The FCO Cockpit
Global Bubble Status Report
December 2020

Entrepreneurial Risks

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Contents

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.

New features in the FCO Report (from Dec 2020)

Asset Class Selection:

▶ Newly, we base the computation of bubble signals in the first report part on an entirely new, revised and (for some) much larger selection of assets. We add the asset class "single stocks" and show the corresponding fractions of positive and negative bubble signals in the bubble overview plot and table for this class, as well. Furthermore, the sub-classification of assets is now done by geographic zones; we present results for Global, European and United States markets, with more geographic regions to be added in future reports.

▶ According to this update of the asset selection and classification, we recompute the bubble overview plot that displays the fractions of positive and negative bubbles over time. We also choose a daily resolution (instead of monthly, as done before) for the overview plot, which allows one to study the signals in more detail.

DS LPPLS Multi-Scale Confidence Indicators:

▶ We extend our methodology of the DS LPPLS Confidence Indicator to the so-called Multi-Scale Confidence Indicators (MCI). The MCI are finer version of the Confidence Indicator, computed in the same way, however based on different sets of time windows that are taken to account for different investors' timescales. More specifically, we base the computation of the MCI on the following window sets:

— Super-Short (SS) Scale: [40,183] days

— Short (S) Scale: [40,365] days

— Medium (M) Scale: [365,730] days

— Long (L) Scale: [730,1460] days

▶ These different time scales range from a few months up to several years. For each window set, LPPLS signals are computed over all contained fit windows in steps of 1 day. The resulting signals are aggregated into four corresponding versions of the Confidence Indicator. These MCI range from very reactive (SS,S) to more stable (M,L) versions. Observing them simultaneously allows understanding the formation and evolution of speculative bubbles in more detail.

▶ Based on these four new indicators, we also update the indicator plots, by showing the detailed positive and negative bubble indicator time series for all four of them. In the asset tables, we report only the strongest of the four in the column "DS LPPLS Confidence". The new column "strongest signal" indicates which of the four indicator this corresponds to.

New features in the FCO Report (from Dec 2020)

Additional Bubble Metrics:

▸ We update the asset tables that show the top positive and negative bubble signals, as well as the corresponding bubble characteristics.

▸ A new metric, the "bubble CAGR" (bg), is introduced. It measures the annualized compound bubble growth (bg) of the price during a bubble phase, as implied by the size (bs) and duration (bd) of a bubble.

$$bg = \exp\left(\frac{\ln(bs+1)}{bd}\right) - 1$$

where, as before, the bubble size since the bubble start t1 is $bs = \frac{p_t}{p_1} - 1$ and the bubble duration is $bd = t - t_1$ (in years)

▸ We introduce the bubble progress. By estimating the start time t1 and the predicted end time tc of a bubble, the progress of the bubble at the current time t is computed as:

$$bp = \frac{t - t_1}{t_c - t_1}$$

The bubble progress measures the percentage of time until the predicted end of the bubble that has passed so far (i.e. until t) since the beginning of the bubble. The numerator is the current bubble duration and the denominator $t_c - t_1$ is the bubble duration determined from the LPPLS model.
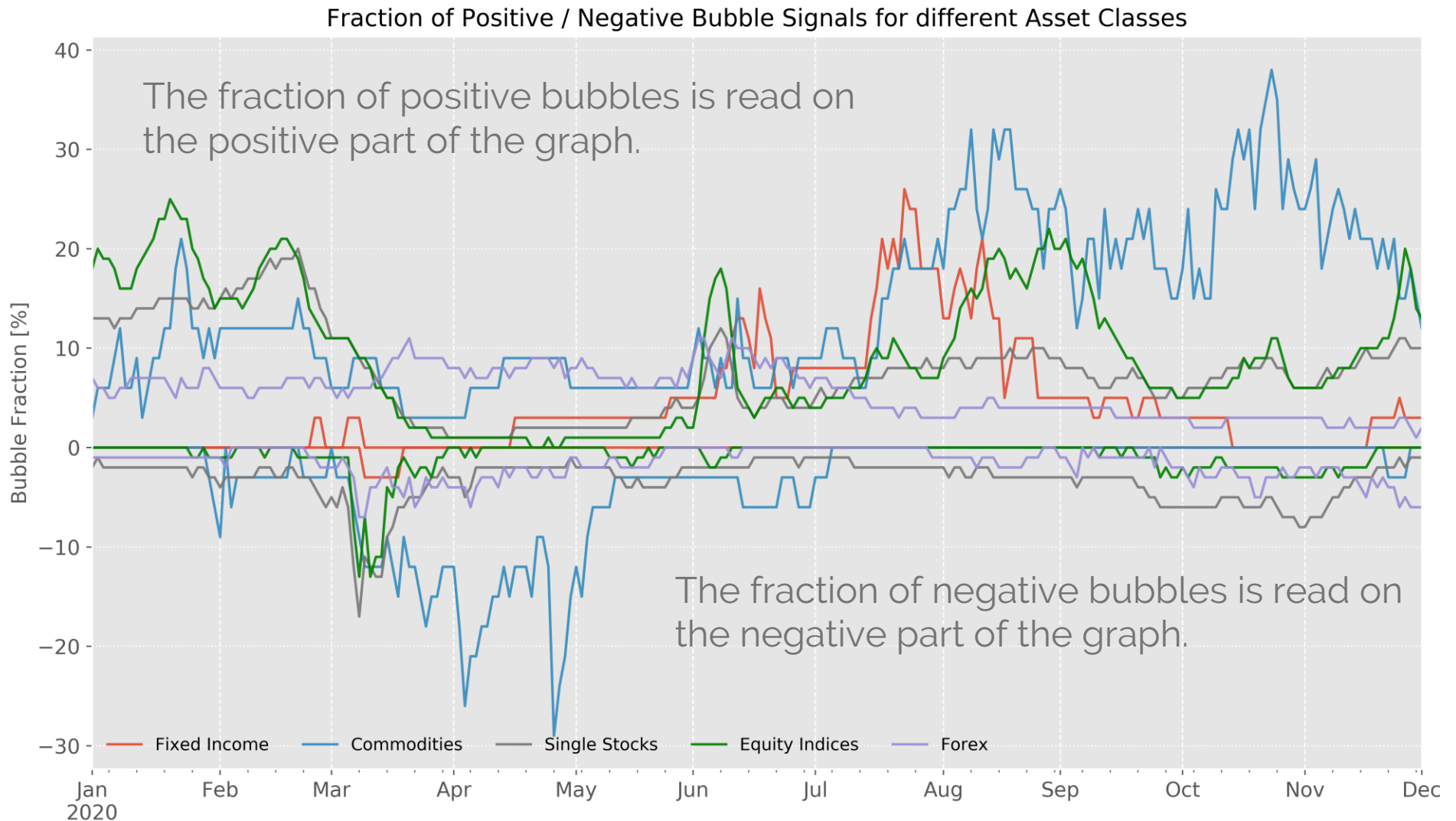
New Ranking Methodology:

▸ We rank top positive and negative bubble signals from our database according to the geometric average of the confidence indicator, the bubble CAGR and the bubble progress:

$$ga = (ci \cdot bg \cdot bp)^{1/3}$$

This geometric average (ga) considers the strength of the bubble signal, the intensity of the bubble (compound growth), as well as the maturity of the bubble. These three metrics characterize the most relevant "dimensions" of a bubble. We thus consider the geometric average as a reasonable choice to rank bubble signals.

General Results – The Big Picture

Fraction of Positive / Negative Bubble Signals for different Asset Classes

The fraction of positive bubbles is read on the positive part of the graph.

The fraction of negative bubbles is read on the negative part of the graph.

Legend: Fixed Income, Commodities, Single Stocks, Equity Indices, Forex

General Results – Dec. 2020 Overview

	Region	Analyzed Assets	Fraction of Pos. Bubbles [%]	Fraction of Neg. Bubbles [%]
Fixed Income		38	3	0
Commodities		34	12	0
Single Stocks		1601	10	1
	Europe	932	8	2
	United States	663	13	0
Equity Indices		891	13	0
	Europe	57	0	0
	United States	378	15	0
	Global	386	13	0
Forex		100	2	6

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FCO Market Outlook

As we mentioned in the FCO report of July 2020, the Federal Reserve, the "protective mother", has consistently paid great attention to the market, "the spoiled boy". Given the astonishing quantity of liquidity injected into the market, it is very hard for the Fed to shrink its balance sheet in the foreseeable future. Thus, while the current market is very expensive and dizzying high by any valuation methods, the inexhaustible liquidity, together with the ultra-low interest rate, still supports the market for the time being. In contrast, we notice that Dr. Rebert Redfield from CDC predicted that Covid-19 would claim 450,000 American lives by the end of February 2021, because of the hospitalization crisis. Increasing death numbers, a larger scale of lockdown in more countries, and soaring stock price, this is indeed a weird and ironic 2020: if one would give these data to AI algorithms or an alien civilisation, we surmise that the entity would be quite confused by human's behaviors.

Joe Biden has chosen Janet Yellen (the former chair of the US Fed reserve) as the new US treasury secretary to oversee the economic recovery. Ms. Yellen, who is the student of 1981 Nobel-price-winning economist James Tobin and also the wife of 2001 Nobel-price-wining economist George Akerlof, is a good choice given the current situation in the US: 1. She a had strong influence on the Fed monetary decisions for the past decade during Ben Bernanke's term, in her term, and then in Jerome Powell's term. Thus, she understands the limits of the policy, the behavior of financial markets, and she is clear at communicating and cautious about what she will do; 2. She has sound academic research experience of the labour market, especially in women and minorities; 3. She can smoothly cooperate with Powell's monetary policy with necessary and more direct fiscal stimulates. So, there is hope that she can implement the urgent-need fiscal stimulus, targeting the right population groups.

