I. H1 assets of the Financial Bubble Experiment as of 12 May 2010. All listed assets are candidates for H1 (identified bubble phase).

H2 asset	Quantile windows
Palladium future (CHF)	20/80%: 2010-06-05/2010-07-05 5/95%: 2010-05-16/2010-07-22
Platinum future (CHF)	20/80%: 2010-06-02/2010-08-04 5/95%: 2010-05-23/2010-09-16
NASDAQ (USD)	20/80%: 2010-07-05/2010-08-12 5/95%: 2010-05-28/2010-08-19
FTSE EPRA US	20/80%: 2010-05-18/2010-07-16 5/95%: 2010-05-13/2010-08-22

TABLE II. H2 assets of the Financial Bubble Experiment as of 12 May 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 show.

II. H1 ASSETS

We diagnose that the 3 assets in this Section (see Table I) are in a bubble phase (H1) but we do not make forecasts of likely dates of change of regime (H2). For each asset, we present a figure showing the time series of the observations and indicate the range over which our analysis was performed (the shaded area in each figure). We also supply a brief summary of the sentiment of the market for each asset at the time of this document, so that our diagnostic can be put in context.

A. Cotton future (CHF)

The Cotlook A Index (representative of the level of offering prices on the international raw cotton market) rose almost continuously from 64 cents per pound in August 2009 to 84-87 cents per pound in March and early April 2010. This significant increase was driven mainly by a rising gap between declining production and recovering consumption. Global cotton mill use rebounded faster and stronger than expected after a sharp drop in 2008/09 caused by the global financial and economic crisis, while global cotton production declined for the third consecutive season. As a result, global cotton stocks are expected to drop by 18% to 10.4 million tons by the end of July 2010, the smallest level in six years.

The Cotlook A Index jumped to over 90 cents per pound in the last part of April, after the Indian government announced the suspension of cotton export registrations in an attempt to reduce domestic prices. India is the second largest cotton exporter after the US.

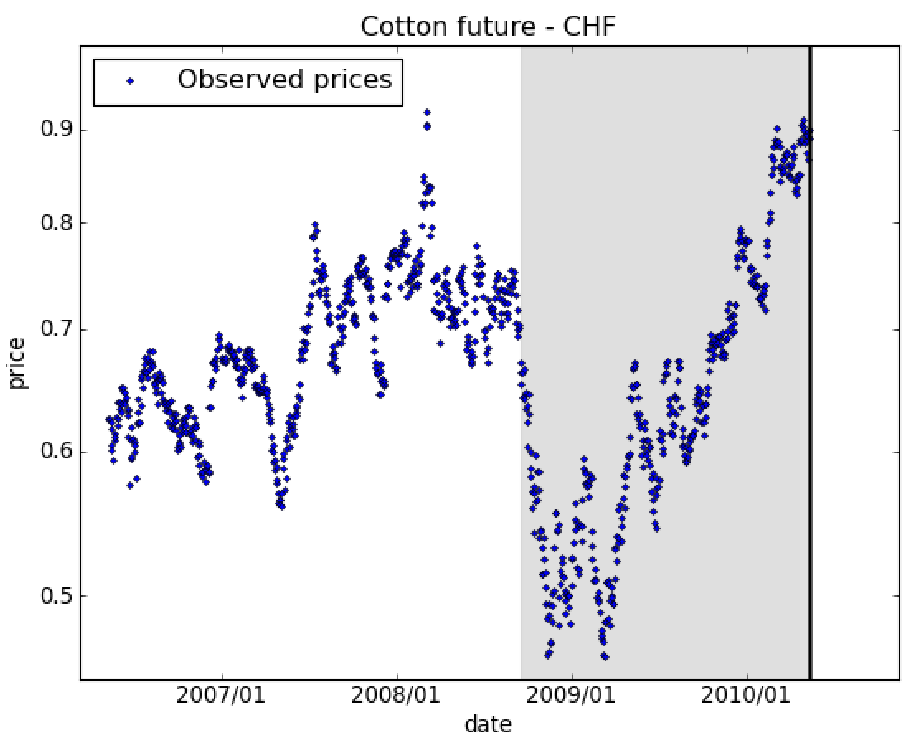

FIG. 1. Cotton future (CHF): Time series of observations (filled circles) and range over which our analysis was performed (shaded region).

