Indexed into the Financial Bubble and/or bubbled into the financial index?

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After alpha investing lost its shining, smart beta strategies flourished, until they lost their lustre, in particular during the 2008 financial crisis that revealed the limits of so-called risk factors. Nowadays, the explosion of ETFs and of other passive investment vehicles expose the reality of a very different regime supported by central banks in their various forms of quantitative easing and monetary policies. The actions of central banks have been pushing asset prices for a decade now. In this climate, any passive investment or portfolio strategy is profitable. Consider that the S&P500 delivered close to 17% annual return over 2016 and 2017 with a Sharpe ratio reaching 2.5! Why work hard and develop active investment strategies when just buying the market delivers such outstanding performance? The new fashion of passive investment is clearly an avatar of the novel stance of central banks and their policies since 2008.

However, like with creep [1], all of a sudden something may snap or break. A vivid example is XIV ETF, which stopped trading after an 80% drop in its indicative value on in February 5, 2018. The strategy was one of short volatility, selling options and earning from the premia, which amounts to "picking pennies in front of a steam roller". It was considered a safe winning strategy with many reputable institutions amongst its investors, like Harvard endowment trust. However, this view failed to account for the unsustainable nature of accelerating markets, as shown in figure 1, where one can observe the clear warning signals developed in our Financial Crisis Observatory (FCO) at ETH Zurich, using a methodology briefly described below.

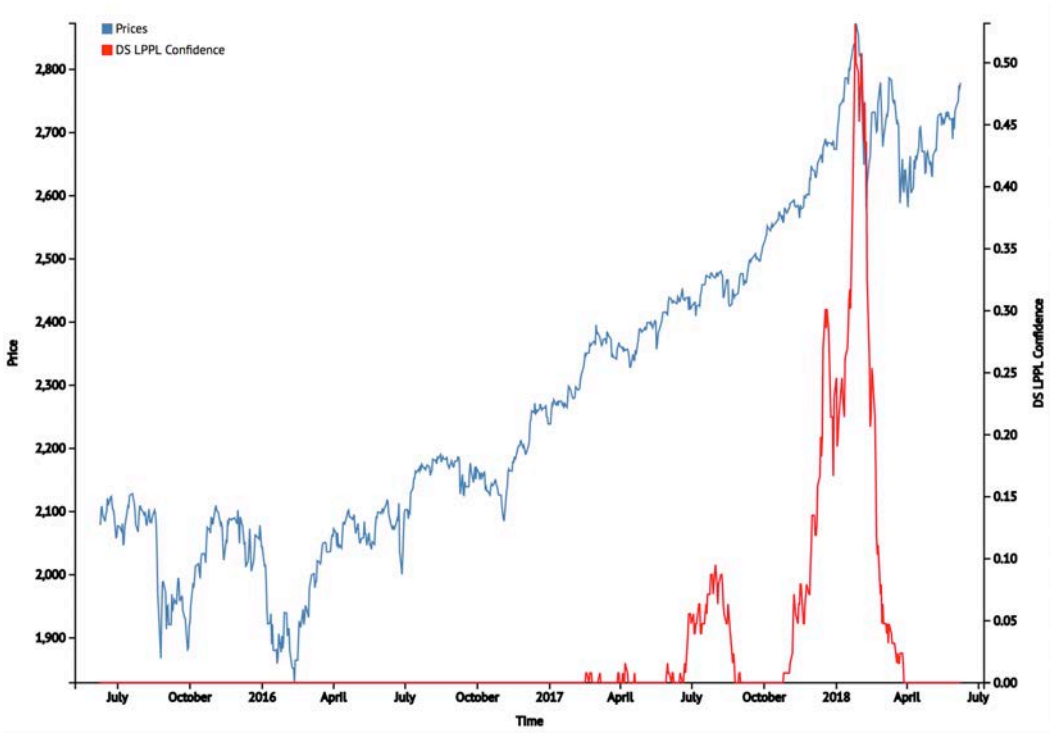

Figure 1: The S&P500 composite index (blue and left scale) and the bubble indicator developed at ETH Zurich in my group (red and right scale), which can be accessed at the site http://tasmania.ethz.ch/pubfco/fco.html of the Financial Crisis Observatory (ETH Zurich).

