



The FCO Cockpit Global Bubble Status Report January 2020



A collaboration of the Chair of Entrepreneurial Risks,
ETH Zurich and Systematic Investment Management AG

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ETH FCO and SIMAG Join Forces

The Financial Crisis Observatory (FCO) is...

- **Part of** the Chair of Entrepreneurial Risks at the Department of Management, Technology and Economics at the **ETH Zurich**
- A **scientific platform** aimed at quantifying in a systematic way the hypothesis that financial markets exhibit a degree of inefficiency and a **potential for predictability**, especially during regimes when **bubbles** develop
- Aiming to **provide warnings** at different time scales (week, month, quarter) on the development of future financial instabilities

Systematic Investment Management AG (SIMAG) is ...

- A **Joint Venture** between **Credit Suisse Asset Management** and an **ETH Zurich spin off**
- A **FINMA-licensed Investment Manager** for collective investment schemes.
- Relying on a **proprietary machine learning engine** specifically designed for **financial markets**
- The first and only investment manager globally which can **systematically leverage ETH's Financial Crisis Observatory (FCO) research insights**

Together we are able to provide you with richer investment content
and deeper research insights

Purpose and Benefits

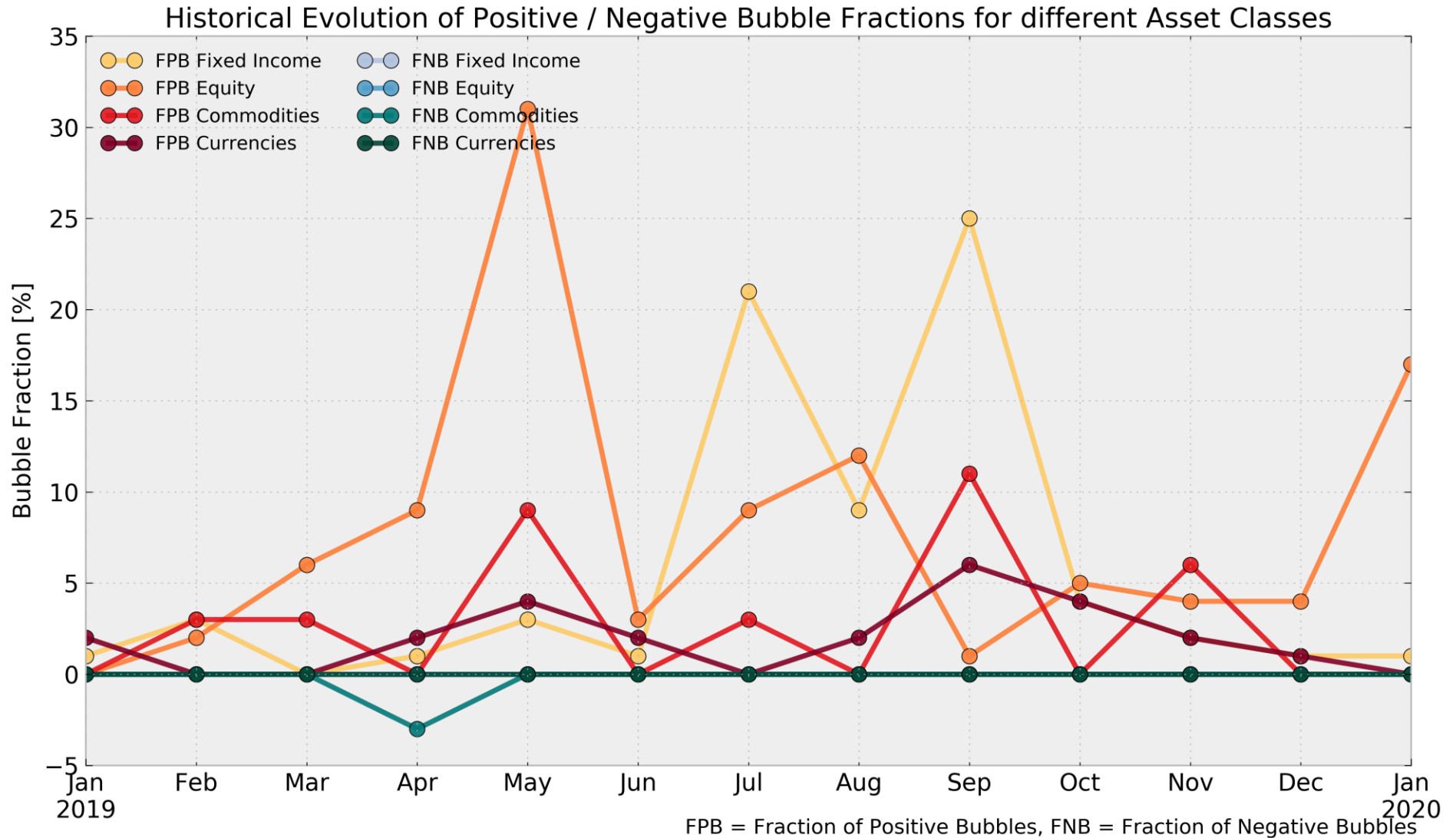
- ▶ The **Financial Crisis Observatory (FCO)** monthly report discusses the historical evolution of bubbles in and between different asset classes and geographies. The purpose of the FCO report is to ascertain which asset classes and sectors are deemed to be **crowded** and to what degree they can develop contagion risks.
- ▶ Today, the report is **used by 600+ institutions world-wide**, including universities, think tanks, sovereign wealth funds, hedge funds, family offices, private banks and pension funds.
- ▶ It delivers the big picture in terms of growing bubbles and instabilities in today's financial markets for **Chief Investment Officers, Senior Researchers, Fund Managers**, and **Independent Financial Advisors**, and all parties with **investment performance responsibility** or **managing financial risks**.
- ▶ The report is the result of an extensive analysis done on the historical time series of about 450 systemic assets and about 850 single stocks. The systemic assets are bond, equity and commodity indices, as well as a selection of currency pairs. The single stocks are mainly US and European equities. The data is from Thomson Reuters.
- ▶ To new readers, we recommend proceeding to the appendix for more detailed information about the methodology and procedures applied in this report.

Access to the FCO analysis data can be granted upon request. Please contact info@simag.com or visit <https://www.simag.com/insights/fco-cockpit/>

General Results – Key Take Aways

- ▶ In January 2020, we observe **mixed bubble signals** amongst the various analyzed asset classes,
- ▶ Most striking, the fraction of positive bubbles in equities rises strongly from 4% in December 2019 to now 17%.
- ▶ Many markets have closed in 2019 with substantial growth. This trend seems to continue, but bubble activity also increases.
- ▶ There are still no new signals detected in the Commodity, Currency and Cryptocurrency sectors.
- ▶ The fraction of negative bubbles amongst all asset classes remains zero.

General Results – The Big Picture



General Results – This Month's Overview

| Category | Analyzed Assets | Fraction of Pos. Bubbles [%] | Fraction of Neg. Bubbles [%] |
|-----------------------|-----------------|------------------------------|------------------------------|
| Fixed Income | 155 | 1 | 0 |
| Government Bonds | 55 | 0 | 0 |
| Finance and Insurance | 21 | 0 | 0 |
| Corporate Bonds | 79 | 1 | 0 |
| Equity | 306 | 17 | 0 |
| Country Indices | 67 | 13 | 0 |
| Europe | 36 | 33 | 0 |
| United States | 203 | 15 | 0 |
| Commodities | 37 | 0 | 0 |
| Forex | 97 | 0 | 0 |

Macro environment – the big picture

The global debt bubble and asset price inflation continued during December making 2019 another strong year for equities. The S&P 500 closed almost +30% with Big Tech contributing the bulk to the performance. The main purchasers of stocks remain corporates themselves via share buybacks which are financed by issuing debt. At the same time, the number of companies, which are unable to make enough money and rely on debt to service existing debt, continued to rise as well. Global profit margins are stagnating and in various parts of the world even contracting. But the real worry is that banks continue tightening their lending standards. Most banks are very vulnerable to an increase in loan losses given their poor capitalization and rather invest their capital in so-called safe-haven assets such as government bonds driving down bond yields. The health of the credit markets remains key for the health of various equity sectors.

Take for example the energy sector in the US. According to Moody's, North American oil-and-gas companies face 200 bn. USD of debt maturing until 2024, with 40 bn. USD to be rolled over this year. But banks have begun to tighten lending restrictions in the shale gas industry which makes it harder for smaller companies to survive. The value of the shale reserves has been held as collateral for loans to producers, but now banks have started questioning the value as many shale wells produce less than forecasted. Banks are also concerned that if some shale gas producers will go bankrupt their tangible assets won't be enough to cover the loan. The shale industries price war with OPEC to gain market share is finally taking its toll and U.S. oil growth is expected to slow down this year.

Another example is the financial industry where solvency issues and funding pressure required a huge liquidity injection by the FED during December. Funding pressure is not a US specific issue, but a global phenomenon given the interconnectivity of financial firms via the interbanking and Eurodollar market. Banks outside the US, most notably in China are struggling to meet their demand for short term USD loans. The Chinese central bank was forced to cut the reserve requirement ratio by 50bp. China needed to add liquidity into the Chinese repo market in December. A dozen of Chinese banks have also been forced to buy back shares of their own company to help stabilize stock prices after the pressure on banks intensified (regulators require banks to buy their own shares when they drop below their net asset value per share for more than 20 consecutive days in a so-called stock price stabilization plan – which is common among China's listed companies -within the first three years of listing). China's financial industry is especially vulnerable to a deterioration in their loan book quality, given the huge pile of debt they have amassed since the financial crisis in 2008. A wave of defaults has pushed China's private sector default rate already to record highs, according to Fitch Rating Agency. India's default problems in the shadow banking system have been overshadowed by violent protests across the country after the government has introduced a new citizenship law. Nevertheless, S&P Global Ratings warned it will

downgrade India's sovereign rating if the country's economic growth does not recover. That comes on the back of warnings from the world bank that Emerging Markets would be more vulnerable today than before the great financial crisis as foreign denominated debt is much higher and more unsustainable given current account deficits. Empirical evidence suggests that financial markets in emerging market countries have been vulnerable to contagion risks in the past. As such, we believe it is very important for both bond and equity investors to keep a close eye on liquidity conditions in those countries.

Turning to Europe (which relies so heavily on the Emerging markets growing middle class and consumers), the European Central bank (ECB) seems to have capitulated. ECB governing council member Klaus Wehnert said that he cannot rule out that the current low interest rate environment could last another five years. The ECB is – like the other central banks – very aware that flooding the financial markets with “free money” could turn out to be a Faustian bargain. Monetary disorder has already resulted in the breakdown of market pricing mechanism, very similar to Japan, which has a lot more experience when it comes to “liquidity traps”. A liquidity trap means that no amount of money ‘printing’ or central bank bond purchases will get the ‘real’ economy going. Nevertheless, monetary stimulus continues as BOJ Governor Kurod argued that the central bank could take short-term rates even deeper into negative territory if the economy needs it. We could expect another wave of Central bank Equity ETF buying as the Abenomics' stimulus program seems to lose traction. Growth is sputtering as Japan's export numbers continue to be under pressure as shipments to the US and China cooled down. In December, the Japanese service sector contracted at the fastest pace in over three years as business activity from abroad but also domestically declined. Even if the Japanese real economy might not do well, asset price inflation in its financial market will be ensured by the Bank of Japan.

Many analysts have become more bearish for 2020. Moody's has already downgraded its outlook for global banks on the back of slowing growth and low interest rates. The rating agency sees rising recession risk for both the US and Europe while Asia Pacific and emerging markets might face a slowdown in growth with deteriorating loan quality and higher loan-loss provisioning costs for bank. China remains the largest single contributor of global growth and credit growth. A bursting of the Chinese Bubble would have very negative consequences for the rest of the world. The Chinese authorities are very aware of that fact and have already signaled further financial easing. Chinese policy makers will announce their 3-year action plan to reform state owned enterprises in early 2020.

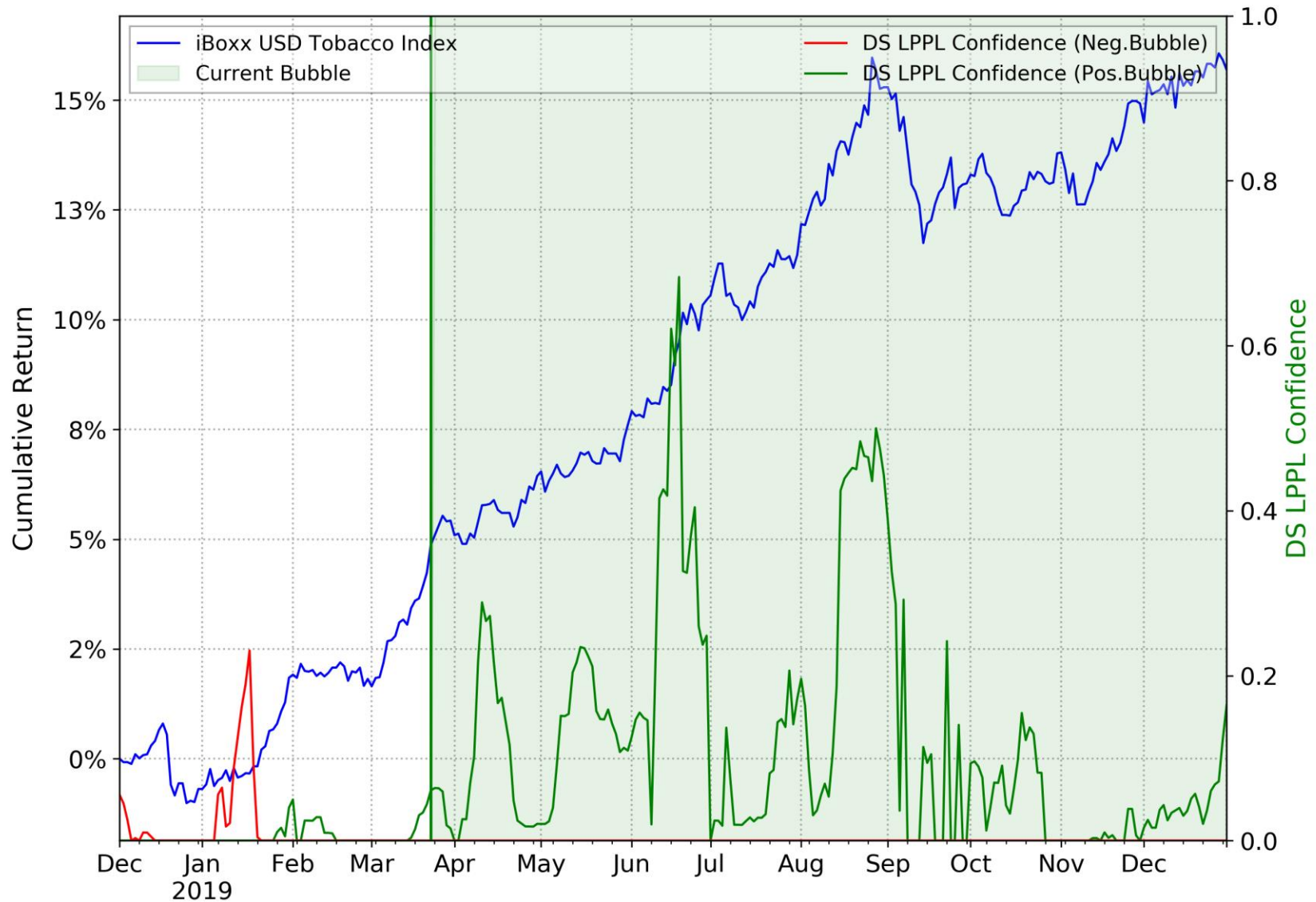
So, given that a lot of negative news are already priced into the market, there is a clear risk for being too bearish in 2020, as liquidity conditions will remain fairly relaxed (central bank will do whatever it takes to stabilize the market – at the cost of debasing the currency). Business climate could quickly brighten too when geopolitical tensions start to ease. As equities continue to have an attractive yield advantage over most bonds, they could do well in 2020. At the sector level, information technology remains as one of the few high-growth areas for globally diversified investors.