B. Gold future (CHF)

According to the World Gold Council's most recent quarterly report, the strong gold price performance during the first three months of 2010 was sustained by investor inflows, continuing to support robust market fundamentals, including evidence of stronger jewelry demand in India, and growth in Chinese jewelry demand. On average, gold remained among the least volatile of the commodities.

Gold is also being used as a hedge against a potential financial crisis. European credit woes based on the underlying finances of Portugal, Ireland, Italy, Greece and Spain, had a negative impact on the euro and the British pound. The yellow metal gained almost 6 percent in April, its biggest one-month rise since November, as credit ratings downgrades of Greece, Spain and Portugal have dispersed a wave of risk aversion, channeling money into gold.

"Gold is sort of the anticurrency. A lot of people think the gold price is rising, but you could argue that many of the currencies are just declining," said Nick Barisheff, president and CEO of Bullion Management Group. He noted that while gold is only up about 5% in Canadian dollar terms in the past six months, bullion has risen 23% in euros and 19% in British pounds. "Eventually, all the currencies will go down relative to gold," Mr. Barisheff said. "The U.S. dollar will probably be the last one. Even though there are a lot of arguments about how weak it is on a fundamental basis, it could rise because it's the best of a bad bunch and also the most liquid."

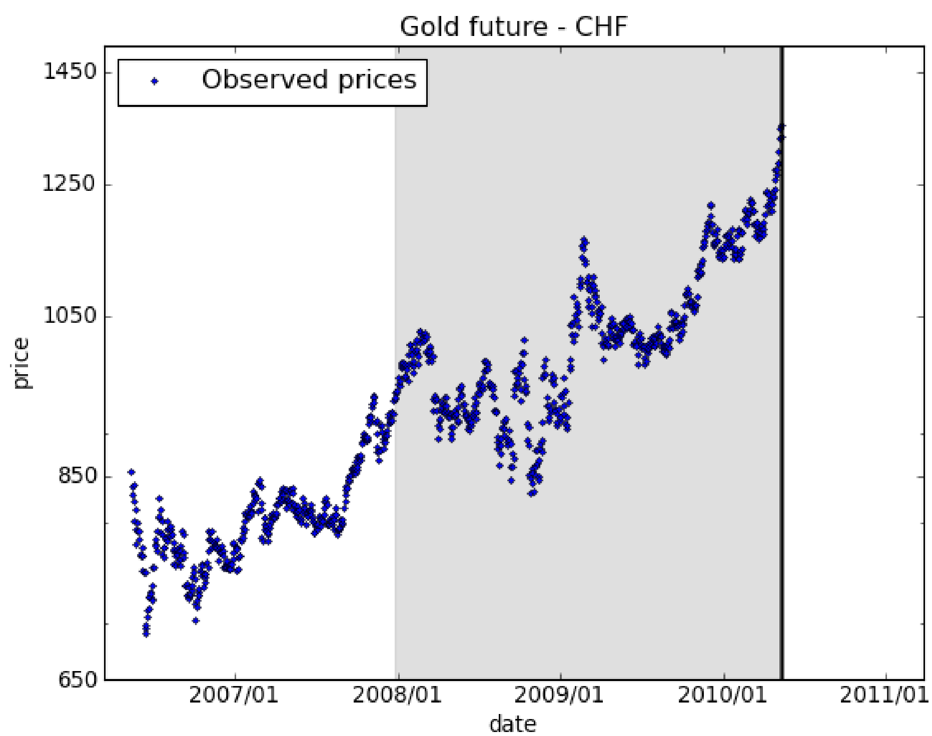

FIG. 2. Gold future (CHF): Time series of observations (filled circles) and range over which our analysis was performed (shaded region).

