The FCO Cockpit
Global Bubble Status Report

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About

The Financial Crisis Observatory (FCO) monthly report discusses the historical evolution of bubbles in and between different asset classes and geographies.

It 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.

In the first part of this report, we present the state of the world, based on the analysis of the systemic assets. In the second part, we zoom in on the bubble behavior of single stocks and discuss some specific cases.

For an intuitive explanation of the methodology and the specifics of the indicators that are used in this report, we refer to: D. Sornette and P. Cauwels, Financial bubbles: mechanisms and diagnostics. Review of Behavioral Economics 2 (3), 279- 305 (2015)
http://arxiv.org/abs/1404.2140 and http://ssrn.com/abstract=2423790

Methodology

We use the Log-Periodic Power Law Singularity (LPPLS) model to hunt for the distinct fingerprint of Bubbles:

1. Price rises faster than exponentially, therefore the logarithm of the price rises faster than linearly;

2. There are accelerating oscillations, with a distinct characteristic.

Starting Nov 2017, we have a major upgrading of our LPPLS bubble warning signals. The new method significantly increases the prediction power of the signal, and better normalizes the signal values. A bubble signal is identified if our new bubble indicator is larger than 0%. Bubble Size is the cumulative return since the starting point of the bubble we identified.
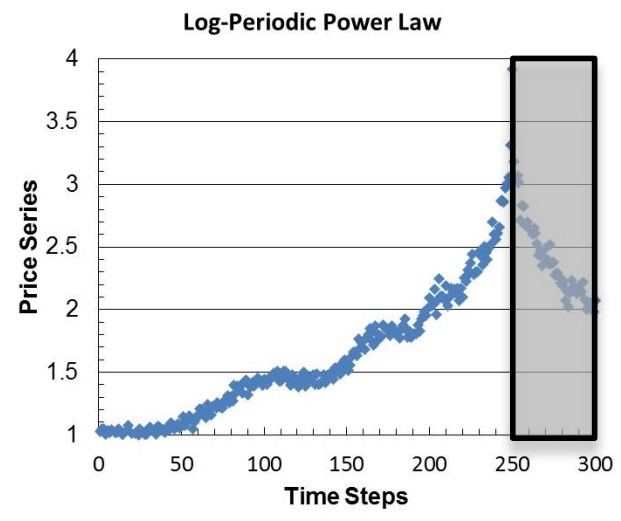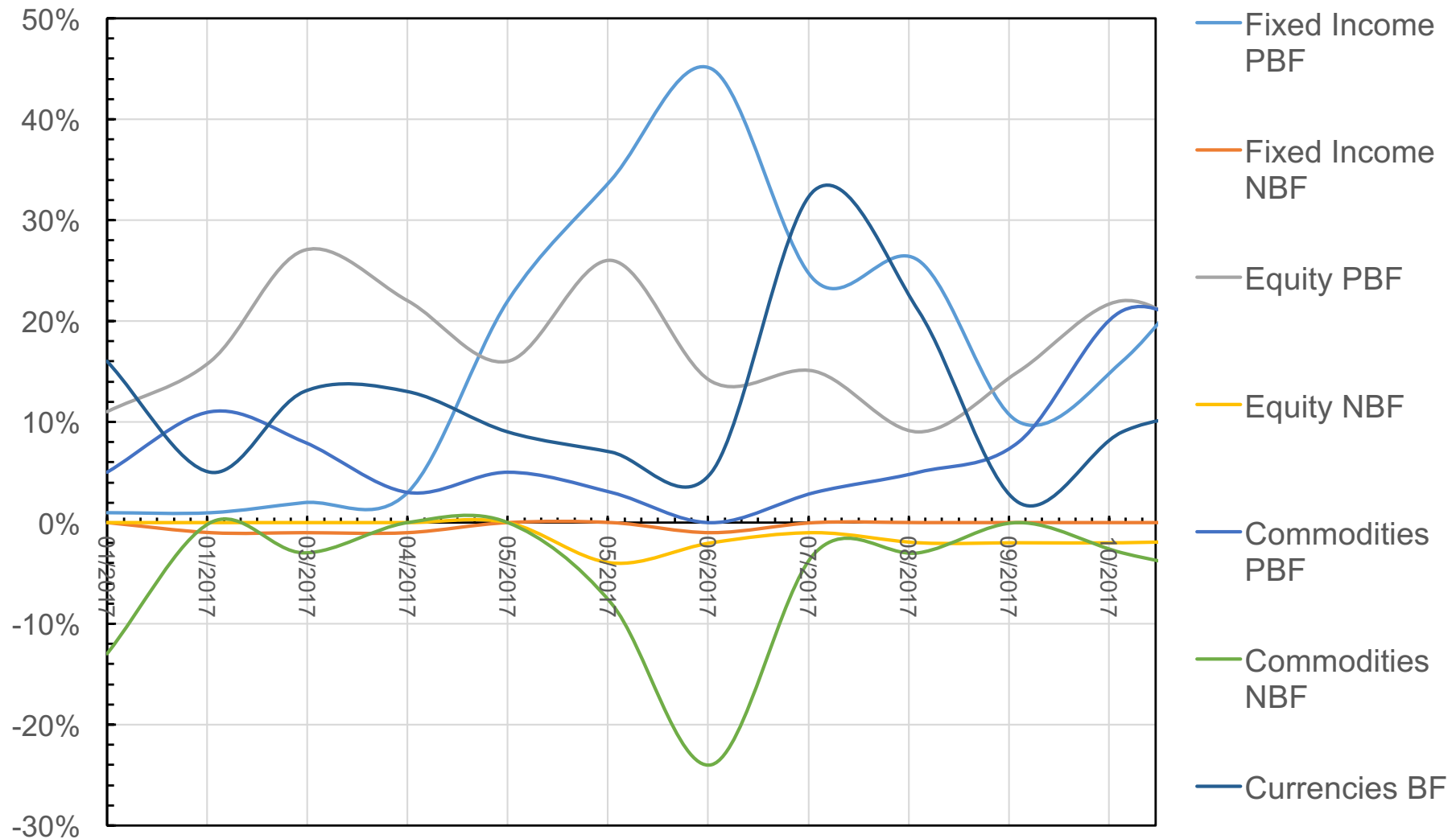

Positive bubble: imitation in **buying**
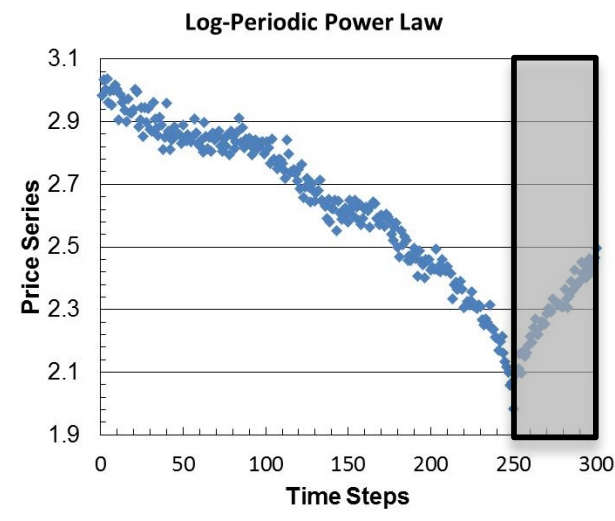
Negative bubble: imitation in **selling**

Announcement:

Coming this month are new improvements to the currency section of this report. Instead of analyzing directly the currency cross rates, the bubble analysis is performed on real effective exchange rate indices. Additionally, a principal component analysis on major currency pairs is carried out. More details on these methods can be found on the corresponding slides. Furthermore, a new cryptocurrency section focusing on Bitcoin and Ethereum is added to the report.

General Results – The Big Picture

Historical evolution of the fraction of assets within an asset class that show significant bubble signals

Legend: Fixed Income PBF, Fixed Income NBF, Equity PBF, Equity NBF, Commodities PBF, Commodities NBF, Currencies BF

General Results – This Month's Overview

Asset Class	Subtype	Analyzed Assets	FPB	FNB
Fixed Income		**155**	**28%**	**0%**
	Government Bonds	55	20%	0%
	Finance and Insurance	21	33%	0%
	Corporate Bonds	79	32%	0%
Equity		**169**	**18%**	**2%**
	Country Indices	73	16%	3%
	Europe	36	0%	0%
	United States	60	30%	2%
Commodities		**38**	**18%**	**5%**
Forex		**111**	**10%**	

FPB – Fraction of assets in asset class showing positive bubble signals,
FNB – Fraction of assets in asset class showing negative bubble signals

In November, Fixed Income is still led by bubble activity in the Financial and Insurance corporate bond sector. Moreover, the fractions of positive bubbles in the other corporate bond sectors have also risen remarkably. Negative bubble signals are still at zero amongst all bond indices.

For equities, positive bubble signals have decreased in number and negative bubble signals remain low. In the S&P500 sub-indices, this month, increased positive bubble activity could be determined while the total bubble activity in European Equities has decreased to zero.

Commodities remain at approximately the same fractions of bubbles as in the beginning of November.

In the forex section, about ten percent of all assets show bubble signs.

Fixed Income - Government Bonds

Name	YOY-Return	Bubblesize	DS LPPL Confidence
iBoxx EUR Slovakia Index	2%	2%	67%
iBoxx EUR Finland Index	1%	2%	53%
iBoxx GEMX Hungary Index	7%	6%	43%
iBoxx EUR Italy Index	3%	4%	30%
iBoxx EUR Ireland Index	2%	3%	16%
iBoxx GEMX Colombia Index	11%	8%	16%
iBoxx EUR Spain Index	2%	3%	11%
iBoxx GEMX Russia Index	12%	10%	2%

During the previous month, positive bubble activity has slightly risen from 16% to 20% within the government bond index class. Signals for bubble formation are identified in several indices, however at low bubble sizes, which indicates the potential continuous formation of positive bubbles amongst these assets. The GEMX Brazil and Kenya Indices mentioned in the previous report have vanished from the list, as the indices time series have experienced sidewards, flattening movements during November. Positive bubble signals in the iBoxx Thailand Government Index, which were identified during the past few month have vanished, as well, due to sidewards corrections of the index score. The negative bubble fraction is still at zero percent.