Let us now discuss some asset classes:

Fixed Income: Renewed optimism about U.S. stimulus and the coming vaccines will push upward the 10 year treasury yield, thus steepening the yield curve. But if the yields climb higher, it will be more difficult for the central banks to control the yield curve. The unstable state of the 10 years treasury yield, which is considered as the anchor of equity valuation, might shake the current stock valuations and make them vulnerable to corrections. Moreover, the high-yield bond spread remains narrow due to Fed's liquidity provision and the hope on the vaccines, but we think that betting on high yields may still be risky due to the potential late occurrence of mass vaccination.

US equity: Many investors, even professional investors, are claiming that the value factor will become valid again and outperform the growth factor in the future, and the small size factor will standout. Their rationales are based essentially on mean reversion. However, we are cautious about the style rotation since prices are inflated mainly due to liquidity injections. In addition, we also notice that many tech companies have reached a very high valuation and any bad news that might be detrimental to the earnings will lead to a quick stock correction, even when the "bad" news is actually the good news of working vaccines.

Emerging Market: The Chinese PMI has raised to a near-decade high due to the effective measures in the early stage of Covid-19, and the post-coronavirus economic recovery ignites huge demand for commodities and provides strong manufacture power to provide the world. However, given 2020 has the lowest GDP for decades, it will be no surprise if the Chinese GDP reaches 10% in the next first quarter. It is believed that the Chinese monetary polity will be tightened in order to avoid overheating next year. Accordingly, we think the Chinese stock market will see no further increase.

Commodity: Just in line with our November FCO report, the market has witnessed a strong price increase in renewable energy (e.g. battery/storage materials) and hard commodities (e.g. iron ore, copper, zinc, and aluminium). For example. the copper price soared as the result of the strong demand from top consumers in China, the decline in production in Chile, and also the expected stimulus in the US. We reckon that, with more fiscal stimulus from more countries (not just China and the US but also European countries and other developing countries who are suffering from the economic slowdown), hard commodities still have some room to go. In addition, also in line with our October FCO report, La Nina effect has pushed the price of heating oil and coal.

Currency: Some institutions reckon that the Yellen-Powell combination is a dovish sign and thus puts downward pressure on the US dollar index. Given Yellen's previous show of patience in monetary policy, many institutions think that the US dollar downturn might extend to the foreseeable future. Thus, the non-US currencies will be pushed upward and the emerging currency will have less pressure. However, the current high Euro and the increasing lockdown due to the second wave of Covid-19 will make the European economic recoveries very complicated. The European countries will have a tough winter for the next few months.
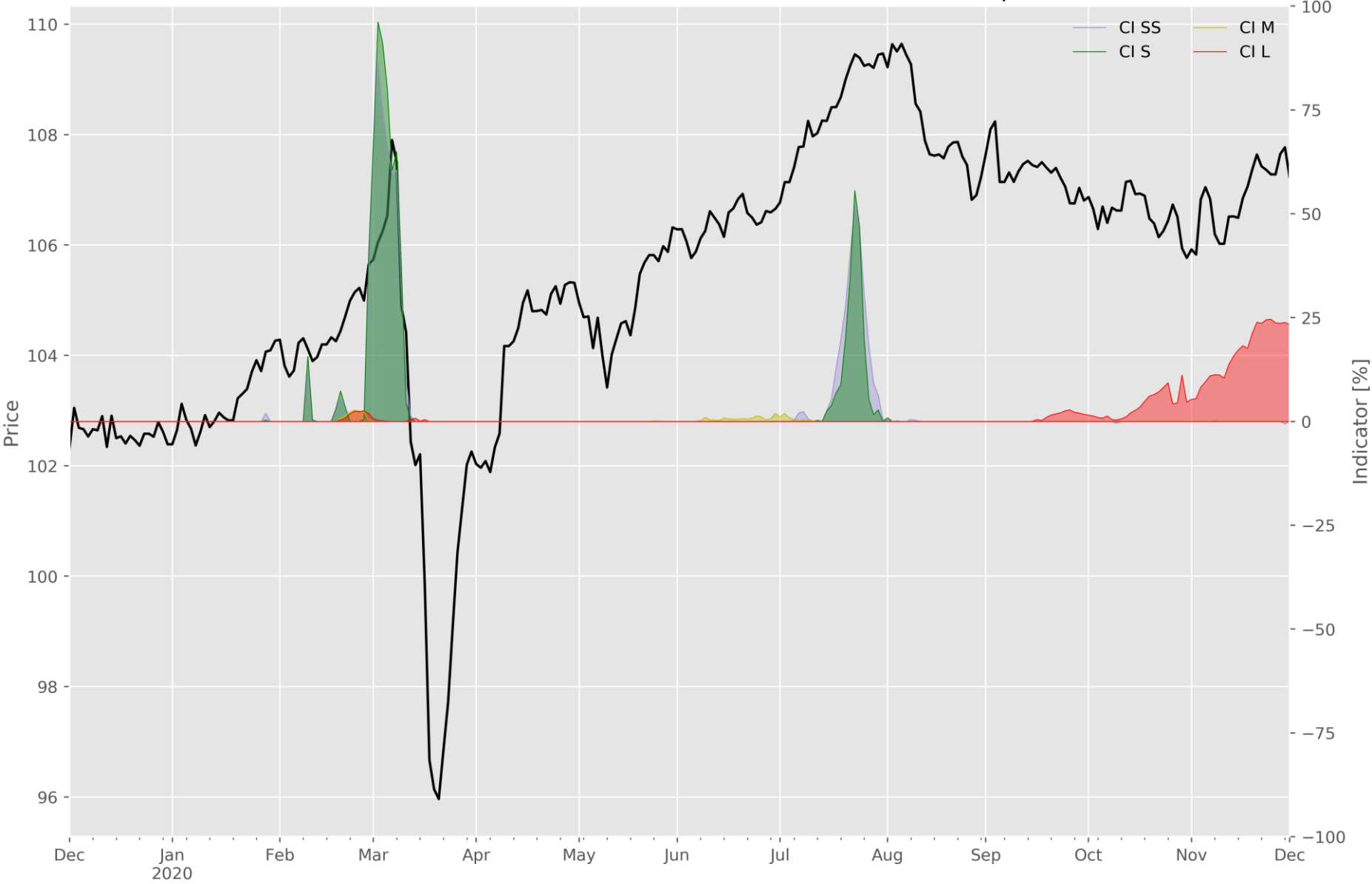
Fixed Income

	Name	Strongest Signal	DS LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [$days$]	Bubble Progress bp [%]	Geometric Average $\sqrt[3]{ci \cdot bg \cdot bp}$ [%]	Critical Time $\bar{t}_c$	Scenario Probability [%]
Positive Bubbles										
1	Iboxx $ Corporates Aa	Long-Term	23	11	4	729	75	19	2021-07-30	40

▸ For Fixed Income Security Indices, the fraction of positive (negative) bubbles is 3% (0%) at the start of December 2020.

▸ A single significant signal is detected for the double-A iBoxx Corporates Index, as shown above. The strongest amplitude for this asset is observed for the long-term multi-scale confidence indicator, as the table reports in the strongest signal column. The bubble size is 11%, the CAGR of realized bubble growth until present time is 4%. The duration of the bubble is 729 days, thus roughly two years, and it is predicted to be at 75% of its maturity with the end being reached in July 2021. The probability of this scenario to occur is only 40%.

▸ On the following slide, we provide the plot of the time series of the CI at the four set of scales corresponding to this index. As described at the beginning of this report, the new indicator plot now shows all four different multi-scale indicators, namely the super-short (CI SS) and short (CI SS) and the medium-term (CI M) to long-term (CI L) scales.

▸ As visible in the table above, the long-term confidence indicator currently is at 23%, which coincides exactly with the last shown value in the indicator plot.

▸ Note that there were two strong peaks of the short-scale (and super-short scale) indicator, one before the "Corona crash" and another during summer 2020, which both identify well subsequent price drops / drawdowns.