C. Oil future (CHF)

The Organization of the Petroleum Exporting Countries (OPEC) slashed production quotas at a meeting in December 2008, after energy demand fell during the worst recession since World War II. Crude oil prices slumped from a record \$147 a barrel in July that year to \$32 in December. Since then, oil prices rose to \$87 a barrel at the beginning of May 2010, before dropping on May 7 to their lowest since mid- February, largely due to what is happening in Greece, as well as the consistently rising level of U.S. inventories. Ministers from Arab oil-producing nations showed no signs of wanting to raise or lower OPEC's existing production targets even as oil prices declined 13 percent in early May. Crude oil demand will rise this year, unimpeded by a debt crisis in Greece that may spread to other European nations and slow growth, oil ministers from Saudi Arabia and Algeria said on May 9. OPEC members should abide by oil-production levels approved in 2008 even as demand increases, said Abdalla Salem El-Badri, the group's secretary general.

In early April 2010, the US Energy Information Administration (EIA) predicted world oil prices would likely continue to firm and increase slightly in response to the global economic recovery. "As long as the global economy continues to recover, and OPEC remains satisfied with its constrained supply targets, global oil markets should remain in this situation. Major uncertainties include the pace of global economic recovery and the extent to which the largest economies continue their stimulus and other economic policies." OPEC left its production policy unchanged at its last meeting in Vienna on March 17, 2010, and is not scheduled to meet again until October 14 to review its crude oil production targets. EIA projects that OPEC production of crude oil will increase in 2010. Overall, EIA also projects a slight increase in OPEC surplus crude oil production capacity through 2011 from first-quarter 2010 levels. EIA projects that world oil consumption will grow by 1.5 million barrels per day (bbl/d) in 2010 and 1.6 million bbl/d in 2011. This growth is the result of an expected recovery in the global economy. EIA expects WTI prices to average above \$81 per barrel this summer, slightly less than \$81 for 2010 as a whole, and \$85 per barrel by the fourth quarter 2011.

On May 10, oil rose for the first time in a week after European Union governments and the International Monetary Fund agreed to an emergency lending mechanism.