Fixed Income – Corporate Bonds

| Bubble Data | | | | | Cluster Analysis | | | |
|---------------------------|----------------------|---------------------|-----------------------------|--|-------------------------------------|--------------------------|--------------------------|--|
| Name | Bubble Size bs [%] | Duration [$days$] | DS LPPL Confidence ci [%] | Geometric Average $\sqrt{bs \cdot ci}$ [%] | Critical Time Prediction μ_{tc} | σ_{tc} [$days$] | Scenario Probability [%] | |
| Positive Bubbles | | | | | | | | |
| 1 iBoxx USD Tobacco Index | 10 | 284 | 16 | 13 | 2020-01-03 | 4 | 24 | |

- ▶ Newly, we observe a bubble signal on the iBoxx USD Tobacco index. The signal is however relatively weak, with a low bubble size and long formation time of the bubble, as well as a quite weak indicator magnitude.
- ▶ The reported signal is the only detected one. Thus, overall bubble sector activity in fixed income is quite low.

Fixed Income – Corporate Bonds

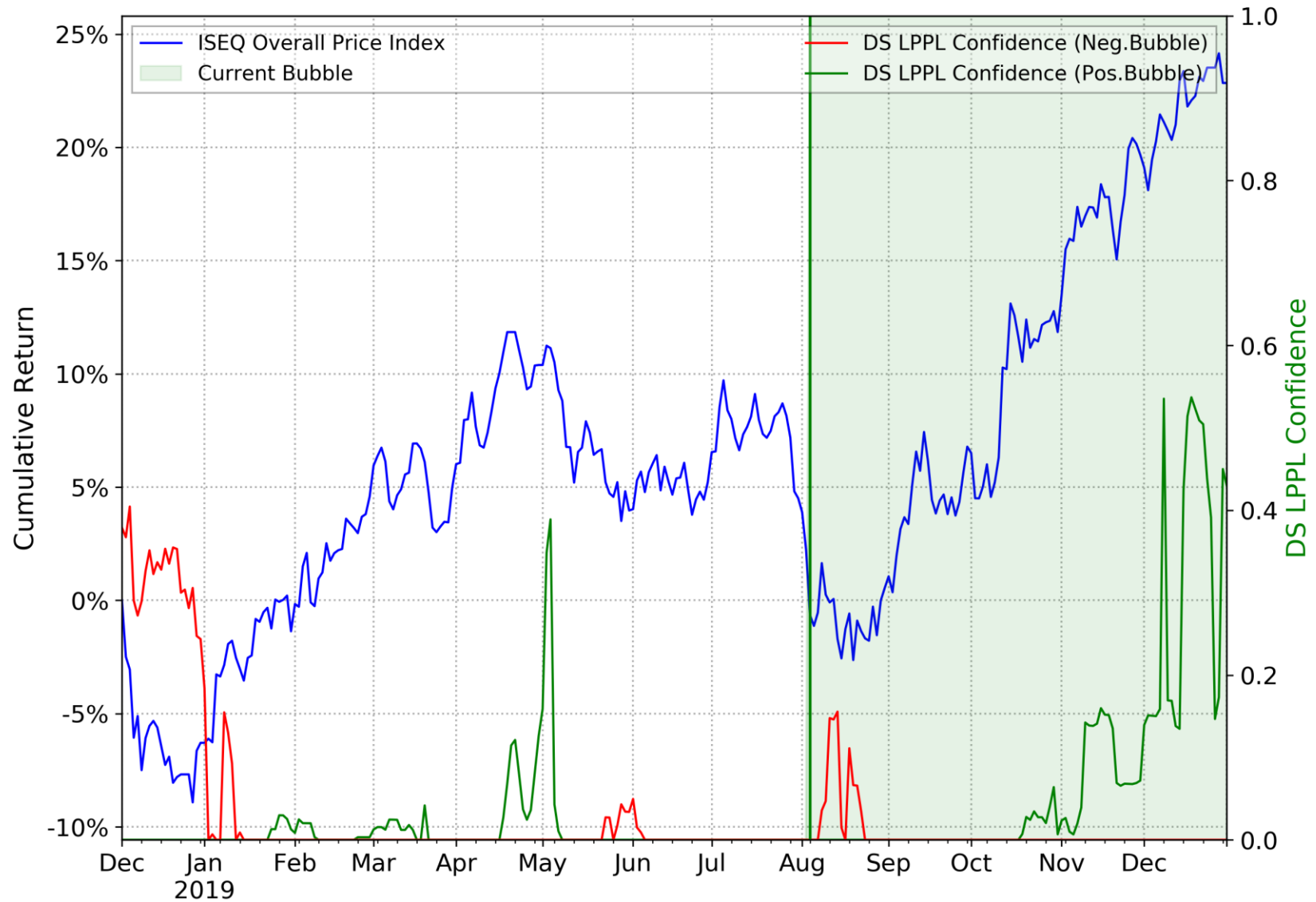


Equities – Country Indices

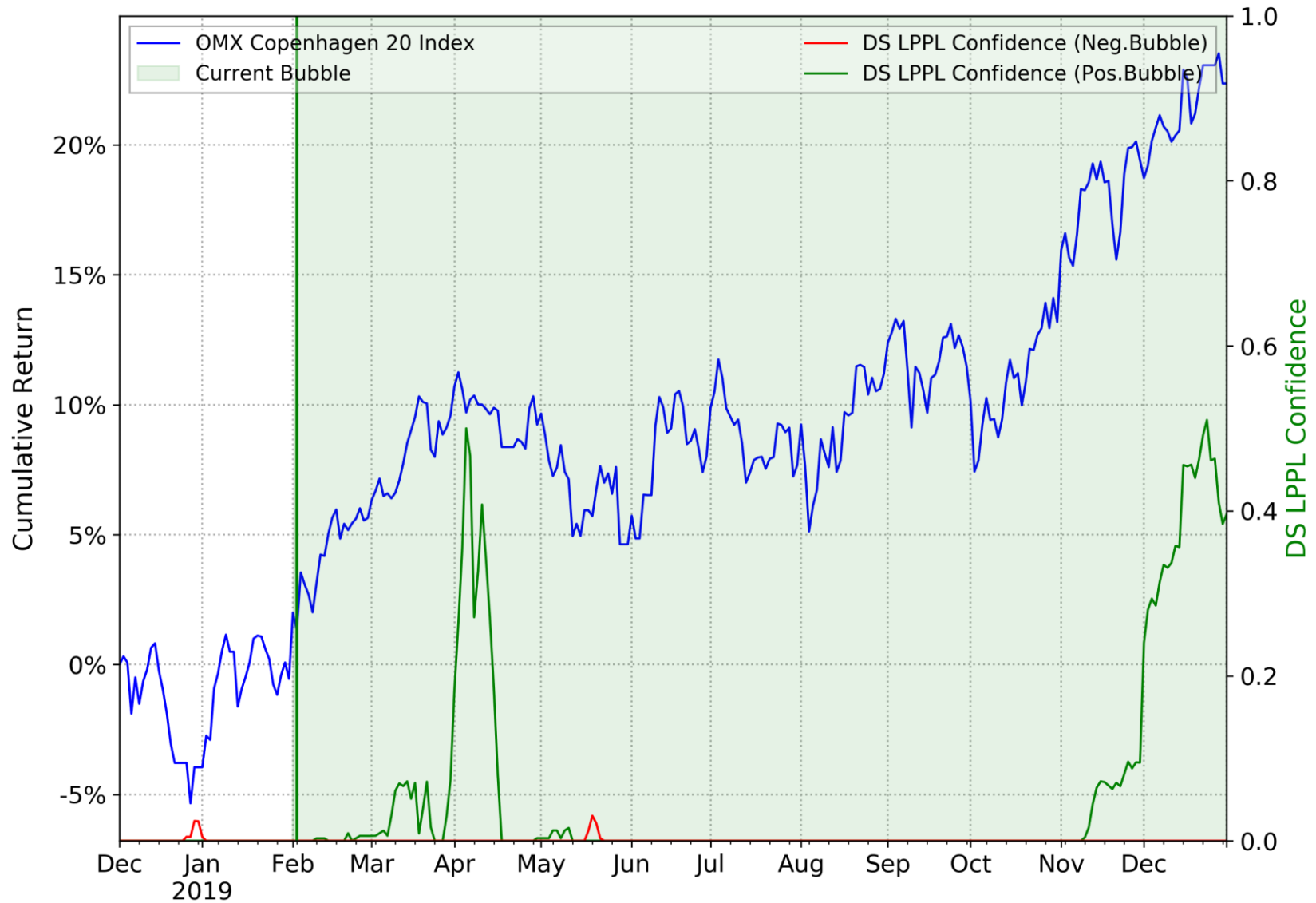
| Bubble Data | | | | | Cluster Analysis | | | |
|------------------|--------------------------|----------------------|-----------------|-----------------------------|--|-------------------------------------|----------------------|--------------------------|
| Name | | Bubble Size bs [%] | Duration [days] | DS LPPL Confidence ci [%] | Geometric Average $\sqrt{bs \cdot ci}$ [%] | Critical Time Prediction μ_{tc} | σ_{tc} [days] | Scenario Probability [%] |
| Positive Bubbles | | | | | | | | |
| 1 | ISEQ Overall Price Index | 24 | 150 | 43 | 32 | 2020-01-03 | 3 | 55 |
| 2 | OMX Copenhagen 20 Index | 16 | 150 | 50 | 29 | 2019-12-31 | 1 | 66 |
| 3 | Bucharest SE BET Index | 17 | 217 | 30 | 23 | 2020-01-07 | 7 | 58 |
| 4 | RTS Index | 25 | 137 | 19 | 21 | 2020-04-18 | 16 | 52 |
| 5 | BIST 100 Index | 20 | 136 | 21 | 20 | 2019-12-31 | | 53 |

- ▶ Strong positive bubble activity is observed in all equity subsectors. Beginning with country indices, we find the top five signals with bubble sizes ranging from 16%-25%, relatively short durations of one to several months, as well as indicator levels between 19%-50%.
- ▶ The ISEQ Index of Ireland moves to the top of our list and the signal is reported for the second time.
- ▶ The Bucharest Market Index shows continued bubble activity for many months, now.
- ▶ Corresponding plots are provided on the next slides.

