The FCO Cockpit
Global Bubble Status Report
March 2020

Entrepreneurial Risks

ETH zürich

SIMAG® Systematic Investment Management AG

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

Contents

ETH FCO and SIMAG Join Forces

The Financial Crisis Observatory (FCO) is…	Systematic Investment Management AG (SIMAG) 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	▪ 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

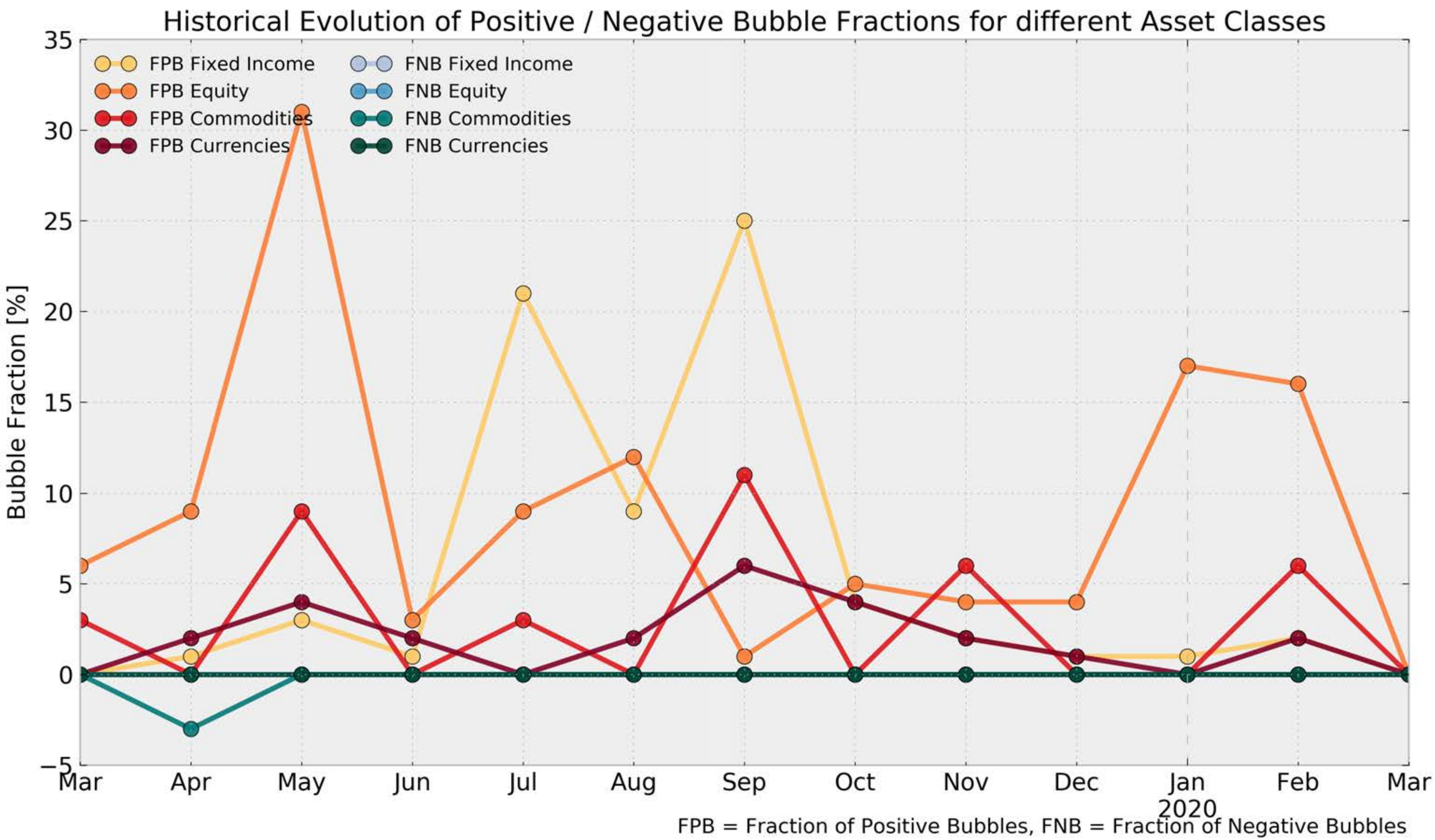
- The **Financial Crisis Observatory (FCO)** monthly report discusses the historical evolution of bubbles in and between different asset classes and geographies. The purpose of the FCO report is to ascertain which asset classes and sectors are deemed to be **crowded** and to what degree they can develop 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

- The global fear of the spread of the Corona Virus has infected financial markets in late February 2020, coincident with the acceleration of the number of cases in Italy first and then in the rest of the Western world.
- As a result, major markets across the US, Europe, as well as China have crashed by about 10-15% in one business week.
- This does not come as a surprise, as we had reported these signals in advance in the previous release.
- As we have now transited into a crash regime, the fraction of detected bubbles declines to zero amongst all sectors.
- Thus, instead of presenting new signals, in the following, we present the time series for several of the indices listed in the previous report, to provide a post-mortem analysis of our previous diagnostics.

General Results – The Big Picture



General Results – This Month's Overview

Category		Analyzed Assets	Fraction of Pos. Bubbles [%]	Fraction of Neg. Bubbles [%]
Fixed Income		154	0	0
	Government Bonds	54	0	0
	Finance and Insurance	21	0	0
	Corporate Bonds	79	0	0
Equity		234	0	0
	Country Indices	52	0	0
	Europe	20	0	0
	United States	162	0	0
Commodities		31	0	0
Forex		96	0	0

Macro environment – the big picture

The macro picture

February was dominated by the economic and financial fallout crated by the Coronavirus event. In the US the initial reaction on the virus contagion was somewhat muted with FED chair Powell telling the Congress on Feb 11th, that the US economy would be in a good place and he sees no reason why the economic expansion couldn't continue. A few days later after equity markets plunged by 15%, the FED had to paddle back cutting rates by a whopping 50bp. Ten-year US yields hit a 150-year low, dropping below the 1% mar, suggesting the market thinks the Fed has lost control and deflationary stagnation awaits. Economic forecasts are being cut dramatically but it is still unclear how much ripple effects the distortions of global supply chains create for the economy. The economic consequences cannot be overestimated. For example: 17.600 Procter & Gamble products rely on materials from China according to the company. Disney is expected to lose 175 mln. USD in operating income in the current quarter if its shuttered Shanghai and Hong Kong theme parks remain closed for two months according to company officials. As a result, banks have begun trimming their earnings per share projections for the US markets and year end index close targets. At the same time, credit analysts are warning, that with less economic activity, default rates across the economy will climb with hotels, event companies, malls and cinemas in the focus. The combination of a supply and demand shock and falling asset prices is a dangerous mix in the current stage of the credit cycle. Falling asset prices create a liquidity shortage, especially in the interbanking sector as we could see with March overnight repo operation which again was oversubscribed with ripple effects for the rest of the economy especially for the 40% of US listed so-called Zombie companies which rely on access to cheap financing. But let's be clear, we had indicators across the global market that suggested we were headed for recession well ahead of the virus.

Turning to China, the epicenter of the virus contagion, Chinas banks already suffered record loan defaults as the economy came under pressure from the collapsing shadow banking system last year, as we have covered extensively. But now, with the outbreak of the coronavirus all hands are off. 90% of Chinese exporters reported difficulties shipping goods, according to a Chinese Commerce Ministry survey of 7.000 companies. China car sales plummeted 80% during February amid the virus outbreak. The critical Chinese housing market which experienced exponential growth over the last year's most probably has slowed down massively as well. But China's companies will now be able to declare force majeure. Force majeure is a legal term which can allow a party of a contract to avoid liability for not meeting their obligations when the underlying event was unforeseeable and beyond the control of the borrower. The bad loan ratio at the top banks could rise substantially according to analysts leaving the country with trillions in non-performing loans which threaten the existence of banks not only in China but also globally as Chinese banks are connected to the world via the interbank market. However, China has already ordered banks to tolerate higher bad debt level to avoid a complete meltdown in its roughly 41 trn. USD financial system – having over 20 trn. USD in "problematic" bank assets according to analysts. And the PBOC has instructed state owned banks to bail out millions of smaller companies by extending loans or granting more loans to provide the necessary liquidity so that the troubled companies can pay the interest due. Chinese authorities have no other choice but to keep throwing good money after bad. The same can be diagnosed for Japan which was forced to flood the market with liquidity 3-times the size of that in the US to combat outright deflation. The Japanese authorities have intervened directly in the stock markets. Now, the BOJ's balance sheet consumes 80% of the ETF market, so that basically the BOJ has become the ETF market in stocks. But substituting monetary policy for real economic activity is not the solution long term in a country where machinery orders fell at their fastest pace since 2018 while exports retreated for the 14th month in a row. The stock market is not the economy, mechanically rising share prices is not the same as rising economic prosperity.

Turning to India, the second most populous country in the world, the supply shock from China is adding to the country's economic malaise. As we have written previously, India was on the brink of recession already before the virus event but now faces even higher risks of a severe economic downturn. India's trade deficit unexpectedly widened even further in January as exports declined for a sixth month in a row. Prices of medicine in India has drastically risen as medicine is sourced from China. Production facilities elsewhere in India are disrupted as critical components from China are missing.

When turning to the Eurozone, home of the third largest population in the world, we observe that analysts have begun cutting their growth forecasts as it turned out that the currency zone grew at a quarterly rate of only 0.1% in the fourth quarter, its slowest rate of expansion since 2013. Germany, again spoiled the party, printing no growth at all during the fourth quarterly. Germany remains in a precarious position when it comes to its banking system. German banks have made widespread use of the ECB "Put". Historically, 2% of companies have gone bankrupt on average every year in the EU but given the ECB "Put", i.e. free money for Zombie companies, the figure fell to only 0.4%. Using this reduced number (i.e. lowering the assumed default rate by 80%) has led to a relief in banks' loan book provisions which was used to increase their notoriously low equity position. But with the ripple effects of the China fallout, it becomes increasingly more difficult to stop defaults from happening, regardless of how negative interest rates become. But in case interest rates (including a higher spread for the increased default risk) in the euro zone were to normalize to historic levels, the loan default rate at European banks would skyrocket for the Zombie companies sending banks and with them the rest of the economy into a tailspin.

Macro environment – the big picture

Outlook

The degree of financialization of our economies has reached a precarious level which requires constantly supply of new credit to prevent the system from collapsing. Today the economic machine has become dominated by the financial economy, so that defaults are no longer an option given their existential role as collateral in the credit intermediation process.

Central banks are forced to buy up assets in order to stabilize collateral values and prevent the banking system from falling. Unfortunately, the spread of the coronavirus coincides with the sharp downturn in the global credit cycle which begun already in the last quarter of 2019, when the system was already surviving on life-support by central banks. Policy makers having the choice between a debt jubilee and disorderly default will likely choose the first by using the coronavirus as an excuse to reset the system. The PBOC, BOJ, ECB and FED most likely will continue with the zombification of the economy as debtors will plead forced majeure as part of their debt default explanation. Basically, this is a debt jubilee which lowers the debt/equity ratio of the most troubled corporates. So, another 4 trn or so of Quantitative easing could indeed prevent the bubble from deflating for some time. Financial assets such as stocks and bonds will mainly be driven by money supply over the next weeks. And this is important because asset price stability is important since there are multiplies of that same asset used over and over again as collateral in the debt creation mechanism when really there is only the original asset. This is called rehypothecation and explains why a drop in asset values can start a cascading collapse of failures and defaults. To stop financial disorder, more monetary disorder is required. These measures are designed to ensure asset price "stability" even at the cost of further debasing the currency. Gold, again, should benefit from the increase in solvency risks in the system. Indeed, based on the current Euro economic situation (negative interest rate), Fed monetary policy movement and the spread of the virus in Italy and Germany, it is likely that gold (gold ETF) will be a very good hedging asset for now.

But there is a limit of how much cheap money the system can absorb, like a sponge. At one point, the sponge will not be able to take on more water. This is called the saturation point. The same can be said for the market which cannot take unlimited amount of money without consequences for the purchasing power of the currency.