This makes plain that the most profound misunderstandings of financial markets derive from the explicit or implicit assumption that stock price time series are approximately stationary, that stable statistical laws apply and that simple linear risk factor decompositions can capture the main risks associated to investments. Figure 2 illustrates the fallacy of this assumption by comparing major economic indicators over different periods of time, stressing their non-stationarity. The Great Moderation shown here preceded and could be viewed as a precursor of) the 2008 financial crisis [2]. Before the crisis, it was hailed as the new paradigm of economies immune to recessions. In reality, it was hiding the existence of excessive debts and exploding financialisation and the resulting bubbling asset markets all over the world. Figure 3 reinforces this point using real-estate price data in the US, illustrating the up and downs and occurrence of very different regimes, also associated with different

interest rate policies. Figure 4 presents a long view of the US stock markets, again emphasising the many different regimes powered by different productivity dynamics, geo-politic-economic backgrounds, interest rate policies and so on. In sum, the correct view of financial markets is that their characteristics evolve all the time, with changing risk factors and risk perceptions.

Given this diagnostic, using passive investment is an heroic attitude that puts too much faith in the supposed good behaviour of the stock markets. Of course, a tonne of academic works purports to report that it is impossible to beat the market (buy-and-hold strategy) and the correct approach is to specify one's risk appetite and invest accordingly in the corresponding risk factors. In my understanding based on 25 years spent to study financial markets, this is a flawed concept because it fails to recognise the dynamical and highly nonlinear nature of financial markets. With a yearly volatility of 20% and an average yearly return of 10%, it takes at least 4 years for the risk premium (or real value) to start dominating the stochastic component. In other words, at time scales smaller than 3-5 years, the financial markets are "voting machines" and become sound "weighting machines" only beyond, as quoted from Benjamin Graham. The "voting machine" is not powered by well-defined risk factors but by the collective perceptions, beliefs, anticipations and actions of less-than-well informed investors.

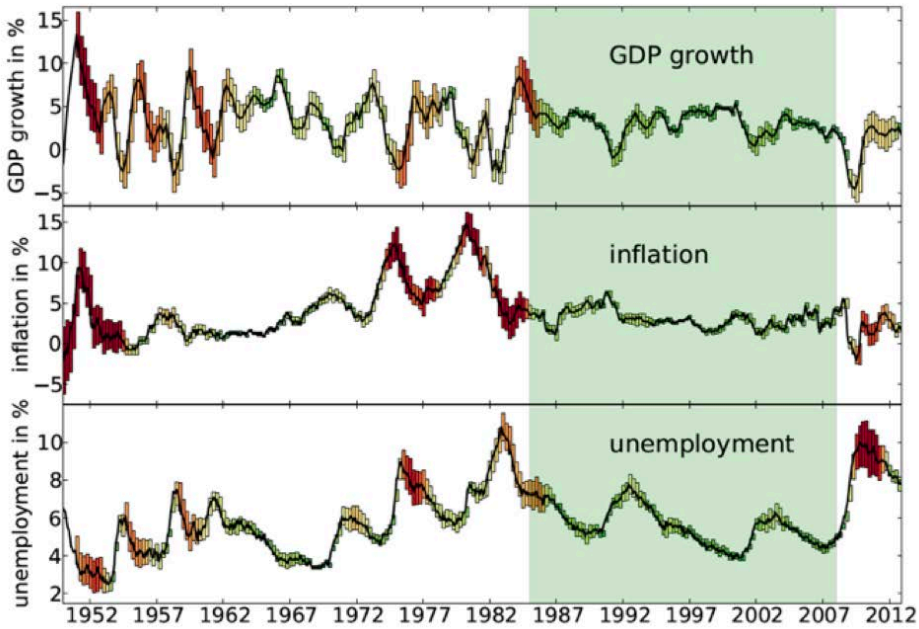

Figure 2: Summary of the indicators of the "Great Moderation" [1]: over the 25 years preceding the 2008 crisis, the GDP growth in the US was strong and with low volatility; inflation was contained and predictable; unemployment was decreasing and with lower volatility than previous periods. Not shown is the financial volatility, which was also at an historical low. (source: U.S. Bureau of Labor Statistics and Zalan Forro, ETH Zurich).