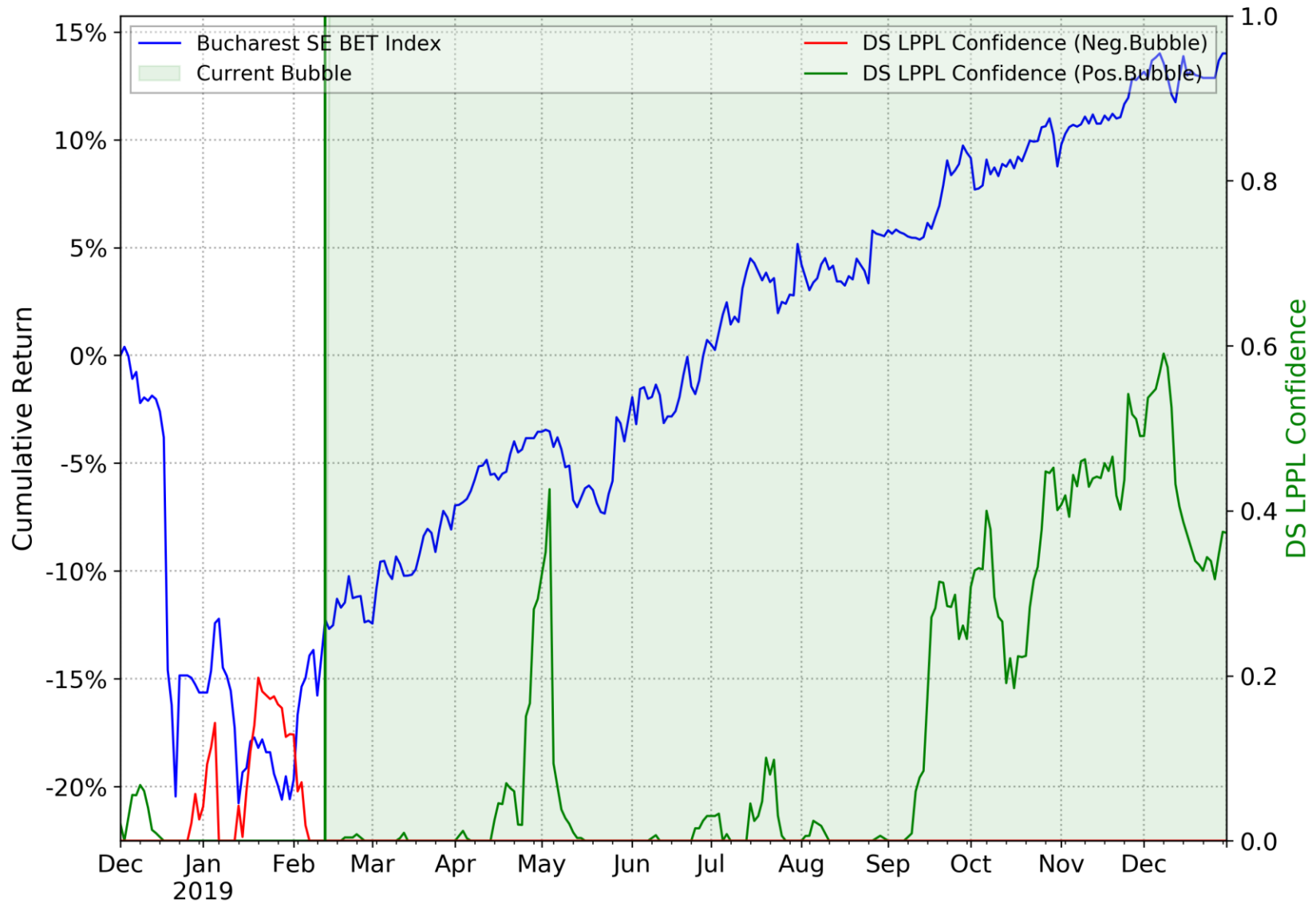
Equities – Country Indices



Equities – Country Indices



Equities – Country Indices



Equities – United States Indices

| Bubble Data | | | | | Cluster Analysis | | | |
|------------------|------------------------------------|-------------------------|--------------------|-----------------------------------|---|--|-------------------------|--------------------------------|
| Name | | Bubble Size bs [%] | Duration [days] | DS LPPL Confidence ci [%] | Geometric Average $\sqrt{bs \cdot ci}$ [%] | Critical Time Prediction μ_{tc} | σ_{tc} [days] | Scenario Probability [%] |
| Positive Bubbles | | | | | | | | |
| 1 | S&P500 Tech Hard, Storage & Periph | 51 | 207 | 47 | 49 | 2019-12-31 | 1 | 73 |
| 2 | S&P500 Div Banks | 18 | 115 | 57 | 32 | 2020-01-05 | 4 | 81 |
| 3 | S&P500 Metals & Mining | 19 | 143 | 46 | 30 | 2020-01-01 | 1 | 75 |

- ▶ In the plots on the following pages, we see strong recent growth for the three above-listed S&P 500 subindices which concentrate around different industry sectors.
- ▶ The current snapshot of bubble activity reveals a top bubble size of 51% for the Technical Hardware, Storage & Peripherals index, at a Confidence Indicator of 47%. This is a quite strong bubble signal, considering the immense size of the bubble and the relatively short duration (2/3 year) of its formation.

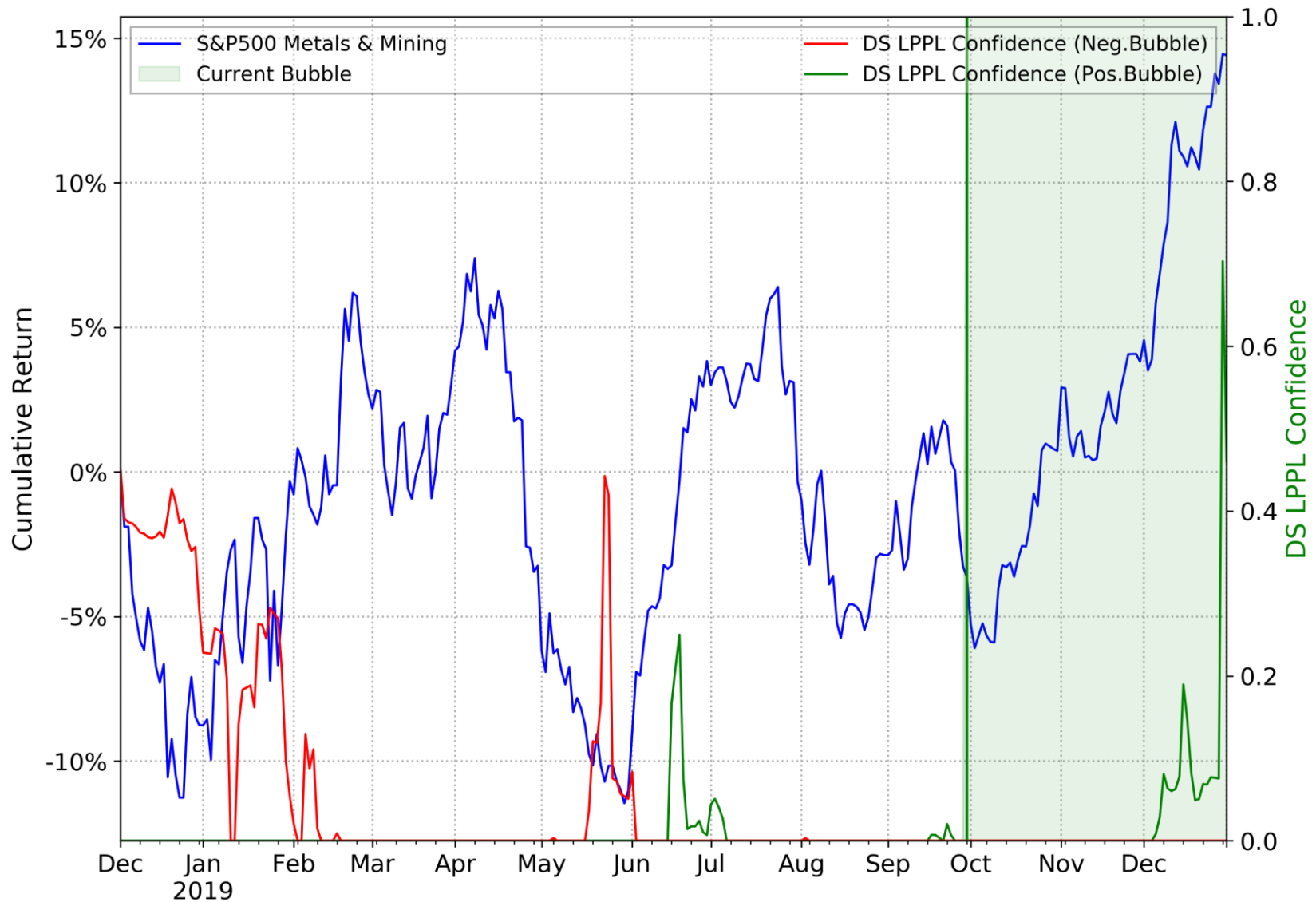
Equities – United States Indices



Equities – United States Indices



Equities – United States Indices

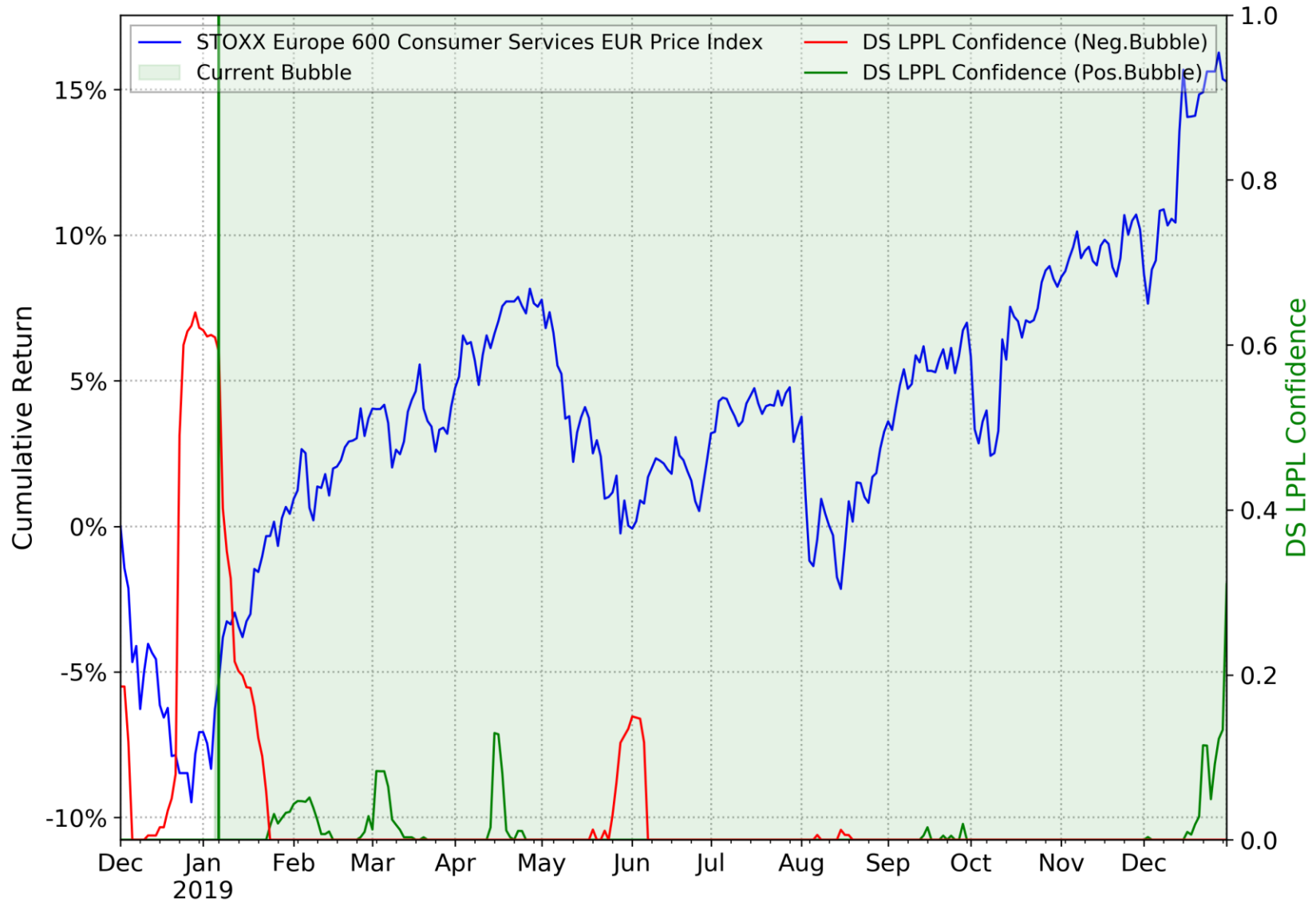


Equities – Europe Indices

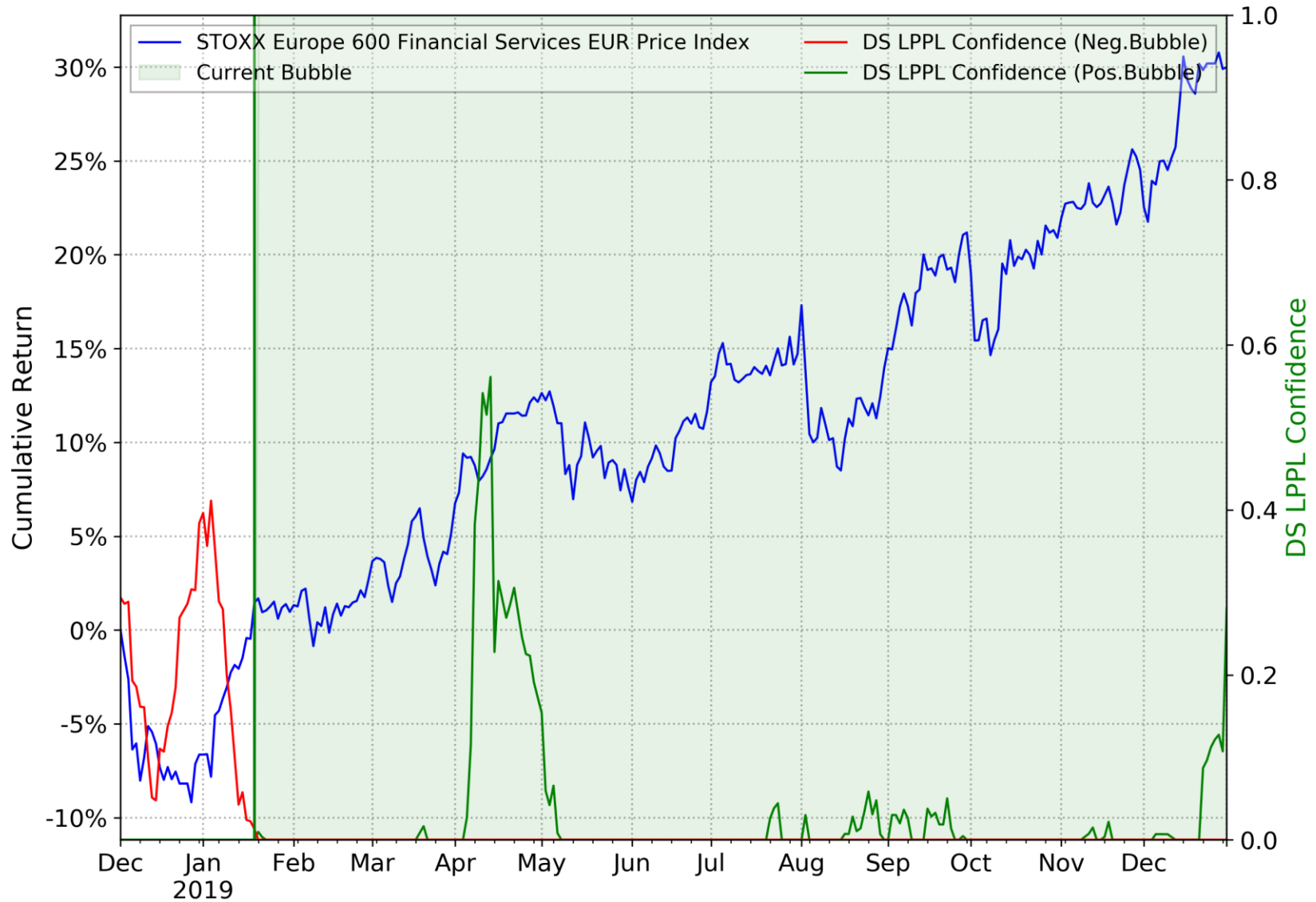
| Bubble Data | | | | | Cluster Analysis | | | |
|------------------|---|----------------------|--------------------------------|---|--|-----------------------------|-----------------------------|----|
| Name | Bubble Size bs [%] | Duration $[days]$ | DS LPPL Confidence ci [%] | Geometric Average $\sqrt{bs \cdot ci}$ [%] | Critical Time Prediction μ_{tc} | σ_{tc} [$days$] | Scenario Probability [%] | |
| Positive Bubbles | | | | | | | | |
| 1 | STOXX Europe 600 Consumer Services EUR Price I... | 17 | 150 | 31 | 23 | 2020-01-20 | 12 | 55 |
| 2 | STOXX Europe 600 Financial Services EUR Price ... | 18 | 150 | 28 | 22 | 2020-01-23 | 11 | 74 |
| 3 | STOXX Europe 600 Retail EUR Price Index | 21 | 214 | 20 | 20 | 2020-01-13 | 13 | 84 |
| 4 | STOXX Europe 600 Construction & Materials EUR ... | 15 | 151 | 25 | 19 | 2020-01-23 | 6 | 86 |
| 5 | STOXX Europe 600 ex Eurozone EUR Price Index | 13 | 150 | 24 | 18 | 2020-01-24 | 10 | 54 |

- ▶ Amongst European Equity Indices, 33% are found to be in a positive bubble, as compared to 15% for US Indices. During the previous month, this fraction was still zero, thus an intense increase is observed.
- ▶ Bubble sizes are within 15%-21%, thus intermediate in size, as well as the confidence indicator values which range from 20% to 31%.
- ▶ Plots for the top three signals are provided on the following pages.