Results per Asset Class

Fixed Income - Corporate Bonds

Name	YOY-Return	Bubblesize	DS LPPL Confidence
iBoxx EUR Sovereigns Index	2%	3%	99%
iBoxx EUR Consumer Goods Index	3%	2%	41%
iBoxx USD Oil & Gas Producers Index	8%	4%	38%
iBoxx EUR Oil & Gas Index	4%	3%	37%
iBoxx EUR Travel & Leisure Index	3%	3%	30%
iBoxx EUR Retail Index	2%	2%	28%
iBoxx EUR Chemicals Index	2%	2%	26%
iBoxx EUR Media Index	3%	2%	24%
iBoxx EUR Basic Resources Index	4%	3%	22%
iBoxx EUR Technology Index	2%	2%	21%

Overall, the fraction of postive bubbles within the Corporate Bond Index Class has notably risen 2.5-fold during November. A recent sharp rise in the EUR Sovereigns Index has catapulted it to the top of the list of positive bubble signals. As pointed out last month, Oil indices still exhibit positive bubble characteristics. However, all obtained signals are accompanied by low bubble sizes, which mitigates the severity of the signals. The EUR Automobiles & Parts index, which had only been identified at a low bubble size has disappeared from the list, again. As in the other subclasses of the fixed income sector, and as in the previous month, no negative bubbles are detected in the 79 analyzed corporate bond indices.

Results per Asset Class

Fixed Income – Financial and Insurance Sectors

Name	YOY-Return	Bubblesize	DS LPPL Confidence
iBoxx EUR Financial Services Index	2%	2%	29%
iBoxx EUR Financial Services Senior Index	2%	2%	28%
iBoxx EUR Insurance Senior Index	3%	3%	22%
iBoxx EUR Banks Index	3%	1%	19%
iBoxx EUR Banks Senior Index	2%	1%	17%
iBoxx EUR Banks Subordinated Index	6%	3%	15%
iBoxx EUR Insurance Subordinated Index	13%	13%	13%

The Financial and Insurance Corporate Bond Sector, with a positive bubble fraction of 33% within the Fixed Income asset class, again shows the highest bubble activity. Within the class, European Financial Services Indices are still amongst the top assets exhibiting positive bubble properties. Compared to the previous month, the indicator values have risen by several percent, strengthening the diagnostic of bubble formation in those sectors. Bubble Sizes are nevertheless small, except in the case of the iBoxx Insurance Index.

Results per Asset Class

Equities - Country Performance

Name	YOY-Return	Bubblesize	DS LPPL Confidence
Positive Bubbles			
NASDAQ Composite Index	23%	10%	76%
New Zealand Se Top50 Free Index	20%	11%	46%
Swiss Market Index	13%	13%	33%
Johannesburg Stock Exchange All Share Index	15%	8%	26%
Bursatil Index	4628%	4142%	23%
Jakarta SE Composite Index	17%	7%	22%
FTSE China 25 Index	28%	16%	15%
PFTS Index	15%	10%	11%
TOPIX Stock Price Index	14%	14%	10%
Negative Bubbles			
FTSE Bursa Malaysia KLCI Index	5%	-4%	53%
Qatar Exchange General Index	-25%	-25%	34%

The equities country sector shows positive and negative bubble fractions of 16% and 3%, at the start of this month. As predicted in the previous month, Shenzhen's SZSE 100 Index has undergone a correction of about 8% downwards in the meantime. Bubble activity had previously (Nov) been identified at an indicator level of 100% with a corresponding estimated bubble size of 25%. Likewise, the Vietnam Index has undergone a correction, that was also predicted at 100% confidence. So far, however, the index has only declined by about 5%, which indicates that the identified bubble (bubble size 19% at Nov 01) might not yet be completely terminated. The Ukrainian PFTS Index, which was also detected at 100% DS LPPL confidence, has continued to increase up to now, which is why the index still appears in the positive bubble list, at a slightly larger bubble size than in the previous month. The Qatar Exchange Index has continued its down phase, strengthening the assumption of a negative bubble. Interesting newcomers to the list are the NASDAQ composite and the Swiss Market Index, which both have continuously grown during 2017.

Results per Asset Class

Equities - United States and Europe

Name	YOY-Return	Bubblesize	DS LPPL Confidence
Positive Bubbles			
S&P 500 -Real Estate Management & Development (Industry)	36%	27%	65%
S&P 500 Air Freight & Logistics (Industry)	10%	16%	38%
S&P 500 - Commercial Services & Supplies (Industry)	14%	10%	35%
S&P 500 Technology Hardware, Storage & Peripherals (Industry)	41%	26%	34%
S&P 500 Multi-Utilities (Industry)	13%	9%	27%
S&P 500 Banks (Industry)	17%	18%	25%
S&P 500 Containers & Packaging (Industry)	14%	11%	21%
S&P 500 Communications Equipment (Industry)	19%	17%	17%
S&P 500 Insurance (Industry)	14%	11%	14%
Negative Bubbles			
S&P 500 Industrial Conglomerates (Industry)	-11%	-10%	6%

In contrast to the previous report, signals in European Equities indices have relaxed. Only assets in the US market are identified to be in a bubble state at the beginning of December. The positive bubble fraction in the US section has even increased to 30%, while still low negative bubble activity is observed. Several major bubbles are identified in the S&P 500 sub-indices, for instance in the Real Estate Management & Development, as well as the Technology Hardware Indices. These bubbly constituents of the S&P500, amongst others, constitute some of the core components that caused the strong growth of the S&P500 during 2017. The large fraction of positive bubble state assets at the end of 2017 confirms that indeed the US market might have grown at an abnormal rate in certain areas this year. It could therefore be prone to corrections in the coming months.

Results per Asset Class

Commodities

Name	YOY-Return	Bubblesize	DS LPPL Confidence
Positive Bubbles			
Crude Oil ER Index	-2%	23%	69%
Palladium ER Index	49%	17%	64%
Petroleum ER Index	5%	31%	61%
Energy ER Index	2%	25%	43%
Brent Crude ER Index	8%	32%	31%
Heating Oil ER Index	10%	29%	23%
Gasoil ER Index	12%	28%	13%
Negative Bubbles			
Robsta Coffee ER Index	-18%	-15%	58%
Natural Gas ER Index	-31%	-18%	36%

Commodities show slightly increased positive and about constant negative bubble activity this month. The Palladium Index, which was on our radar already during the previous months, has grown to even higher levels during November, marking 5-year highs one after another and leading to a year over year return of nearly 50% by now. This development, as well as the increasing returns over time, strongly indicate the existence of a positive price bubble, which is supported by the fact that the value of the DS LPPL confidence indicator has tripled compared to last month's value. As already recognized in November's report, Oil-related indices show positive bubble signs for the second consecutive month now. Indicator values for crude oil have risen during this time. The negative bubble in Natural gas identified in November still prevails, at about the same bubble size and indicator value.

Results per Asset Class

Currencies

Name	YOY-Return	Bubblesize	DS LPPL Confidence
Positive Bubbles			
REER Index Bulgaria	4%	2%	43%
REER Index Thailand	4%	4%	32%
REER Index Czech Republic	9%	5%	19%
Negative Bubbles			
REER Index Australia	-5%	-10%	100%
REER Index New Zealand	-3%	-6%	46%
REER Index Hungary	2%	-3%	46%
REER Index Turkey	-7%	-6%	40%
REER Index Colombia	-4%	-2%	29%
REER Index Indonesia	-5%	-5%	14%
REER Index Vietnam	-10%	-8%	4%

Newly, 98 Real Effective Exchange Rate (REER) Indices for different currencies are investigated for bubble characteristics. The (here CPI-weighted) REER Indices data are a measure for the trading competitiveness of the corresponding country. In contrast to single currency cross rates, the REER is a rather absolute measure of the domestic currency value because it is calculated versus a selection of other currencies. This has the advantage that, unlike with the methodologies that were used in previous reports, positive and negative bubbles in the value of the currency can clearly be distinguished, as visible in the table above.

This month, the Bulgarian Lev and Australian Dollar REER Indices show a strong positive, respectively, a negative signals. For the AUD, this stemps from sharp recent declines in the index value, associated with an estimated negative bubble size 10%.

Results per Asset Class

Currencies – PCA

	AUD	CHF	CNY	EUR	GBP	HKD	INR	JPY	RUB	USD	BTC
Explained Variance	32%	24%	23%	22%	30%	26%	16%	35%	43%	18%	99,50%

Name	YOY-Return	Bubblesize	DS LPPL Confidence
BTC PC1	214895%	7714%	94%

As an alternative method to generate a base currency time series from a variety of the currency's cross rates, we apply a principal component analysis (PCA). In total, for the 10 major currencies - and the Bitcoin - that are listed in the first table above, about 1400 currency cross pairs are analyzed. For each currency, more than 100 cross rates (and about 10 for BTC) are grouped into a dataset, which is then condensed down into a single time series that is assembled according to the weights of the first principal component (PC1) of the dataset and is used as an equivalent representation of the currency cross rates.

More precisely, taking the Swiss franc as a base currency for instance, we consider N=100 currency crosses expressing how much the Swiss franc is valued in these N other currencies. Constructing the corresponding returns, this yields N time series of returns for the base currency (Swiss franc) valued in N other currencies. We then perform a PCA analysis on these N time series and the corresponding PC1 represents the common factor explaining the most the variances of the returns of these N time series. It is interpreted as the embodiment of the real Swiss franc dynamics, filtering out the impact of the other currencies. The LPPLS algorithm is then applied to this equivalent time series.

The first table depicts the percentage of total variance in the dataset that can be explained by the PC1, according to its corresponding eigenvalue magnitude. A high explained variance means that most of the crosses of the base currency with other currencies move in a correlated way, which can be interpreted as reflecting a common factor, namely the base currency intrinsic value dynamics. The second table shows the bubble results identified by applying the LPPLS analysis to the PC1 time series of each base currency. Only Bitcoin shows large magnitudes of both the explained variance, as well as the DS LPPL confidence. Note that the YOY-return of rhe PC1 series is not representative of the real YOY-return of the Bitcoin.

Results per Asset Class

Currencies – Cryptocurrencies

Name	YOY-Return	Bubblesize	DS LPPL Confidence
BTC/USD	1016%	200%	76%

The third extension introduced for this month report, in response to various requests by readers, is the introduction of a cryptocurrency section. The section looks quite sparse, so far, because currently, only two currency pairs, BTC/USD and ETH/USD, are being analyzed, due to lack of exchange rate data. The analysis of more cryptocurrencies is in preparation.

In this direct analysis of the cross rate time series, the confidence indicator shows a lower, but still significantly large value for BTC, compared to the result for its PC1 time series presented in the previous slide. The two results in combination confirm that bubble signals can consistently be detected for the BTC under different measures.

The ETH/USD currency pair did not show any bubble signal this month. Ethereum has undergone a sideward movement during the past few months, and only recently appreciated again, responding to the surge of Bitcoin.

Single Stocks

For 806 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.

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.

The two financial strength indicators are:

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;

A growth score that has characteristics similar to the PEG ratio, which is the Price to Earnings ratio normalized for expected EPS-growth (Earnings per Share).

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.

We upgrade the calculation method of the value score, which takes into account the ROIC heterogeneity among different industries.