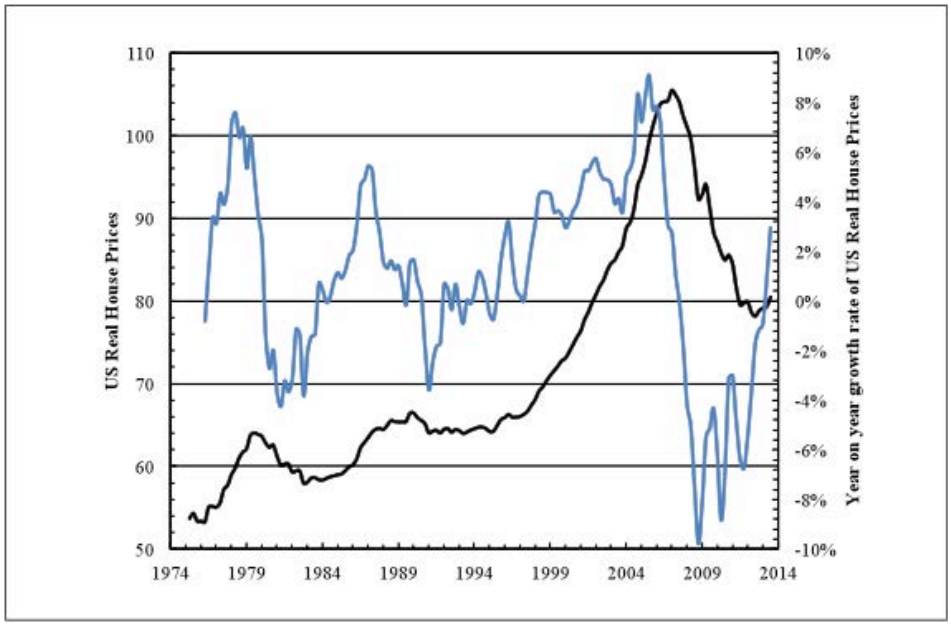

Figure 3: Real U.S. House Prices between 1974 and 2014. Levels are shown in black and should be read on the left axis. Yearly growth rates are shown in blue and should be read on the right axis. Three peaks in the growth rate coincide with a correction in the levels. When the growth itself grows, the process becomes unstable and a correction follows (Source: Federal Reserve Bank of Dallas international house price dataset, http://www.dallasfed.org/institute/houseprice/)

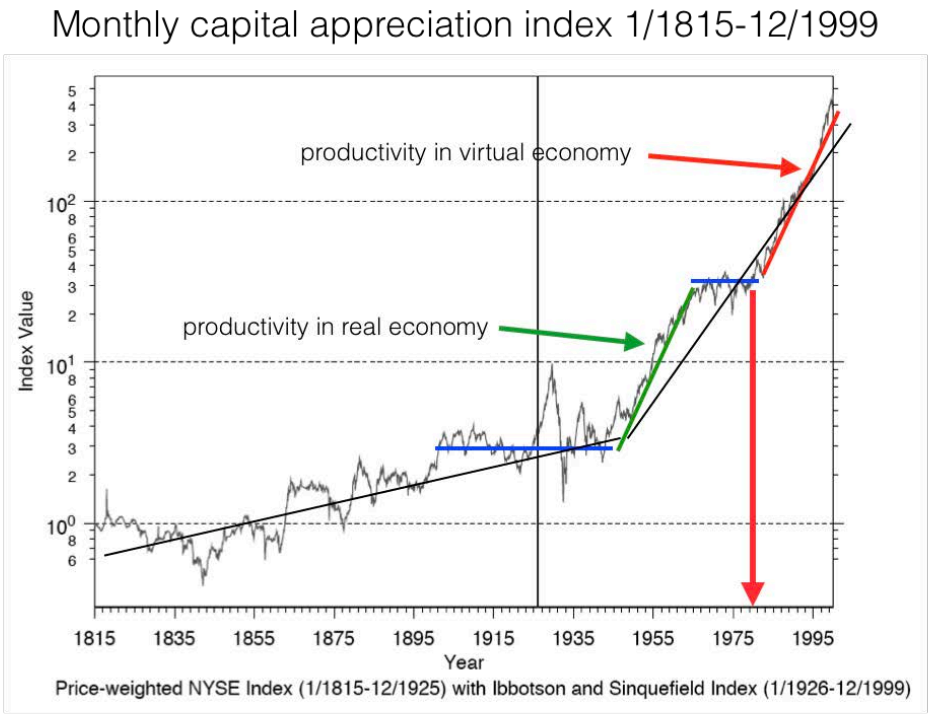

Figure 4: Long view of the history US financial market, exemplifying the many different regimes.