Equities – Europe Indices



Equities – Europe Indices



Equities – Europe Indices

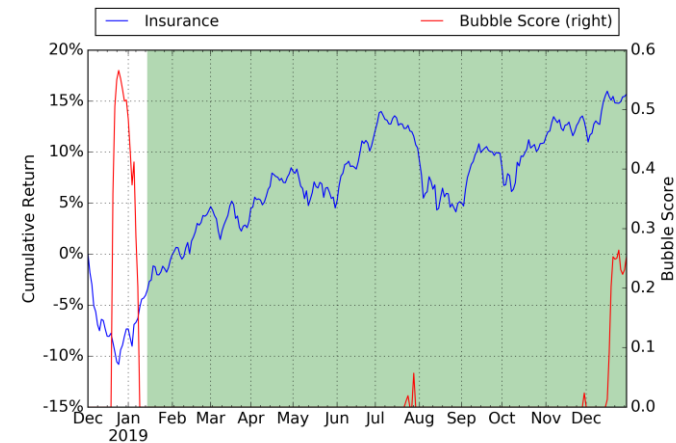
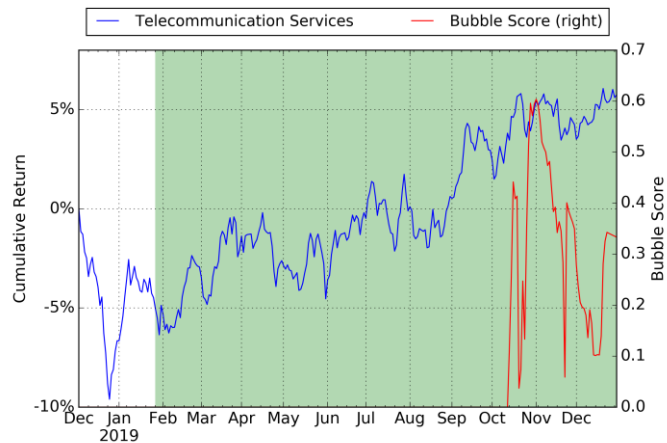
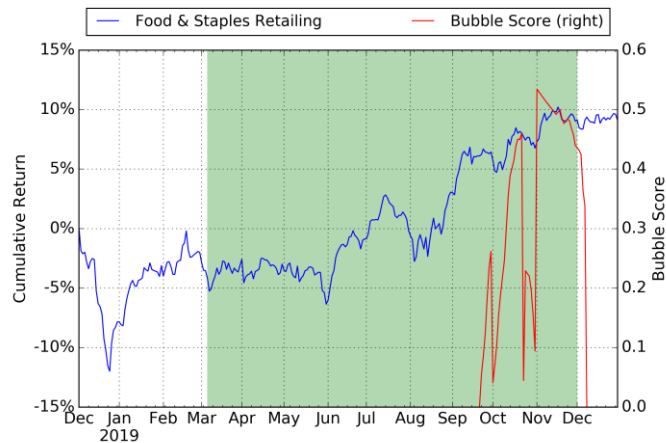


Sectors

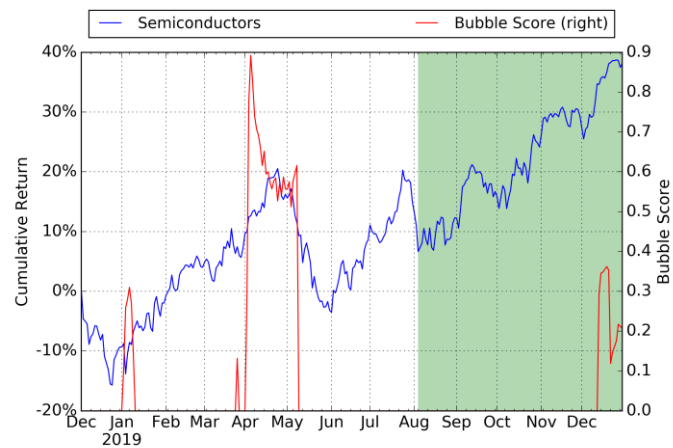
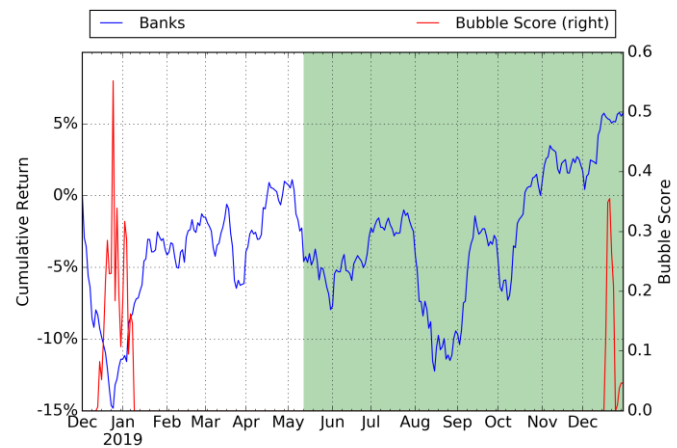
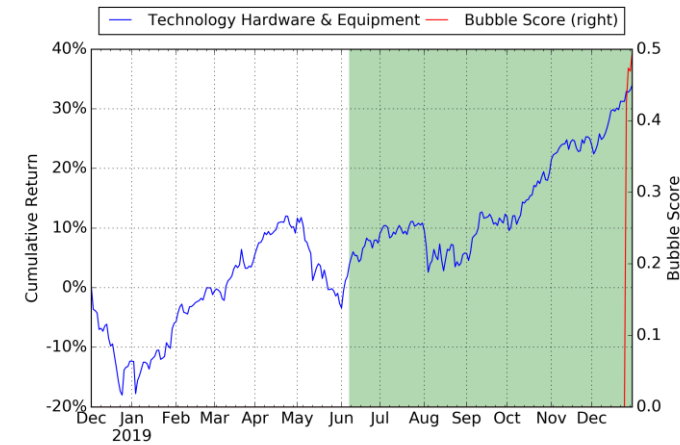
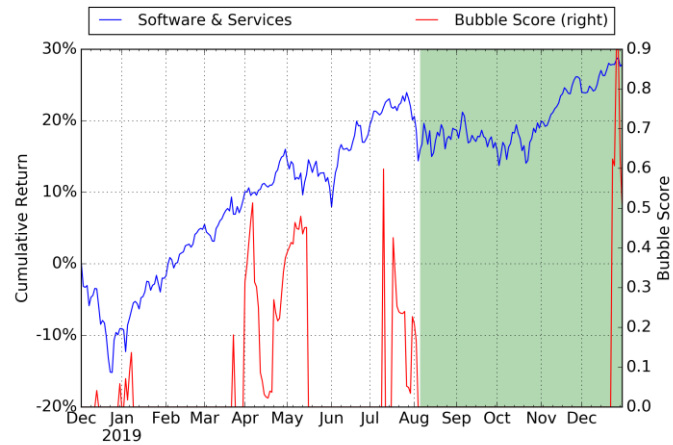
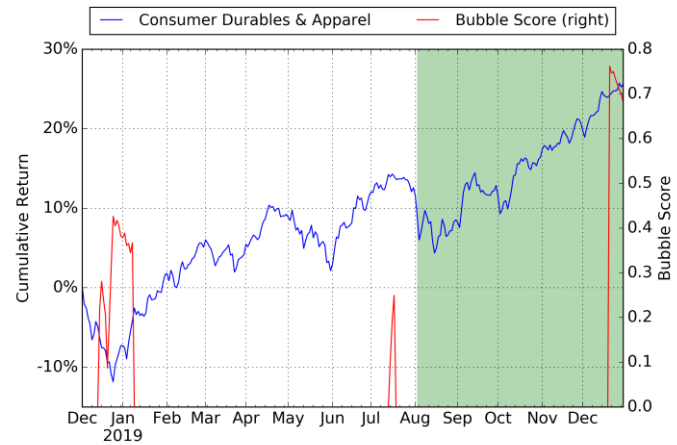
| GICS Industry Group Name | Yearly Return | | Bubble Size | | Bubble Score | | Value Score | | Growth Score | |
|--|---------------|---------|-------------|---------|--------------|---------|-------------|---------|--------------|---------|
| | Jan 1st | Dec 1st | Jan 1st | Dec 1st | Jan 1st | Dec 1st | Jan 1st | Dec 1st | Jan 1st | Dec 1st |
| Pharmaceuticals, Biotechnology & Life Sciences | 16.6% | 8.8% | 0.0% | 0.0% | 0.0% | 0.0% | 64.8% | 64.6% | 53.1% | 53.0% |
| Consumer Services | 21.4% | 14.6% | 0.0% | 0.0% | 0.0% | 0.0% | 28.5% | 31.4% | 50.7% | 49.4% |
| Retailing | 19.4% | 15.6% | 0.0% | 0.0% | 0.0% | 0.0% | 21.1% | 20.4% | 55.1% | 55.4% |
| Transportation | 13.4% | 14.4% | 0.0% | 0.0% | 0.0% | 0.0% | 52.4% | 50.2% | 48.5% | 49.1% |
| Consumer Durables & Apparel | 30.1% | 26.9% | 15.4% | 0.0% | 68.2% | 0.0% | 34.0% | 36.2% | 55.2% | 55.4% |
| Semiconductors & Semiconductor Equipment | 47.0% | 37.4% | 29.5% | 0.0% | 20.6% | 0.0% | 61.4% | 60.9% | 37.0% | 35.9% |
| Technology Hardware & Equipment | 55.1% | 33.1% | 29.0% | 0.0% | 49.4% | 0.0% | 69.7% | 68.5% | 41.3% | 40.0% |
| Automobiles & Components | 4.8% | 5.8% | 0.0% | 0.0% | 0.0% | 0.0% | 74.1% | 74.7% | 57.1% | 57.1% |
| Telecommunication Services | 9.5% | 7.7% | 11.4% | 8.9% | 33.3% | 35.0% | 61.4% | 60.4% | 41.7% | 41.9% |
| Energy | 0.4% | -4.9% | 0.0% | 0.0% | 0.0% | 0.0% | 53.4% | 53.4% | 48.6% | 48.5% |
| Software & Services | 36.5% | 30.4% | 10.3% | 0.0% | 51.1% | 0.0% | 33.4% | 33.1% | 46.3% | 46.9% |
| Materials | 16.1% | 13.4% | 0.0% | 0.0% | 0.0% | 0.0% | 53.6% | 54.0% | 50.8% | 50.6% |
| Health Care Equipment & Services | 25.2% | 15.6% | 0.0% | 0.0% | 0.0% | 0.0% | 59.3% | 57.5% | 50.1% | 50.2% |
| Capital Goods | 20.6% | 20.4% | 0.0% | 0.0% | 0.0% | 0.0% | 50.0% | 49.2% | 48.1% | 48.1% |
| Media & Entertainment | 25.3% | 22.8% | 0.0% | 0.0% | 0.0% | 0.0% | 33.2% | 31.6% | 42.9% | 43.4% |
| Commercial & Professional Services | 29.1% | 25.9% | 0.0% | 0.0% | 0.0% | 0.0% | 29.0% | 29.8% | 53.3% | 53.3% |
| Food & Staples Retailing | 14.7% | 11.9% | 0.0% | 13.8% | 0.0% | 44.0% | 47.4% | 47.0% | 54.0% | 54.3% |
| Household & Personal Products | 22.0% | 14.2% | 0.0% | 0.0% | 0.0% | 0.0% | 33.2% | 34.2% | 46.3% | 46.8% |
| Food, Beverage & Tobacco | 18.3% | 9.5% | 0.0% | 0.0% | 0.0% | 0.0% | 46.7% | 46.7% | 53.5% | 54.0% |
| Utilities | 18.5% | 9.5% | 0.0% | 0.0% | 0.0% | 0.0% | 50.5% | 50.1% | 45.0% | 45.2% |
| Insurance | 20.6% | 20.9% | 19.9% | 18.2% | 25.3% | 2.4% | - | - | - | - |
| Real Estate | 15.3% | 12.6% | 0.0% | 0.0% | 0.0% | 0.0% | - | - | - | - |
| Diversified Financials | 21.2% | 18.5% | 0.0% | 0.0% | 0.0% | 0.0% | - | - | - | - |
| Banks | 13.3% | 11.4% | 10.9% | 0.0% | 4.6% | 0.0% | - | - | - | - |

Sectors

- ▶ We use the MSCI World Industry Group Indices to calculate bubble size and bubble score of the corresponding sectors. To determine the value scores and growth scores of the sectors, we average over the corresponding values for each stock of a given sector, weighted by market cap.
- ▶ This month, we find 7 industry groups with a positive bubble score: Consumer Durables & Apparel, Semiconductors & Semiconductor Equipment, Technology Hardware & Equipment, Telecommunication Services, Software & Services, Insurance, and Banks, two of which were already identified last month. The bubble signal of the Bank industry group is weak, indicating that the bubble is at an early stage and may or may not continue to develop. The industry groups with significant bubbles we identified last month are presented below, and the new ones in this month are presented in the next slide.