Single Stocks

The four quadrants: value versus bubble score
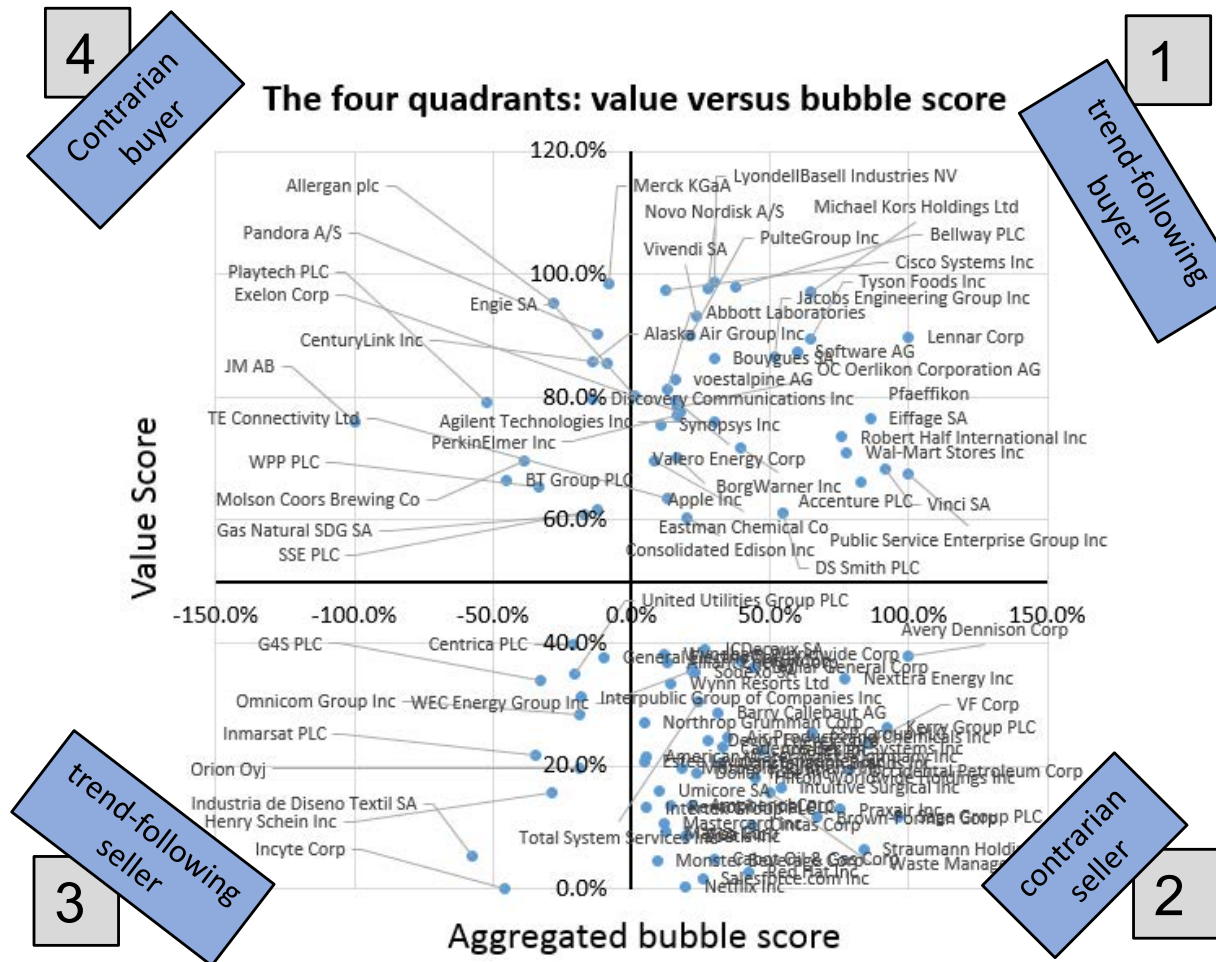
By plotting the value score against the aggregated bubble score, we can divide the stocks into four quadrants*:

1. Quadrant 1: Stocks with a strong positive bubble score and a strong value score (e.g. Lennar Corp);

2. Quadrant 2: Stocks with a strong positive bubble score and a weak value score (e.g. Red Hat Inc);

3. Quadrant 3: Stocks with a strong negative bubble score and a weak value score (e.g. G4S PLC);

4. Quadrant 4: Stocks with strong negative bubble score and a strong financial strength (e.g. JM AB)

*A strong positive bubble signal is identified if bubble score is larger than 10%, and a strong negative bubble signal is identified if bubble score is smaller than -10%. 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

Each quadrant has its own specs:

1. 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.

2. 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.

3. 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.

4. 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.
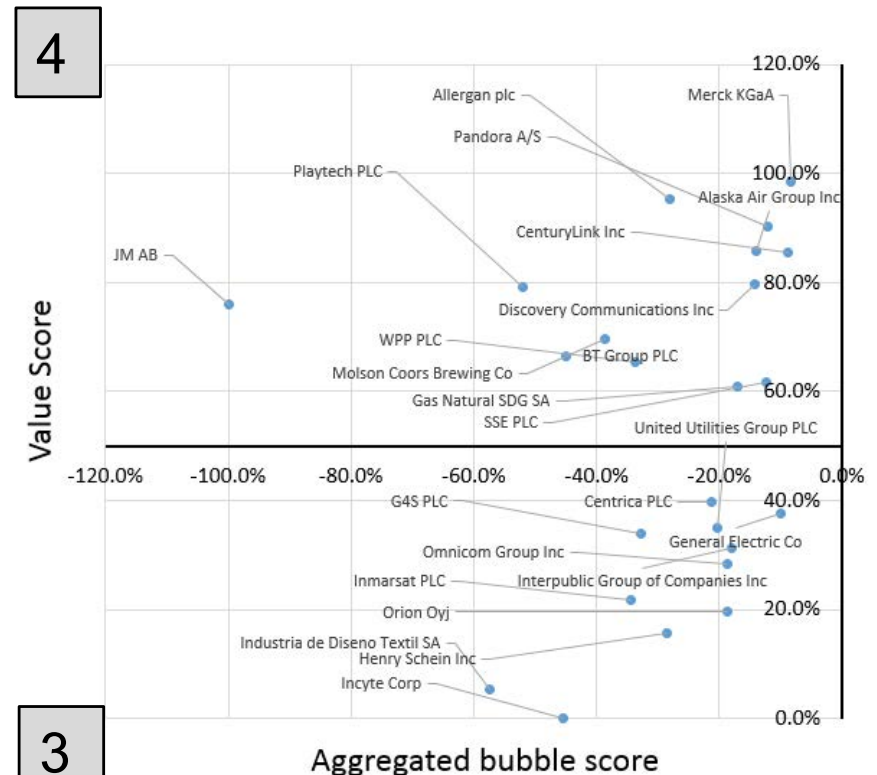
Single Stocks

Quadrant 1 and 2 stocks

Strong positive bubble signals with strong (respectively weak) fundamentals

Single Stocks

Quadrant 3 and 4 stocks

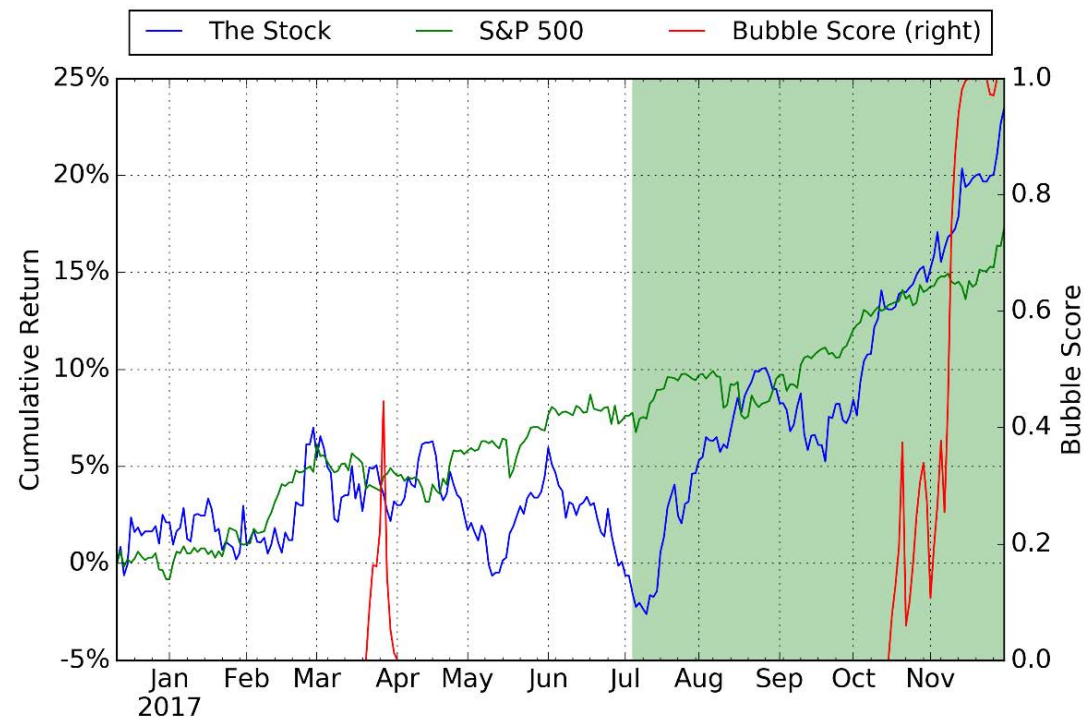Strong negative bubble signals with weak respectively strong fundamentals