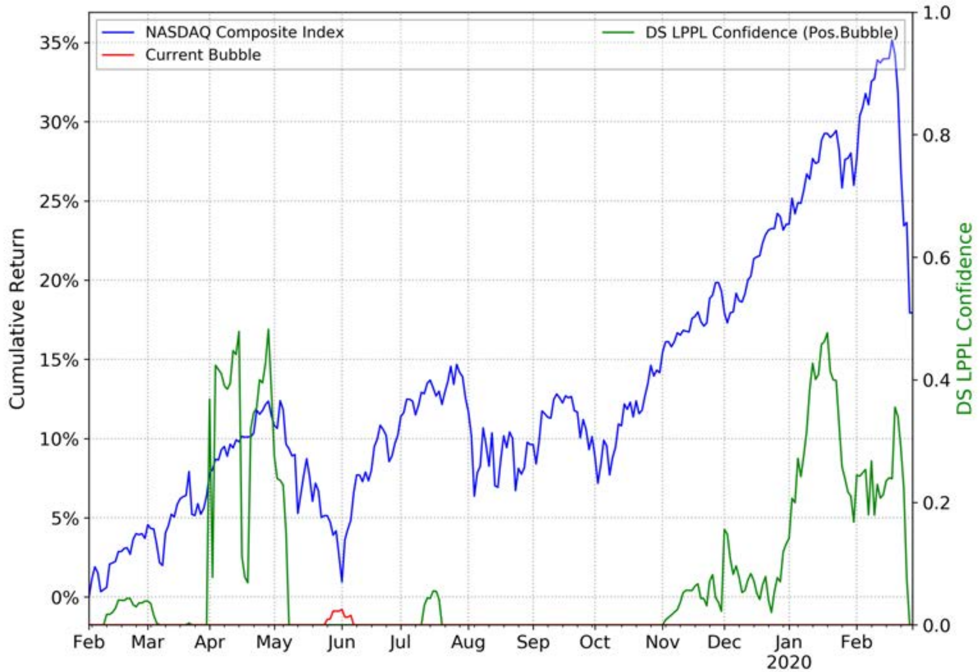
The biggest question therefore is how fast the world economy can get back to normal operations.

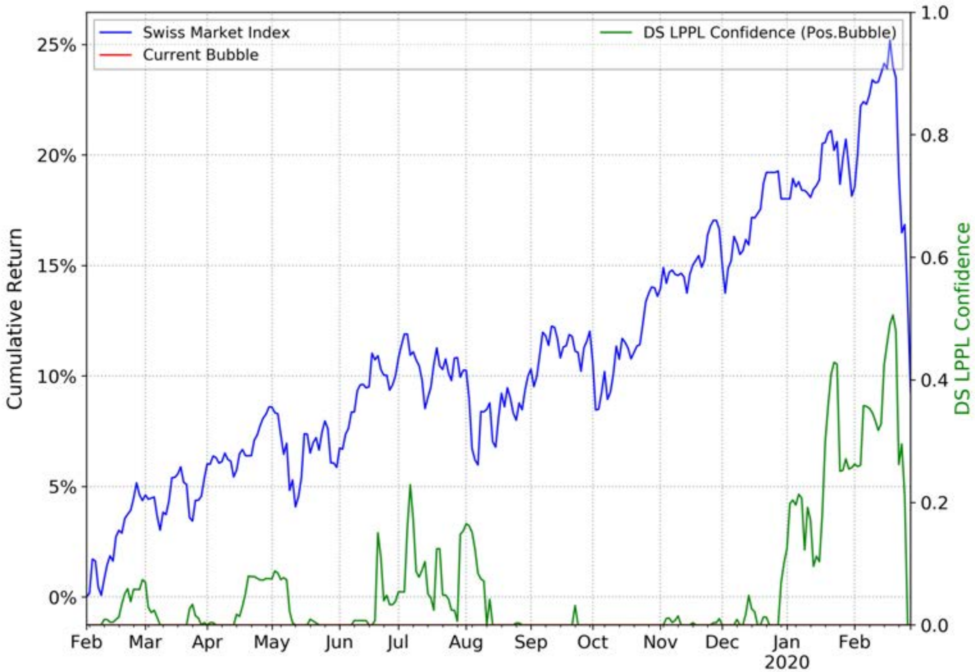
The downside is that the longer the coronavirus crisis last, the more unlikely a V-shaped recovery in the global economy and hence corporate earnings become.

On the positive side, we see the situation in China steadily improving according to official statistics. The virus ultimately will vane at one point. This obviously creates upside risks given the expected significant stimuli that could be introduced. Cyclical stocks, Momentum stocks and EM exposure should be most benefiting in such a reversal situation. So, there is a possibility that the current turmoil will in hindsight appear to have been the best buying opportunity of the year.

Equities – Country Indices

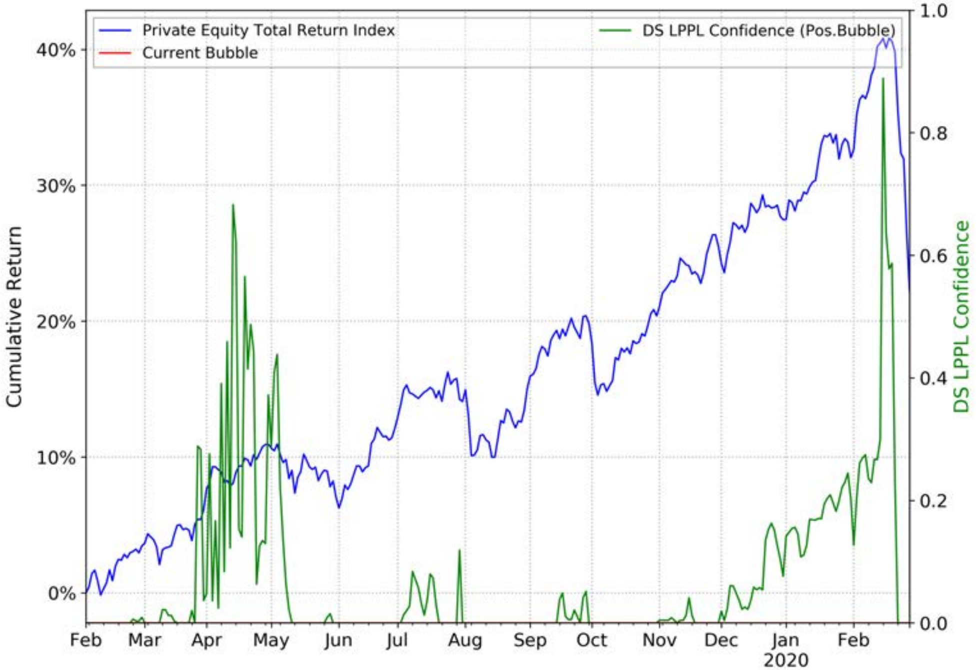
- In the previous reports on Equity country indices, we listed positive bubble signals for the NASDAQ and SMI. The corresponding indicator time series plots are depicted below.
- In both cases, we see similar behavior: strong surge of the indicator value during the bubble, due to accelerating returns leading to super-exponential price dynamics, followed by a crash of about 15%. The indicator sharply drops as a result of the passing peak of the bubble i.e. the transition into the crash regime.
- Since the beginning of the year, we have detected two bubble regimes.

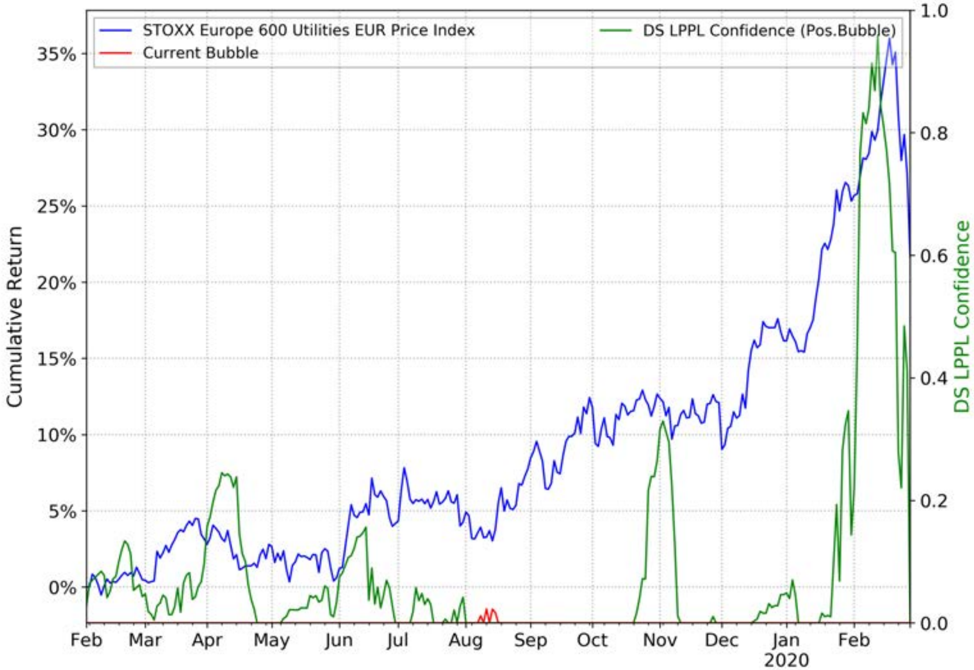




Equities – European Indices

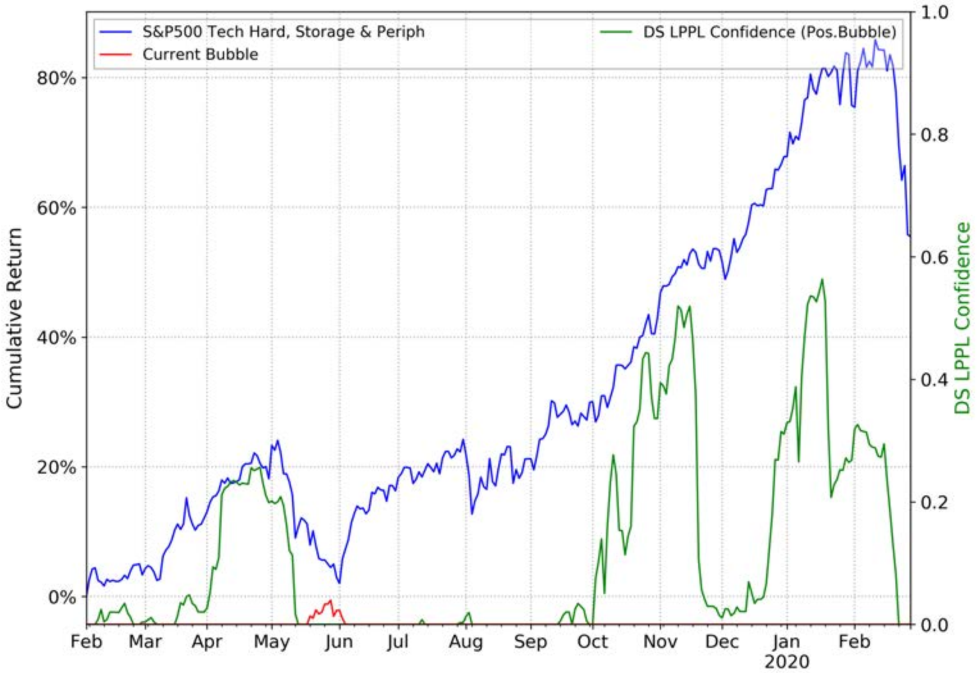
- We present two previously reported signals for the European Equity sector.
- For these two prime examples, the indicator peaks almost at the maximum of level of 100% in both cases, due to the immense growth seen at the end of the bubble.
- Observing these time series, it can be imagined how in the final phase of a bubble, investors are already aware of the risk of a crash and therefore rationally demand ever higher returns to remain invested in the asset at this risk. This pushes up prices even more until finally a fragile price level is reached for which this behavior is not sustainable anymore, and suddenly many investors simultaneously transit into “sell mode”.
- This abrupt change in behavior may have many reasons such as cashing in gains, an increasing fraction of short traders, panicking and imitation, and of course the trigger of the Covid-19 accelerating epidemics in Europe and the USA, leading to a drop in demand for the underlying asset.