Sectors



Portfolio Construction & Performance

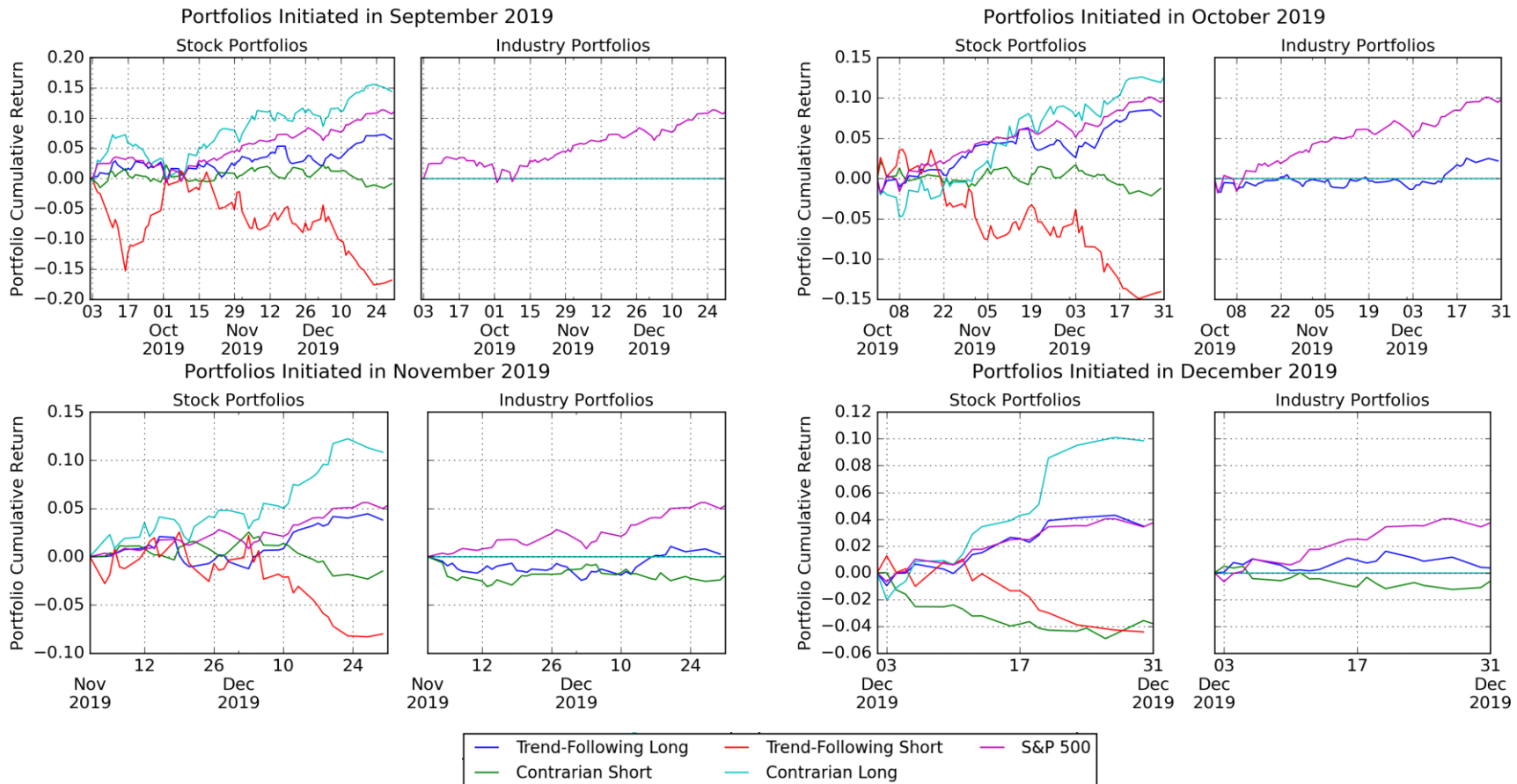
- ▶ Here we illustrate the methodology of the portfolio construction process based on the results of our previous analyses.
- ▶ For individual stocks that we identified in the 4 quadrants, we constructed 4 portfolios based on the 4 quadrants defined in the last report. Each portfolio consists of all the stocks listed in the corresponding quadrant.
 1. **Trend-Following Long Stock Portfolio (TFLSP)** is made of the stocks that have a **positive** bubble signal as well as a **strong** value score. For instance, TFLSP November consists of all the stocks listed in quadrant 1, identified in slide 37 of November 2017 FCO Report.
 2. **Trend-Following Short Stock Portfolio (TFSSP)** is made of the stocks that have a **negative** bubble signal as well as a **weak** value score.
 3. **Contrarian Long Stock Portfolio (CLSP)** is made of the stocks that have a **negative** bubble signal as well as a **strong** value score.
 4. **Contrarian Short Stock Portfolio (CSSP)** is made of the stocks that have a **positive** bubble signal as well as a **weak** value score.

Portfolio Construction & Performance

- ▶ At the same time, we also classified 20 industries into 4 quadrants, and constructed 4 type of industry portfolios based on the 4 industry quadrants. Each portfolio consists of all the stocks in the industries listed in the corresponding quadrant. Following the same definitions as above, we have Trend-Following Long Industry Portfolio (TFLIP), Trend-Following Short Industry Portfolio (TFSIP), Contrarian Long Industry Portfolio (CLIP), and Contrarian Short Industry Portfolio (CSIP).
- ▶ In each month, we initiated 8 new portfolios based on the updated results. The performance of every 8 portfolios we initiated since November 2017 are presented in the next slide. All of the stocks in our portfolios are weighted by their market capitalizations and we don't consider transaction cost in the portfolio performance.

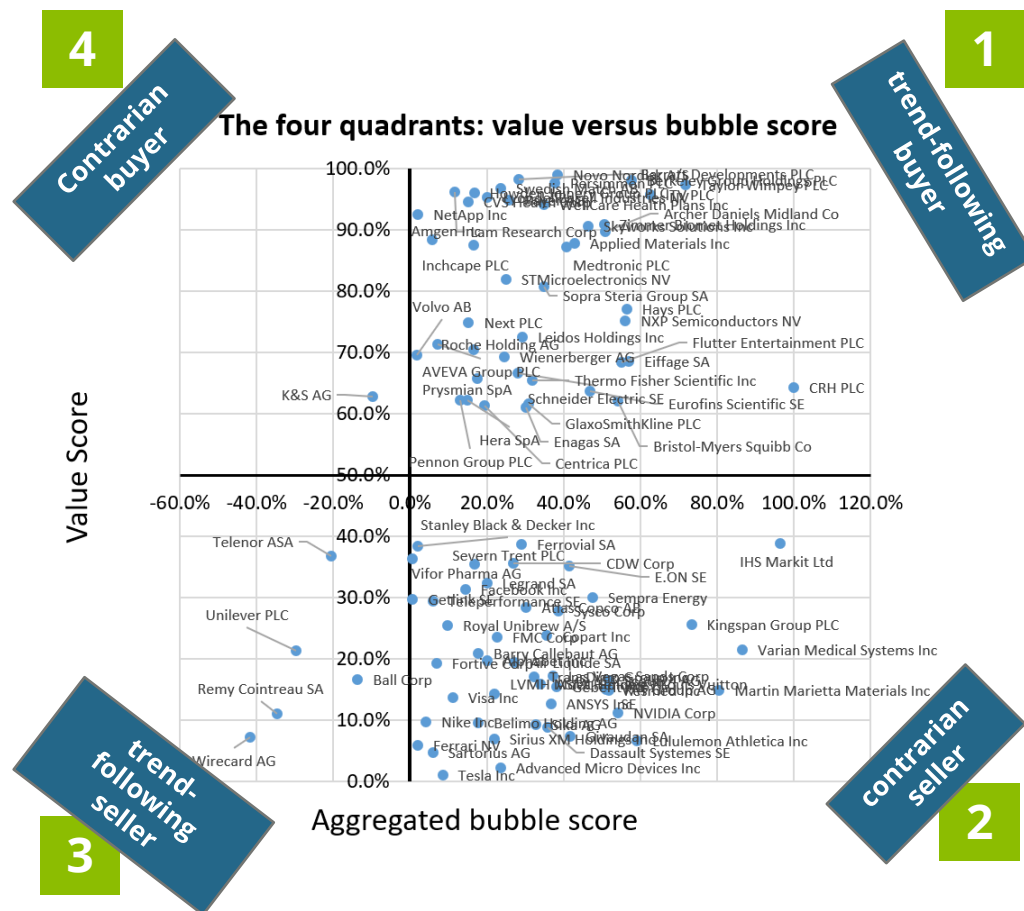
Portfolio Construction & Performance

- With the market achieving new highs this month, we find that the Contrarian Long Stock Portfolios have outperformed most of the portfolios, while the Short Portfolios have poor performances. Contrarian Portfolios are more delicate to use due to their sensitivity to timing the expected reversal and exhibit very volatile performances, indicating that most of bubbles in the market are still dominating and that fundamentals have not yet played out. We expect trend-following positions to perform in the months following the position set-up and then contrarian positions to over-perform over longer time scales as the predicted corrections play out.



Single Stocks

We can divide the stocks into four quadrants¹⁾



- **Quadrant 1:** Stocks with a strong value score are cheap relative to their earnings potential. The strong positive bubble signal should be interpreted as a momentum indicator possibly the consequence of a repricing based on the fundamentals. As an investor, one could be a **trend-following buyer**. E.g. CRH PLC
- **Quadrant 2:** Stocks with a weak value score are expensive relative to their earnings potential. The strong positive bubble signal is an indication of sentiment and herding increasing the price until it is not linked to fundamentals anymore. As an investor, one could be a **contrarian seller**. E.g. HIS Markit Ltd
- **Quadrant 3:** These stocks are expensive relative to their earnings potential. On top of that, there are clear negative bubble signals. Such stocks should be considered as falling knives. As an investor, one could be a **trend-following seller**. E.g. Ball Corp
- **Quadrant 4:** These stocks are cheap relative to their financial performance. The strong negative bubble signal is an indication of sentiment and herding. These stocks can be considered as over-sold. As an investor, one could be a **contrarian buyer**. E.g. K&S AG

¹⁾ A strong positive bubble signal is identified if bubble score is positive, and a strong negative bubble signal is identified if bubble score is negative.

A strong value score is identified if value score is larger than 60%, and a weak value score is identified if value score is smaller than 40%.

Single Stocks

- ▶ For 823 stocks, we calculate the **bubble warning indicators** as well as two financial strength indicators, which indicate the **fundamental value** of the stock and the **growth capability** respectively.
- ▶ To analyze the **financial strength of individual stocks**, we have two indicators. Both scores give a value between zero and one, one being the best of the set and zero the worst, so the higher the score, the higher the financial strength.
 - A **value score** that is based on the ROIC (Return on Invested Capital) taking into account the EV (Enterprise Value) to normalize for high/low market valuations and/or high/low debt; Value scores are calculated by comparing ROIC level versus EV/IC in each industry.
 - A **growth score** that has characteristics similar to the PEG ratio, which is the Price to Earnings ratio normalized by the expected growth of the EPS (Earnings per Share).
- ▶ The stocks are the constituents of the Stoxx Europe 600, the S&P 500 and the Nasdaq 100 indices. From these, all doubles and stocks with incomplete data are removed. Because our financial strength indicators are specifically designed for corporates, all financial institutions are taken out of the set as well.