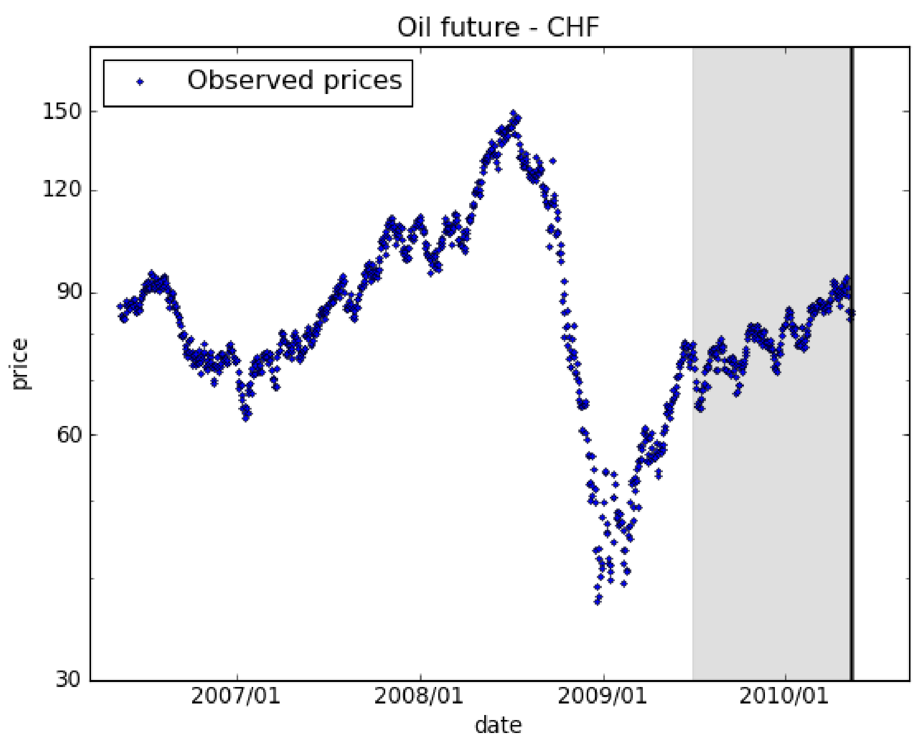

FIG. 3. Oil future (CHF): Time series of observations (filled circles) and range over which our analysis was performed (shaded region).

III. H1 AND H2 ASSETS

We hypothesize that the 4 assets in this Section (see Table II) are all in a bubble phase (H1) and are likely to end within the quantile ranges indicated in Table II (H2).

A. Common market analysis for palladium and platinum

Prospects of a global economic recovery, and the tentative signs that the motor industry is getting back on its feet, is boosting the price of the white metals again. Two main factors drive these metals to premium prices: their use in catalytic converters and the fact that investors can now easily get exposure to platinum and palladium via an exchange-traded fund. Such ETFs, particularly those backed by physical assets, have influenced the supply-and-demand effect that drives prices. Investors were the primary drivers behind the rising prices of platinum and palladium, according to the latest Platinum and Palladium Survey, published in April 2010 by independent research house GFMS. The recovery in the auto sector will obviously boost demand for both metals, but palladium has the superior outlook, due not only to its continued substitution of platinum but also by the fact that the platinum market is skewed towards Europe (high diesel market share) and this is the region with the least appetizing economic outlook.

In late April, the dollar started to rally on a potential ratings agency downgrade of Portugal. A stronger dollar often pressures US-traded metals by making them more expensive for buyers using other currencies, hampering demand. Platinum and palladium don't have the same haven allure as gold, which has left them more susceptible to pressure from the stronger dollar.

B. Palladium future (CHF)

The restricted supply from South Africa, cessation of Russian stockpile sales and resuming demand from auto manufacturers (particularly from the Chinese car markets, which use palladium-rich catalytic converters) should create a high global demand for palladium. Palladium demand in 2010 is expected to rebound to the levels enjoyed in 2008, implying an increase of almost 12%. However, supply should also respond positively, with gains across the board in mine production eclipsed by a surge in autocatalyst scrap supply in 2010. Electronics (autos, PCs, digital TV, for example) is the second largest use for palladium and demand in this sector fell by 8% last year to account for 17% of gross global industrial demand. This pattern was skewed however, with the losses concentrated in the first quarter of the year and the industry started re-stocking in the second half.

Fears that palladium had become overstretched in its run up to two-year highs in April and concerns over resurgent euro-zone sovereign risk have sparked a correction, but analysts are broadly confident that underlying demand will lift palladium back toward $600 an ounce this year.

From a price perspective, GFMS (a leading precious metals consultancy based in London, UK) is forecasting continued strength in palladium prices this year, for similar reasons as discussed above for platinum. In keeping with its sister metal, inflows into palladium ETFs this year, for example, have already eclipsed last year's volumes.