PB/NB DS LPPLS Confidence Multi-Scale Indicators for Iboxx $ Corporates Aa
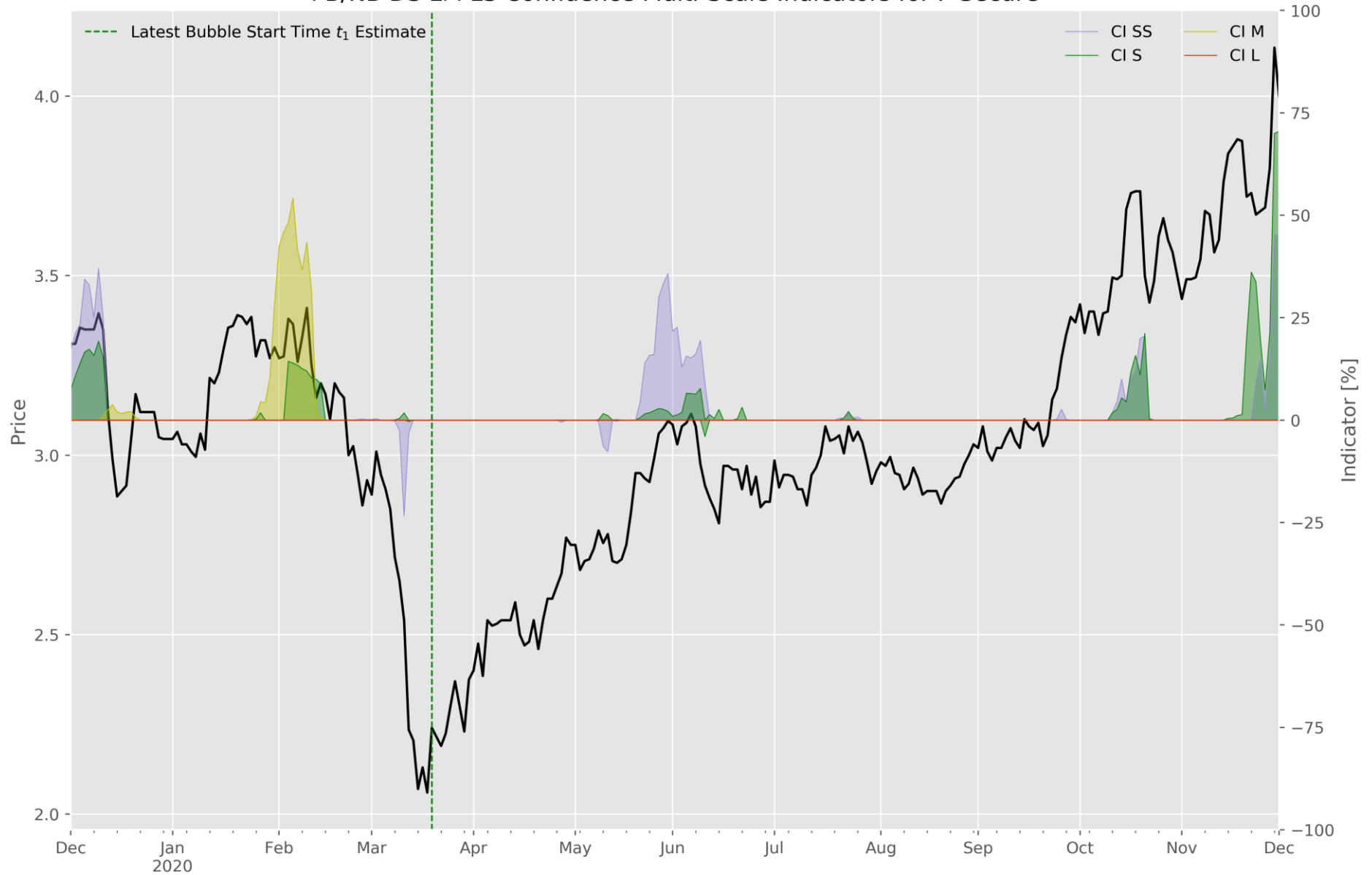
Single Stocks – Europe

	Name	Strongest Signal	DS LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [$days$]	Bubble Progress bp [%]	Geometric Average $\sqrt[3]{ci \cdot bg \cdot bp}$ [%]	Critical Time $\bar{t}_c$	Scenario Probability [%]
Positive Bubbles										
1	Edf	Short-Term	76	42	170	89	92	106	2020-12-09	100
2	F-Secure	Short-Term	70	79	121	184	99	95	2020-12-02	100
3	Bang And Olufsen	Short-Term	25	89	341	108	90	91	2020-12-13	100
Negative Bubbles										
1	Ontex Group	Medium-Term	100	-41	-38	280	67	63	2021-04-20	66
2	Coloplast B	Short-Term	51	-16	-28	131	94	51	2020-12-10	99
3	Maurel Et Prom	Long-Term	37	-72	-40	638	91	51	2021-01-31	85

▸ We add 1601 single stocks to our analysis of assets. The single stock section is discussed in more depth also in the second part of this report. Out of all the analyzed stocks, this month, about 10% are reported to be in a positive bubble and 1% in a negative bubble.

▸ We report the top three positive and negative bubble signals for the European stock selection. For this market, the positive (negative) bubble activity is 8% (2%) among the 932 corresponding stocks.

▸ For the positive bubbles, all strongest indicators are short-term type, with their values in the interval 25% - 76%. Bubble sizes are estimated between 42% and 89%, with also large corresponding CAGR values and bubble progress of more than 90% for all of them. Thus, the bubble are quite intense and predicted to burst soon. Similar interpretations hold for the negative bubbles. The plot of the time series of the CI at the four set of scales for these three positive and negative bubbles are provided in the following slides.
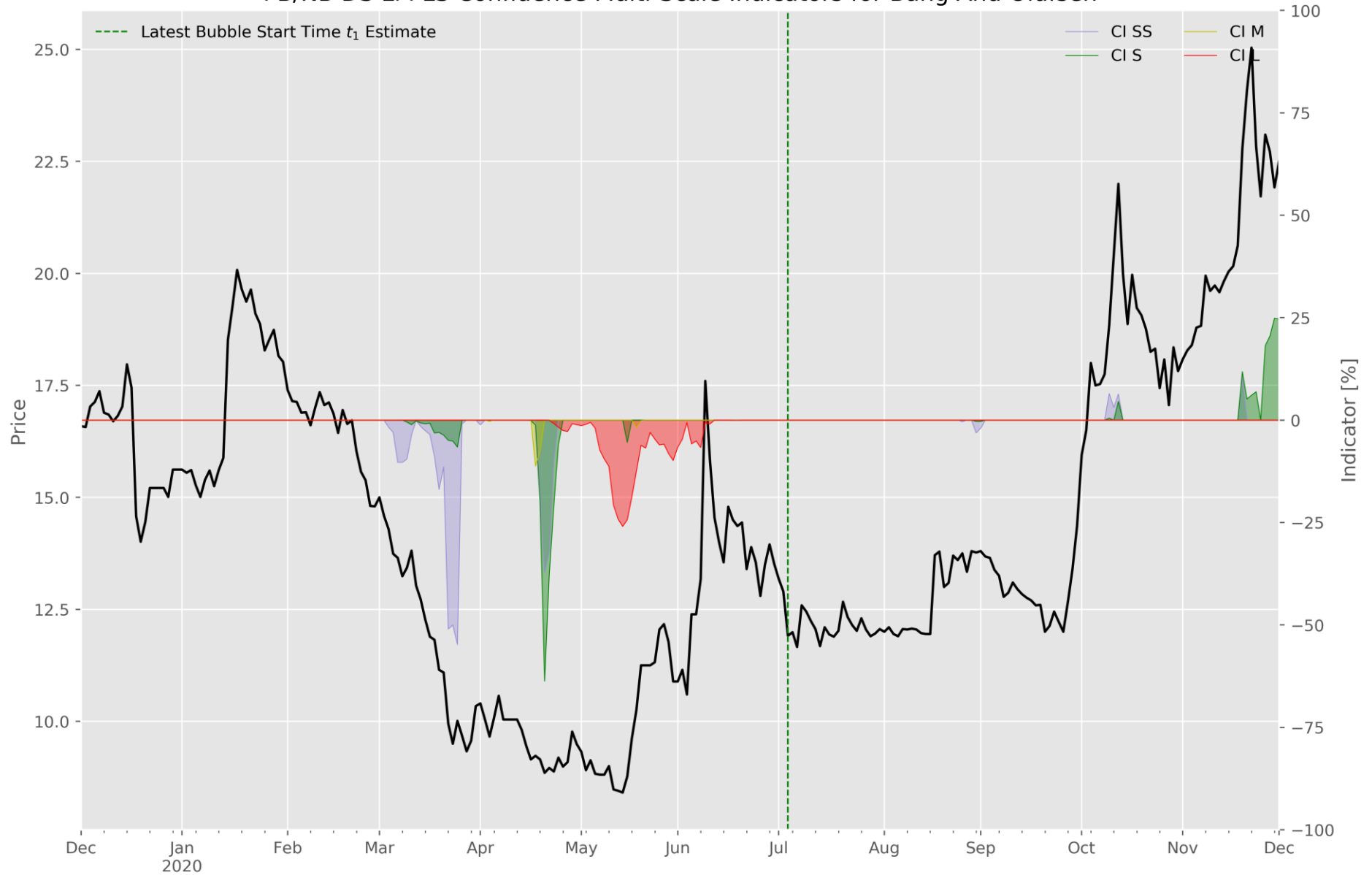
PB/NB DS LPPLS Confidence Multi-Scale Indicators for Edf