The good news is that there is order and predictability in the behaviour of the voting machine. The main concepts that are needed to understand stock markets include social dynamics, imitation, herding, collective behaviors, self-organization and positive feedbacks, leading to the development of endogenous instabilities. Financial markets are indeed continuously punctuated by bubble regimes, followed by their corrections, at many time scales [3,4]. Accordingly, local effects such as interest raises, new tax laws, new regulations and so on,

invoked as the cause of the burst of a given bubble leading to a crash, are only some of the triggering factors but not the fundamental cause of the bubble collapse. The true origin of a bubble and of its collapse lies in the unsustainable pace of stock market price growth [3,4]. As a speculative bubble develops, it becomes more and more unstable and very susceptible to any disturbance. In general, bubbles follow a universal scenario. They start with a new investment opportunity—either a new technology or access to a new market. An initial strong demand from first-movers and so-called smart money leads to a first price appreciation. This often goes together with an expansion of credit, which in turn further pushes up prices. This generates a positive feedback mechanism as new participants enter the market. Its behavior then no longer reflects any real underlying value and a bubble is born, eventually ending in collapse. A key concept is that the bubbles are characterized by faster-than-exponential growth patterns, which results from amplified growth due to positive feedback among traders.

This understanding makes feasible to implement the important maxim "Gouverner, c'est prévoir" (Governing is the art of planning and predicting), as formulated by Émile de Girardin, which I adapt to "investing is predicting and dynamically adapting one's exposure to market risks". In our complex world, projecting oneself into the future provides immense benefits to strategic decision making and to effective action. Good forecasting means being prepared to exploit potential upside opportunities, as well as to prevent or optimally manage adverse developments and crises. Forecasting the occurrence of changes of regimes promotes the evolution of the system towards a higher level of resilience that could not be achieved even by evolution (which is backward looking). Advanced diagnostics of crises constitutes the next level of evolution for cognizant creatures who use advanced scientific tools to forecast their future.

The systematic application of this theory and methodology to monitor financial markets worldwide, to diagnose the presence of bubbles in real time, and to forecast their burst ex ante can be found at the Financial Crisis Observatory at ETH Zurich, which is a scientific platform that aims at testing and quantifying rigorously, in a systematic way, and on a large scale, the hypothesis that financial markets exhibit a degree of inefficiency and a potential for predictability, especially during regimes when bubbles develop (see an output in figure 1). Monitoring about 25,000 assets worldwide, including indices, stocks, bonds, commodities, currencies, and derivatives, the FCO constructs a daily update of a number of bubble indicators, based on the analyses of price time series with the log-periodic power law singularity (LPPLS) model that I have developed over the last 25 years [3,4]. In a public version of the FCO, we share the results on 21 major assets of the behavior of our financial bubble indicators, with the goal of helping develop a science and culture of dynamical crisis risk monitoring, which I refer to "time@risk", in particular targeting large downward losses, as well as large potential upward gains.

The "time@risk" approach (to contrast with the Value@Risk approach, which is static and assumes stationarity) embodies the fundamental time dependent and changing nature of risks and opportunities. It addresses the outstanding challenge to develop predictions of systemic risk and global financial instabilities that have emerged as leading concerns in modern economies and with globalization. The "time@risk" approach can be extended to various domains of application to signal the possible occurrence of a crisis; provide insights to adopt the appropriate policy measures; and allow evaluating future scenarios according to the chosen policy [5]. This is based on a general conceptual framework and methodology for understanding why, how, and when financial bubbles appear, develop, and often end in ruinous crashes [4].