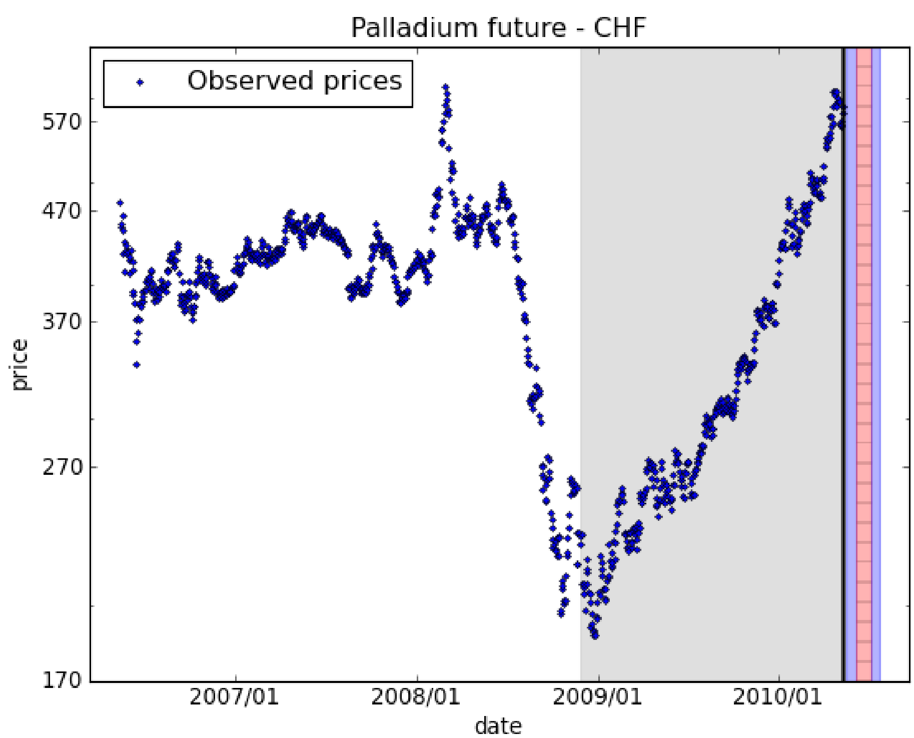

FIG. 4. Palladium future (CHF): Time series of observations (filled circles) and range over which our analysis was performed (wide grey shaded region). The black vertical line represents the date of the last observation used in our analysis (2010-05-11). The two shaded regions to the right of this vertical line represent quantile regions of the most likely date of the end of the bubble. The inner, red (with hatching) region is the 20/80% (2010-06-05/2010-07-05) quantile range and the outer, blue (without hatching) region is the 5/95% (2010-05-16/2010-07-22) quantile range.

C. Platinum future (CHF)

In spite of the larger gross surplus for platinum last year, prices achieved a near uninterrupted rise in 2009, a situation which has continued this year. This has owed much to a surge in investment demand, highlighted by the growth in ETF demand last year. In fact, this trend shows little sign of slowing in 2010, encouraged by the launch of two new funds in the United States.

Jewelry is the second largest use for platinum and staged a healthy recovery last year (driven almost exclusively by China) to absorb 35% of gross platinum demand; in absolute terms jewelry demand recovered to levels not seen for five years.

Looking ahead to this year, although platinum autocatalyst and industrial demand should benefit from the improved economic outlook, this may be partially offset by weaker jewelry demand, principally in China. At this stage, therefore, GFMS is forecasting a modest 5% rise in global demand, but its impact on the gross surplus will be offset by a recovery in global mine production and the resumption of an upward trend in autocatalyst scrap.