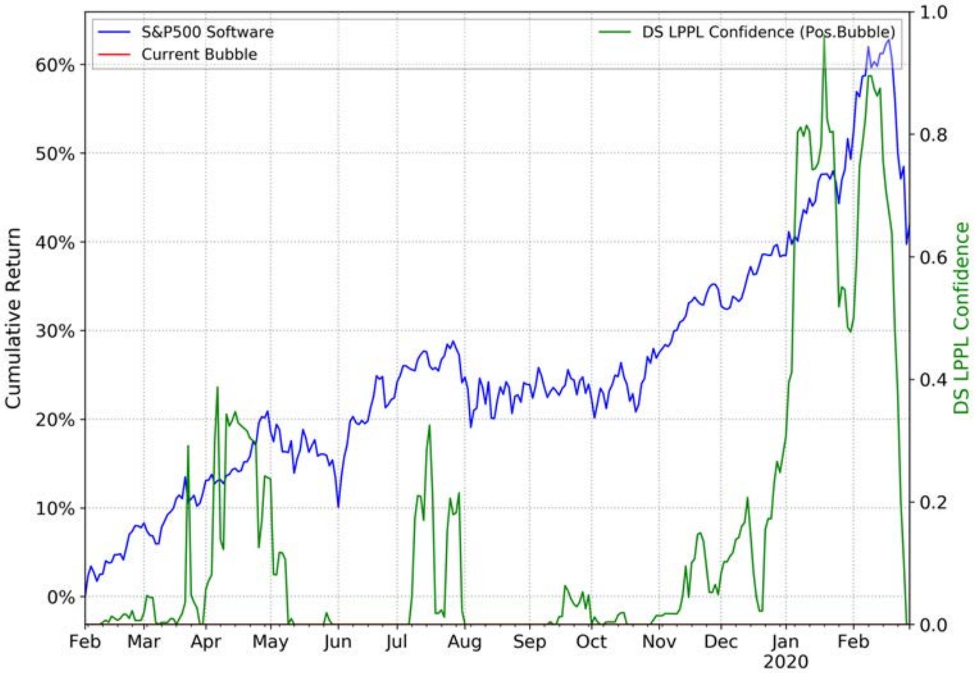




Equities – United States Indices

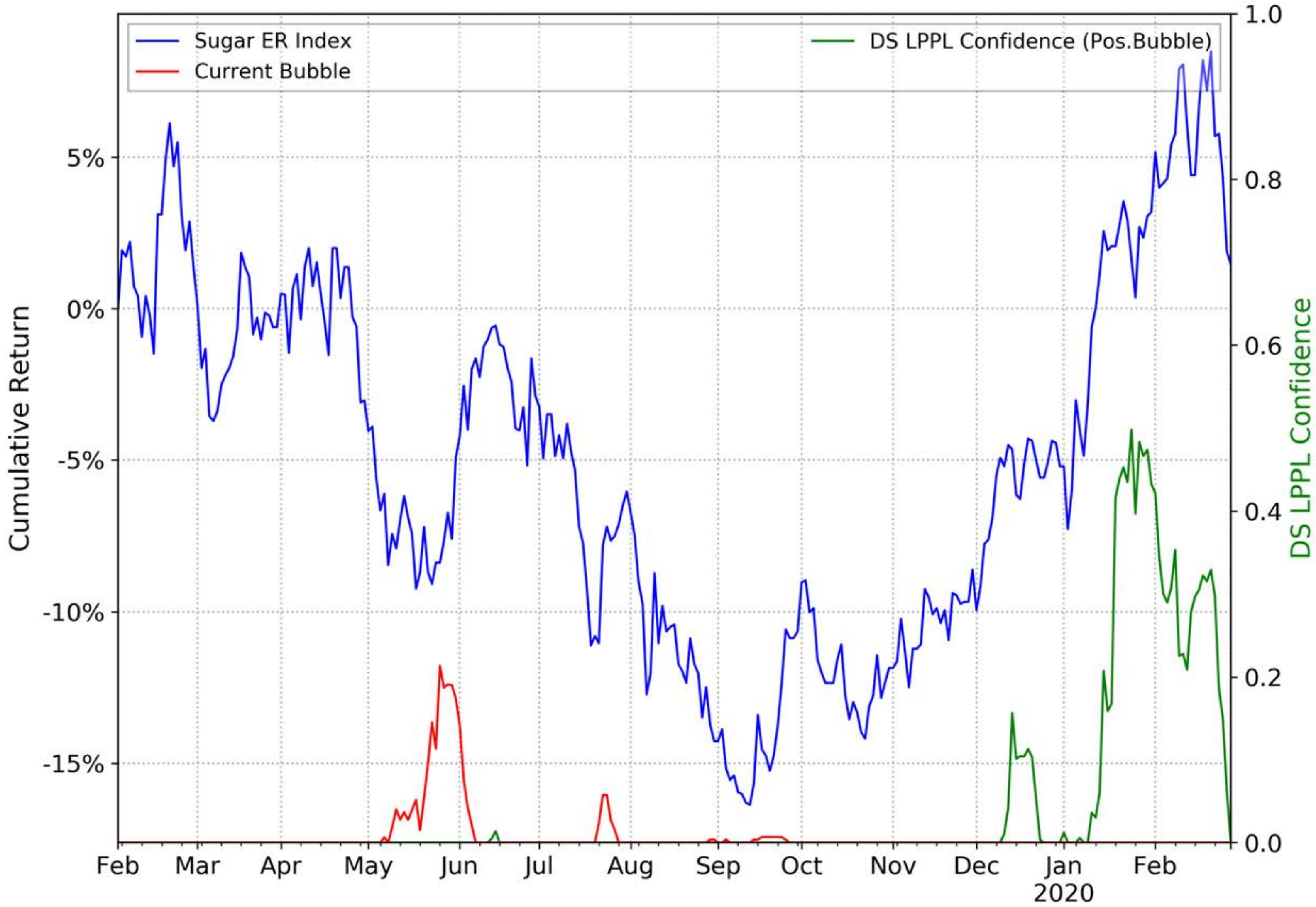
- We also list two indices that were reported amongst the top signals in the US Equity sector in the previous report.
- For both S&P 500 subsector indices, we even observe a crash size surpassing 20% (up to now).
- It is debatable whether such an intense correction is justified and just drove the price back to its now fair value, or whether we now even see a temporary undervaluation of asset prices. On the one hand, the impact of the Corona Virus is already forcing companies cut their quarterly targets because of lower real production and potential disruption of supply lines. On the other hand, there is an even more accommodating policy of central banks that has facilitated markets growth in the past, and thus markets should be able to recover after the panic is over.
- Investors that bet on a controlled decline of the "Corona Epidemic" can use the opportunity of this strong correction to buy the dip. Investors that fear a spread of the virus are possibly better served with safer investments.





Commodities

- The signal that we showed for the Sugar ER Index in the Commodity section of previous month's report has disappeared as well, following a minor downturn of the price of about 5%.