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
Apple Inc	United States of America	Technology Hardware & Equipment	49.2%	28.9%	Feb-17	16.5%	70.1%	36.4%
Cisco Systems Inc	United States of America	Technology Hardware & Equipment	22.5%	18.9%	May-17	12.6%	97.3%	42.4%
Synopsys Inc	United States of America	Software & Services	50.7%	25.1%	May-17	10.5%	75.4%	39.8%
Bellway PLC	United Kingdom	Consumer Durables & Apparel	43.5%	38.9%	Jan-17	37.6%	97.9%	18.9%
Software AG	Germany	Software & Services	39.9%	20.9%	Jun-17	59.6%	87.3%	29.8%
Novo Nordisk A/S	Denmark	Pharmaceuticals, Biotechnology & Life Sciences	30.1%	37.4%	Mar-17	27.8%	97.5%	52.5%
Vinci SA	France	Capital Goods	35.5%	11.4%	Jul-17	91.4%	68.2%	9.9%
Engie SA	France	Utilities	22.2%	16.7%	Mar-17	1.5%	80.3%	1.6%
Bouygues SA	France	Capital Goods	30.2%	11.8%	Apr-17	29.8%	86.4%	10.9%
Vivendi SA	France	Media	23.7%	26.5%	Mar-17	23.5%	93.2%	53.3%
Eiffage SA	France	Capital Goods	43.8%	13.3%	Jul-17	86.0%	76.4%	24.6%
voestalpine AG	Austria	Materials	30.6%	26.5%	Jan-17	15.7%	82.8%	6.5%
OC Oerlikon Corporation AG Pfaeffikon	Switzerland	Capital Goods	65.8%	65.8%	Dec-16	16.4%	78.4%	36.8%
DS Smith PLC	United Kingdom	Materials	32.5%	12.2%	Jun-17	54.8%	61.0%	12.7%
Agilent Technologies Inc	United States of America	Pharmaceuticals, Biotechnology & Life Sciences	50.1%	34.1%	Feb-17	29.7%	75.9%	37.0%
Abbott Laboratories	United States of America	Health Care Equipment & Services	45.2%	25.8%	Mar-17	13.2%	81.3%	67.0%
Accenture PLC	Ireland; Republic of	Software & Services	19.7%	21.2%	Jun-17	82.5%	66.1%	64.3%
BorgWarner Inc	United States of America	Automobiles & Components	41.6%	43.9%	Apr-17	39.5%	71.7%	51.4%
Consolidated Edison Inc	United States of America	Utilities	25.0%	25.0%	Dec-16	20.2%	60.3%	52.7%
Eastman Chemical Co	United States of America	Materials	22.1%	15.7%	Mar-17	8.5%	69.5%	42.8%
Exelon Corp	United States of America	Utilities	18.9%	16.7%	Dec-16	17.8%	77.4%	77.2%
Jacobs Engineering Group Inc	United States of America	Capital Goods	9.5%	26.9%	May-17	51.6%	86.6%	23.9%
Michael Kors Holdings Ltd	United Kingdom	Consumer Durables & Apparel	23.6%	76.1%	May-17	64.5%	97.1%	36.6%
Lennar Corp	United States of America	Consumer Durables & Apparel	45.2%	21.9%	Jun-17	100.0%	89.8%	27.7%
LyondellBasell Industries NV	United States of America	Materials	18.9%	29.6%	May-17	30.0%	98.6%	35.1%
Public Service Enterprise Group Inc	United States of America	Utilities	24.2%	25.4%	Jul-17	100.0%	67.5%	56.3%
PulteGroup Inc	United States of America	Consumer Durables & Apparel	78.8%	45.9%	Mar-17	20.9%	90.0%	15.0%
PerkinElmer Inc	United States of America	Pharmaceuticals, Biotechnology & Life Sciences	37.6%	29.7%	Mar-17	16.6%	76.9%	85.2%
Robert Half International Inc	United States of America	Commercial & Professional Services	18.4%	25.2%	May-17	75.9%	73.4%	73.3%
TE Connectivity Ltd	Switzerland	Technology Hardware & Equipment	33.7%	25.6%	Jan-17	12.9%	63.6%	39.3%
Tyson Foods Inc	United States of America	Food, Beverage & Tobacco	32.4%	38.3%	May-17	64.4%	89.5%	81.1%
Valero Energy Corp	United States of America	Energy	28.8%	37.9%	May-17	15.8%	79.4%	9.7%
Wal-Mart Stores Inc	United States of America	Food & Staples Retailing	36.3%	29.0%	Jul-17	77.6%	71.0%	58.6%

Single Stocks - Quadrant 1 stocks

Quadrant 1 stocks: strong positive bubble signals with strong fundamentals
Example: Public Service Enterprise Group 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 is the strong positive bubble we identified. The Bubble Score of this five month bubble has reached the maximum value 100% with a bubble size 25.4%.

Last month example: strong positive bubble signals with strong fundamentals, PulteGroup Inc.

The figure below plots the one year cumulative return of PulteGroup Inc (blue), S&P 500 (green) and LPPLS Bubble Score (red lines on the right y-axis). The green shaded period is the strong positive bubble we identified and reported last month. Note that the stock continued to appreciate, which is agreement with the strong fundamentals together with the DS LPPLS indicator. One should remain cautious as this stock is still identified with strong bubble signal this month.
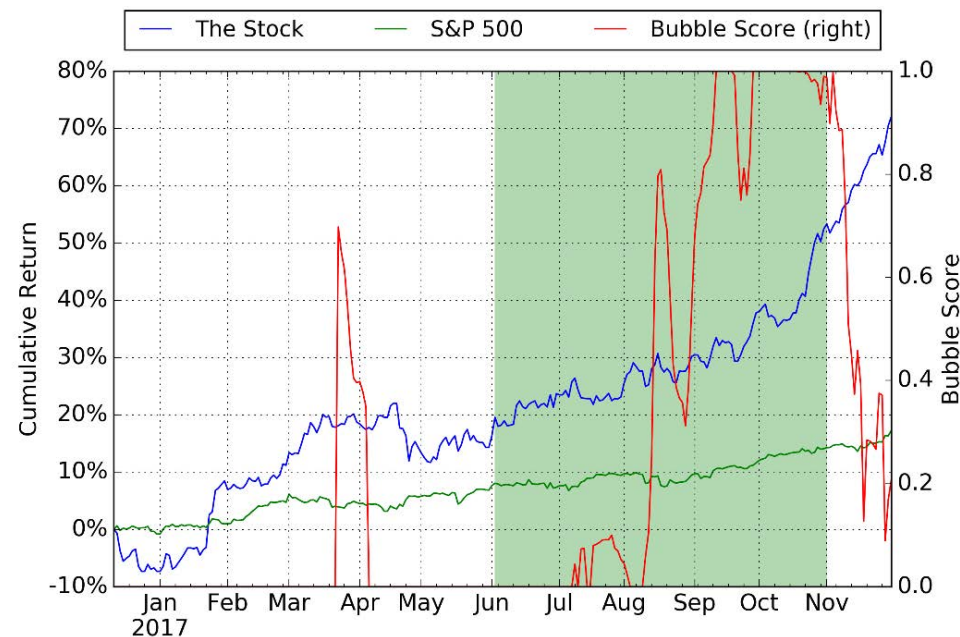
Single Stocks - Quadrant 2 stocks

Quadrant 2 stocks: strong positive bubble signals with weak fundamentals

This month we again observe an abnormally large number of stocks in this Quadrant.

This suggests that the fundamentals are still dominantly weak while there is a general positive investment sentiment, possibly in denial of the weakness of the existing recovery.

Single Stocks - Quadrant 2 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
Cadence Design Systems Inc	United States of America	Software & Services	71.1%	26.5%	Jun-17	32.6%	23.0%	55.7%
Cintas Corp	United States of America	Commercial & Professional Services	31.7%	37.2%	Jan-17	43.2%	10.4%	85.7%
Dollar Tree Inc	United States of America	Retailing	21.3%	30.6%	Dec-16	23.3%	18.9%	32.9%
Intuit Inc	United States of America	Software & Services	33.6%	18.1%	Jun-17	39.0%	37.1%	49.9%
Intuitive Surgical Inc	United States of America	Health Care Equipment & Services	88.4%	28.9%	Jun-17	53.8%	16.5%	49.6%
Monster Beverage Corp	United States of America	Food, Beverage & Tobacco	42.4%	33.4%	Mar-17	9.1%	4.5%	46.4%
Netflix Inc	United States of America	Retailing	52.0%	52.0%	Dec-16	19.6%	0.2%	58.4%
Wynn Resorts Ltd	United States of America	Consumer Services	71.5%	29.4%	May-17	14.3%	33.4%	83.0%
Umicore SA	Belgium	Materials	46.4%	46.4%	Dec-16	10.1%	15.9%	30.8%
JCDecaux SA	France	Media	29.3%	16.8%	May-17	26.7%	39.0%	59.9%
Sodexo SA	France	Consumer Services	3.6%	6.6%	Jul-17	23.1%	35.2%	11.4%
Intertek Group PLC	United Kingdom	Commercial & Professional Services	56.5%	56.5%	Dec-16	5.4%	13.2%	30.4%
Kerry Group PLC	Ireland; Republic of	Food, Beverage & Tobacco	35.8%	17.3%	Jun-17	92.3%	26.3%	70.0%
Rentokil Initial PLC	United Kingdom	Commercial & Professional Services	54.4%	15.1%	Jun-17	13.8%	13.4%	38.0%
Barry Callebaut AG	Switzerland	Food, Beverage & Tobacco	53.9%	35.1%	Jun-17	31.3%	28.5%	82.5%
Straumann Holding AG	Switzerland	Health Care Equipment & Services	96.0%	35.1%	Jun-17	83.8%	6.5%	50.5%
Sage Group PLC	United Kingdom	Software & Services	21.4%	15.4%	Jul-17	96.4%	11.7%	23.6%
SSP Group PLC	United Kingdom	Consumer Services	69.9%	34.7%	Jun-17	65.3%	25.3%	35.4%
Ametek Inc	United States of America	Capital Goods	45.9%	23.1%	May-17	46.8%	22.6%	69.4%
Air Products and Chemicals Inc	United States of America	Materials	10.0%	14.8%	Jan-17	34.7%	24.7%	51.1%
Amphenol Corp	United States of America	Technology Hardware & Equipment	33.7%	26.7%	May-17	21.6%	13.5%	49.1%
Avery Dennison Corp	United States of America	Materials	59.0%	37.2%	Apr-17	100.0%	38.0%	40.9%
American Water Works Company Inc	United States of America	Utilities	27.3%	27.3%	Dec-16	5.3%	21.5%	62.5%
Brown-Forman Corp	United States of America	Food, Beverage & Tobacco	33.6%	21.4%	Jun-17	67.2%	11.5%	62.8%

# Single Stocks - Quadrant 2 stocks

Quadrant 2 stocks: strong positive bubble signals with weak fundamentals (cont'd)