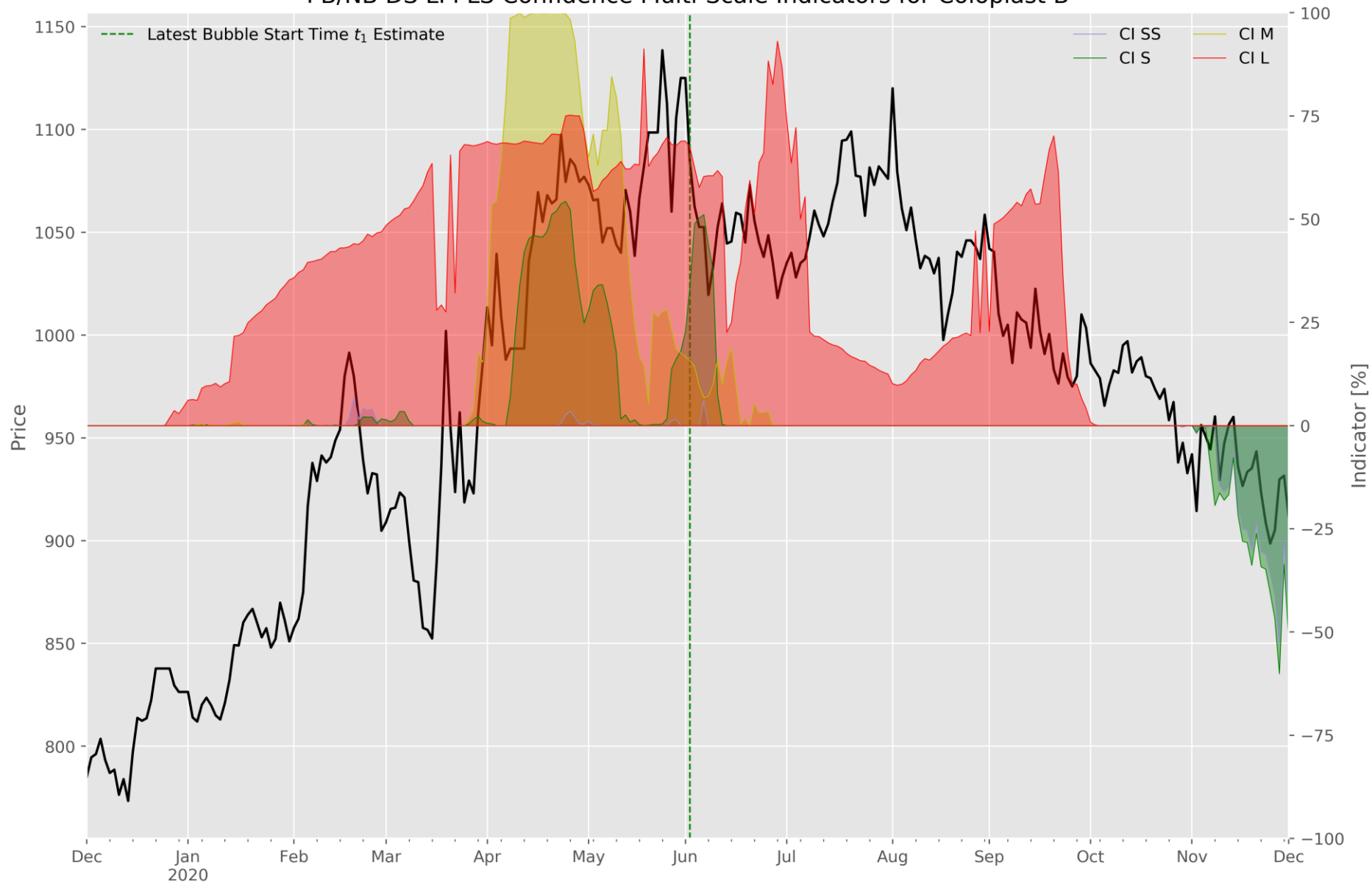PB/NB DS LPPLS Confidence Multi-Scale Indicators for F-Secure

PB/NB DS LPPLS Confidence Multi-Scale Indicators for Bang And Olufsen

PB/NB DS LPPLS Confidence Multi-Scale Indicators for Ontex Group

PB/NB DS LPPLS Confidence Multi-Scale Indicators for Coloplast B

PB/NB DS LPPLS Confidence Multi-Scale Indicators for Maurel Et Prom
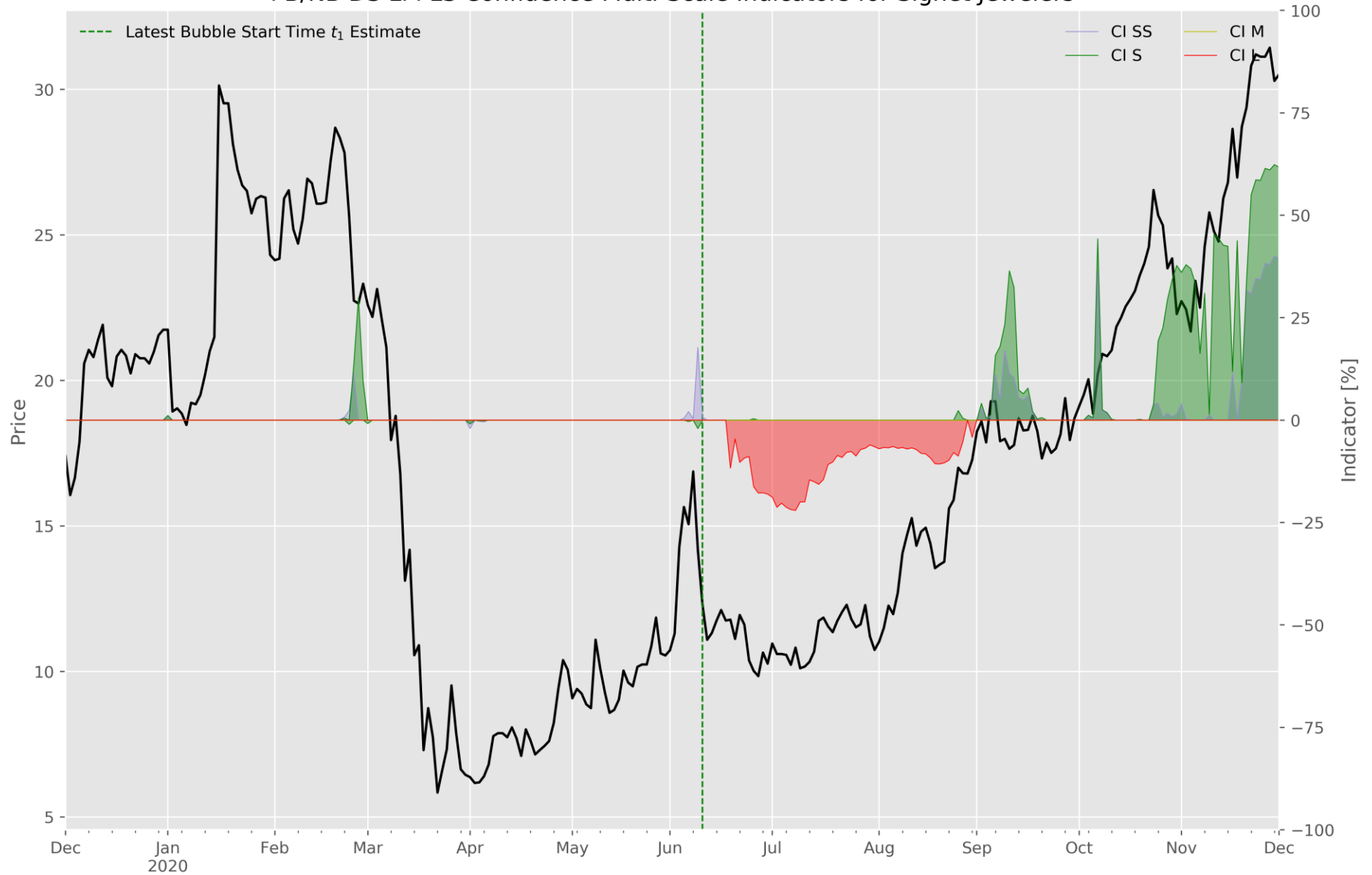
Single Stocks – United States

	Name	Strongest Signal	DS LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [$days$]	Bubble Progress bp [%]	Geometric Average $\sqrt[3]{ci \cdot bg \cdot bp}$ [%]	Critical Time $\bar{t}_c$	Scenario Probability [%]
Positive Bubbles										
1	Adient	Short-Term	85	93	542	89	95	163	2020-12-06	100
2	Signet Jewelers	Short-Term	62	148	526	125	80	138	2021-01-01	77
3	Zebra Technologies 'A'	Short-Term	70	49	424	61	75	131	2020-12-21	100
Negative Bubbles										
1	National Oilwell Varco	Long-Term	18	-68	-24	1008	93	35	2021-02-10	100

▸ For US stocks, the fraction of positive bubble signals is at 13% and there is 0% negative bubble activity. Thus, the tendency toward positive bubble activity is similar, but a bit higher compared to European stocks at the moment.

▸ The confidence indicator values for positive signals range from 62% to 85%. For all of them, the short-term indicator corresponding to fit windows in the interval [40,365] days is the strongest one. The bubble sizes are from 49% to 148%, with large estimated annualized growth rates and short durations of up to four months. All predicted bubble ends are towards the end of 2020, with large scenario probabilities.

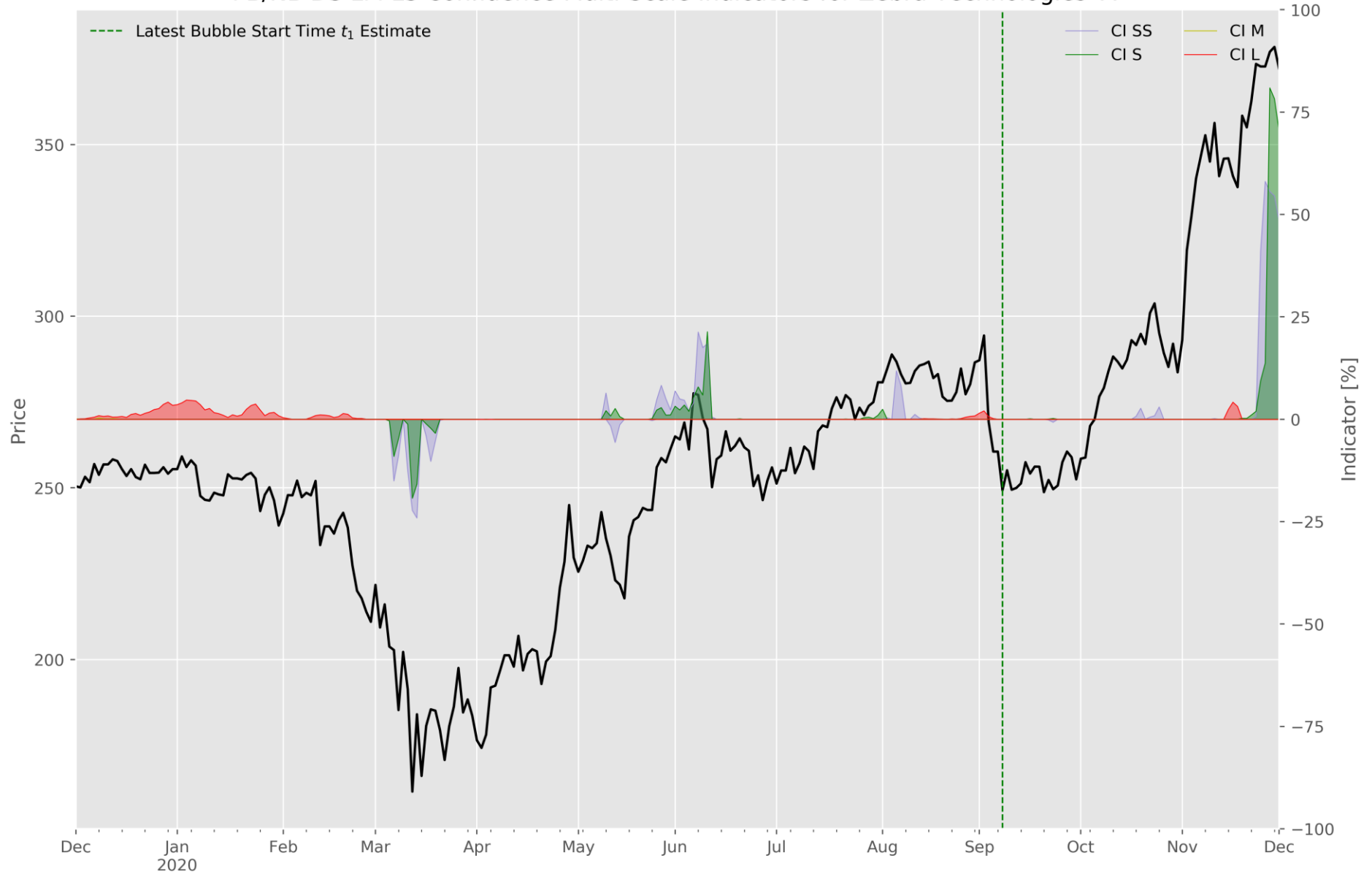▸ The corresponding plots of the time series of the CI at the four set of scales are provided below.