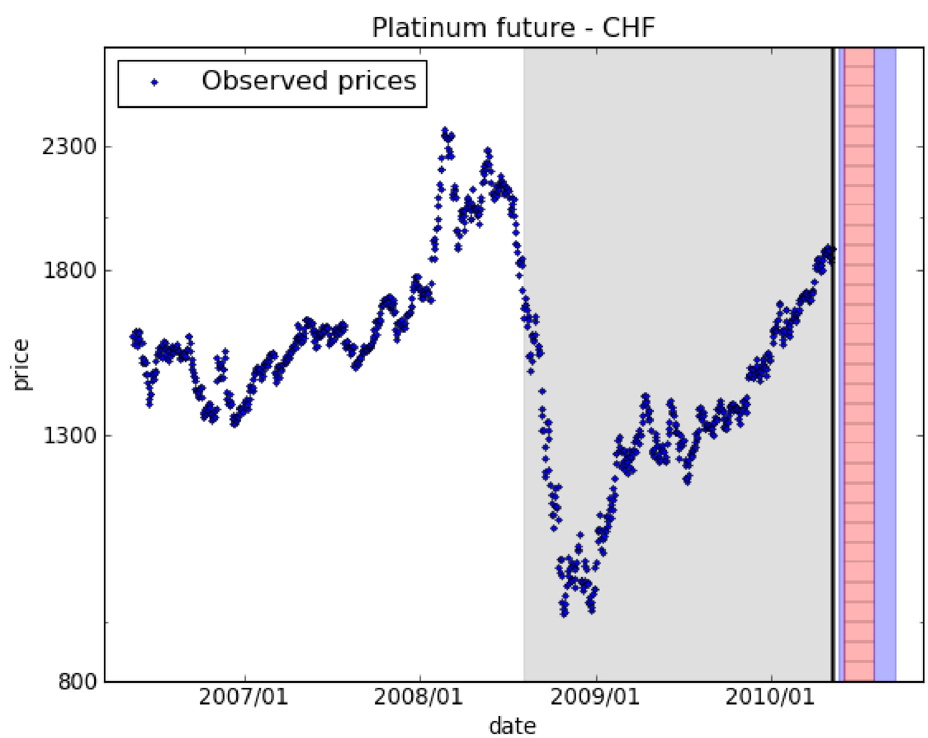

FIG. 5. Platinum future (CHF): Time series of observations (filled circles) and range over which our analysis was performed (wide grey shaded region). The black vertical line represents the date of the last observation used in our analysis (2010-05-11). The two shaded regions to the right of this vertical line represent quantile regions of the most likely date of the end of the bubble. The inner, red (with hatching) region is the 20/80% (2010-06-02/2010-08-04) quantile range and the outer, blue (without hatching) region is the 5/95% (2010-05-23/2010-09-16) quantile range.

D. NASDAQ (USD)

With over 3,000 components, the NASDAQ Composite is a stock market index comprised of all the common stocks and similar securities listed on the NASDAQ stock market. In terms of indicating the performance of technological companies and growth companies, the NASDAQ Composite is the most followed in the United States, although is it not solely a U.S. index.

The NASDAQ composite index increased from early February until late April, when the market started to reel over fears of the economic situations in Greece and Portugal, and the index dropped 3% in 7 days in the first week of May. On May 7 the NASDAQ composite dropped 3.4% due to a number of erroneous trades. On May 10 the index increased by 4.8% as an agreement on an emergency rescue package of 750 Billions euros from the EU quelled fears a new credit crisis would derail European economies.