Single Stocks

Quadrant 1 stocks: strong positive bubble signals with strong fundamentals

| Company Name | Country of Headquarters | GICS Industry Group Name | Yearly Return | Bubble Size | Bubble Start | Bubble Score | Value Score | Growth Score |
|-----------------------------|-------------------------|--|---------------|-------------|--------------|--------------|-------------|--------------|
| Wienerberger AG | Austria | Materials | 38.5% | 30.4% | May-19 | 24.5% | 69.3% | 9.0% |
| Roche Holding AG | Switzerland | Pharmaceuticals, Biotechnology & Life Sciences | 22.7% | 20.8% | May-19 | 16.7% | 70.4% | 41.7% |
| Bayer AG | Germany | Pharmaceuticals, Biotechnology & Life Sciences | 10.5% | 27.6% | May-19 | 25.7% | 94.9% | 23.2% |
| Novo Nordisk A/S | Denmark | Pharmaceuticals, Biotechnology & Life Sciences | 22.9% | 23.1% | May-19 | 38.5% | 99.0% | 74.4% |
| Enagas SA | Spain | Utilities | -9.0% | 16.4% | Jul-19 | 30.2% | 61.1% | 22.1% |
| Eurofins Scientific SE | Luxembourg | Pharmaceuticals, Biotechnology & Life Sciences | 39.4% | 37.0% | Mar-19 | 46.9% | 63.6% | 3.5% |
| Sopra Steria Group SA | France | Software & Services | 64.6% | 22.6% | Jul-19 | 34.9% | 80.7% | 93.2% |
| Schneider Electric SE | France | Capital Goods | 52.7% | 23.0% | Aug-19 | 28.1% | 66.7% | 14.2% |
| Eiffage SA | France | Capital Goods | 36.6% | 19.4% | May-19 | 57.1% | 68.6% | 12.0% |
| Barratt Developments PLC | United Kingdom | Consumer Durables & Apparel | 57.1% | 20.2% | Aug-19 | 28.3% | 98.3% | 18.1% |
| Hays PLC | United Kingdom | Commercial & Professional Services | 27.8% | 27.6% | Jul-19 | 56.5% | 77.1% | 30.5% |
| Howden Joinery Group PLC | United Kingdom | Capital Goods | 44.5% | 36.5% | Feb-19 | 16.7% | 96.1% | 57.6% |
| Persimmon PLC | United Kingdom | Consumer Durables & Apparel | 27.7% | 37.9% | Jun-19 | 37.7% | 97.7% | 11.6% |
| Taylor Wimpey PLC | United Kingdom | Consumer Durables & Apparel | 38.7% | 31.2% | Aug-19 | 71.7% | 97.5% | 13.2% |
| GlaxoSmithKline PLC | United Kingdom | Pharmaceuticals, Biotechnology & Life Sciences | 15.8% | 13.6% | Mar-19 | 30.8% | 61.7% | 18.9% |
| Next PLC | United Kingdom | Retailing | 46.6% | 46.6% | Jan-19 | 15.3% | 74.9% | 61.1% |
| ITV PLC | United Kingdom | Media & Entertainment | 9.9% | 43.5% | Jun-19 | 62.5% | 95.8% | 10.9% |
| Berkeley Group Holdings PLC | United Kingdom | Consumer Durables & Apparel | 30.1% | 36.5% | May-19 | 57.6% | 98.2% | 3.3% |
| Centrica PLC | United Kingdom | Utilities | -32.8% | 36.3% | Aug-19 | 19.3% | 61.3% | 87.2% |
| Pennon Group PLC | United Kingdom | Utilities | 43.0% | 40.1% | Apr-19 | 13.1% | 62.3% | 13.9% |

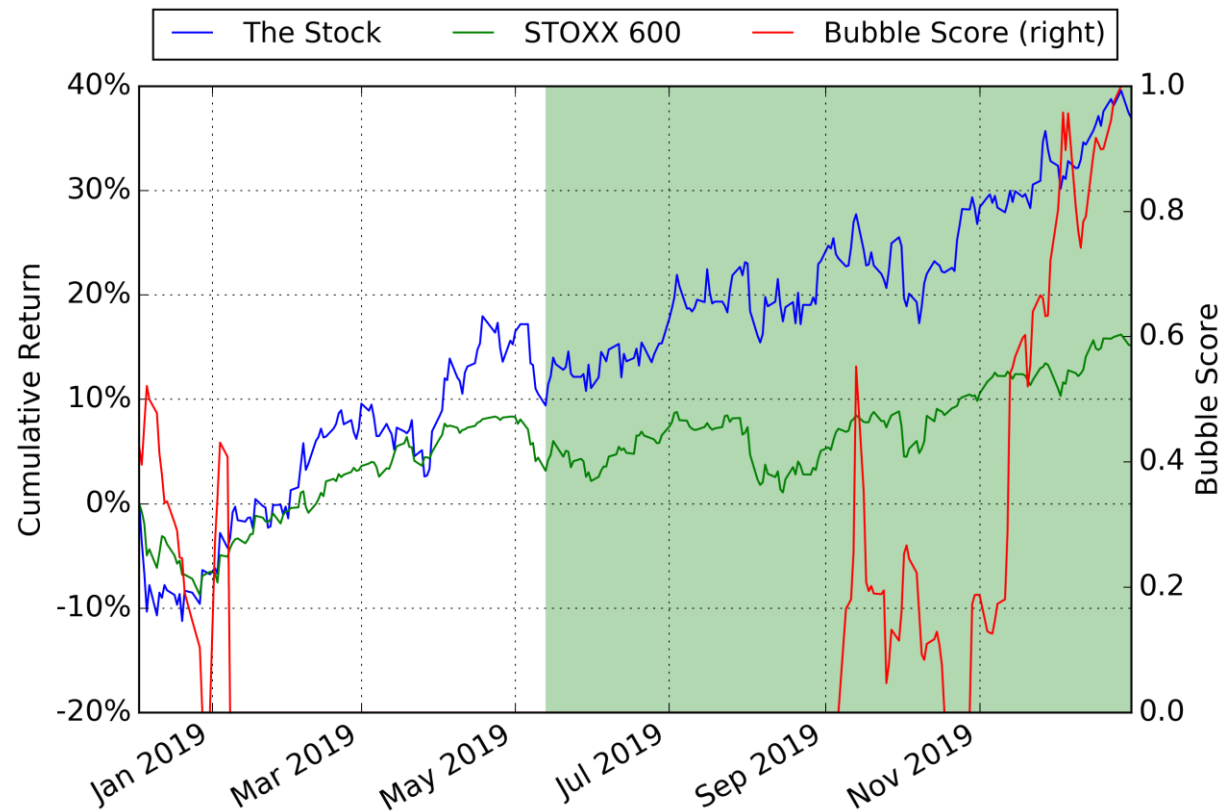
Single Stocks

Quadrant 1 stocks: strong positive bubble signals with strong fundamentals

| Company Name | Country of Headquarters | GICS Industry Group Name | Yearly Return | Bubble Size | Bubble Start | Bubble Score | Value Score | Growth Score |
|------------------------------|--------------------------|--|---------------|-------------|--------------|--------------|-------------|--------------|
| Inchcape PLC | United Kingdom | Retailing | 23.3% | 19.0% | Feb-19 | 16.5% | 87.5% | 7.2% |
| AVEVA Group PLC | United Kingdom | Software & Services | 75.0% | 75.0% | Jan-19 | 7.2% | 71.4% | 43.5% |
| CRH PLC | Ireland; Republic of | Materials | 37.3% | 22.9% | May-19 | 100.0% | 64.4% | 8.5% |
| Medtronic PLC | Ireland; Republic of | Health Care Equipment & Services | 33.7% | 17.5% | Jun-19 | 40.8% | 87.3% | 45.8% |
| Flutter Entertainment PLC | Ireland; Republic of | Consumer Services | 40.0% | 34.9% | Jul-19 | 55.0% | 68.4% | 50.5% |
| Hera SpA | Italy | Utilities | 39.3% | 24.4% | Mar-19 | 15.0% | 62.2% | 17.3% |
| Prysmian SpA | Italy | Capital Goods | 15.9% | 15.9% | Jan-19 | 17.5% | 65.7% | 98.8% |
| STMicroelectronics NV | Switzerland | Semiconductors & Semiconductor Equipment | 97.2% | 75.5% | May-19 | 25.0% | 81.9% | 21.5% |
| LyondellBasell Industries NV | United Kingdom | Materials | 8.1% | 8.1% | Jan-19 | 20.2% | 95.4% | 88.0% |
| NXP Semiconductors NV | Netherlands | Semiconductors & Semiconductor Equipment | 59.0% | 28.9% | Jul-19 | 56.1% | 75.2% | 37.2% |
| Volvo AB | Sweden | Capital Goods | 29.6% | 29.6% | Jan-19 | 1.8% | 69.6% | 12.1% |
| Swedish Match AB | Sweden | Food, Beverage & Tobacco | 27.8% | 24.1% | Jul-19 | 23.6% | 96.8% | 44.7% |
| Amgen Inc | United States of America | Pharmaceuticals, Biotechnology & Life Sciences | 18.9% | 32.7% | Jun-19 | 5.7% | 88.5% | 56.1% |
| Applied Materials Inc | United States of America | Semiconductors & Semiconductor Equipment | 75.6% | 51.0% | Jun-19 | 42.9% | 87.9% | 45.9% |
| Archer Daniels Midland Co | United States of America | Food, Beverage & Tobacco | 6.9% | 22.7% | Aug-19 | 50.9% | 89.8% | 60.2% |
| Bristol-Myers Squibb Co | United States of America | Pharmaceuticals, Biotechnology & Life Sciences | 34.5% | 45.7% | Jul-19 | 54.2% | 62.1% | 33.3% |
| CVS Health Corp | United States of America | Health Care Equipment & Services | 13.3% | 34.2% | May-19 | 15.1% | 94.7% | 30.4% |
| Lam Research Corp | United States of America | Semiconductors & Semiconductor Equipment | 102.3% | 59.2% | May-19 | 11.8% | 96.2% | 33.8% |
| Leidos Holdings Inc | United States of America | Software & Services | 78.3% | 21.2% | Jul-19 | 29.3% | 72.6% | 63.5% |
| NetApp Inc | United States of America | Technology Hardware & Equipment | 1.3% | 35.2% | Aug-19 | 2.1% | 92.6% | 65.1% |
| Skyworks Solutions Inc | United States of America | Semiconductors & Semiconductor Equipment | 76.2% | 71.7% | May-19 | 46.4% | 90.7% | 55.2% |
| Thermo Fisher Scientific Inc | United States of America | Pharmaceuticals, Biotechnology & Life Sciences | 36.0% | 19.4% | Aug-19 | 31.9% | 65.5% | 54.2% |
| WellCare Health Plans Inc | United States of America | Health Care Equipment & Services | 35.9% | 27.4% | Apr-19 | 34.9% | 94.2% | 46.4% |
| Zimmer Biomet Holdings Inc | United States of America | Health Care Equipment & Services | 44.3% | 26.1% | May-19 | 50.6% | 90.9% | 65.5% |

Single Stocks

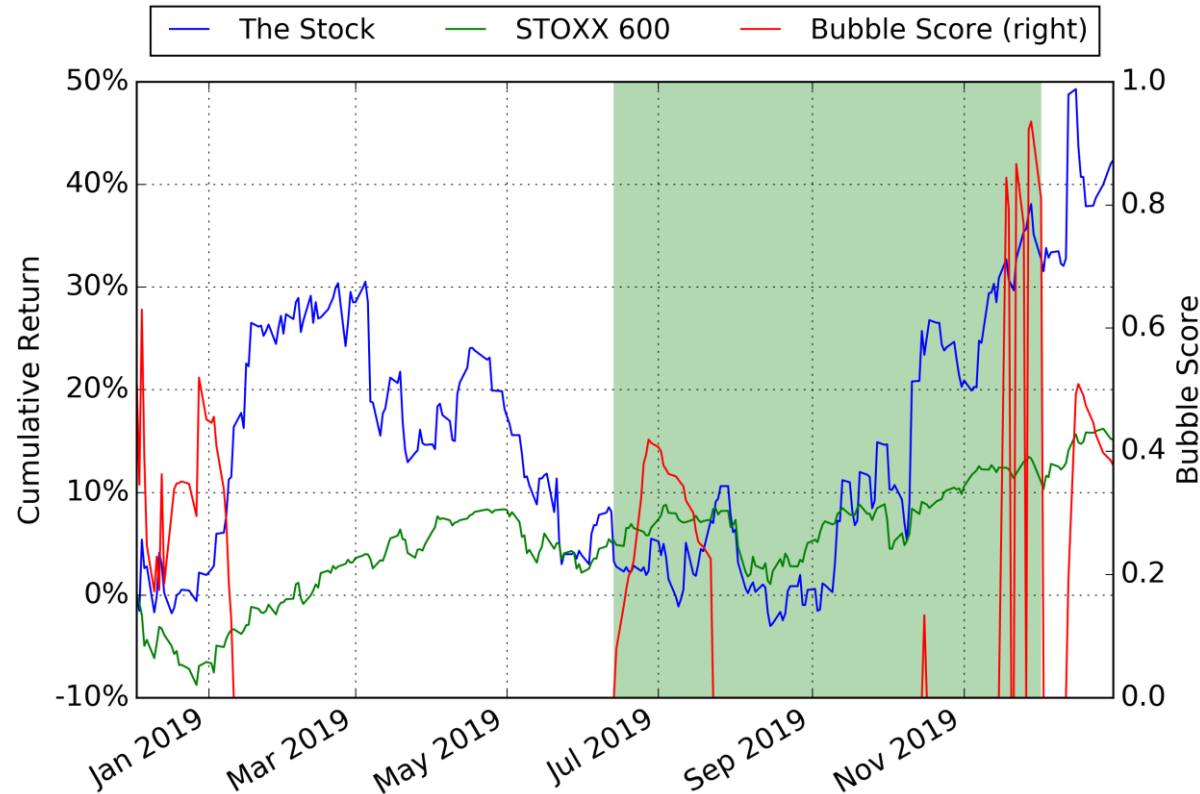
Quadrant 1 Stocks Current Month Example – CRH PLC.



- The above graph shows the one year cumulative return of the stock in blue (left hand scale), STOXX 600 in green (left hand scale) and the calculated DS LPPLS Bubble Score in red (right hand scale). The green shaded period delineates the time interval within which the strong positive bubble is identified. The Bubble Score of this eight month bubble has reached 100% with a bubble size 22.9%.

Single Stocks

Quadrant 1 Stocks Last Month Example – Persimmon PLC.



- The figure above plots the one year cumulative return of the stock (blue), STOXX 600 (green) and LPPLS Bubble Score (red lines on the right y-axis). The green shaded period delineates the time interval within which a strong positive bubble has been identified and reported last month. The bubble continues to develop with a high volatility in the past month. One should remain cautious given that this stock is still identified in Quadrant 1.