Company Name	Country of Headquarters	GICS Industry Group Name	Yearly Return	Bubble Size	Bubble Start	Bubble Score	Value Score	Growth Score
Cabot Oil & Gas Corp	United States of America	Energy	27.0%	26.9%	May-17	29.7%	4.8%	48.1%
Salesforce.com Inc	United States of America	Software & Services	46.2%	15.4%	Jul-17	25.6%	1.6%	61.4%
Dollar General Corp	United States of America	Retailing	16.1%	21.8%	Jun-17	43.9%	36.0%	39.0%
Devon Energy Corp	United States of America	Energy	-18.1%	27.7%	Jul-17	27.9%	24.2%	81.5%
Estee Lauder Companies Inc	United States of America	Household & Personal Products	60.1%	36.7%	May-17	4.4%	20.6%	46.8%
Hilton Worldwide Holdings Inc	United States of America	Consumer Services	37.5%	37.5%	Dec-16	44.7%	18.1%	48.3%
Alliant Energy Corp	United States of America	Utilities	23.2%	15.3%	Feb-17	13.2%	36.8%	80.0%
Mastercard Inc	United States of America	Software & Services	45.7%	29.0%	May-17	11.7%	10.5%	53.2%
Masco Corp	United States of America	Capital Goods	32.0%	32.0%	Dec-16	12.2%	9.2%	65.9%
Motorola Solutions Inc	United States of America	Technology Hardware & Equipment	13.5%	9.3%	Jun-17	18.5%	19.7%	28.4%
NextEra Energy Inc	United States of America	Utilities	36.2%	13.2%	Jul-17	77.0%	34.1%	69.0%
Northrop Grumman Corp	United States of America	Capital Goods	32.4%	28.6%	Feb-17	4.5%	27.0%	25.3%
Occidental Petroleum Corp	United States of America	Energy	-0.6%	19.8%	Jul-17	78.7%	19.2%	93.1%
Praxair Inc	United States of America	Materials	25.6%	16.2%	Jun-17	75.3%	12.9%	67.4%
Red Hat Inc	United States of America	Software & Services	60.3%	32.7%	Jun-17	42.1%	2.7%	58.2%
Constellation Brands Inc	United States of America	Food, Beverage & Tobacco	39.8%	12.9%	Jun-17	32.5%	20.3%	48.6%
Total System Services Inc	United States of America	Software & Services	50.5%	43.8%	Jan-17	23.9%	30.5%	66.5%
Visa Inc	United States of America	Software & Services	42.3%	30.8%	Feb-17	20.0%	8.7%	48.9%
VF Corp	United States of America	Consumer Durables & Apparel	32.9%	33.6%	Apr-17	84.9%	23.6%	77.9%
WEC Energy Group Inc	United States of America	Utilities	22.1%	11.2%	May-17	21.6%	35.6%	57.4%
Waste Management Inc	United States of America	Commercial & Professional Services	17.4%	13.4%	Mar-17	50.2%	15.6%	54.8%
Wyndham Worldwide Corp	United States of America	Consumer Services	46.2%	35.3%	Mar-17	12.0%	38.1%	50.1%
Zoetis Inc	United States of America	Pharmaceuticals, Biotechnology & Life Sciences	42.2%	33.6%	Jan-17	19.6%	8.4%	47.4%

Quadrant 2 stocks: strong positive bubble signals with weak fundamentals
Example: VF Corp.
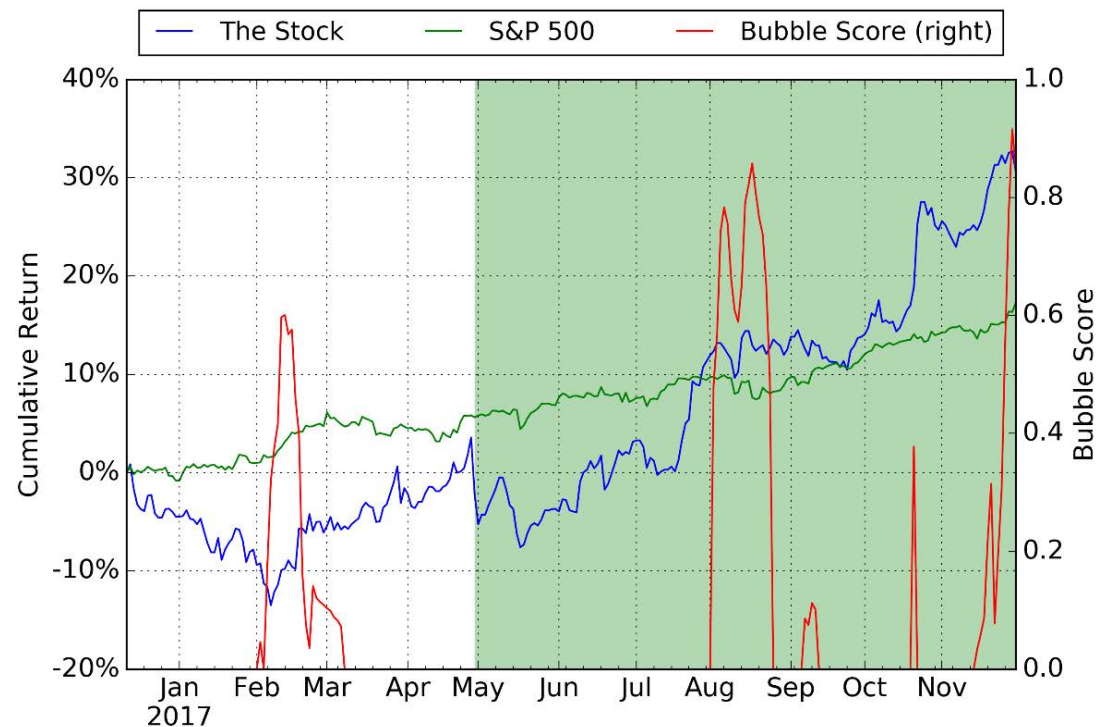
The above graph shows the one year cumulative return of the stock in blue (left hand scale), S&P 500 in green (left hand scale) and the calculated DS LPPLS Bubble Score in red (right hand scale). The green shaded period is the strong positive bubble we identified. The Bubble Score of this seven month bubble has reached 84.9% with a bubble size 33.6%. The strong positive bubble signals and weak fundamentals indicate a high probability of correction in the future.

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Last month example: strong positive bubble signals with weak fundamentals, Red Hat Inc.

The figure below plots the one year cumulative return of Red Hat Inc (blue), S&P 500 (green) and LPPLS Bubble Score (red lines on the right y-axis). The green shaded period is the strong positive bubble we identified and reported in last month. Note that the stock continued to appreciate, in contradiction with our DS LPPLS indicator and the weak fundamentals. We expect this stock to have a future correction due to the strong bubble and weak fundamentals.
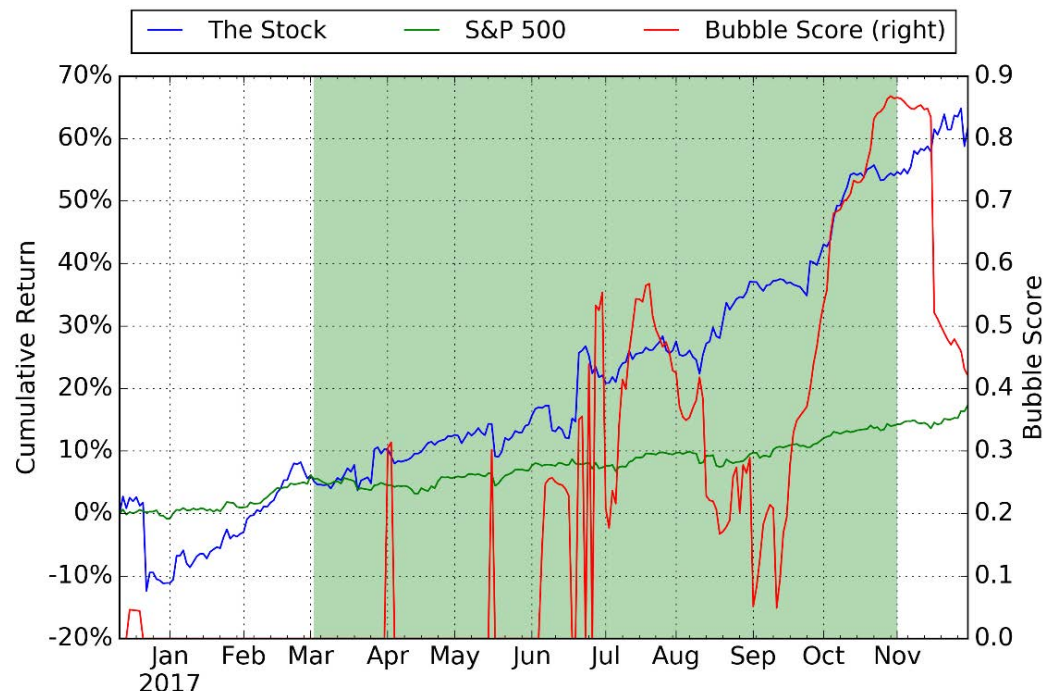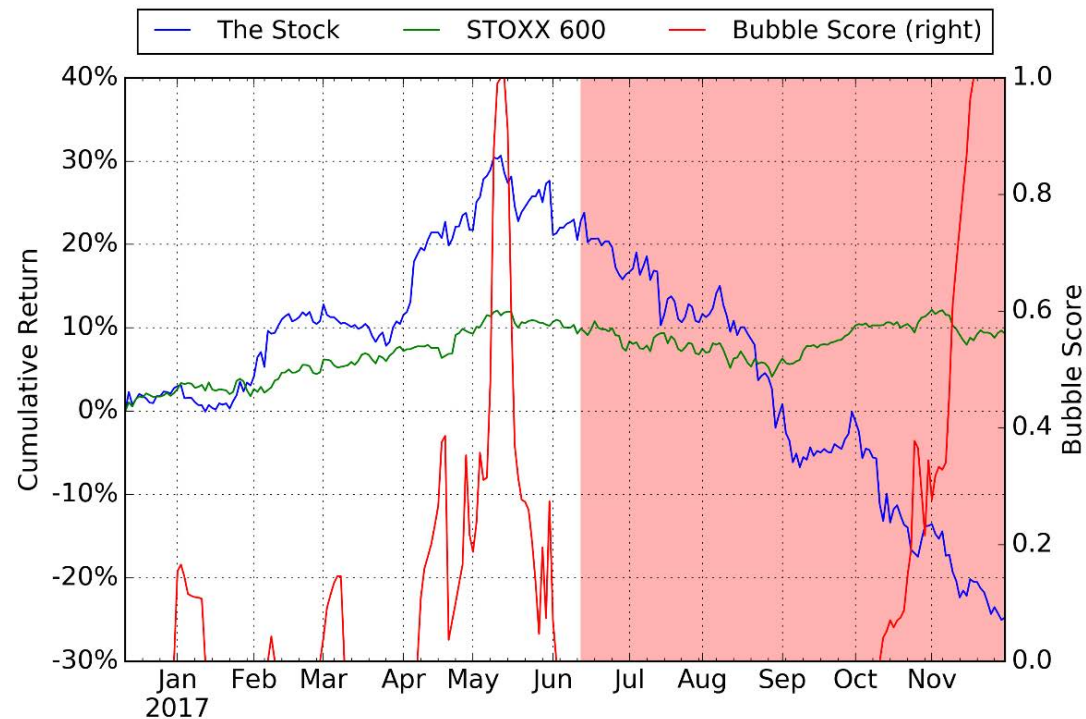
Single Stocks - Quadrant 3 stocks