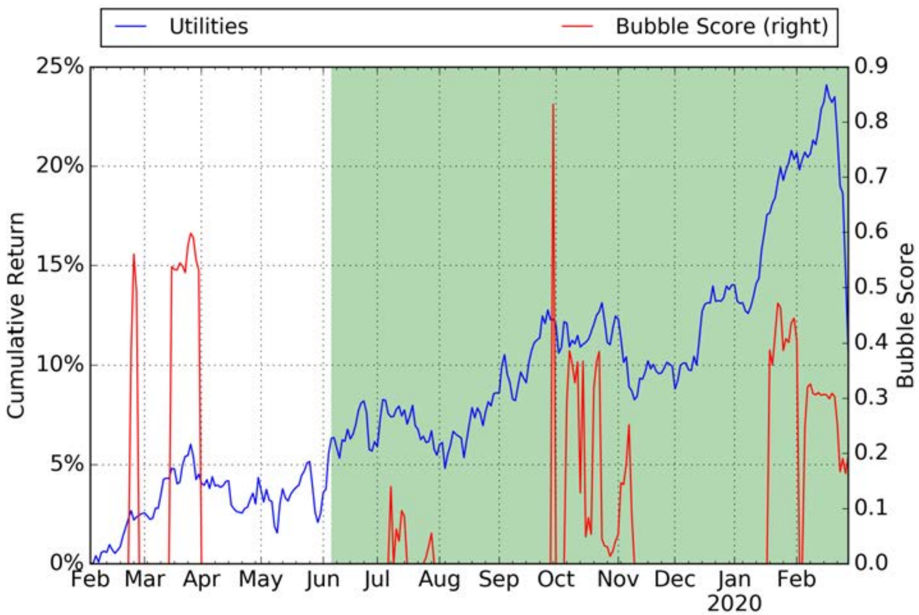


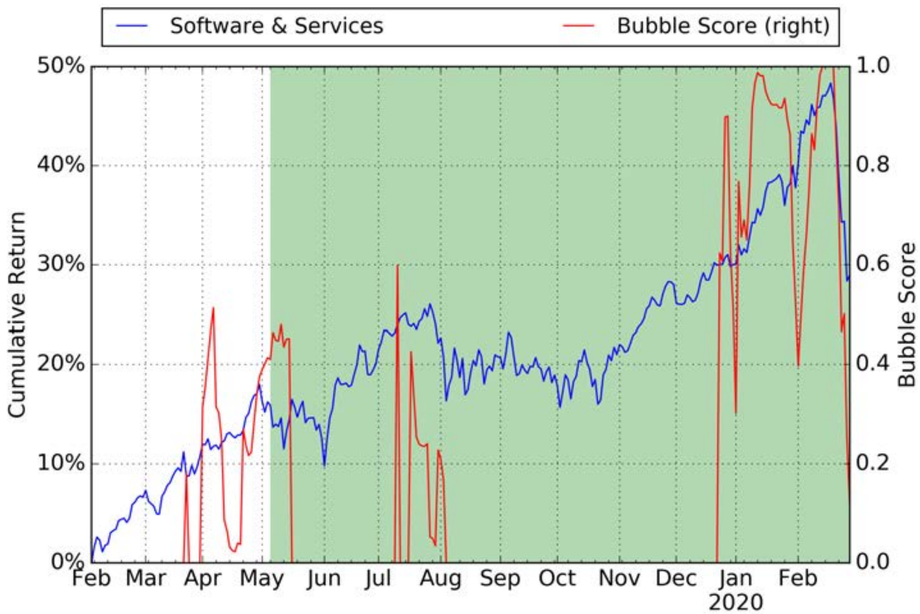
Sectors

GICS Industry Group Name	Yearly Return		Bubble Size		Bubble Score		Value Score		Growth Score	
	Mar 1st	Feb 1st	Mar 1st	Feb 1st	Mar 1st	Feb 1st	Mar 1st	Feb 1st	Mar 1st	Feb 1st
Pharmaceuticals, Biotechnology & Life Sciences	2.9%	12.4%	0.0%	0.0%	0.0%	0.0%	68.8%	65.5%	48.9%	47.3%
Consumer Services	-1.0%	12.5%	0.0%	0.0%	0.0%	0.0%	33.6%	33.0%	46.4%	49.5%
Retailing	8.4%	17.6%	0.0%	0.0%	0.0%	0.0%	23.6%	20.2%	44.2%	45.6%
Transportation	-7.8%	5.2%	0.0%	0.0%	0.0%	0.0%	55.1%	56.8%	47.3%	50.8%
Consumer Durables & Apparel	5.6%	19.8%	0.0%	12.7%	0.0%	45.6%	30.5%	31.4%	59.7%	61.6%
Semiconductors & Semiconductor Equipment	23.4%	31.1%	0.0%	27.6%	0.0%	30.4%	61.9%	64.3%	36.7%	35.8%
Technology Hardware & Equipment	19.2%	40.3%	0.0%	25.7%	0.0%	28.8%	69.1%	73.1%	39.9%	40.8%
Automobiles & Components	-2.9%	3.8%	0.0%	0.0%	0.0%	0.0%	70.7%	72.7%	49.1%	51.9%
Telecommunication Services	0.6%	9.7%	0.0%	0.0%	0.0%	0.0%	62.4%	66.8%	44.2%	43.9%
Energy	-26.6%	-12.1%	0.0%	0.0%	0.0%	0.0%	52.8%	57.6%	64.2%	62.4%
Software & Services	19.3%	33.2%	11.3%	18.4%	12.1%	52.7%	34.8%	37.2%	47.2%	47.3%
Materials	-7.7%	4.9%	0.0%	0.0%	0.0%	0.0%	51.7%	52.9%	50.9%	48.6%
Health Care Equipment & Services	4.7%	13.3%	0.0%	0.0%	0.0%	0.0%	58.1%	65.6%	51.7%	49.3%
Capital Goods	-0.3%	10.9%	0.0%	0.0%	0.0%	0.0%	44.8%	49.6%	51.2%	46.0%
Media & Entertainment	7.1%	19.2%	0.0%	12.8%	0.0%	51.3%	31.6%	31.0%	34.8%	41.4%
Commercial & Professional Services	13.3%	27.0%	0.0%	12.9%	0.0%	100.0%	28.6%	28.8%	53.8%	53.6%
Food & Staples Retailing	3.0%	10.7%	0.0%	0.0%	0.0%	0.0%	47.6%	46.4%	60.0%	53.8%
Household & Personal Products	1.7%	15.1%	0.0%	0.0%	0.0%	0.0%	32.7%	34.1%	45.1%	46.3%
Food, Beverage & Tobacco	-1.0%	13.5%	0.0%	0.0%	0.0%	0.0%	49.0%	46.8%	51.9%	54.0%
Utilities	6.2%	19.7%	4.2%	13.2%	19.5%	44.4%	51.0%	50.3%	44.8%	45.4%
Insurance	-0.7%	14.1%	0.0%	0.0%	0.0%	0.0%	-	-	-	-
Real Estate	-1.1%	9.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-
Diversified Financials	4.4%	18.3%	0.0%	0.0%	0.0%	0.0%	-	-	-	-
Banks	-8.5%	4.6%	0.0%	0.0%	0.0%	0.0%	-	-	-	-

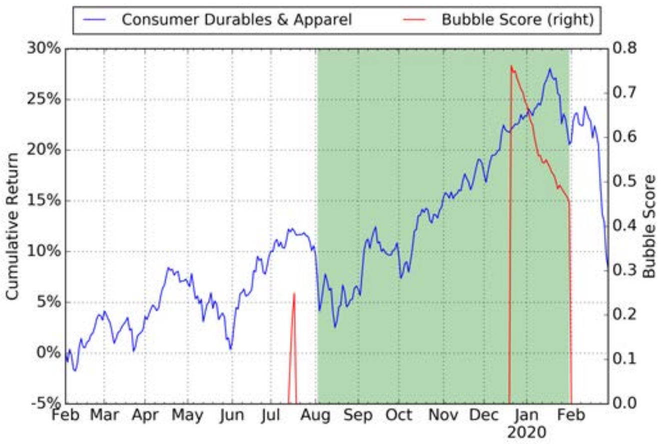
Sectors

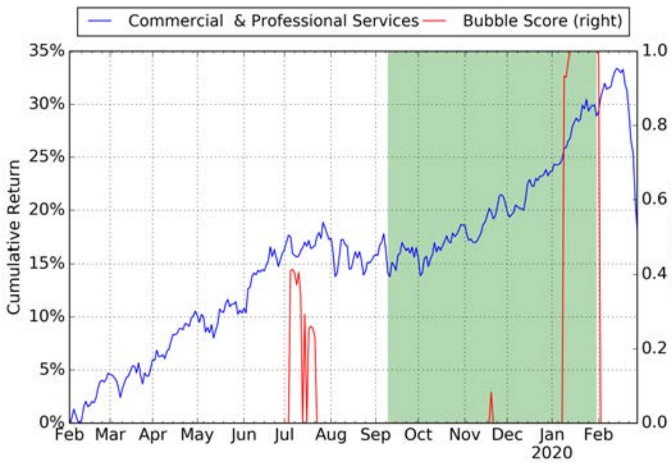
- We use the MSCI World Industry Group Indices to calculate bubble size and bubble score of the corresponding sectors. To determine the value scores and growth scores of the sectors, we average over the corresponding values for each stock of a given sector, weighted by market cap.
- This month, we find 2 industry groups with a positive bubble score: Software & Services, and Utilities. All of the bubbles we identified last month has experienced significant corrections due to the market reactions to the spread of the novel coronavirus.

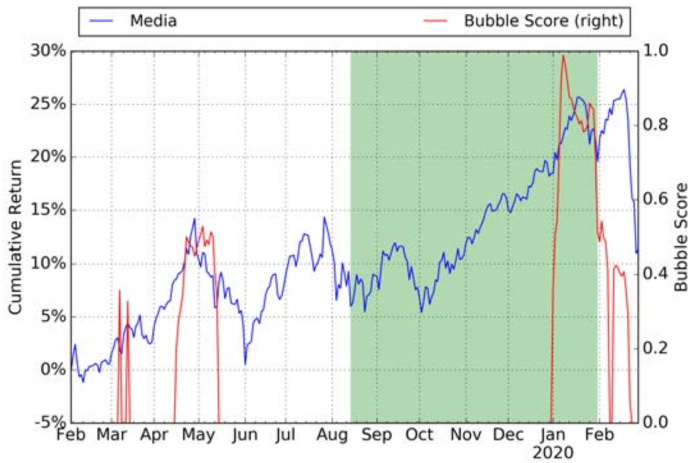


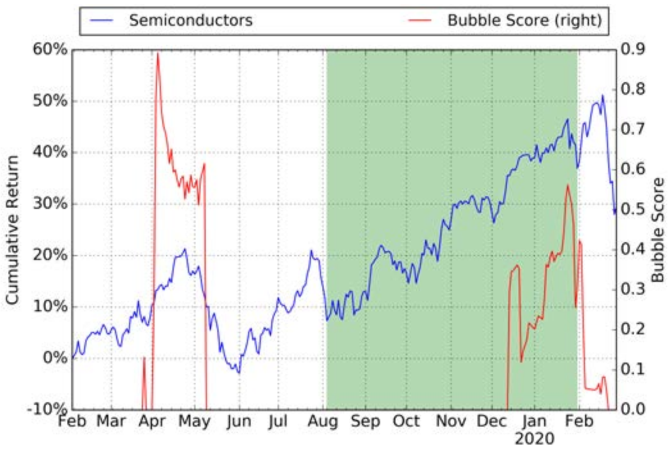


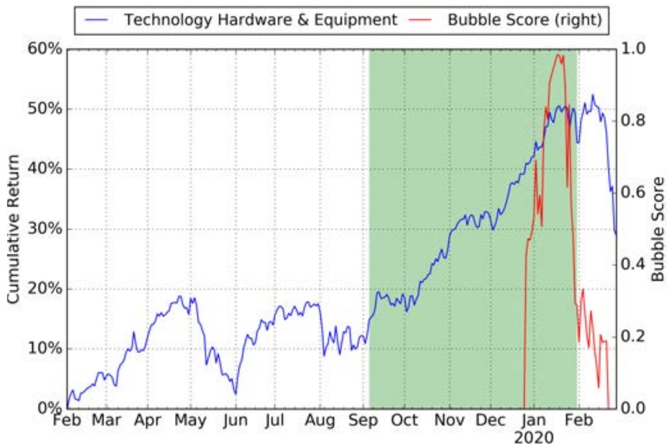
Sectors


Consumer Durables & Apparel
Bubble Score (right)
Cumulative Return
Bubble Score
2020


Commercial & Professional Services
Bubble Score (right)
Cumulative Return
Bubble Score
2020


Media
Bubble Score (right)
Cumulative Return
Bubble Score
2020


Semiconductors
Bubble Score (right)
Cumulative Return
Bubble Score
2020


Technology Hardware & Equipment
Bubble Score (right)
Cumulative Return
Bubble Score
2020

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.

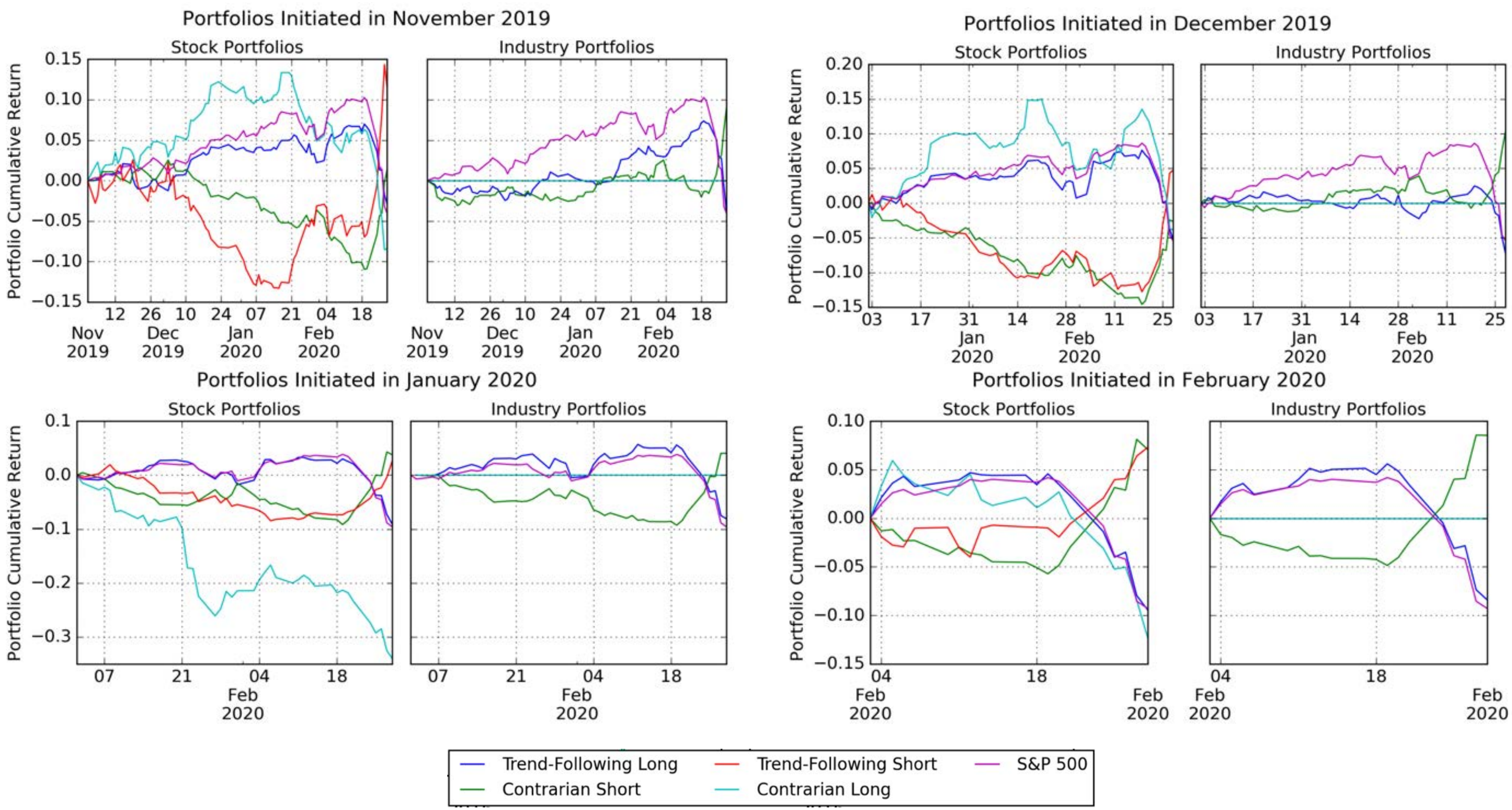
Portfolio Construction & Performance

- 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.