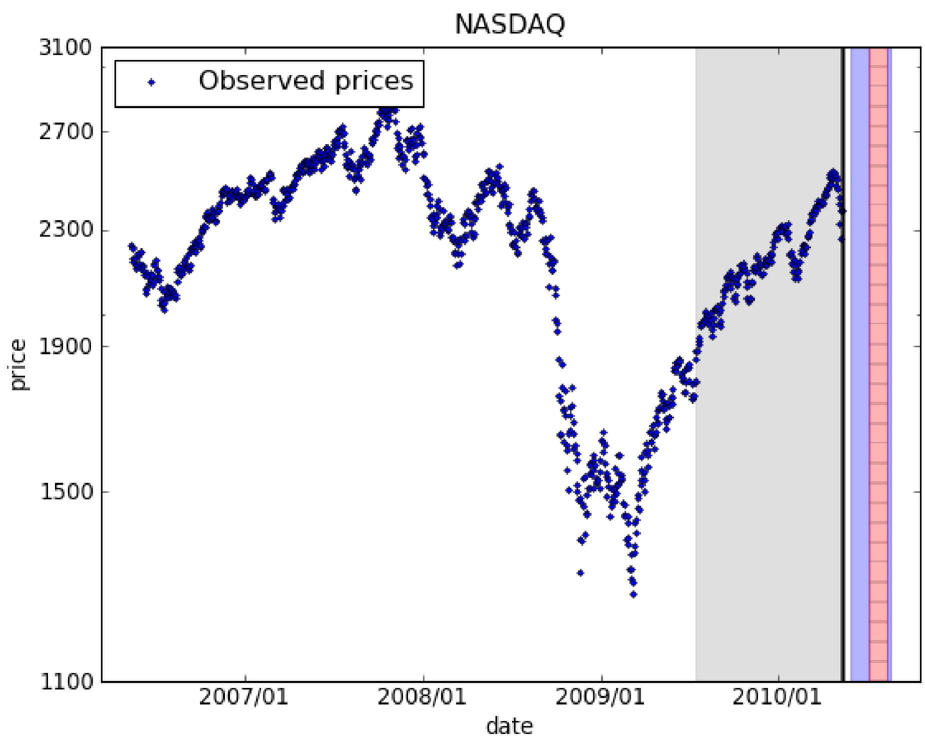

FIG. 6. NASDAQ index (USD): Time series of observations (filled circles) and range over which our analysis was performed (wide grey shaded region). The black vertical line represents the date of the last observation used in our analysis (2010-05-11). The two shaded regions to the right of this vertical line represent quantile regions of the most likely date of the end of the bubble. The inner, red (with hatching) region is the 20/80% (2010-07-05/2010-08-12) quantile range and the outer, blue (without hatching) region is the 5/95% (2010-05-28/2010-08-19) quantile range.

E. FTSE EPRA US

From the FTSE website[3], this index "is designed to represent general trends in eligible real estate equities.... Relevant real estate activities are defined as the ownership, disposure and development of income-producing real estate." Recent talk of a recovery in the US real estate market has been dealt a blow by the latest figures that show foreclosures still rising and prices falling. Foreclosure filings including default notices, scheduled auctions and bank repossessions rose 7% in the first quarter of 2010 compared with the last three months of 2009, the most recent figures from RealtyTrac show. Foreclosure auctions reached the highest quarterly total in the history of the report and bank repossessions also reached a record high for the quarter. Credit ratings agency Fitch said that any recovery in US real estate market can only be described as anaemic at best. The federal housing credit and very attractive affordability both gave the housing sector a brief jolt after bottoming out in the middle of last year. However, faltering consumer confidence has somewhat restrained the recovery so far, with numerous challenges still awaiting the sector, said analyst Bob Curran. Among the challenges facing the US housing market include the termination of the Federal Reserve's mortgage-backed securities purchase program, the conclusion of the housing credit program, and continued high levels of delinquency and foreclosure. One encouraging sign, however, is that there seems to be more first time buyers. They made up a record high share of sales in March, according to the latest Campbell Surveys poll of more than 1,500 real estate agents nationwide.

Residential property prices in the US are now 5.1% higher than they were last April, according to the latest home price index to be published. But in the last few months prices have been falling and dropped another 5% in April on a rolling three month period, the figures from data provider Clear Capital show. The index shows it is very much a mixed picture across the country. "However, the short term picture for these markets has improved somewhat from last month, and while prices continue to fall, their drop is less dramatic than that of previous months," the index report says. "This provides an early indication that prices might be searching for a bottom, rather than starting a steeper decline, especially with the arrival of the spring buying season."

Commercial real estate investors in the US are more hopeful amid a general improved outlook with regard to the industry as the US economy shows some encouraging signs of improvement, according to a new survey. Investors find it easier to envision a commercial real estate market recovery today than at any point during the past 24 months although they acknowledge that challenges and concerns still exist, the Price Waterhouse Coopers Korpacz real estate investor survey for the first quarter of 2010 shows. Investors also said that owners and lenders are finally coming to grips with what assets are truly worth. As a result, the report finds that while 2010 is expected to be a slow year for sales activity by historical comparison, there could be marked improvement from 2009, as banks appear more willing to lend although underwriting remains very conservative and more equity is needed to secure debt.