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
Henry Schein Inc	United States of America	Health Care Equipment & Services	-6.5%	-22.3%	May-17	-28.5%	15.5%	56.2%
Incyte Corp	United States of America	Pharmaceuticals, Biotechnology & Life Sciences	-3.3%	-27.2%	Mar-17	-45.5%	0.0%	59.6%
Centrica PLC	United Kingdom	Utilities	-33.9%	-35.8%	Feb-17	-21.2%	39.8%	27.0%
Industria de Diseno Textil SA	Spain	Retailing	-7.1%	-15.1%	Apr-17	-57.5%	5.2%	66.6%
G4S PLC	United Kingdom	Commercial & Professional Services	10.5%	-12.9%	Mar-17	-32.7%	33.9%	31.4%
Inmarsat PLC	United Kingdom	Telecommunication Services	-34.3%	-37.9%	Mar-17	-34.4%	21.7%	1.5%
Orion Oyj	Finland	Pharmaceuticals, Biotechnology & Life Sciences	-24.3%	-35.3%	Mar-17	-18.7%	19.5%	37.8%
General Electric Co	United States of America	Capital Goods	-41.9%	-41.5%	Dec-16	-9.9%	37.7%	50.6%
Interpublic Group of Companies Inc	United States of America	Media	-17.9%	-20.0%	Feb-17	-18.0%	31.1%	14.6%
Omnicom Group Inc	United States of America	Media	-18.7%	-16.3%	Mar-17	-18.7%	28.3%	47.9%
United Utilities Group PLC	United Kingdom	Utilities	-8.0%	-13.4%	Feb-17	-20.3%	35.0%	26.8%

Single Stocks - Quadrant 3 stocks

Quadrant 3 stocks: strong negative bubble signals with weak fundamentals
Example: Industria de Diseno Textil SA.
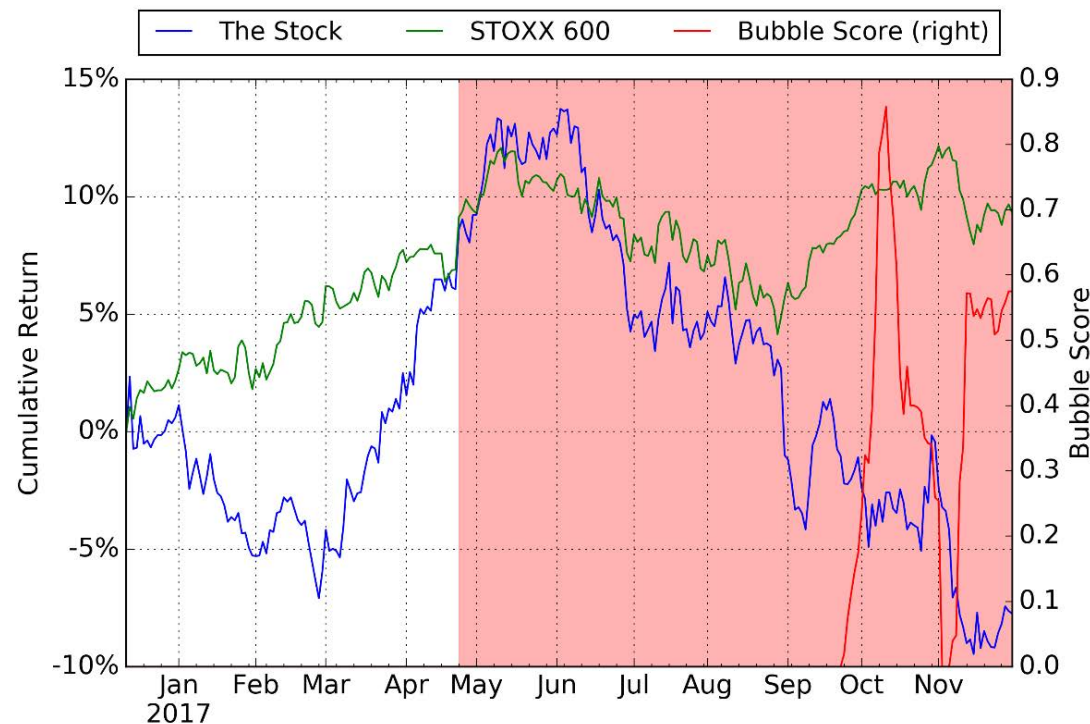
The above graph shows the one year cumulative return of the stock in blue (left hand scale), STOXX 600 in green (left hand scale) and the calculated DS LPPLS Bubble Score in red (right hand scale). The red shaded period is the strong negative bubble we identified. The Bubble Score of this seven month bubble has reached 57.5% with a bubble size -15.1%.

Single Stocks - Quadrant 4 stocks

Quadrant 4 stocks: strong negative bubble signals with strong fundamentals

Company Name	Country of Headquarters	GICS Industry Group Name	Yearly eturn	Bubble Size	Bubble Start	Bubble Score	Value Score	Growth Score
Discovery Communications Inc	United States of America	Media	-33.7%	-29.0%	May-17	-14.2%	79.8%	78.9%
BT Group PLC	United Kingdom	Telecommunication Services	-28.3%	-19.3%	Feb-17	-45.0%	66.4%	7.8%
Merck KGaA	Germany	Pharmaceuticals, Biotechnology & Life Sciences	-6.9%	-11.7%	Jan-17	-8.4%	98.5%	74.3%
Pandora A/S	Denmark	Consumer Durables & Apparel	-24.9%	-26.5%	Dec-16	-12.0%	90.2%	76.3%
Gas Natural SDG SA	Spain	Utilities	9.8%	-11.1%	Apr-17	-17.0%	60.8%	26.7%
Playtech PLC	Isle of Man	Software & Services	9.6%	-15.3%	Jun-17	-52.1%	79.2%	90.6%
SSE PLC	United Kingdom	Utilities	-9.2%	-9.0%	May-17	-12.3%	61.5%	11.3%
Allergan plc	Ireland; Republic of	Pharmaceuticals, Biotechnology & Life Sciences	-9.7%	-29.7%	Jun-17	-28.1%	95.2%	93.2%
Alaska Air Group Inc	United States of America	Transportation	-19.9%	-18.6%	Apr-17	-13.9%	85.7%	23.7%
CenturyLink Inc	United States of America	Telecommunication Services	-38.9%	-42.7%	Jan-17	-8.8%	85.4%	15.4%
Molson Coors Brewing Co	United States of America	Food, Beverage & Tobacco	-21.0%	-13.0%	Jun-17	-38.5%	69.7%	98.1%
JM AB	Sweden	Consumer Durables & Apparel	-25.3%	-38.7%	Jun-17	-100.0%	76.1%	89.8%
WPP PLC	United Kingdom	Media	-26.4%	-16.7%	Jul-17	-33.7%	65.4%	19.9%

Quadrant 4 stocks: strong negative bubble signals with strong fundamentals
Example: JM AB.

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 is the strong negative bubble we identified. The Bubble Score of this six month bubble has reached the maximum value 100% with a bubble size -38.7%. We expect a future rebound, which is due to our diagnostic of a negative bubble signal with strong fundamentals, calling for a contrarian buyer position.

Last month example: strong negative bubble signals with strong fundamentals, Discovery Communications Inc.

The figure below plots the one year cumulative return of Discovery Communications Inc (blue), NASDAQ 100 (green) and LPPLS Bubble Score (red line on the right y-axis). The red shaded period is the strong negative bubble we identified and reported in last month. Note that the stock started a rebound after a big drawdown at the beginning of this month, which is in synchrony with our DS LPPLS indicator and the strong fundamentals. We expect this stock to appreciate in the future due to the strong fundamentals and following its neglect by investors in previous months.
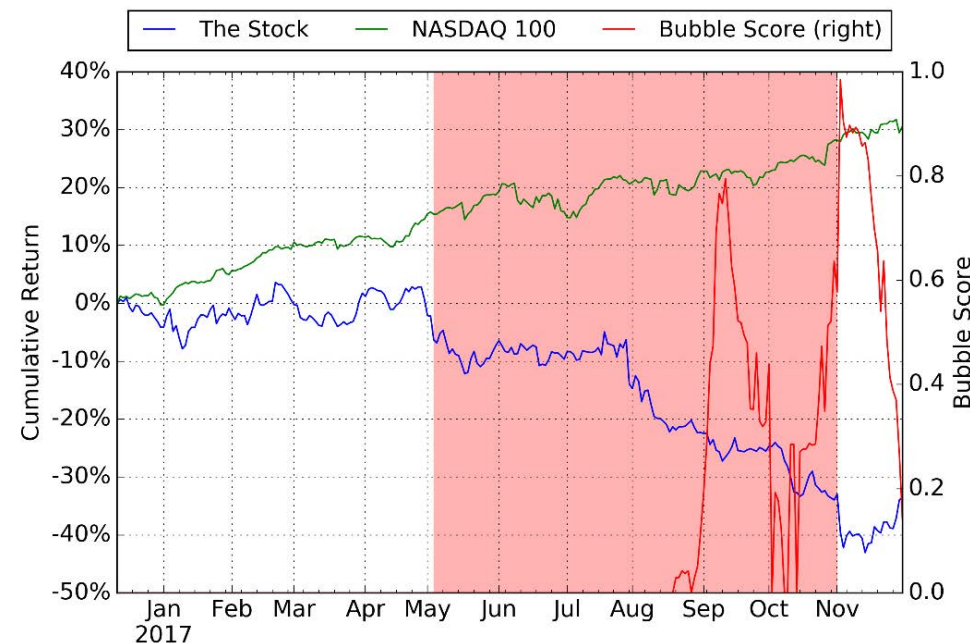
Sectors