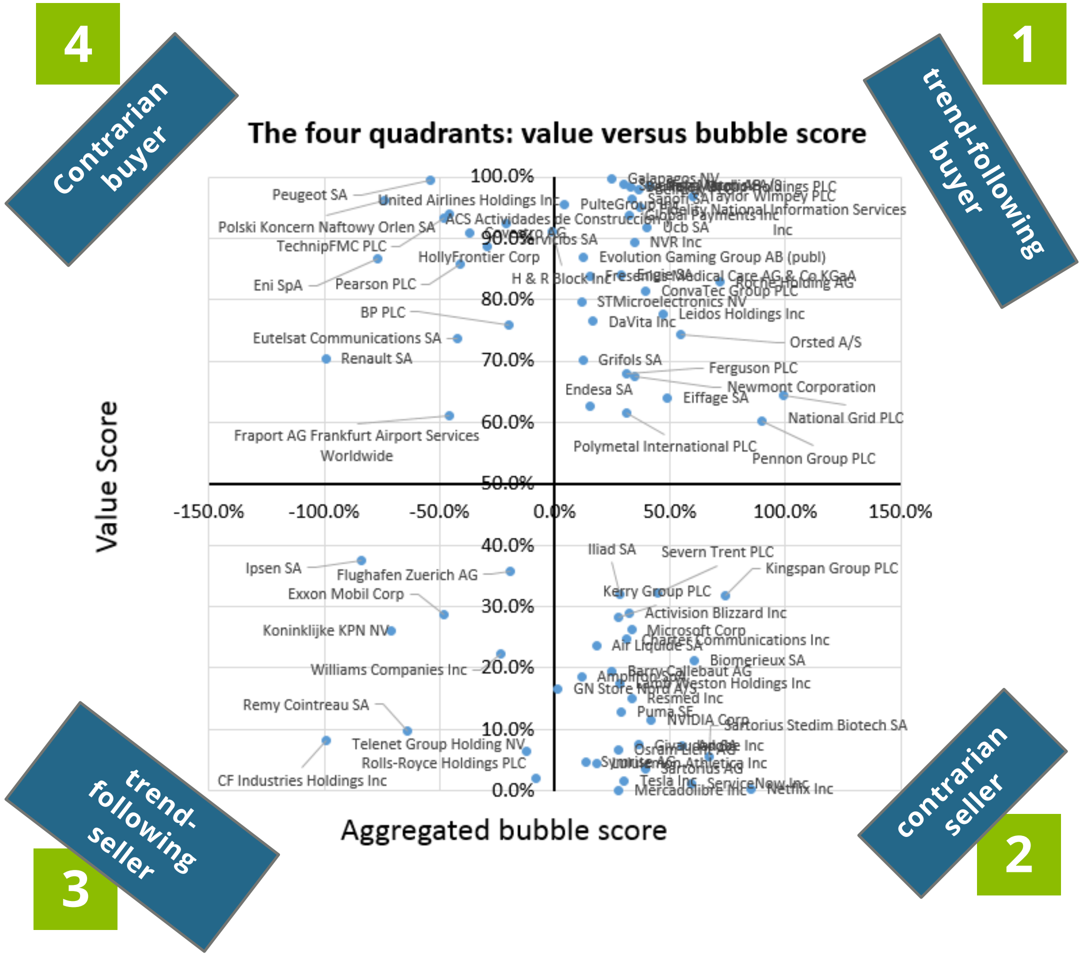
Portfolio Construction & Performance

- The market experienced a 15% drawdown in the past month due to the outbreak of COVID-19 in various countries, which impacted negatively our Long portfolios. 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 over which the predicted corrections play out, as illustrated here by the difference between the contrarian portfolio initiated in January and the earlier ones.



Single Stocks

We can divide the stocks into four quadrants[1)]



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%.

- **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. National Grid 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. Netflix Inc
- **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. Ipsen SA
- **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. BP PLC

Single Stocks

- For 768 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.

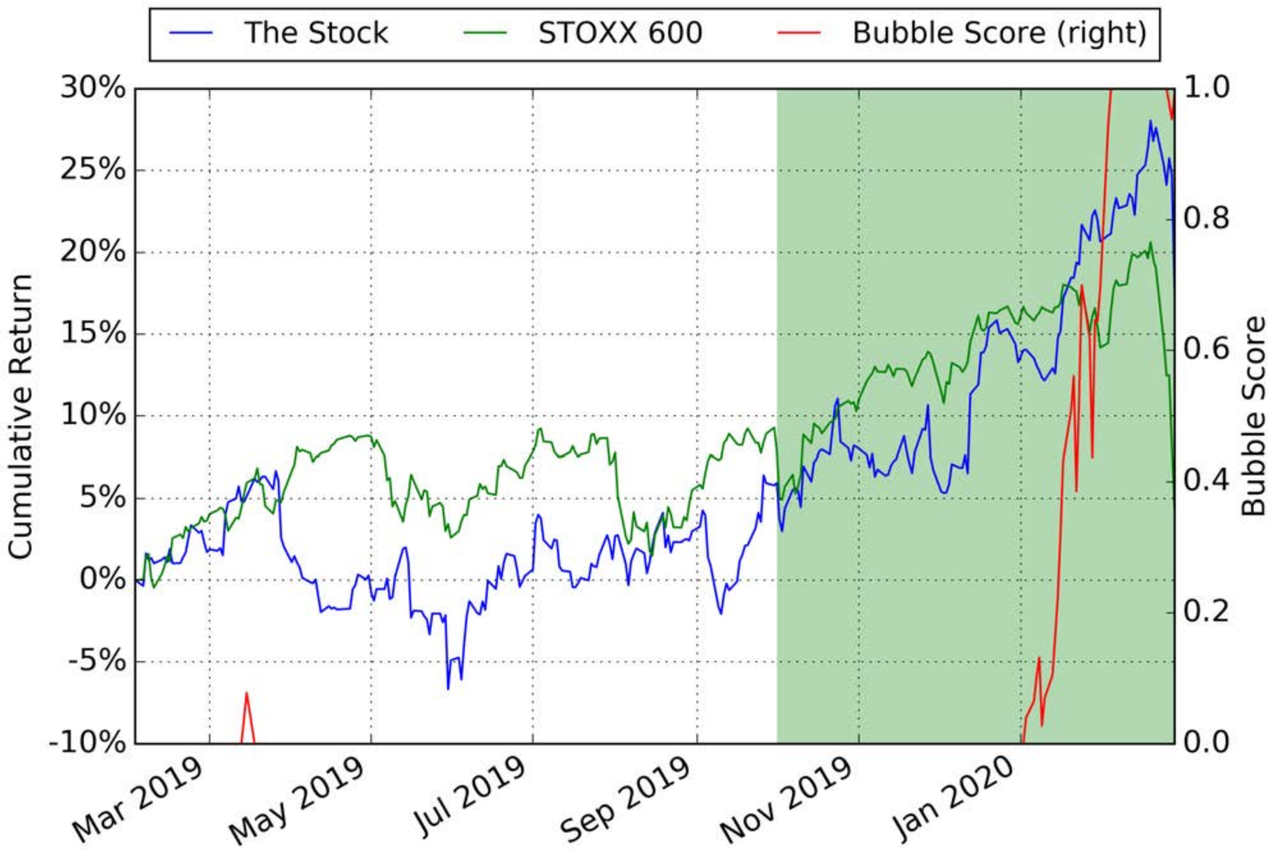
Single Stocks

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
Ucb SA	Belgium	Pharmaceuticals, Biotechnology & Life Sciences	10.3%	20.0%	Jul-19	40.1%	91.8%	6.8%
Galapagos NV	Belgium	Pharmaceuticals, Biotechnology & Life Sciences	114.0%	82.0%	May-19	24.9%	99.6%	94.0%
Roche Holding AG	Switzerland	Pharmaceuticals, Biotechnology & Life Sciences	14.2%	10.0%	Sep-19	71.6%	82.8%	29.9%
Fresenius Medical Care AG & Co KGaA	Germany	Health Care Equipment & Services	3.3%	15.2%	Aug-19	15.1%	83.9%	11.8%
Orsted A/S	Denmark	Utilities	39.0%	10.8%	Sep-19	54.6%	74.2%	53.4%
Novo Nordisk A/S	Denmark	Pharmaceuticals, Biotechnology & Life Sciences	20.1%	24.2%	Jul-19	41.3%	98.6%	75.3%
Endesa SA	Spain	Utilities	3.2%	4.6%	Apr-19	15.0%	62.6%	99.3%
Grifols SA	Spain	Pharmaceuticals, Biotechnology & Life Sciences	22.7%	20.0%	Mar-19	12.2%	70.2%	70.4%
Sanofi SA	France	Pharmaceuticals, Biotechnology & Life Sciences	9.1%	11.3%	Apr-19	33.7%	96.4%	59.4%
Eiffage SA	France	Capital Goods	10.8%	6.2%	Aug-19	49.0%	64.1%	28.8%
Engie SA	France	Utilities	16.4%	16.4%	Mar-19	28.9%	84.0%	7.4%
Bellway PLC	United Kingdom	Consumer Durables & Apparel	24.4%	29.6%	May-19	36.6%	97.9%	14.2%
Taylor Wimpey PLC	United Kingdom	Consumer Durables & Apparel	21.3%	37.2%	Aug-19	59.8%	96.7%	30.3%
Berkeley Group Holdings PLC	United Kingdom	Consumer Durables & Apparel	23.4%	35.3%	May-19	32.6%	98.3%	3.3%
Pennon Group PLC	United Kingdom	Utilities	37.2%	43.8%	Jul-19	89.8%	60.3%	15.6%
ConvaTec Group PLC	United Kingdom	Health Care Equipment & Services	52.4%	11.4%	Aug-19	39.6%	81.4%	81.0%
National Grid PLC	United Kingdom	Utilities	12.3%	13.7%	Oct-19	99.1%	64.3%	14.5%
Polymetal International PLC	Cyprus	Materials	38.1%	4.3%	Sep-19	31.1%	61.6%	31.5%
Ferguson PLC	United Kingdom	Capital Goods	27.7%	9.0%	Oct-19	31.3%	68.0%	87.2%
STMicroelectronics NV	Switzerland	Semiconductors & Semiconductor Equipment	72.1%	77.6%	May-19	11.8%	79.6%	16.7%
Swedish Match AB	Sweden	Food, Beverage & Tobacco	20.9%	40.6%	Oct-19	29.8%	98.7%	30.1%
Evolution Gaming Group AB (publ)	Sweden	Consumer Services	146.7%	146.7%	Mar-19	12.6%	86.8%	52.7%
DaVita Inc	United States of America	Health Care Equipment & Services	53.8%	65.4%	May-19	16.7%	76.4%	42.6%
Fidelity National Information Services Inc	United States of America	Software & Services	30.5%	4.4%	Sep-19	36.9%	95.1%	49.5%
Global Payments Inc	United States of America	Software & Services	39.5%	39.5%	Mar-19	32.3%	93.8%	61.7%
Leidos Holdings Inc	United States of America	Software & Services	62.5%	20.7%	Sep-19	47.0%	77.6%	30.6%
NVR Inc	United States of America	Consumer Durables & Apparel	33.9%	8.4%	Jul-19	34.5%	89.3%	37.6%
Newmont Corporation	United States of America	Materials	36.8%	26.4%	Jun-19	34.4%	67.6%	19.5%
PulteGroup Inc	United States of America	Consumer Durables & Apparel	42.6%	47.7%	Mar-19	4.4%	95.4%	35.5%