PB/NB DS LPPLS Confidence Multi-Scale Indicators for Adient

PB/NB DS LPPLS Confidence Multi-Scale Indicators for Signet Jewelers

PB/NB DS LPPLS Confidence Multi-Scale Indicators for Zebra Technologies 'A'

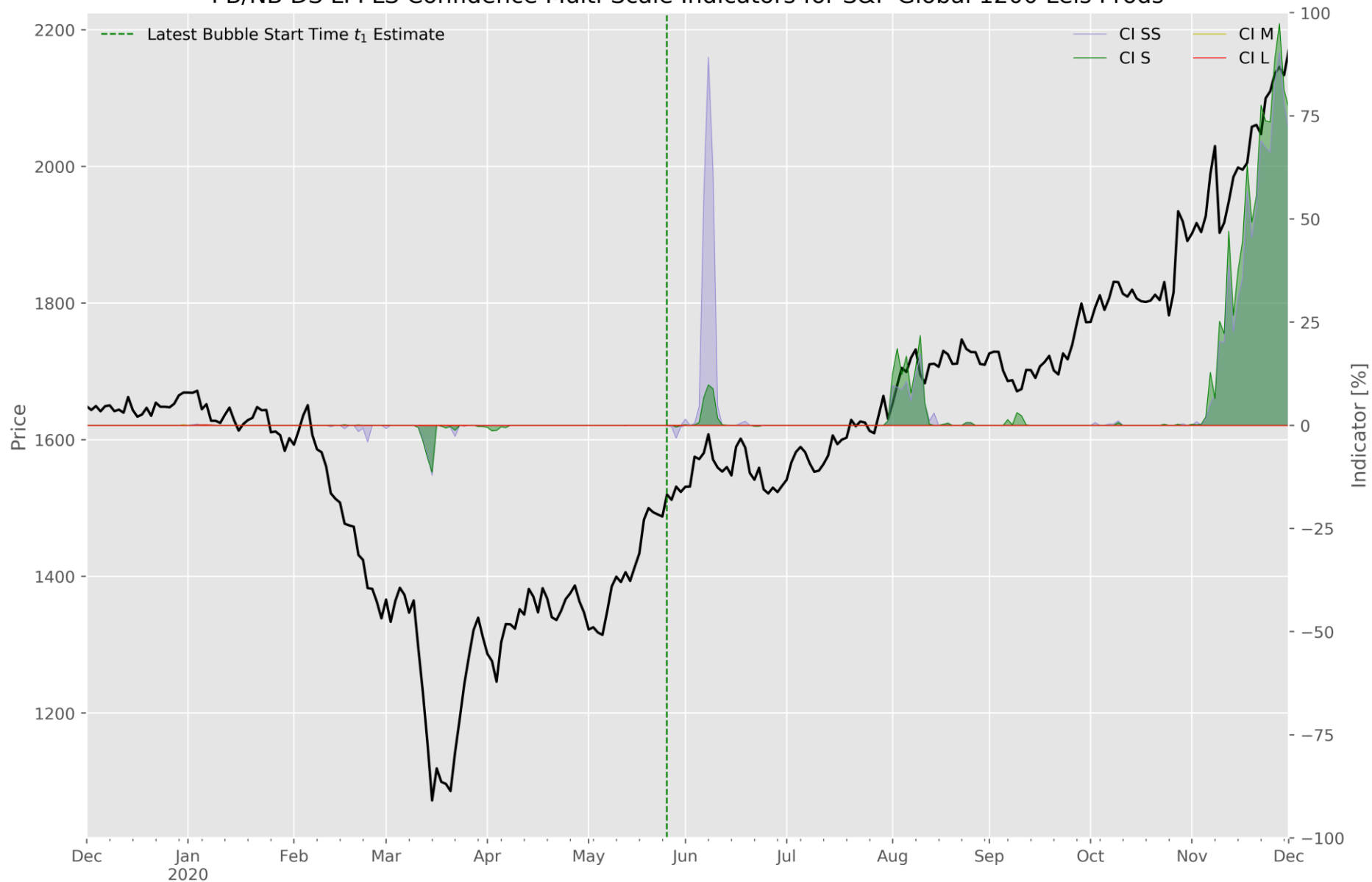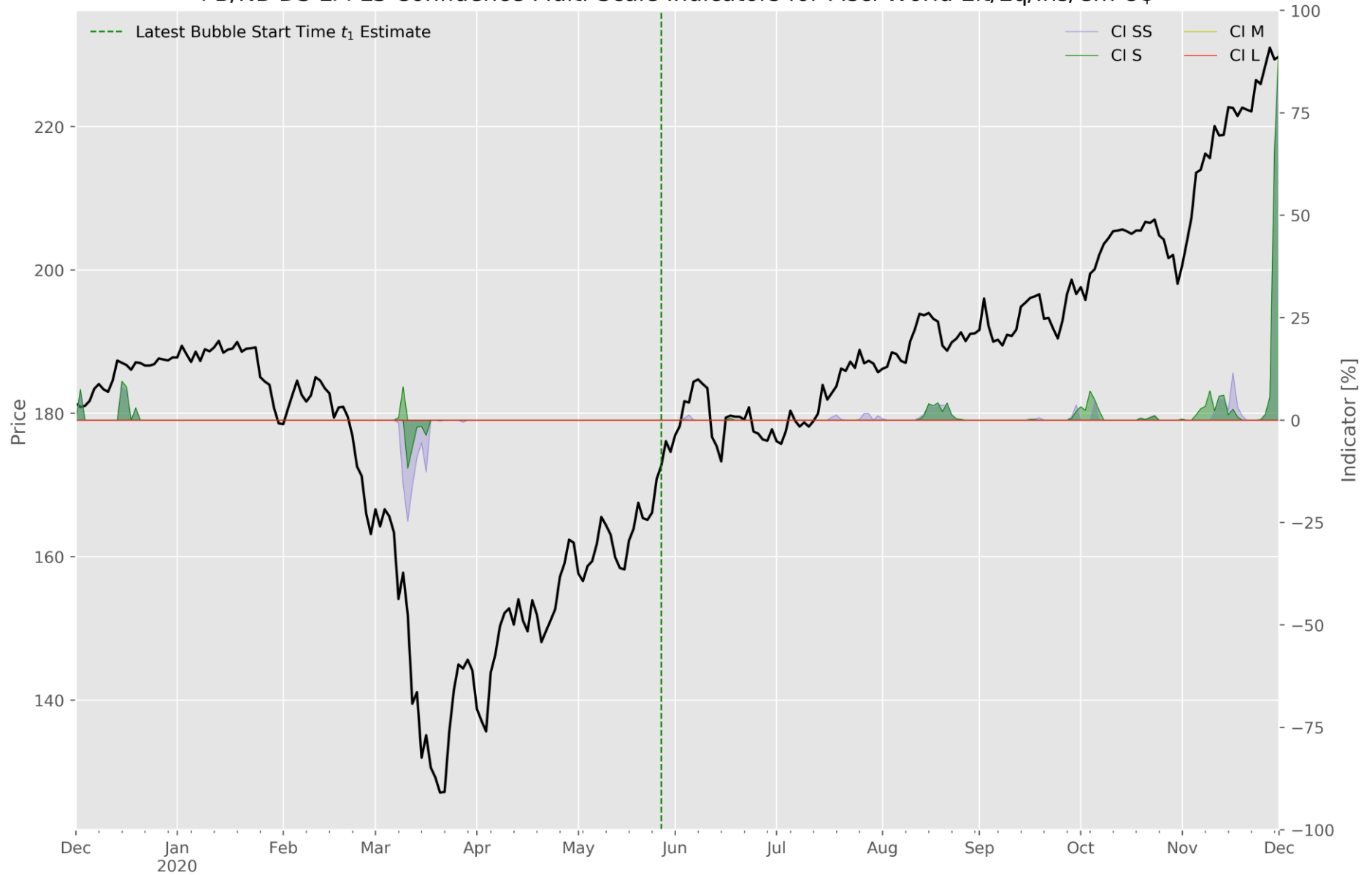# PB/NB DS LPPLS Confidence Multi-Scale Indicators for National Oilwell Varco

CI SS   CI M
CI S   CI L

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Equity Indices – Global

	Name	Strongest Signal	DS LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [$days$]	Bubble Progress bp [%]	Geometric Average $\sqrt[3]{ci \cdot bg \cdot bp}$ [%]	Critical Time $\bar{t}_c$	Scenario Probability [%]
Positive Bubbles										
1	S&P Global 1200 Leis Prods	Short-Term	77	43	93	136	97	89	2020-12-05	100
2	Msci World Elt/Eq/Ins/Cm U$	Short-Term	93	33	70	135	94	85	2020-12-09	100

▶ This section on equity indicess provides another aggregate view of stocks, by analyzing stock indices of various markets. The positive and negative bubble activity is at 13% and 0%, respectively.