These are not wishful thinking or illusionary dreams. In the past decade, we at ETH Zurich have developed a large number of rigorous testing experiments, such as the Financial Bubble Experiment within the FCO (see https://arxiv.org/abs/1011.2882). Since October 2014, with a collaborator and two Ph.D. students, I have offered the "monthly FCO cockpit," (see http://www.er.ethz.ch/financial-crisis-observatory.html) which analyzes the dynamical evolution of bubbles in various asset classes, sectors, and geographic locations. It is the result of an extensive analysis on the historical time series of 431 systemic assets and 898 single stocks worldwide. The goal is to establish a track record and, as mentioned above, a culture of dynamical risk forecast and management. In addition to the correct call in June 2005 on the U.S. real estate bubble, we have published a number of remarkably successful predictions.

In early September 2007, Dr. Wei-Xing Zhou and I performed a LPPLS analysis of the Shanghai index that led to both a diagnostic of an ongoing bubble and the prediction of the end of the bubble in early 2008. I communicated this prediction on October 18, 2007, at a prominent global-macro hedge-fund conference in Stockholm. The Hang Seng China Enterprises Index (HSCEI) reached the historical high 20609.10 on November 2, 2007. Afterwards, the first valley HSCEI = 15460.72 (down 25 percent from historical high) was reached on November 22, 2007, and the bottom HSCEI = 4792.37 (down 77 percent from historical high) was on October 29. 2008. On March 19, 2008, HSCEI = 11379.91 was another deep valley. These drops occurred after a sixfold appreciation of the Chinese market from mid-2005 to October 2007 [6].

On July 10, 2009, my group, together with a team at the Bank Fortis, submitted a prediction on arXiv.org

of a coming crash in the Chinese market, in which we estimated a 60 percent (respectively 80 percent) probability that the end of the bubble would occur in the interval between July 7 and 27, 2009 (respectively, July 10 and August 10, 2009). Redoing the analysis five days later on July 14, 2009, the predictions tightened up with an 80 percent probability for the change of regime to start between July 19 and August 3, 2009. On July 29, 2009, Chinese stocks suffered their steepest drop since November 2008, with an intraday bottom of more than 8 percent and an open-to-close loss of more than 5 percent. The market rebounded with a peak on August 4, 2009, before plummeting the following weeks. The SSEC slumped 22 percent in August, the biggest decline among 89 benchmark indices tracked worldwide by Bloomberg, in stark contrast with being the number one performing index during the first half of that year [6].

On June 6, 2008, we published on arXiv.org (http://arXiv.org/abs/0806.1170) our LPPLS analysis of the oil prices in U.S. dollars and in other major currencies, which confirmed the start of a bubble between the last quarter of 2005 and the first quarter of 2006, beyond which a net unsustainable faster-than-exponential acceleration could be observed. We estimated an 80 percent probability that the Oil bubble would burst between May 17, 2008, and July 14, 2008. The actual peak oil price was observed on July 3 and the steep descent in price began on July 11.

From 2014 to June 2015, the Chinese domestic market accelerated, more than doubling within a year. In June 15, 2015, it started to crash in a series of very large drawdowns. This was the catalyst of the largest one-day drop in U.S. equity markets since the end of the financial crisis. My team demonstrated how our LPPLS metrics correctly flagged the growing risks of a sharp correction in the Shanghai stock market index, initially in early 2015 and then repeatedly from April through June 2015 [7]. This last example demonstrates the power of our theoretical model and our computational methodology, giving interested readers a clear illustration of our log-periodic power-law singularity model and a direct path to learning about it.

The following recommendations emerge from this discussion. First, given the great Central Banks experiment, the investor must be watchful of the signs for normalization. It must be recognized that, as long as they are protecting the intergenerational pension contract, it will be difficult to make money as a contrarian investor. Second, financial markets are not more stable than before, and the reasonable investor needs to be prepared for sudden market corrections. The strategy I recommend is to track the performance of an index but minimize the maximum drawdown by using new and sophisticated types of analysis to filter out companies at risk dynamically. And of course, closely monitor the risk for structural breaks using observatories, fueled by big data and non-linear models allowing for ruptures. This is now implemented professionally in SIMAG (www.simag.com) since March 2018, a joint venture between an ETH Zurich spinoff company and Credit Swiss Wealth Management.

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