Single Stocks

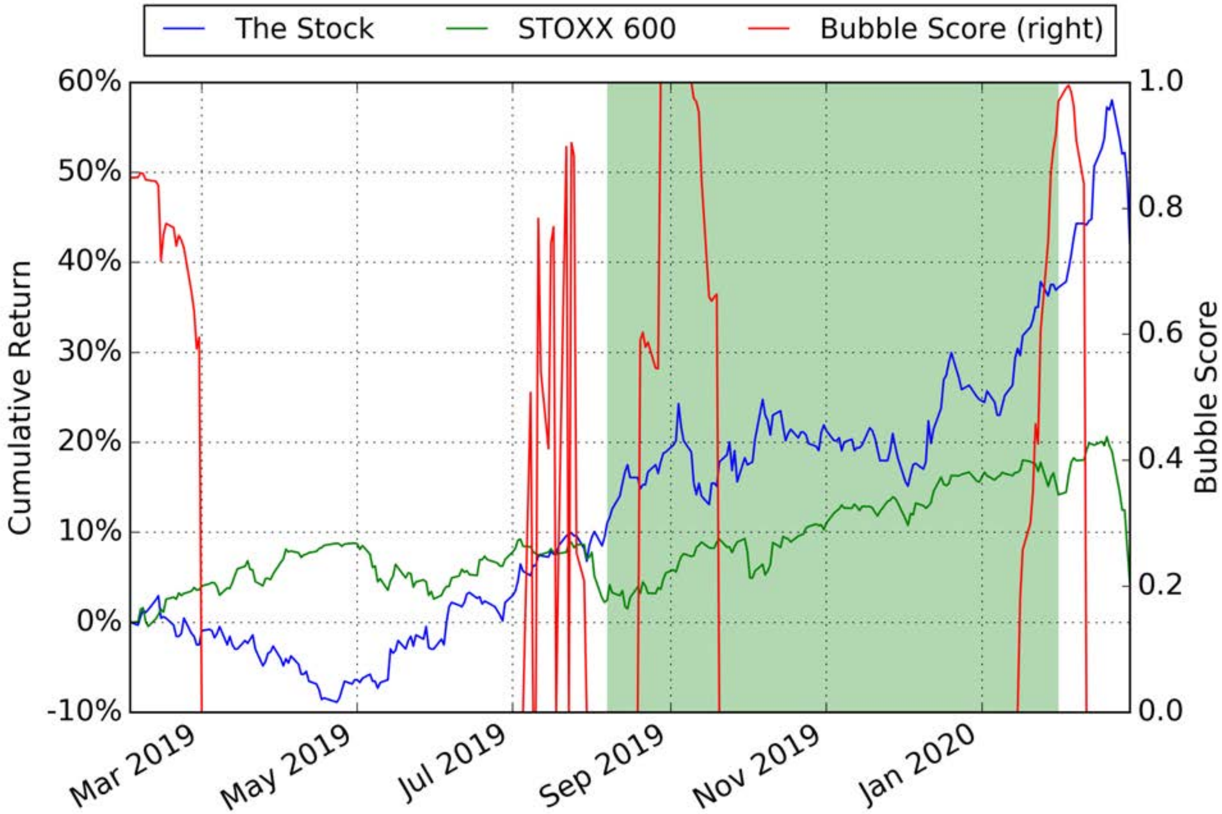
Quadrant 1 Stocks Current Month Example – National Grid PLC.



- 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 five month bubble has reached 99.1% with a bubble size 13.7%.

Single Stocks

Quadrant 1 Stocks Last Month Example – Elia System Operator SA.



- 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 regime has finished, followed by a strong correction in the past month triggered by the global market. This change of regime is in agreement with our DS LPPLS indicator, suggesting that the bubble exuberance, and also the more exogenous impact of the covid-19 epidemics, are here stronger than the fundamentals.

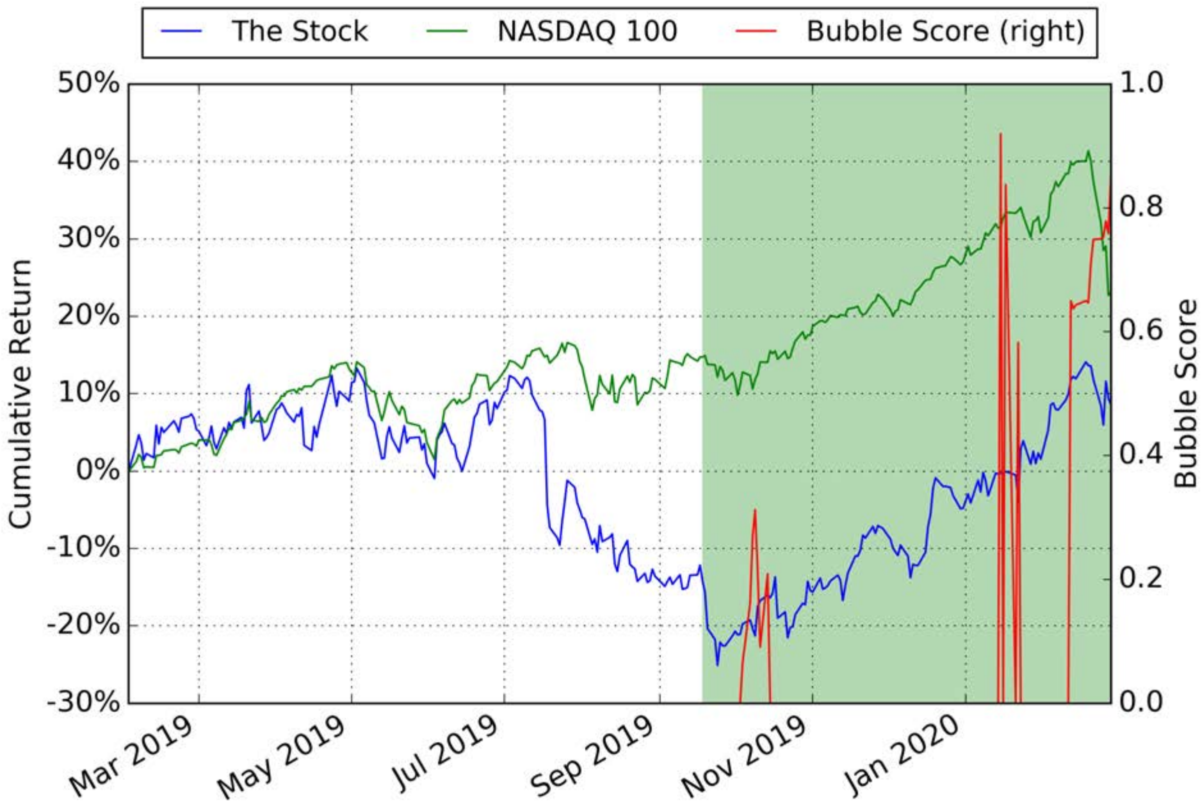
Single Stocks

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
Barry Callebaut AG	Switzerland	Food, Beverage & Tobacco	12.0%	12.0%	Mar-19	24.8%	19.4%	82.7%
Givaudan SA	Switzerland	Materials	19.1%	9.7%	Sep-19	36.5%	7.4%	19.8%
Puma SE	Germany	Consumer Durables & Apparel	40.2%	30.2%	May-19	28.9%	12.8%	74.5%
Sartorius AG	Germany	Health Care Equipment & Services	44.6%	20.0%	Aug-19	39.3%	3.5%	41.1%
Osram Licht AG	Germany	Capital Goods	25.0%	44.7%	Jul-19	27.7%	6.6%	99.1%
Symrise AG	Germany	Materials	12.1%	9.1%	Aug-19	13.4%	4.7%	87.8%
GN Store Nord A/S	Denmark	Health Care Equipment & Services	20.5%	34.8%	Sep-19	1.4%	16.7%	86.7%
Air Liquide SA	France	Materials	21.3%	11.4%	Aug-19	18.0%	23.7%	83.5%
Iliad SA	France	Telecommunication Services	44.7%	27.8%	May-19	28.0%	32.0%	96.9%
Sartorius Stedim Biotech SA	France	Pharmaceuticals, Biotechnology & Life Sciences	58.5%	34.4%	Sep-19	66.7%	5.6%	55.5%
Biomerieux SA	France	Health Care Equipment & Services	14.8%	13.1%	Sep-19	60.5%	21.2%	47.8%
Severn Trent PLC	United Kingdom	Utilities	20.7%	18.5%	Jul-19	44.3%	32.3%	11.1%
Kerry Group PLC	Ireland; Republic of	Food, Beverage & Tobacco	21.7%	9.2%	Jun-19	27.5%	28.3%	72.0%
Kingspan Group PLC	Ireland; Republic of	Capital Goods	34.7%	32.7%	Sep-19	73.8%	31.8%	34.4%
Amplifon SpA	Italy	Health Care Equipment & Services	58.2%	25.2%	Jul-19	11.6%	18.5%	68.2%
Activision Blizzard Inc	United States of America	Media & Entertainment	35.4%	28.1%	Jun-19	32.4%	28.9%	51.2%
Adobe Inc	United States of America	Software & Services	32.3%	24.3%	Sep-19	55.2%	7.3%	84.4%
Charter Communications Inc	United States of America	Media & Entertainment	44.6%	20.0%	Sep-19	31.0%	24.6%	39.2%
Lamb Weston Holdings Inc	United States of America	Food, Beverage & Tobacco	23.8%	11.6%	Oct-19	28.3%	17.4%	60.7%
Lululemon Athletica Inc	Canada	Consumer Durables & Apparel	49.6%	17.2%	Aug-19	18.0%	4.4%	54.4%
Mercadolibre Inc	Argentina	Retailing	28.0%	14.1%	Sep-19	27.8%	0.0%	77.6%
Microsoft Corp	United States of America	Software & Services	43.6%	21.2%	Aug-19	33.2%	26.2%	33.5%
Netflix Inc	United States of America	Media & Entertainment	2.8%	38.8%	Sep-19	85.2%	0.3%	28.6%
NVIDIA Corp	United States of America	Semiconductors & Semiconductor Equipment	67.6%	83.3%	May-19	41.9%	11.6%	35.9%
Resmed Inc	United States of America	Health Care Equipment & Services	56.8%	17.7%	Sep-19	33.3%	15.0%	65.1%
ServiceNow Inc	United States of America	Software & Services	36.0%	26.6%	Sep-19	59.4%	1.2%	56.0%
Tesla Inc	United States of America	Automobiles & Components	129.6%	186.7%	Oct-19	30.2%	1.6%	45.2%

Single Stocks

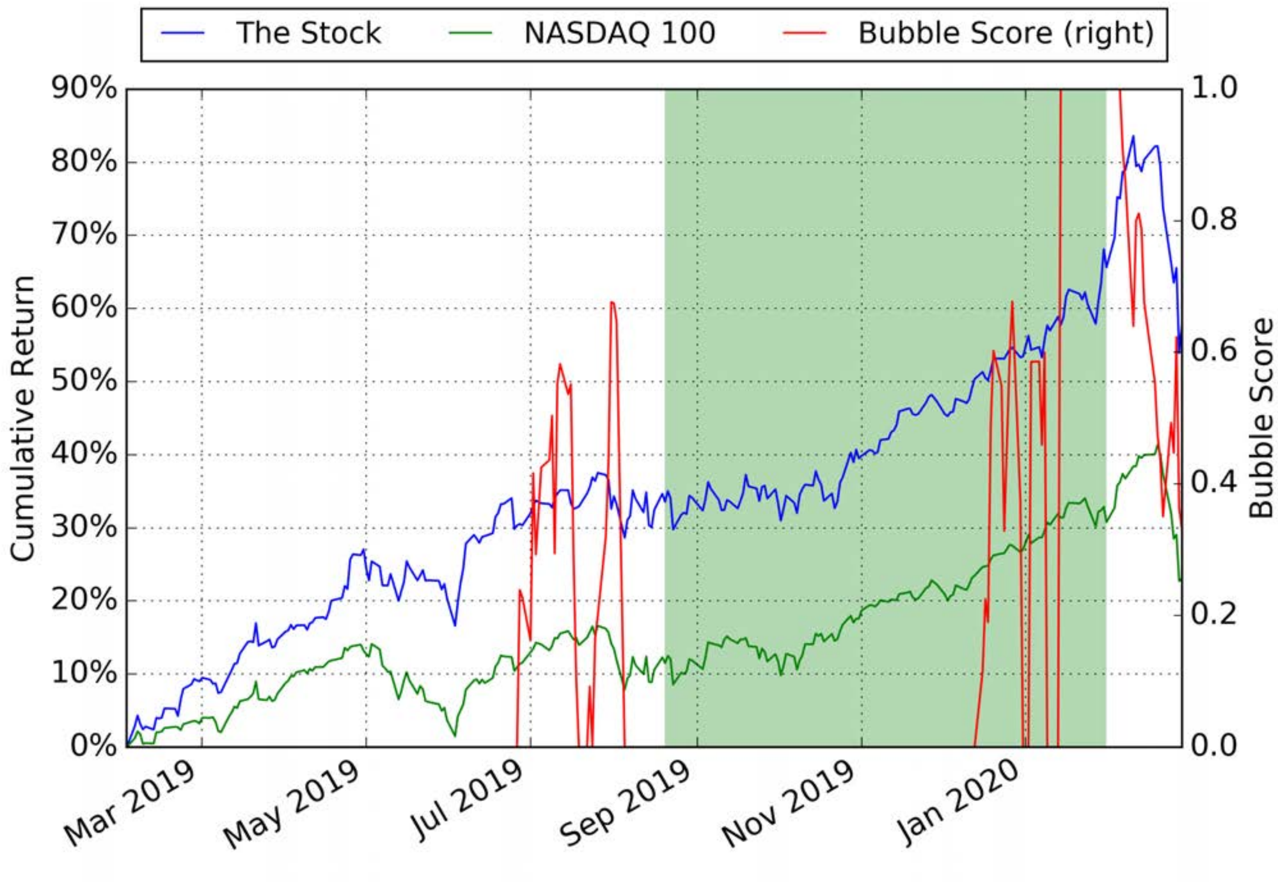
Quadrant 2 Stocks Current Month Example – Netflix Inc.