Single Stocks

Quadrant 2 stocks: strong positive bubble signals with weak fundamentals

| Company Name | Country of Headquarters | GICS Industry Group Name | Yearly Return | Bubble Size | Bubble Start | Bubble Score | Value Score | Growth Score |
|-------------------------------------|-------------------------|--|---------------|-------------|--------------|--------------|-------------|--------------|
| IHS Markit Ltd | United Kingdom | Commercial & Professional Services | 51.0% | 20.8% | Jun-19 | 96.5% | 38.9% | 53.1% |
| Belimo Holding AG | Switzerland | Capital Goods | 75.2% | 75.2% | Jan-19 | 17.8% | 9.6% | 79.3% |
| Barry Callebaut AG | Switzerland | Food, Beverage & Tobacco | 38.4% | 18.9% | Mar-19 | 17.8% | 20.8% | 82.8% |
| Givaudan SA | Switzerland | Materials | 29.3% | 29.0% | Jan-19 | 41.7% | 7.4% | 22.8% |
| Geberit AG | Switzerland | Capital Goods | 46.4% | 18.6% | Jul-19 | 38.2% | 15.5% | 77.6% |
| VAT Group AG | Switzerland | Capital Goods | 80.4% | 42.6% | Aug-19 | 51.1% | 15.0% | 91.9% |
| Vifor Pharma AG | Switzerland | Pharmaceuticals, Biotechnology & Life Sciences | 53.2% | 48.2% | Jan-19 | 0.6% | 36.4% | 93.8% |
| Sika AG | Switzerland | Materials | 40.4% | 40.3% | Feb-19 | 32.8% | 9.3% | 79.5% |
| Sartorius AG | Germany | Health Care Equipment & Services | 61.1% | 34.4% | Feb-19 | 5.9% | 4.7% | 28.1% |
| Scout24 AG | Germany | Media & Entertainment | 47.4% | 28.2% | Feb-19 | 51.7% | 16.5% | 53.6% |
| E.ON SE | Germany | Utilities | 5.6% | 13.3% | Aug-19 | 41.4% | 35.2% | 7.6% |
| Royal Unibrew A/S | Denmark | Food, Beverage & Tobacco | 31.3% | 25.0% | Mar-19 | 9.8% | 25.5% | 49.6% |
| Ferrovial SA | Spain | Capital Goods | 47.2% | 9.4% | Aug-19 | 29.1% | 38.7% | 5.8% |
| Teleperformance SE | France | Commercial & Professional Services | 51.3% | 24.7% | May-19 | 5.9% | 29.5% | 95.9% |
| Air Liquide SA | France | Materials | 33.5% | 11.6% | Aug-19 | 27.3% | 19.4% | 43.0% |
| LVMH Moët Hennessy Louis Vuitton SE | France | Consumer Durables & Apparel | 59.8% | 49.2% | Jan-19 | 22.1% | 14.3% | 50.2% |
| Dassault Systemes SE | France | Software & Services | 36.4% | 13.7% | Aug-19 | 35.7% | 8.8% | 37.1% |
| Legrand SA | France | Capital Goods | 42.0% | 15.4% | Jul-19 | 20.0% | 32.4% | 90.1% |
| Getlink SE | France | Transportation | 30.7% | 23.3% | Feb-19 | 0.7% | 29.7% | 83.9% |
| Severn Trent PLC | United Kingdom | Utilities | 35.8% | 30.4% | Jan-19 | 16.9% | 35.5% | 10.4% |
| Kingspan Group PLC | Ireland; Republic of | Capital Goods | 43.7% | 23.2% | Aug-19 | 73.3% | 25.6% | 30.9% |
| ASML Holding NV | Netherlands | Semiconductors & Semiconductor Equipment | 88.2% | 57.0% | Mar-19 | 34.1% | 15.9% | 35.2% |
| Ferrari NV | Italy | Automobiles & Components | 53.5% | 36.2% | Jan-19 | 2.0% | 5.8% | 80.7% |

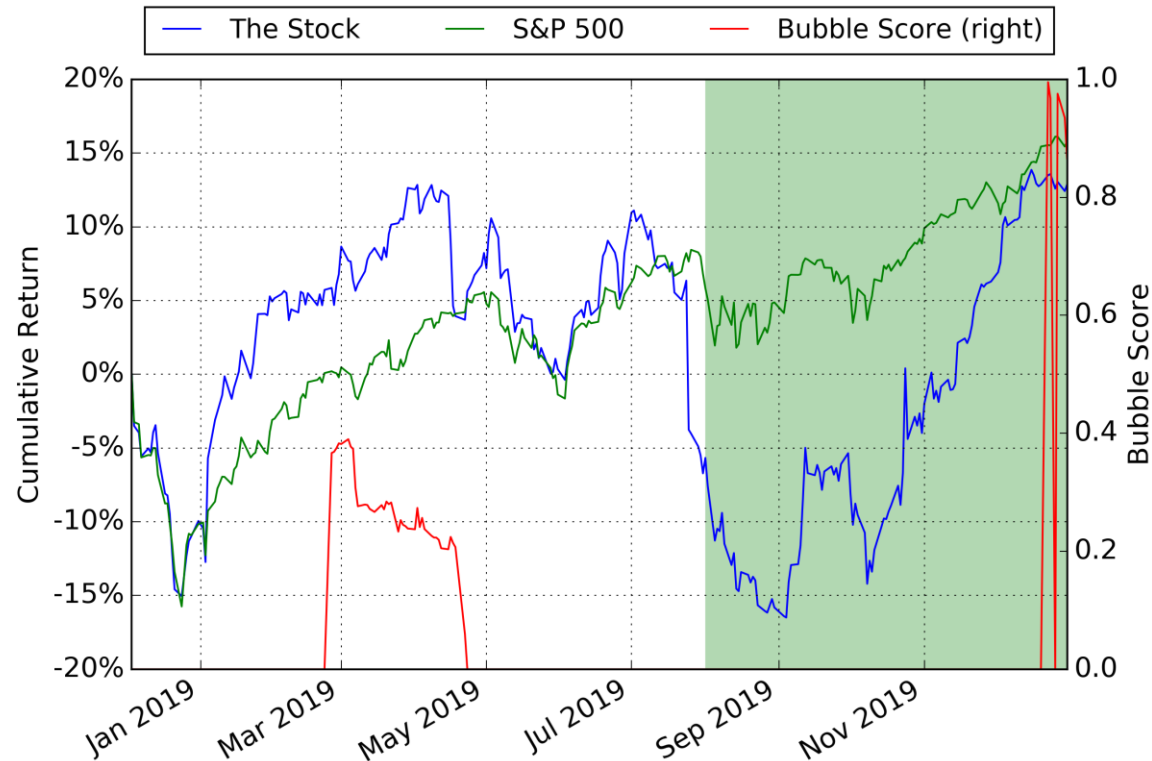
Single Stocks

Quadrant 2 stocks: strong positive bubble signals with weak fundamentals

| Company Name | Country of Headquarters | GICS Industry Group Name | Yearly Return | Bubble Size | Bubble Start | Bubble Score | Value Score | Growth Score |
|-------------------------------|--------------------------|--|---------------|-------------|--------------|--------------|-------------|--------------|
| Atlas Copco AB | Sweden | Capital Goods | 66.1% | 30.0% | Jul-19 | 30.3% | 28.4% | 45.5% |
| Advanced Micro Devices Inc | United States of America | Semiconductors & Semiconductor Equipment | 132.3% | 46.1% | Jun-19 | 23.6% | 2.2% | 50.4% |
| Alphabet Inc | United States of America | Media & Entertainment | 24.9% | 9.9% | Jul-19 | 20.2% | 19.8% | 37.5% |
| ANSYS Inc | United States of America | Software & Services | 68.7% | 56.6% | Jan-19 | 36.7% | 12.6% | 23.9% |
| CDW Corp | United States of America | Technology Hardware & Equipment | 74.3% | 42.1% | Apr-19 | 26.9% | 35.6% | 47.0% |
| Copart Inc | United States of America | Commercial & Professional Services | 79.7% | 25.7% | Jun-19 | 35.7% | 23.8% | 68.2% |
| FMC Corp | United States of America | Materials | 42.8% | 42.8% | Jan-19 | 22.7% | 23.5% | 24.8% |
| Facebook Inc | United States of America | Media & Entertainment | 42.3% | 23.1% | Jan-19 | 14.4% | 31.4% | 29.9% |
| Fortive Corp | United States of America | Capital Goods | 9.3% | 10.6% | Aug-19 | 6.9% | 19.3% | 41.6% |
| Las Vegas Sands Corp | United States of America | Consumer Services | 21.7% | 27.9% | Aug-19 | 37.2% | 17.2% | 64.8% |
| Lululemon Athletica Inc | Canada | Consumer Durables & Apparel | 76.0% | 24.9% | Aug-19 | 59.2% | 6.7% | 53.3% |
| Martin Marietta Materials Inc | United States of America | Materials | 55.8% | 13.5% | Jul-19 | 80.6% | 14.9% | 71.6% |
| Nike Inc | United States of America | Consumer Durables & Apparel | 32.6% | 24.8% | May-19 | 4.2% | 9.7% | 64.0% |
| NVIDIA Corp | United States of America | Semiconductors & Semiconductor Equipment | 62.0% | 48.5% | May-19 | 54.2% | 11.2% | 31.9% |
| Resmed Inc | United States of America | Health Care Equipment & Services | 34.3% | 25.2% | Jul-19 | 51.8% | 14.8% | 63.6% |
| Sempra Energy | United States of America | Utilities | 32.4% | 10.0% | Jun-19 | 47.6% | 29.9% | 27.2% |
| Sirius XM Holdings Inc | United States of America | Media & Entertainment | 17.8% | 25.2% | Apr-19 | 21.9% | 6.9% | 75.3% |
| Stanley Black & Decker Inc | United States of America | Capital Goods | 25.5% | 17.7% | Aug-19 | 2.1% | 38.4% | 60.6% |
| Sysco Corp | United States of America | Food & Staples Retailing | 35.2% | 29.3% | Mar-19 | 38.6% | 27.8% | 34.2% |
| Tesla Inc | United States of America | Automobiles & Components | 21.3% | 117.1% | May-19 | 8.5% | 1.0% | 74.2% |
| TransDigm Group Inc | United States of America | Capital Goods | 79.2% | 34.1% | Jun-19 | 32.3% | 17.1% | 52.8% |
| Varian Medical Systems Inc | United States of America | Health Care Equipment & Services | 14.5% | 27.2% | Aug-19 | 86.6% | 21.5% | 80.8% |
| Visa Inc | United States of America | Software & Services | 35.5% | 7.2% | Aug-19 | 11.1% | 13.7% | 59.0% |

Single Stocks

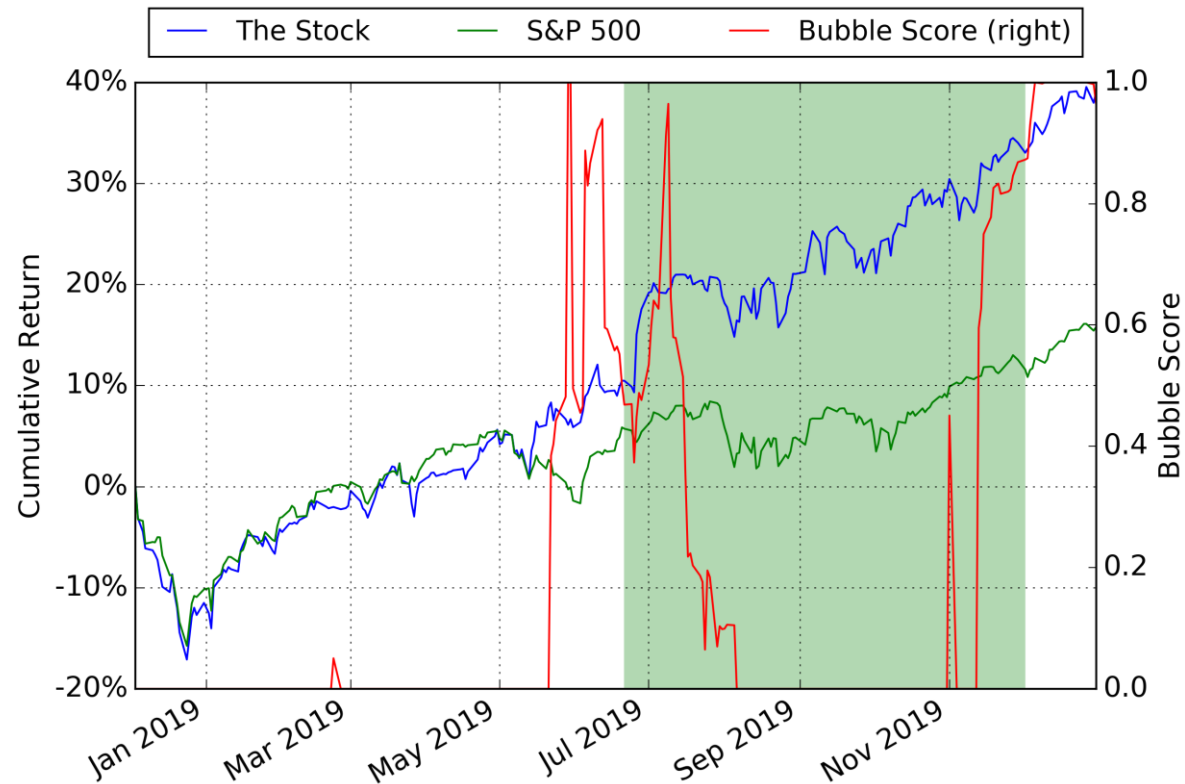
Quadrant 2 Stocks Current Month Example – Varian Medical Systems Inc.



- The above graph shows the one year cumulative return of the stock in blue (left hand scale), S&P 500 in green (left hand scale) and the calculated DS LPPLS Bubble Score in red (right hand scale). The green shaded period delineates the time interval within which the positive bubble is identified. The Bubble Score of this five month bubble has reached 86.6% with a bubble size 27.2%. The strong positive bubble signals and weak fundamentals indicate a high probability of correction in the future.

Single Stocks

Quadrant 2 Stocks Last Month Example – IHS Markit Ltd.



- The figure above plots the one year cumulative return of the stock (blue), S&P 500 (green) and LPPLS Bubble Score (red lines on the right y-axis). The green shaded period delineates the time interval within which the strong positive bubble was identified and reported last month. Note that the stock price continues to appreciate, with the positive bubble signals remaining strong this month.