▶ The analysis of 386 new global equity indices, such as the S&P Global or the MSCI World series reveals two relevant positive bubble signals. The confidence indicator is above 75% for both and the bubble sizes are 43% and 33%. Thus, again, the bubble signals are quite strong, with predicted ends in December 2020.

▶ In particular for the S&P Global 1200 Leis. Prods. Index, on the next slide, we see a recent increase of the super-short and short-term confidence multi-scale indices. Typically, in the course of bubble formation, a successive build-up of the SS, S, M and L CI's can be observed.

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PB/NB DS LPPLS Confidence Multi-Scale Indicators for S&P Global 1200 Leis Prods

Legend:
- Latest Bubble Start Time t_1 Estimate
- CI SS
- CI S
- CI M
- CI L

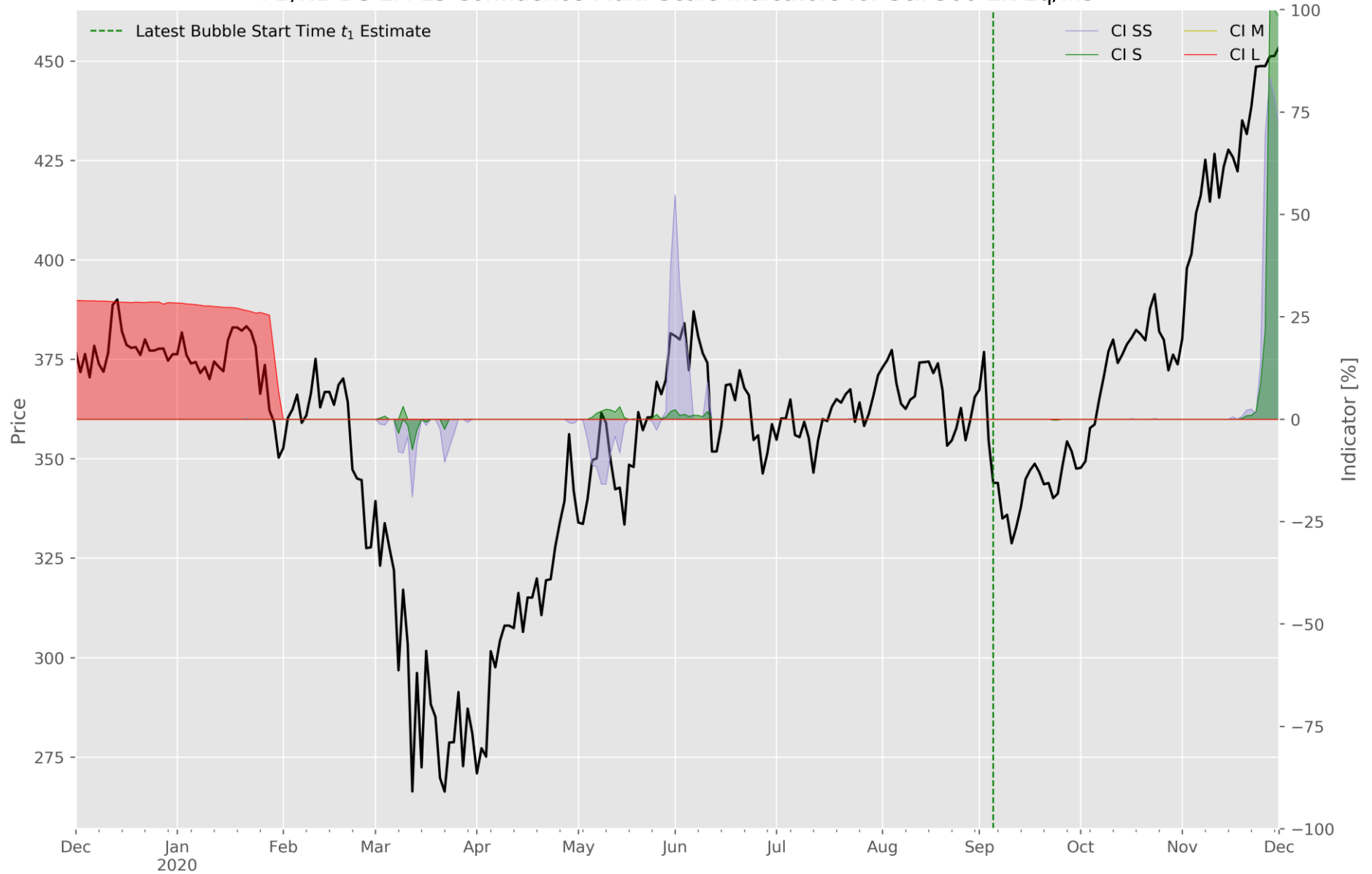# PB/NB DS LPPLS Confidence Multi-Scale Indicators for Msci World Elt/Eq/Ins/Cm U$

Equity Indices – United States

Name	Strongest Signal	DS LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [$days$]	Bubble Progress bp [%]	Geometric Average $\sqrt[3]{ci \cdot bg \cdot bp}$ [%]	Critical Time $\bar{t}_c$	Scenario Probability [%]
Positive Bubbles									
1	S&P500 Elt Eq/Ins	Short-Term	98	32	202	63	83	118	2020-12-13	100
2	S&P1500 Elt Eq/Ins	Short-Term	100	23	123	64	87	102	2020-12-11	100
3	S&P500 S/Con Equipment	Super-Short	25	52	460	61	80	97	2020-12-17	97

▸ The United States Equity Analysis shows three significant positive bubble signals.

▸ Again, the predicted bubble ends are in December 2020. Current bubble durations range from 123 to 460 days.

▸ There are no positive bubble signals.

▸ For the European Equity Index analysis, no signals are detected.

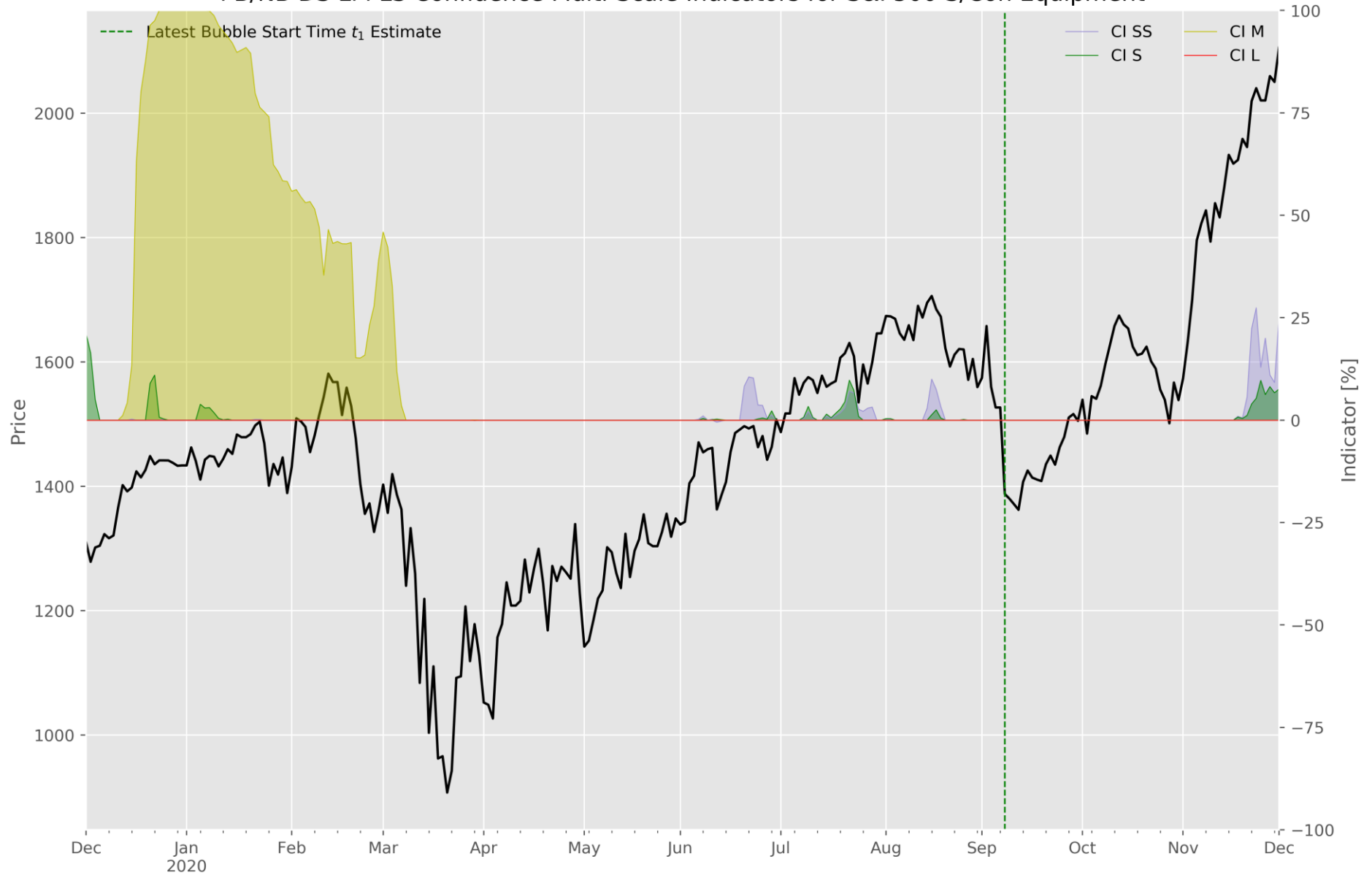▸ The corresponding plots of the time series of the CI at the four set of scales are shown in the following slides.