- The above graph shows the one year cumulative return of the stock in blue (left hand scale), NASDAQ 100 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 six month bubble has reached 85.2% with a bubble size 38.8%. The strong positive bubble signals and weak fundamentals indicate a high probability of continuing correction in the future.

Single Stocks

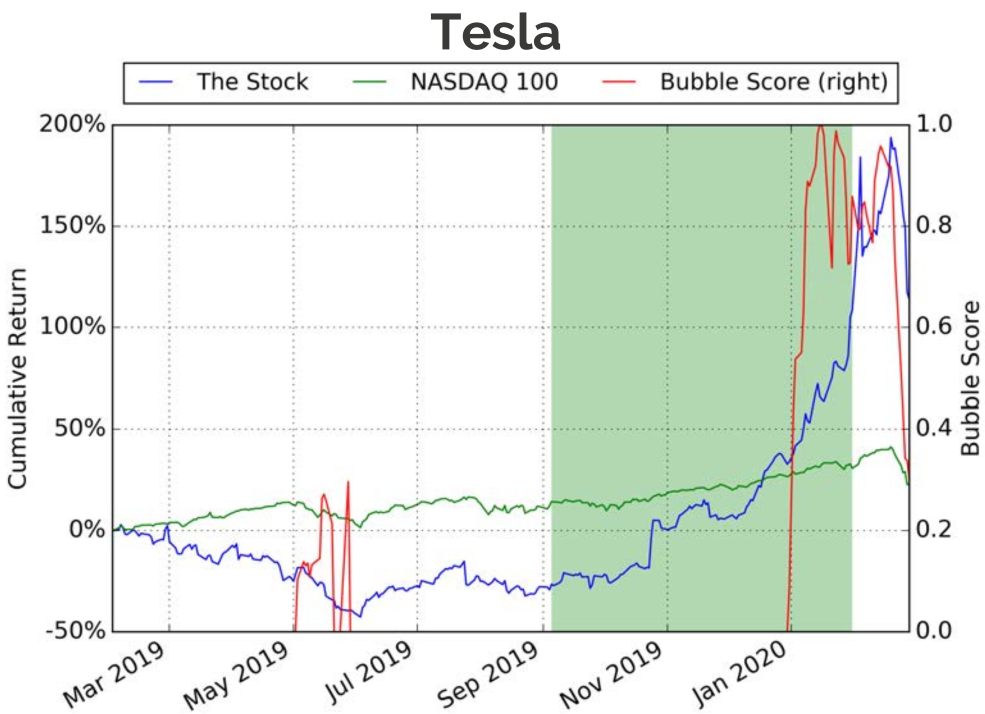
Quadrant 2 Stocks Last Month Example – Microsoft Corp.

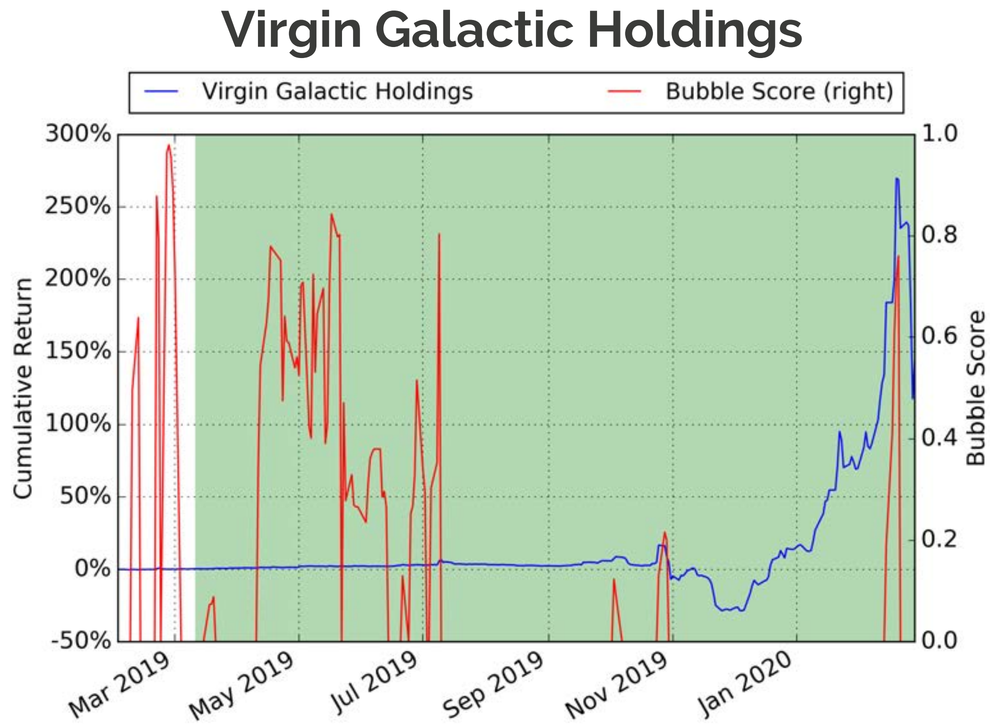


- The figure above plots the one year cumulative return of the stock (blue), NASDAQ 100 (green) and LPPLS Bubble Score (red lines on the right y-axis). The green shaded period delineates the time interval within which the strong positive bubble was identified and reported last month. The stock had a 20% drawdown in the past month after creating a new high at early Feb. The slump of the market triggered the correction of this stock, which is in agreement with our LPPLS Bubble Indicator.

Single Stocks

Quadrant 2 Stocks Last Month Example – Tesla Corp.





- The figure at the upper left plots the one year cumulative return of the stock (blue), NASDAQ 100 (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. The stock price started a strong correction first after reaching $960 on Feb 4, then created a new high on Feb 19 before a real correction of 25%+ in the end of Feb, which is in agreement with our LPPLS Bubble Indicator and the weak fundamentals.
- We show an amplified version of the Tesla bubble at the upper right panel: Virgin Galactic Holdings. This Richard Branson and Chamath Palihapitiya's space company has reached more than 300% stock returns in this year, and just busted (partially) its bubble in the recent two weeks by a halving of its price.

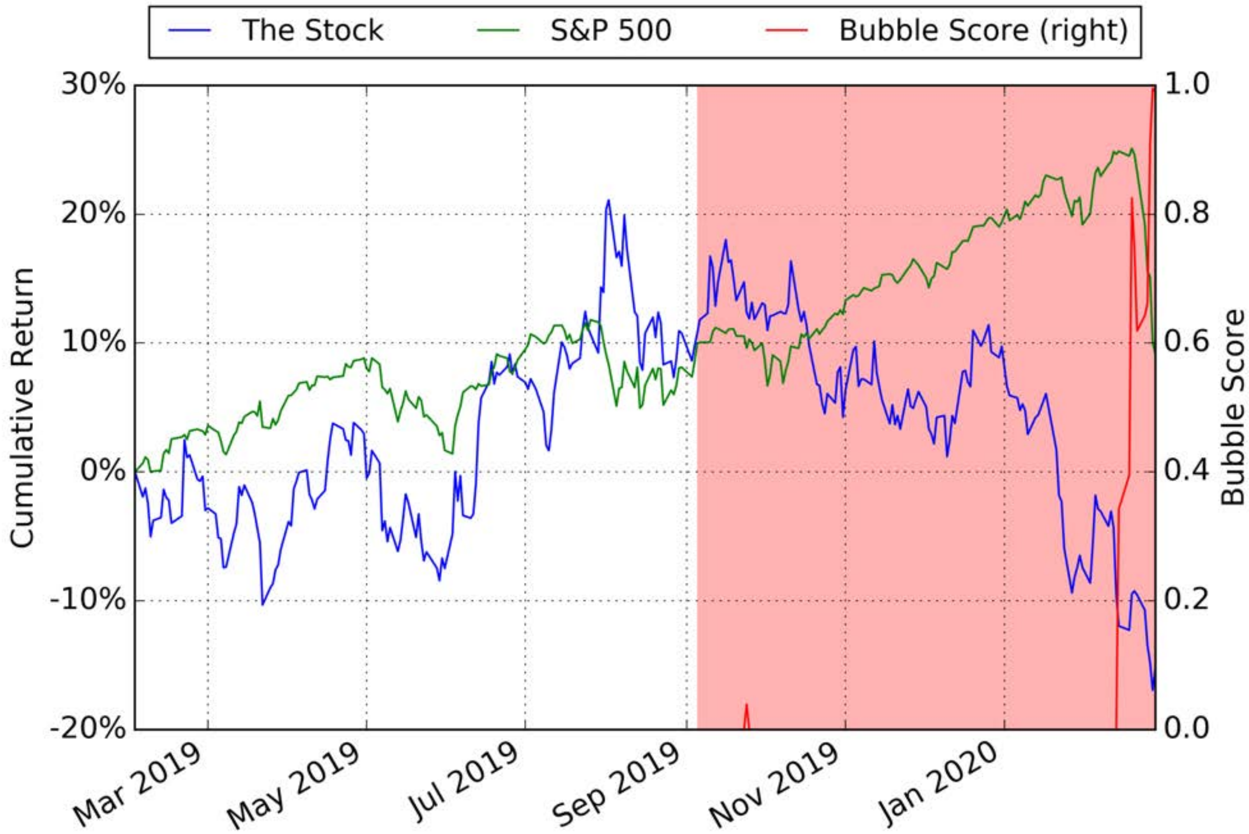
Single Stocks

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
Telenet Group Holding NV	Belgium	Media & Entertainment	-14.7%	-23.9%	Apr-19	-12.5%	6.4%	78.0%
Flughafen Zuerich AG	Switzerland	Transportation	-17.6%	-22.4%	Jun-19	-19.1%	35.8%	72.4%
Remy Cointreau SA	France	Food, Beverage & Tobacco	-21.5%	-27.6%	Oct-19	-63.7%	9.6%	20.8%
Ipsen SA	France	Pharmaceuticals, Biotechnology & Life Sciences	-51.8%	-36.1%	Sep-19	-83.7%	37.5%	26.0%
Rolls-Royce Holdings PLC	United Kingdom	Capital Goods	-29.0%	-29.0%	Mar-19	-8.3%	2.1%	9.0%
Koninklijke KPN NV	Netherlands	Telecommunication Services	-20.6%	-19.1%	Aug-19	-70.7%	26.0%	94.1%
CF Industries Holdings Inc	United States of America	Materials	-11.1%	-27.4%	Sep-19	-98.9%	8.1%	74.7%
Exxon Mobil Corp	United States of America	Energy	-35.5%	-27.5%	Sep-19	-48.2%	28.8%	67.6%
Williams Companies Inc	United States of America	Energy	-30.4%	-24.2%	Jul-19	-23.5%	22.4%	15.2%