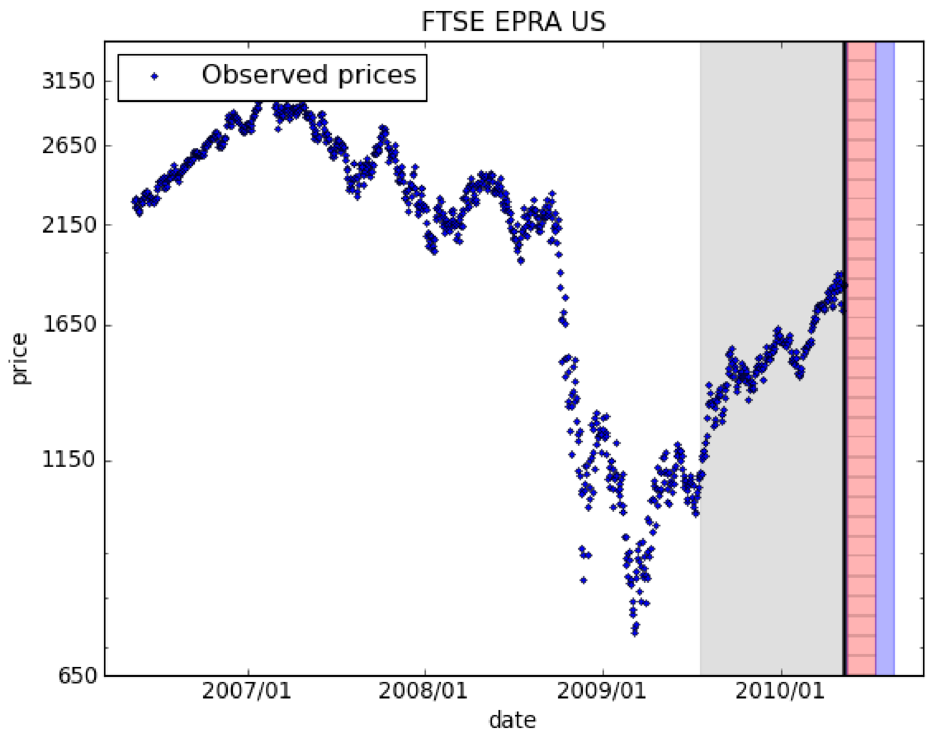

FIG. 7. FTSE EPRA US: Time series of observations (filled circles) and range over which our analysis was performed (wide grey shaded region). The black vertical line represents the date of the last observation used in our analysis (2010-05-11). The two shaded regions to the right of this vertical line represent quantile regions of the most likely date of the end of the bubble. The inner, red (with hatching) region is the 20/80% (2010-05-18/2010-07-16) quantile range and the outer, blue (without hatching) region is the 5/95% (2010-05-13/2010-08-22) quantile range.

[1] D. Sornette, R. Woodard, M. Fedorovsky, S. Reimann, H. Woodard, and W.-X. Zhou (The Financial Crisis Observatory), "The Financial Bubble Experiment: advanced diagnostics and forecasts of bubble terminations, Vol. II–master document," (2010).
[2] D. Sornette, R. Woodard, M. Fedorovsky, S. Reimann, H. Woodard, and W.-X. Zhou (The Financial Crisis Observatory), "The Financial Bubble Experiment: advanced diagnostics and forecasts of bubble terminations," (2009), http://arxiv.org/abs/0911.0454.
[3] http://www.ftse.com/Indices/FTSE_EPRA_NAREIT_Global_Real_Estate_Index_Series/index.jsp.