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PB/NB DS LPPLS Confidence Multi-Scale Indicators for S&P500 Elt Eq/Ins

PB/NB DS LPPLS Confidence Multi-Scale Indicators for S&P1500 Elt Eq/Ins

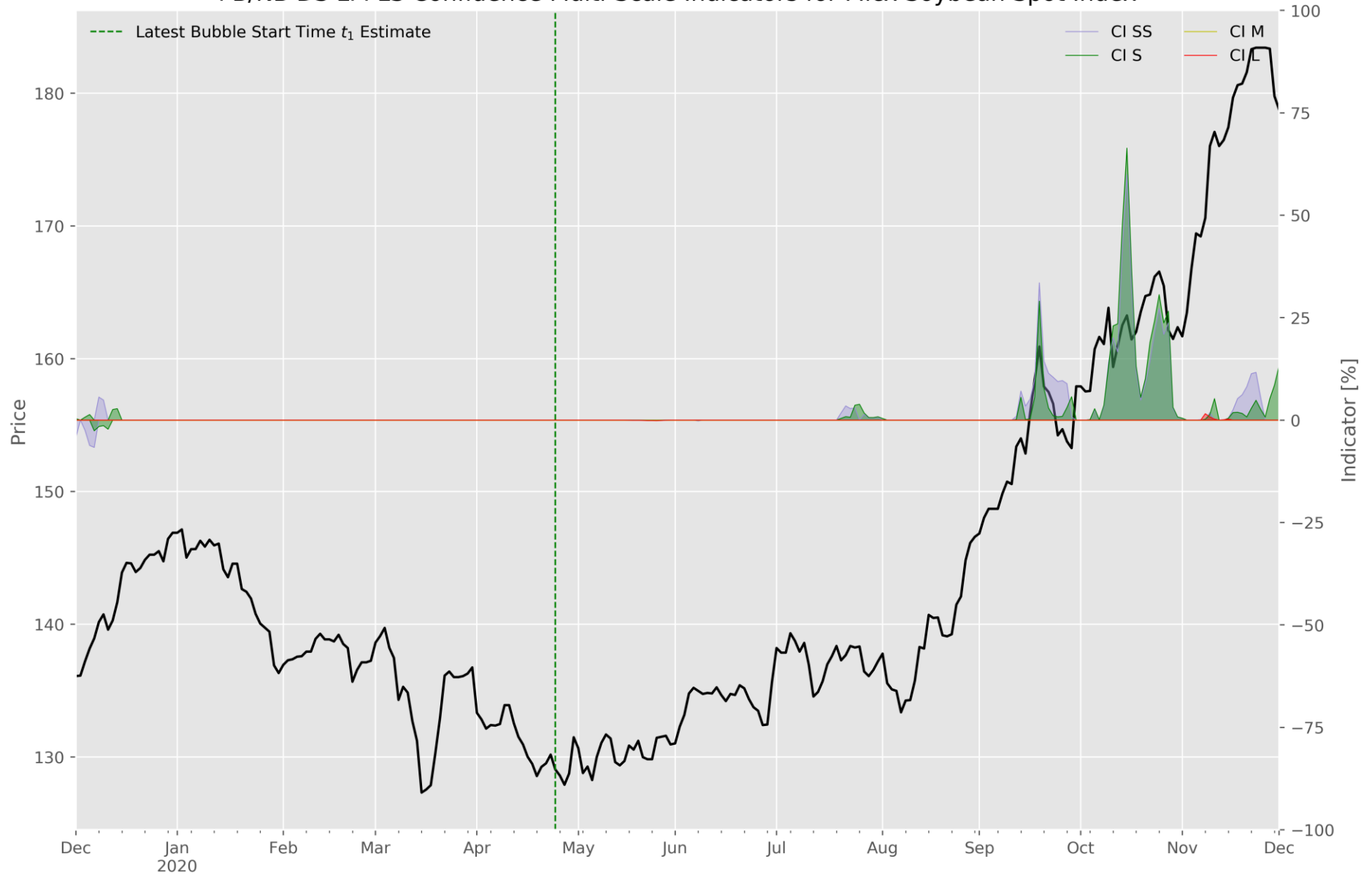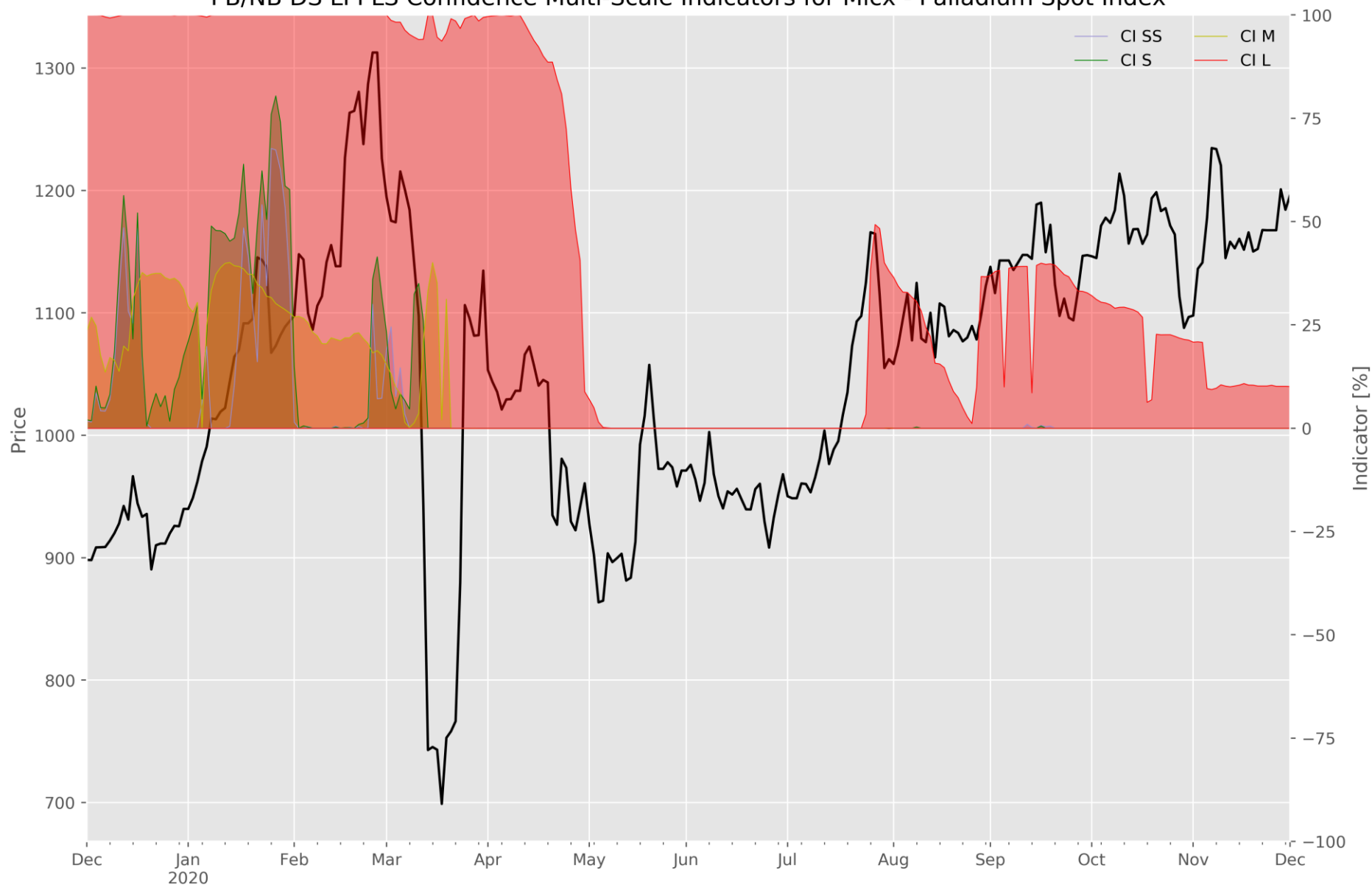# PB/NB DS LPPLS Confidence Multi-Scale Indicators for S&P500 S/Con Equipment

Legend:
- - - Latest Bubble Start Time t_1 Estimate
- CI SS
- CI S
- CI M
- CI L

Commodities

	Name	Strongest Signal	DS LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [$days$]	Bubble Progress bp [%]	Geometric Average $\sqrt[3]{ci \cdot bg \cdot bp}$ [%]	Critical Time $\bar{t}_c$	Scenario Probability [%]
Positive Bubbles										
1	Mlcx Soybean Spot Index	Short-Term	13	39	68	158	90	43	2020-12-18	97
2	Mlcx - Palladium Spot Index	Long-Term	10	208	35	947	82	31	2021-06-24	91

▸ 12% of analyzed commodity indices show positive bubble characteristic this month.

▸ The computed values of the confidence indicator are low, at 10 and 13%. The bubble size differs, with 39% and 208%. This is because the duration of the bubble and the signal scales are very different. As shown on the next slide, for the soybean index, the estimated bubble start time was around May 2020.