| GICS Industry Group Name	Yearly Return		Bubble Size		Bubble Score		Value Score		Growth Score	
	Dec 1st	Nov 1st	Dec 1st	Nov 1st	Dec 1st	Nov 1st	Dec 1st	Nov 1st	Dec 1st	Nov 1st
Pharmaceuticals, Biotechnology & Life Sciences	14.1%	6.1%	0.0%	0.0%	0.0%	0.0%	61.0%	62.9%	60.5%	45.0%
Consumer Services	26.4%	23.7%	8.2%	0.0%	100.0%	0.0%	29.3%	26.6%	54.8%	48.1%
Retailing	19.8%	3.4%	0.0%	0.0%	0.0%	0.0%	18.8%	17.3%	51.8%	36.4%
Transportation	21.0%	32.2%	0.0%	0.0%	0.0%	0.0%	63.1%	58.0%	62.7%	45.3%
Consumer Durables & Apparel	27.8%	46.5%	12.9%	16.6%	52.0%	3.5%	39.2%	26.6%	58.5%	53.1%
Semiconductors & Semiconductor Equipment	37.9%	51.2%	0.0%	41.3%	0.0%	30.4%	63.1%	52.1%	30.0%	76.7%
Technology Hardware & Equipment	35.5%	29.1%	13.7%	0.0%	22.2%	0.0%	73.8%	62.7%	36.9%	39.7%
Automobiles & Components	17.3%	9.4%	0.0%	0.0%	0.0%	0.0%	78.1%	71.0%	48.3%	70.4%
Telecommunication Services	3.0%	-22.9%	0.0%	-16.6%	0.0%	-57.4%	59.6%	60.4%	52.8%	35.0%
Energy	-1.4%	15.8%	0.0%	0.0%	0.0%	0.0%	51.5%	55.8%	57.6%	84.7%
Software & Services	32.6%	26.0%	18.4%	0.0%	50.4%	0.0%	35.0%	31.5%	46.0%	37.9%
Materials	21.4%	12.8%	0.0%	0.0%	0.0%	0.0%	49.8%	53.0%	52.3%	62.7%
Health Care Equipment & Services	26.8%	18.8%	23.1%	0.0%	7.4%	0.0%	64.4%	52.6%	60.7%	40.9%
Capital Goods	19.9%	18.0%	0.0%	0.0%	0.0%	0.0%	46.6%	46.1%	50.7%	49.5%
Media	2.7%	-8.2%	0.0%	-17.0%	0.0%	-6.7%	43.5%	48.1%	59.2%	42.0%
Commercial & Professional Services	19.8%	33.9%	0.0%	0.0%	0.0%	0.0%	26.2%	32.2%	58.6%	47.7%
Food & Staples Retailing	7.0%	-2.8%	0.0%	0.0%	0.0%	0.0%	60.1%	54.5%	51.3%	33.4%
Household & Personal Products	19.7%	16.3%	0.0%	-7.6%	0.0%	-42.2%	37.2%	35.2%	41.8%	51.6%
Food, Beverage & Tobacco	13.2%	14.7%	0.0%	0.0%	0.0%	0.0%	41.7%	41.3%	57.7%	43.5%
Utilities	17.4%	-1.8%	0.0%	-10.3%	0.0%	-20.1%	53.4%	49.9%	52.4%	32.9%
Insurance	17.3%	1.9%	11.7%	0.0%	8.0%	0.0%	-	-	-	-
Real Estate	13.3%	4.9%	0.0%	0.0%	0.0%	0.0%	-	-	-	-
Diversified Financials	18.3%	4.4%	15.4%	0.0%	5.9%	0.0%	-	-	-	-
Banks	14.4%	30.8%	14.4%	11.1%	24.9%	39.6%	-	-	-	-

Sectors
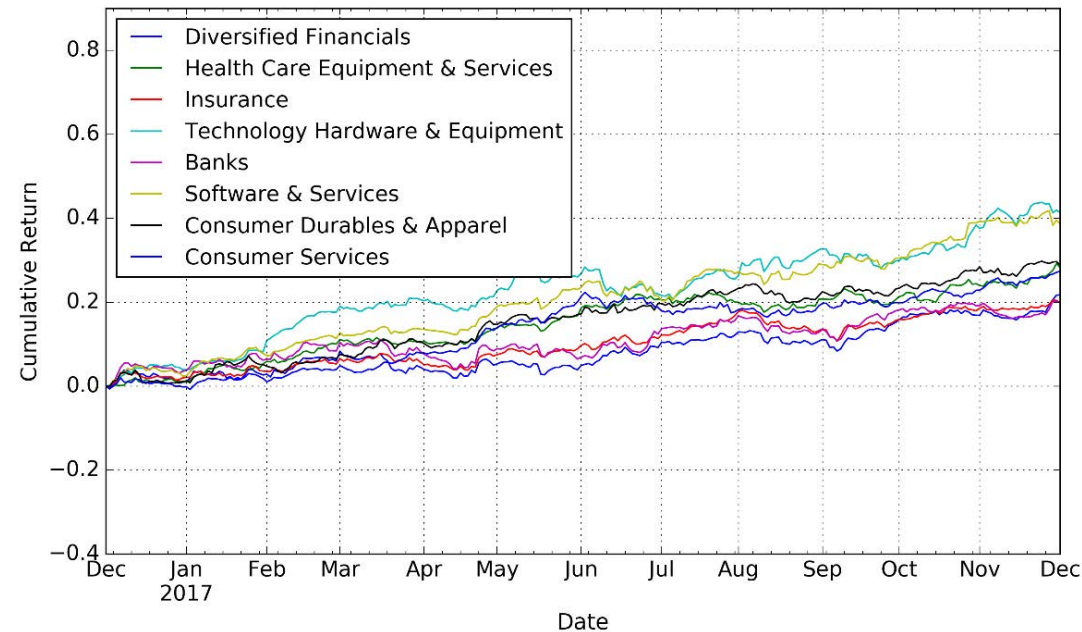
Since Dec 2017, we start to use MSCI World Industry Group Index and calculate bubble size and bubble score of the corresponding sectors. To determine the value scores and growth scores of the sectors, we average over the corresponding values for each stock of a given sector, weighted by market cap.

As we can see from the results showed in the previous slide, we found 8 industry groups with significant negative bubble scores: *Banks, Consumer Services, Consumer Durables & Apparel, Technology Hardware & Equipment, Software & Services, Health Care Equipment & Services, Insurance, Diversified Financials*.

The figure above shows the cumulative return of these 8 industries. We can see that the industry *Software & Services* and *Technology Hardware &* Equipment have achieved about 40% return in the past year, and both of them are in GICS Sector *Information Technology.* The figures in the next two slides show the one year cumulative return of each industry index in blue (left hand scale), and the calculated DS LPPLS Bubble Score in red (right hand scale). The green shaded period is the strong positive bubbles we identified.