Single Stocks

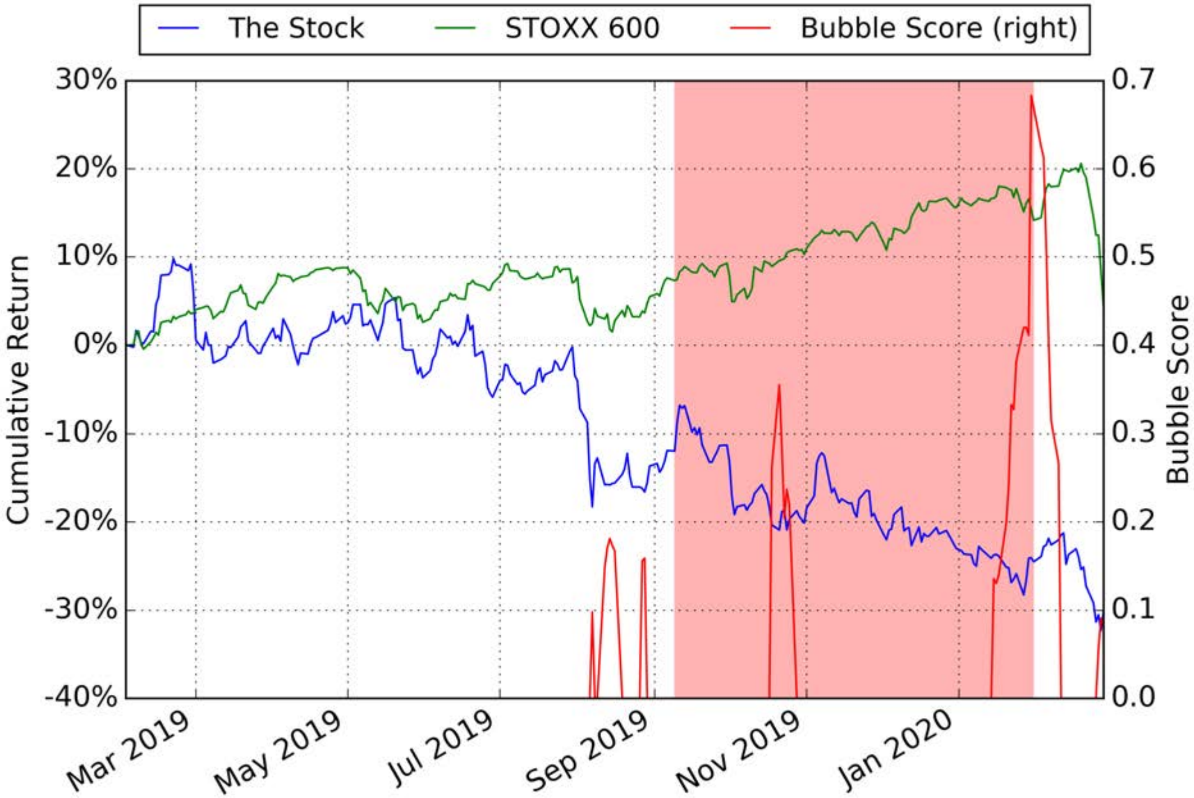
Quadrant 3 Stocks Current Month Example – CF Industries Holdings Inc.



- 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 red shaded period delineates the time interval within which the negative bubble is identified. The Bubble Score of this six month bubble has reached 98.9% with a bubble size -27.4%.

Single Stocks

Quadrant 3 Stocks Last Month Example – Rolls-Royce Holdings PLC.



- The figure above plots the one year cumulative return of the stock (blue), STOXX 600 (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 followed the market's drawdown after a small correction at the beginning of Feb. This recent drawdown might contribute to a larger negative bubble and shall deserve continued attention in the following month.

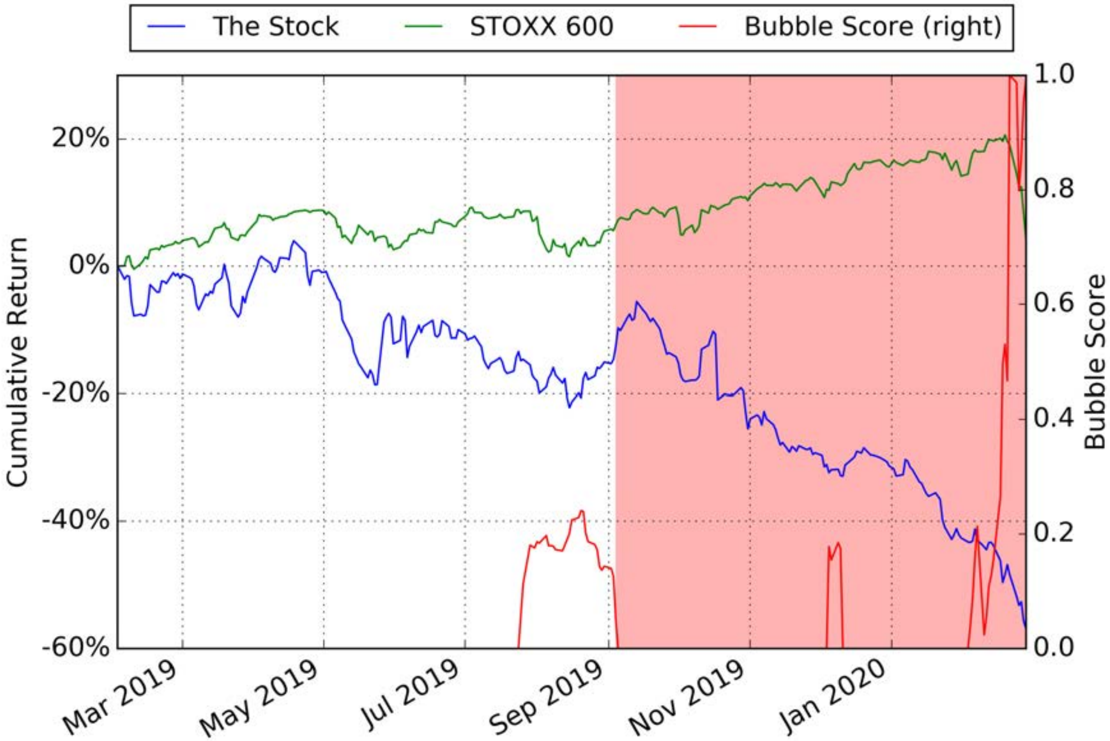
Single Stocks

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
Fraport AG Frankfurt Airport Services Worldwide	Germany	Transportation	-19.5%	-24.6%	Aug-19	-45.6%	61.2%	11.7%
Covestro AG	Germany	Materials	-29.1%	-23.2%	Sep-19	-37.2%	90.9%	37.2%
ACS Actividades de Construccion y Servicios SA	Spain	Capital Goods	-30.6%	-24.0%	Sep-19	-21.3%	92.3%	34.1%
Peugeot SA	France	Automobiles & Components	-18.8%	-26.1%	Sep-19	-54.1%	99.5%	98.2%
Renault SA	France	Automobiles & Components	-54.9%	-52.2%	Sep-19	-99.4%	70.4%	99.9%
Eutelsat Communications SA	France	Media & Entertainment	-27.9%	-27.3%	Sep-19	-42.2%	73.7%	23.0%
Pearson PLC	United Kingdom	Media & Entertainment	-32.1%	-24.6%	Sep-19	-41.0%	85.8%	6.1%
BP PLC	United Kingdom	Energy	-26.0%	-21.9%	Aug-19	-19.8%	75.9%	6.0%
TechnipFMC PLC	United Kingdom	Energy	-31.2%	-40.0%	Aug-19	-48.3%	93.4%	99.0%
Eni SpA	Italy	Energy	-26.2%	-19.5%	Sep-19	-77.1%	86.7%	93.8%
Polski Koncern Naftowy Orlen SA	Poland	Energy	-42.9%	-37.9%	Sep-19	-73.7%	96.1%	98.8%
H & R Block Inc	United States of America	Consumer Services	-16.9%	-18.1%	Apr-19	-1.2%	91.1%	2.7%
HollyFrontier Corp	United States of America	Energy	-32.7%	-37.4%	Sep-19	-29.2%	88.7%	13.0%
United Airlines Holdings Inc	United States of America	Transportation	-25.2%	-25.9%	Sep-19	-45.9%	93.9%	14.8%

Single Stocks

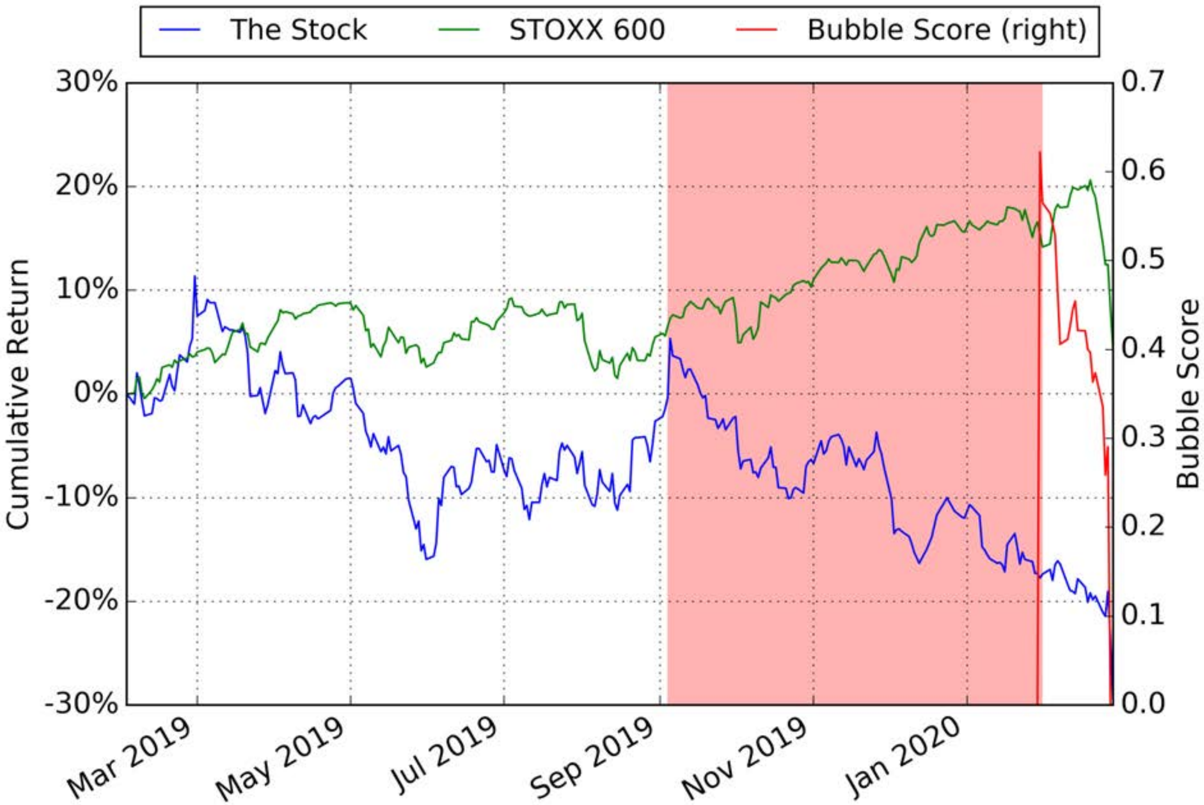
Quadrant 4 Stocks Current Month Example – Renault SA.



- 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 99.4% with a bubble size -52.5%. 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 – Dassault Aviation SA.



- The figure above plots the one year cumulative return of the stock (blue), STOXX 600 (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 continued to drawdown in the past month with less amplitude than the market's slump. We expect this stock to rebound in the future due to our diagnostic of a negative bubble signal with strong fundamentals, calling for a contrarian buyer position.

More Information

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

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

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- Contact **Systematic Investment Management AG** for practical implementation in investment portfolios

  https://www.simag.com/

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