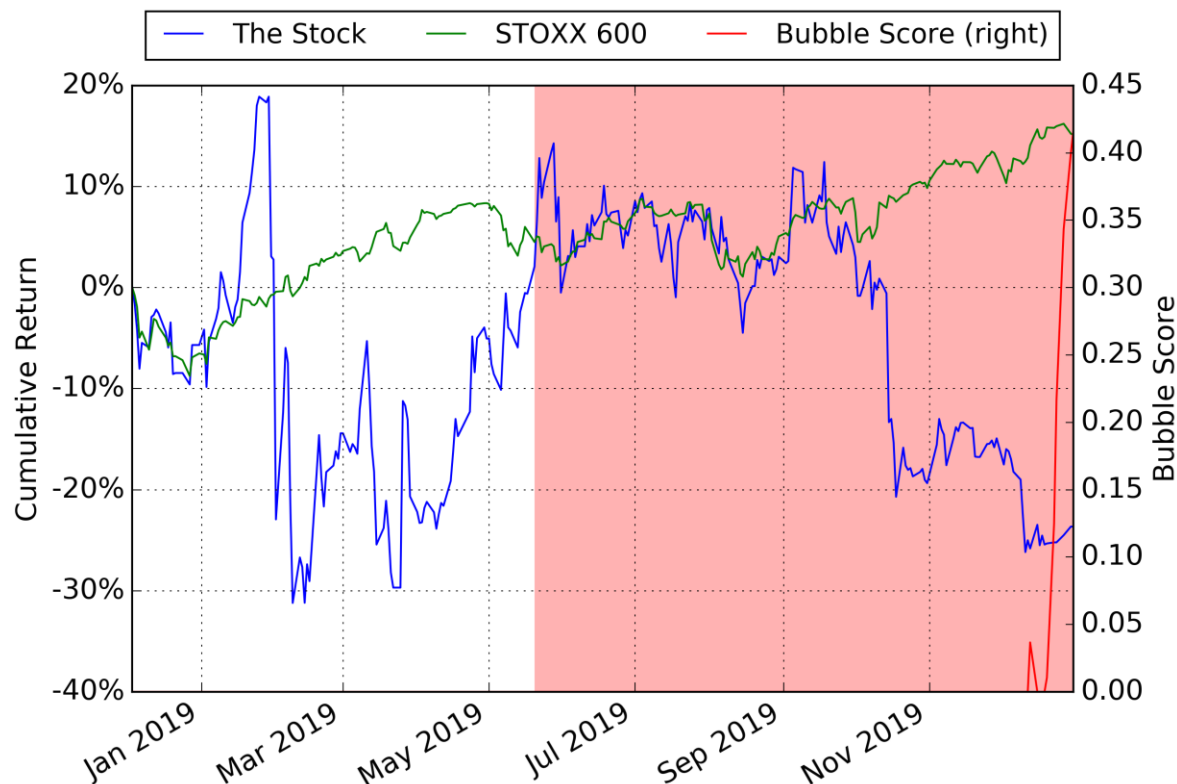
Single Stocks

Quadrant 3 stocks: strong negative bubble signals with weak fundamentals

| Company Name | Country of Headquarters | GICS Industry Group Name | Yearly Return | Bubble Size | Bubble Start | Bubble Score | Value Score | Growth Score |
|-------------------|--------------------------|-------------------------------|---------------|-------------|--------------|--------------|-------------|--------------|
| Wirecard AG | Germany | Software & Services | -24.2% | -28.4% | May-19 | -41.6% | 7.2% | 81.1% |
| Remy Cointreau SA | France | Food, Beverage & Tobacco | 9.8% | -13.6% | Jun-19 | -34.5% | 11.0% | 24.0% |
| Unilever PLC | United Kingdom | Household & Personal Products | 6.3% | -10.4% | May-19 | -29.6% | 21.3% | 25.2% |
| Telenor ASA | Norway | Telecommunication Services | -6.2% | -13.5% | Aug-19 | -20.6% | 36.8% | 43.3% |
| Ball Corp | United States of America | Materials | 35.7% | -15.0% | Aug-19 | -13.6% | 16.6% | 44.1% |

Single Stocks

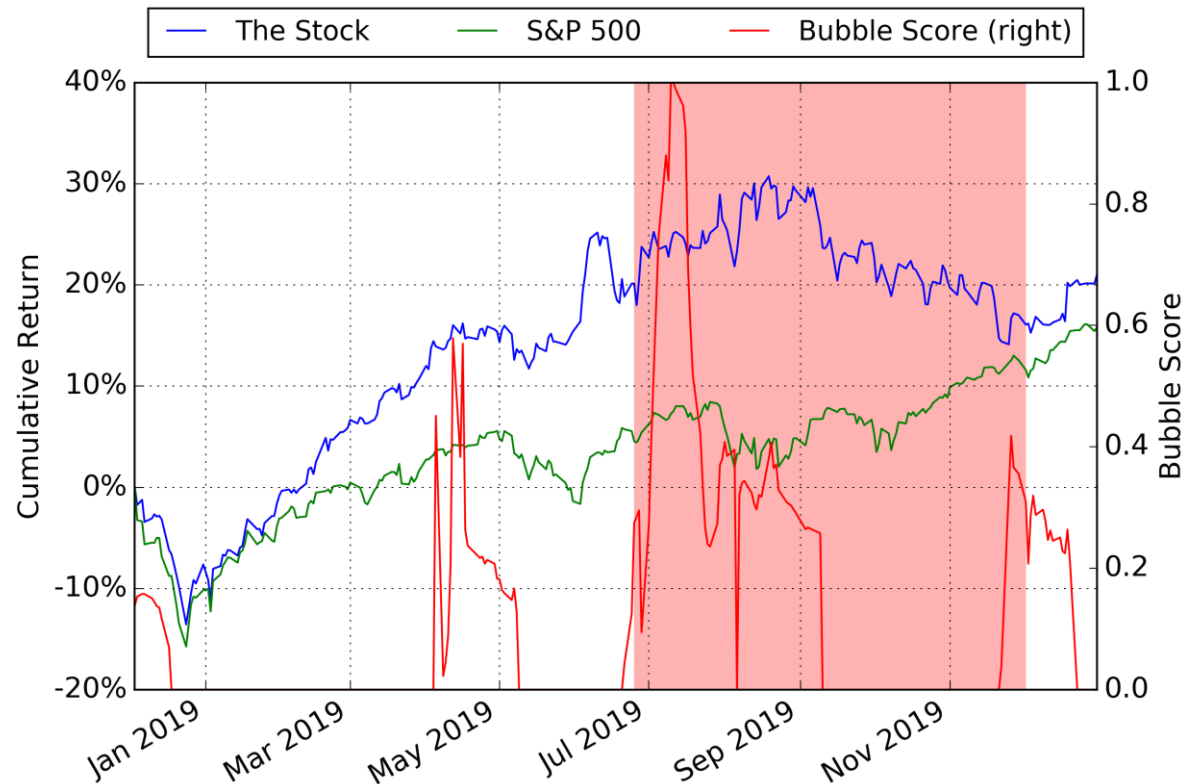
Quadrant 3 Stocks Current Month Example – Wirecard AG.



- The above graph shows the one year cumulative return of the stock in blue (left hand scale), STOXX 600 in green (left hand scale) and the calculated DS LPPLS Bubble Score in red (right hand scale). The red shaded period delineates the time interval within which the negative bubble is identified. The Bubble Score of this eight month bubble has reached 41.6% with a bubble size -28.4%.

Single Stocks

Quadrant 3 Stocks Last Month Example – Ecolab Inc.



- The figure above plots the one year cumulative return of the stock (blue), S&P 500 (green) and LPPLS Bubble Score (red line on the right y-axis). The red shaded period delineates the time interval within which the strong negative bubble was identified and reported last month. The stock has switched into another market regime after the rebound in the past month.

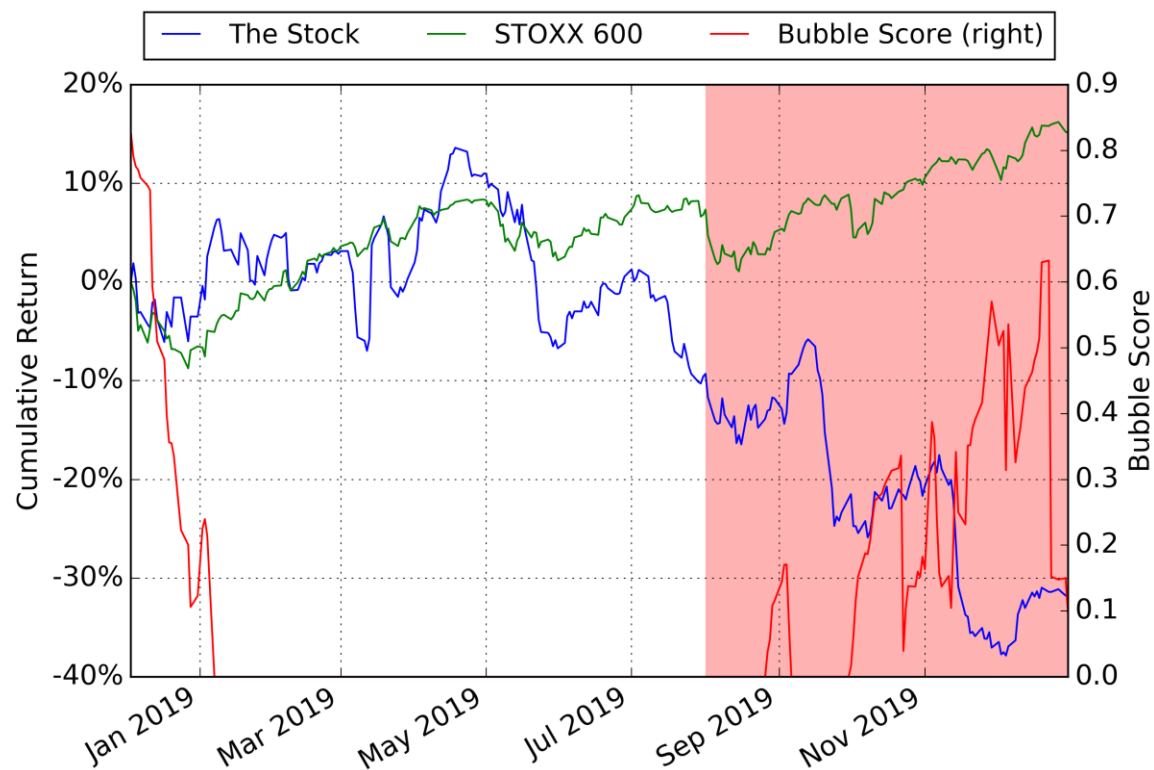
Single Stocks

Quadrant 4 stocks: strong negative bubble signals with strong fundamentals

| Company Name | Country of Headquarters | GICS Industry Group Name | Yearly Return | Bubble Size | Bubble Start | Bubble Score | Value Score | Growth Score |
|--------------|-------------------------|--------------------------|---------------|-------------|--------------|--------------|-------------|--------------|
| K&S AG | Germany | Materials | -35.1% | -22.7% | Aug-19 | -9.8% | 62.8% | 12.2% |

Single Stocks

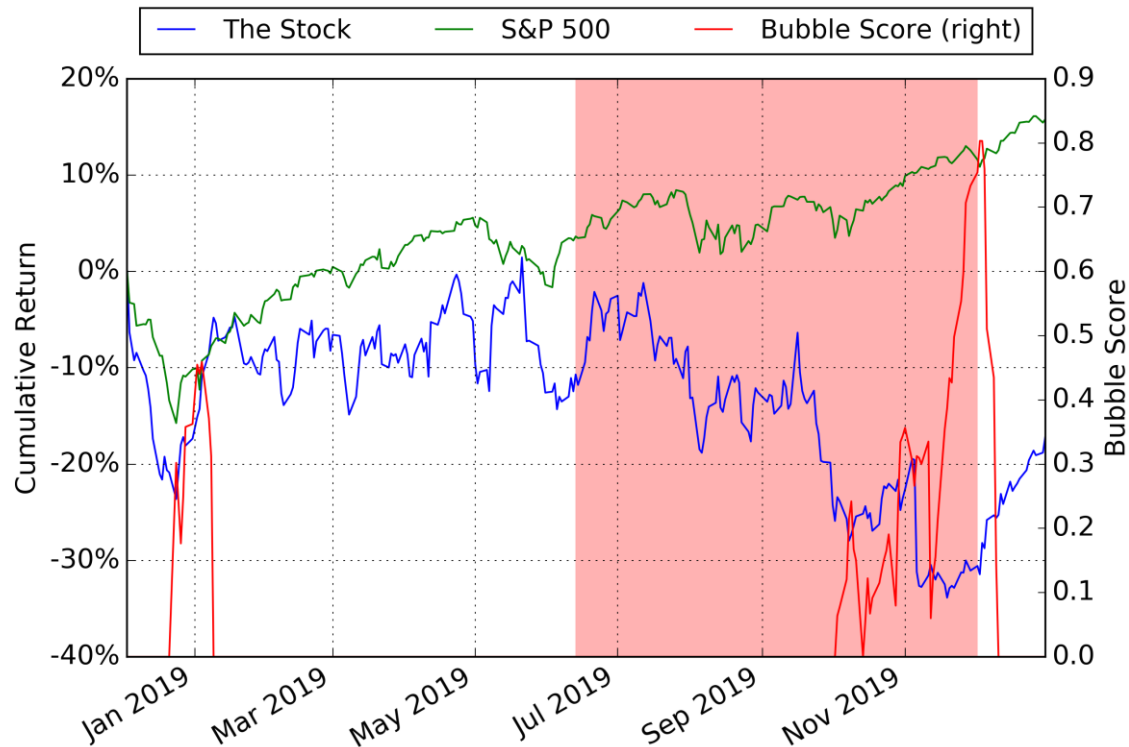
Quadrant 4 Stocks Current Month Example – K&S AG.



- The above graph shows the one year cumulative return of the stock in blue (left hand scale), STOXX 600 in green (left hand scale) and the calculated DS LPPLS Bubble Score in red (right hand scale). The red shaded period delineates the time interval within which the strong negative bubble is identified. The Bubble Score of this six month bubble has reached 9.8% with a bubble size -22.7%. We expect a rebound in the future, which is due to our diagnostic of a negative bubble signal with strong fundamentals, calling for a contrarian buyer position.

Single Stocks

Quadrant 4 Stocks Last Month Example – Diamondback Energy Inc.



- The figure above plots the one year cumulative return of the stock (blue), S&P 500 (green) and LPPLS Bubble Score (red line on the right y-axis). The red shaded period delineates the time interval within which the strong negative bubble was identified and reported last month. The stock has started a strong rebound in the past month. This change of regime is in agreement with our DS LPPLS indicator. The strong fundamentals lead us to expect potential future increase in the price.

More Information

- ▶ Visit the **Financial Crisis Observatory** for more information

<http://www.er.ethz.ch/financial-crisis-observatory.html>

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