Sectors

Sectors

Portfolio Construction & Performance
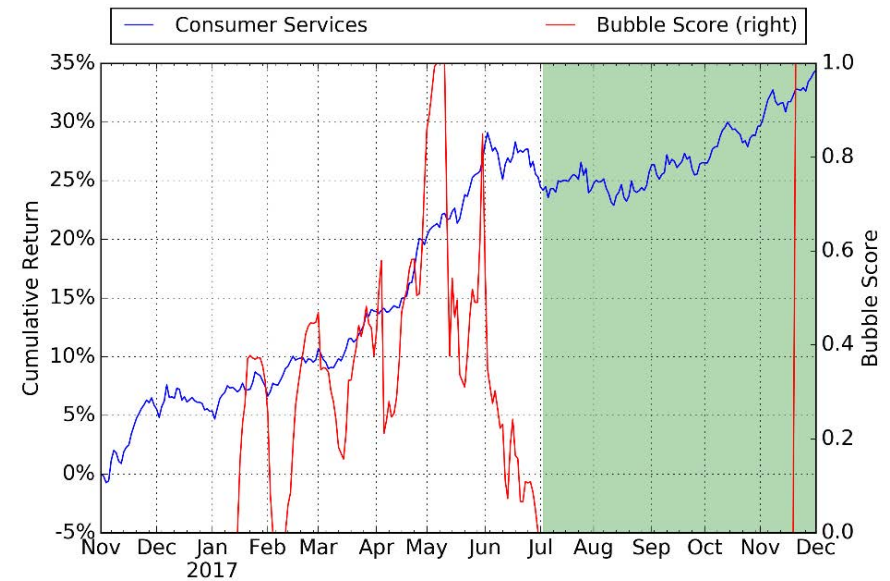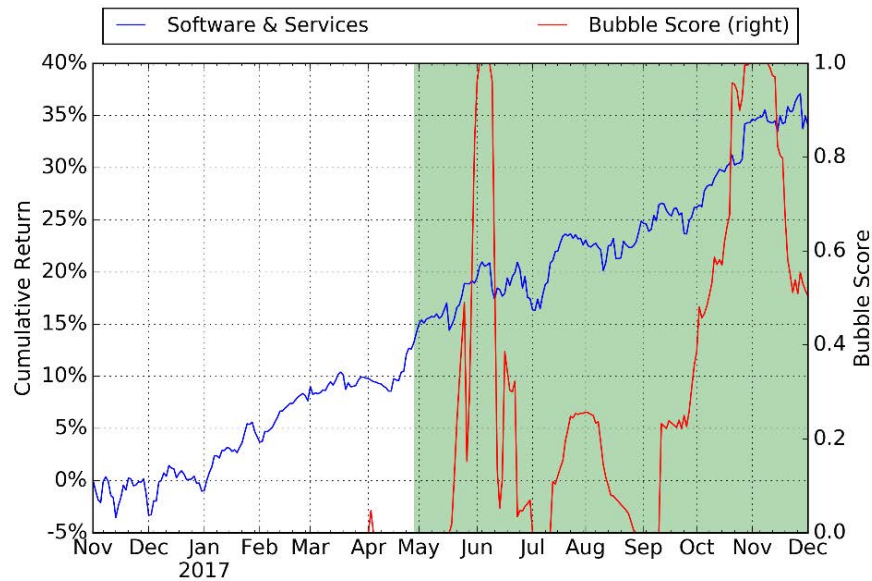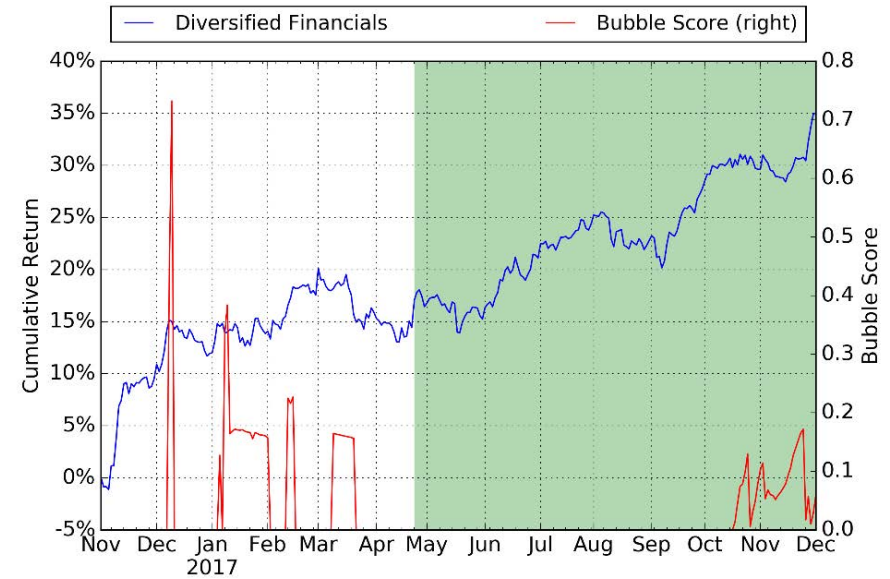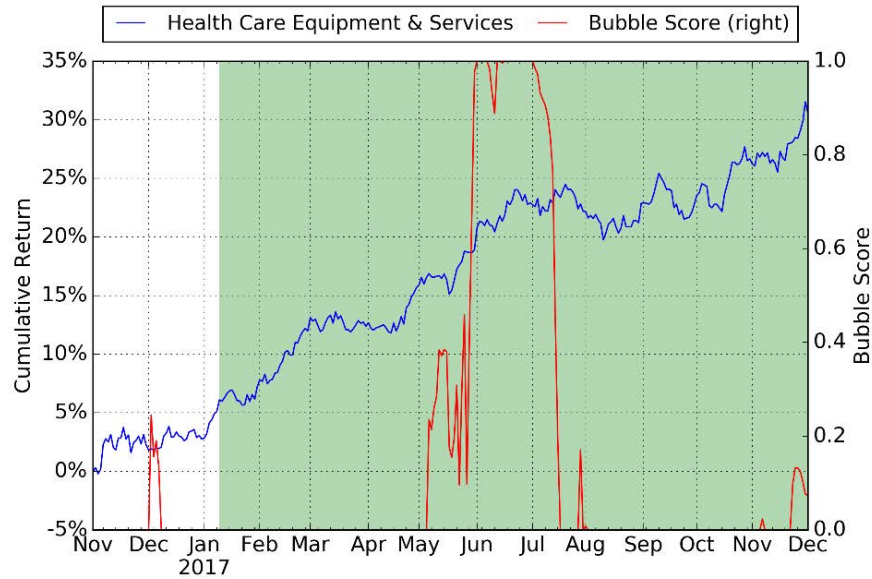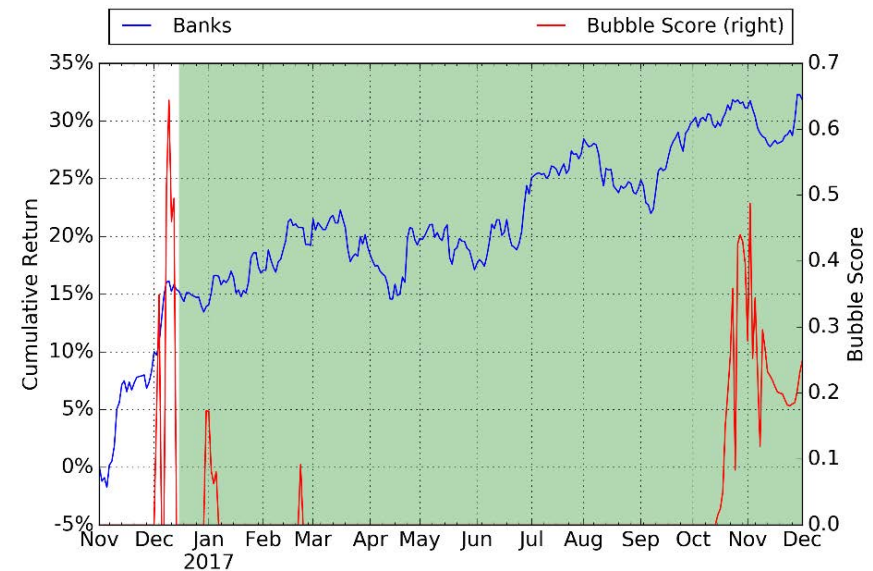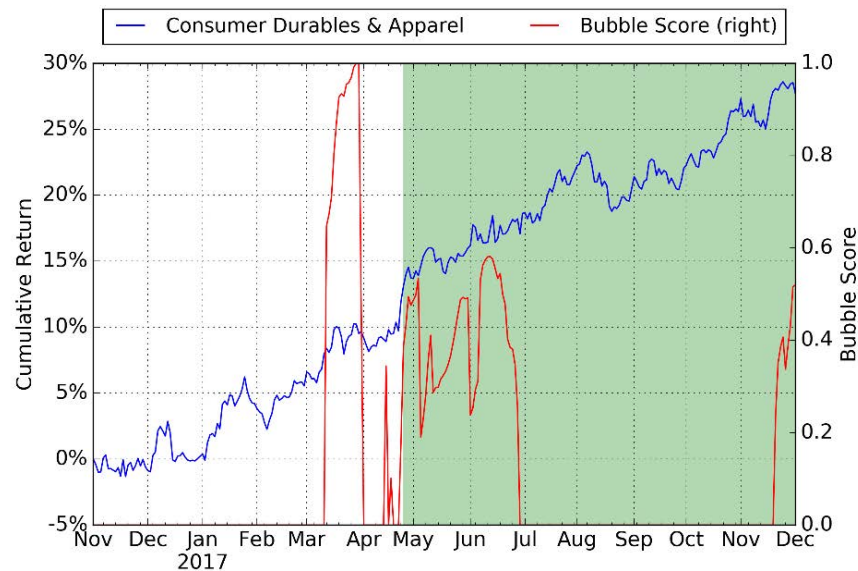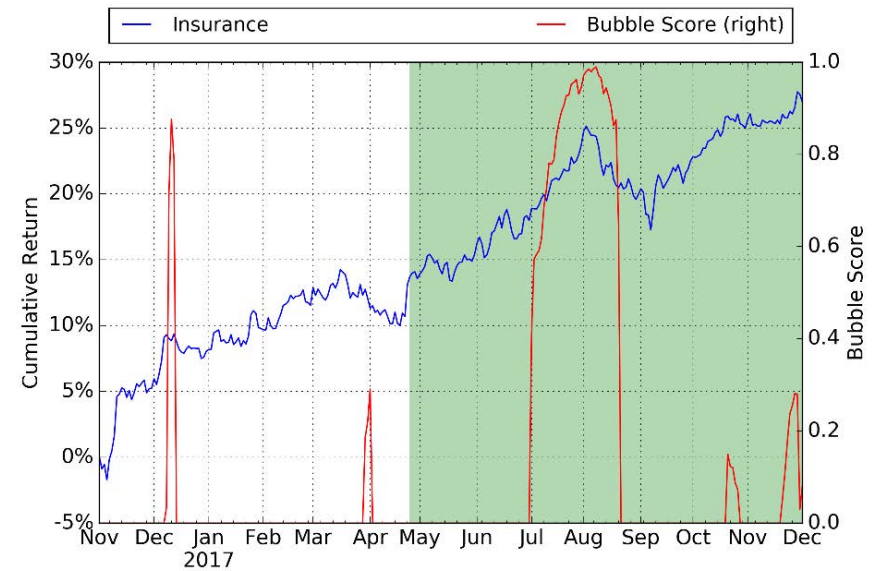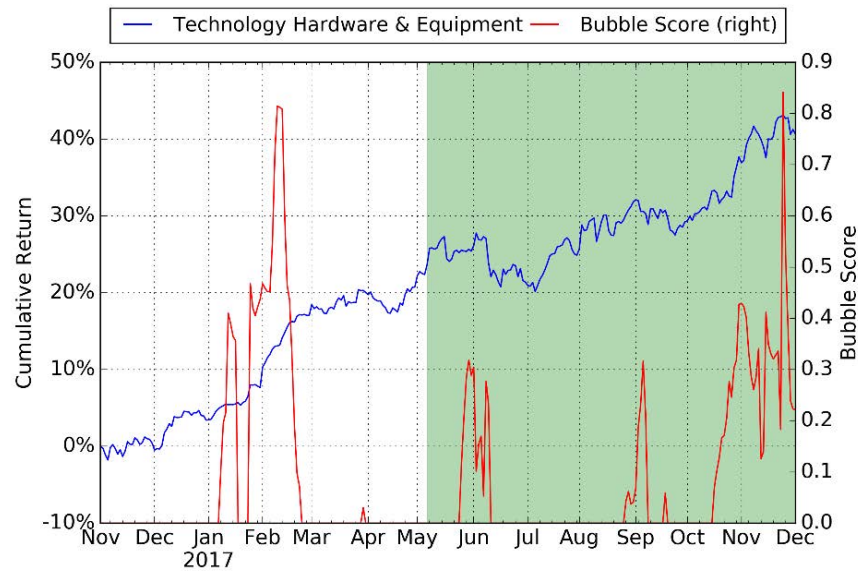
Here we illustrate the methodology of the portfolio construction process based on the results of our previous analyses.

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) and 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 in 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.

Since the we started to use a new version of bubble signals and algorithm last month, we only present the portfolios we initiated in November 2017.

Portfolio Construction & Performance

Portfolios Initiated in November 2017

Legend: Trend-Following Long, Trend-Following Short, S&P 500, Contrarian Short, Contrarian Long
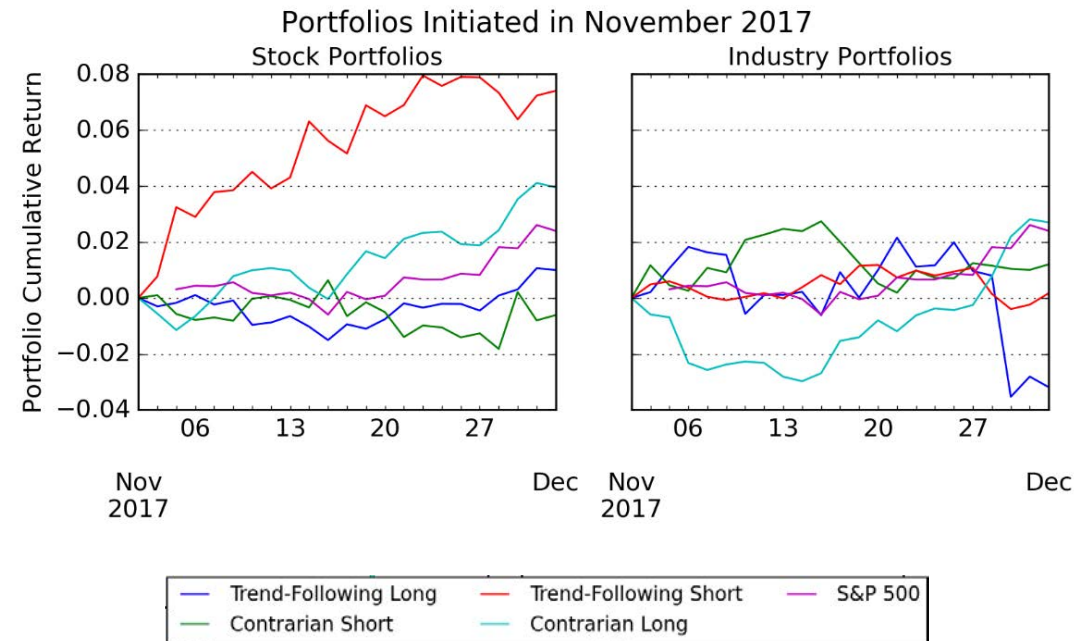
This month, we find that Trend-Following Short Stock Portfolio and Contrarian Long Stock Portfolio initiated in November 2017 have good performances. We have seen some rebounds in the stocks (e.g. Viacom Inc) of quadrant 4 identified in last month report, which contributes to the out-performance of the Contrarian Long Stock Portfolio. However, the stocks in the quadrant 3 identified in the last month report are still domianed by bubbles (e.g. Industria de Diseño Textil, S.A.). 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.

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