PB/NB DS LPPLS Confidence Multi-Scale Indicators for Mlcx Soybean Spot Index

Legend:
- --- Latest Bubble Start Time t_1 Estimate
- CI SS
- CI S
- CI M
- CI L

PB/NB DS LPPLS Confidence Multi-Scale Indicators for Mlcx - Palladium Spot Index
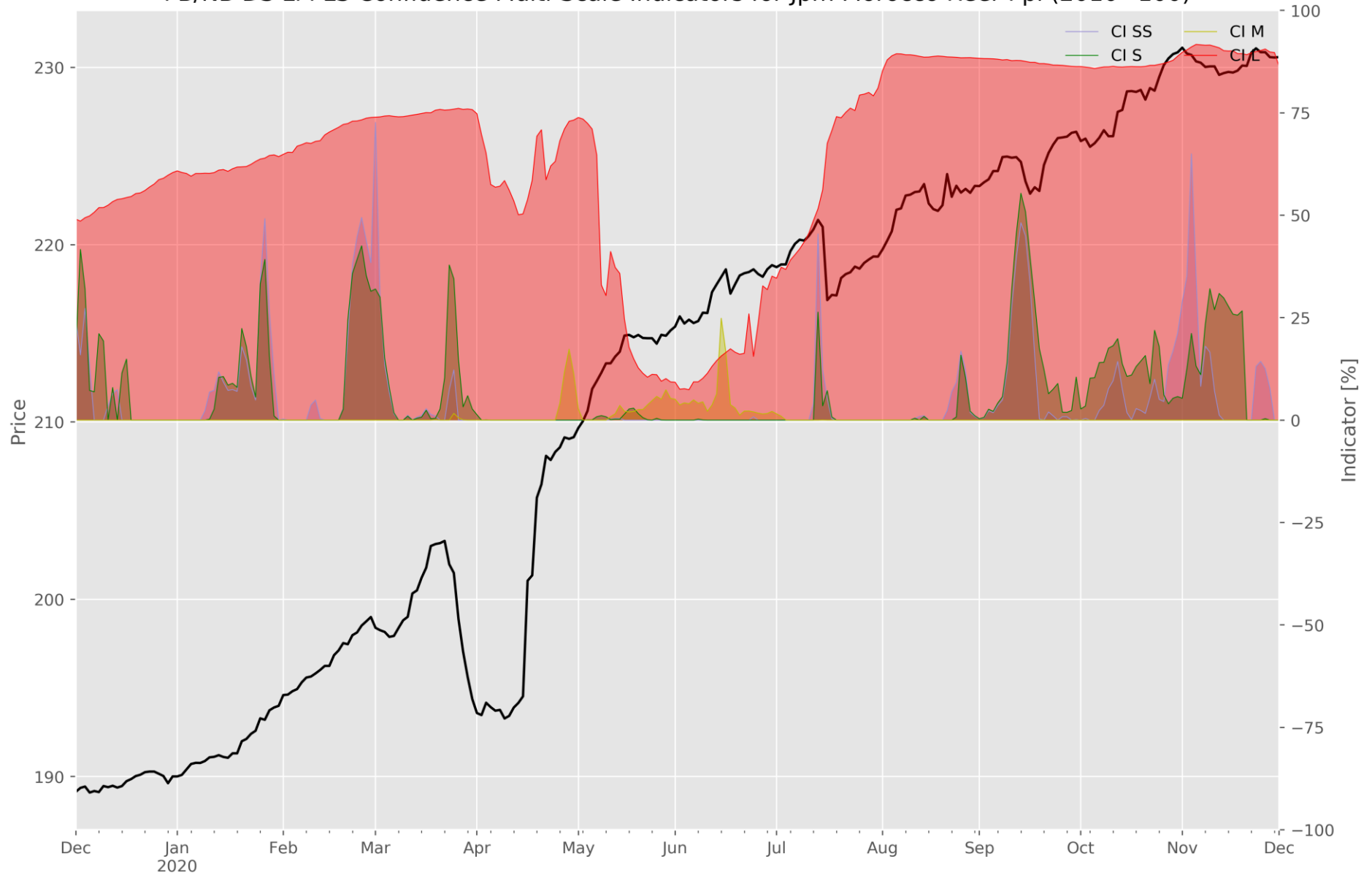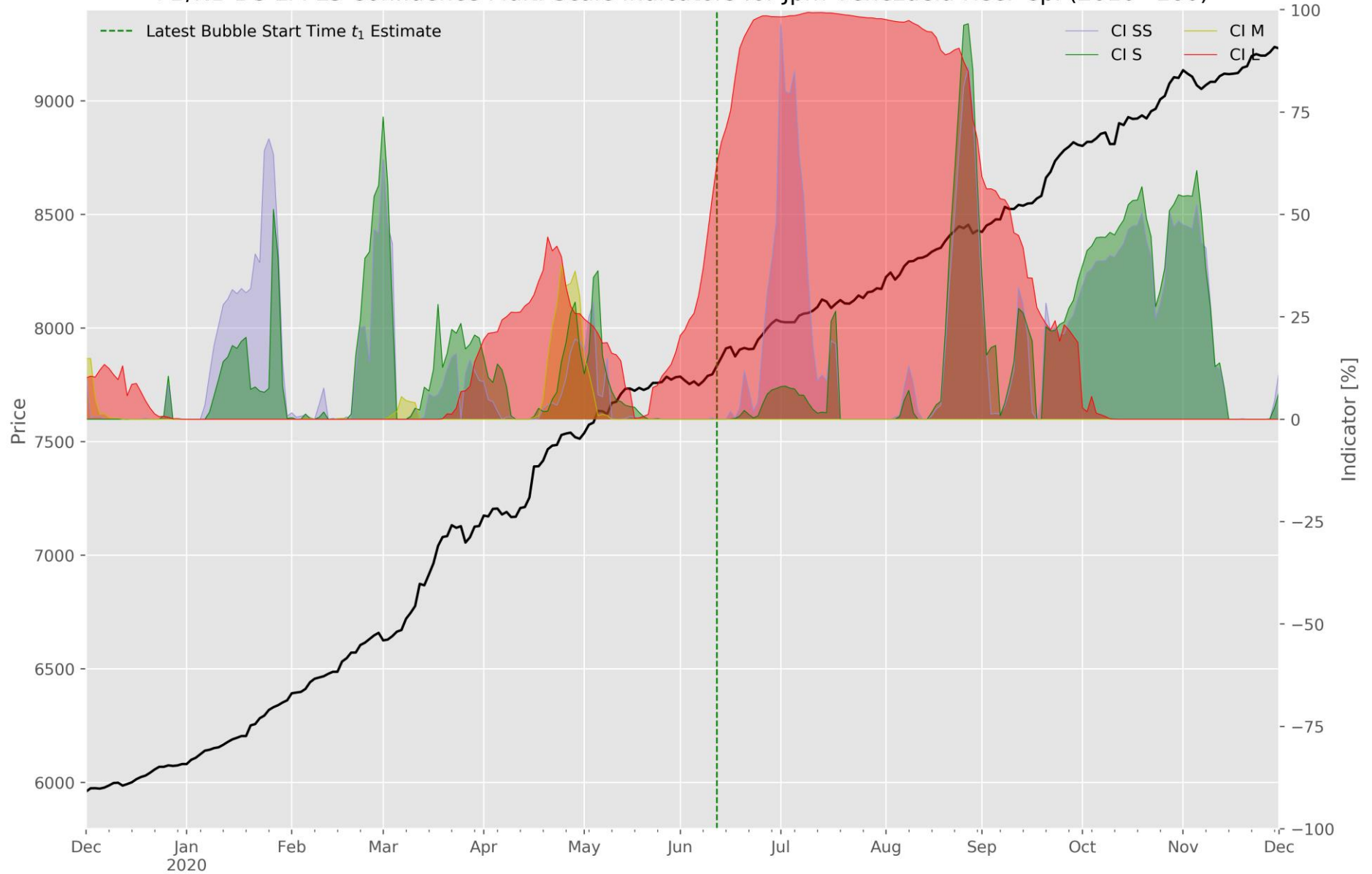
Forex

	Name	Strongest Signal	DS LPPLS Confidence c_i [%]	Bubble Size b_s [%]	Bubble CAGR b_g [%]	Duration [days]	Bubble Progress b_p [%]	Geometric Average $\sqrt[3]{c_i \cdot b_g \cdot b_p}$ [%]	Critical Time $\bar{t}_c$	Scenario Probability [%]
Positive Bubbles										
1	Jpm Morocco Reer Ppi (2010=100)	Long-Term	86	104	20	1003	67	48	2022-04-16	80
2	Jpm Venezuela Reer Cpi (2010=100)	Super-Short	12	18	40	124	96	35	2020-12-07	100
Negative Bubbles										
1	Jpm Argentina Reer Ppi (2010=100)	Short-Term	36	-20	-36	130	100	51	2020-12-01	99
2	Jpm Peru Reer Cpi (2010=100)	Short-Term	23	-13	-19	161	99	35	2020-12-03	97

▸ The analysis of foreign exchange rates, more specifically Real Effective Exchange Rate (REER) Indices, reveals two positive and two negative significant bubble signals.

▸ The corresponding determined bubble activity is at 2% and 6% for positive and negative bubbles.

▸ At the top of the list of positive signals, we find the Morocco index, which shows a strong magnitude of the long-term indicator already since before the beginning of 2020. Both the Morocco and Venezuela indices are strongly linearly trending, which is why the determined bubble signals are likely to be faulty and might be misleading. This is visible from the plots on the next slides.

▸ For the two negative bubble signals, a more plausible picture is drawn by the time series of the CI at the four set of scales.
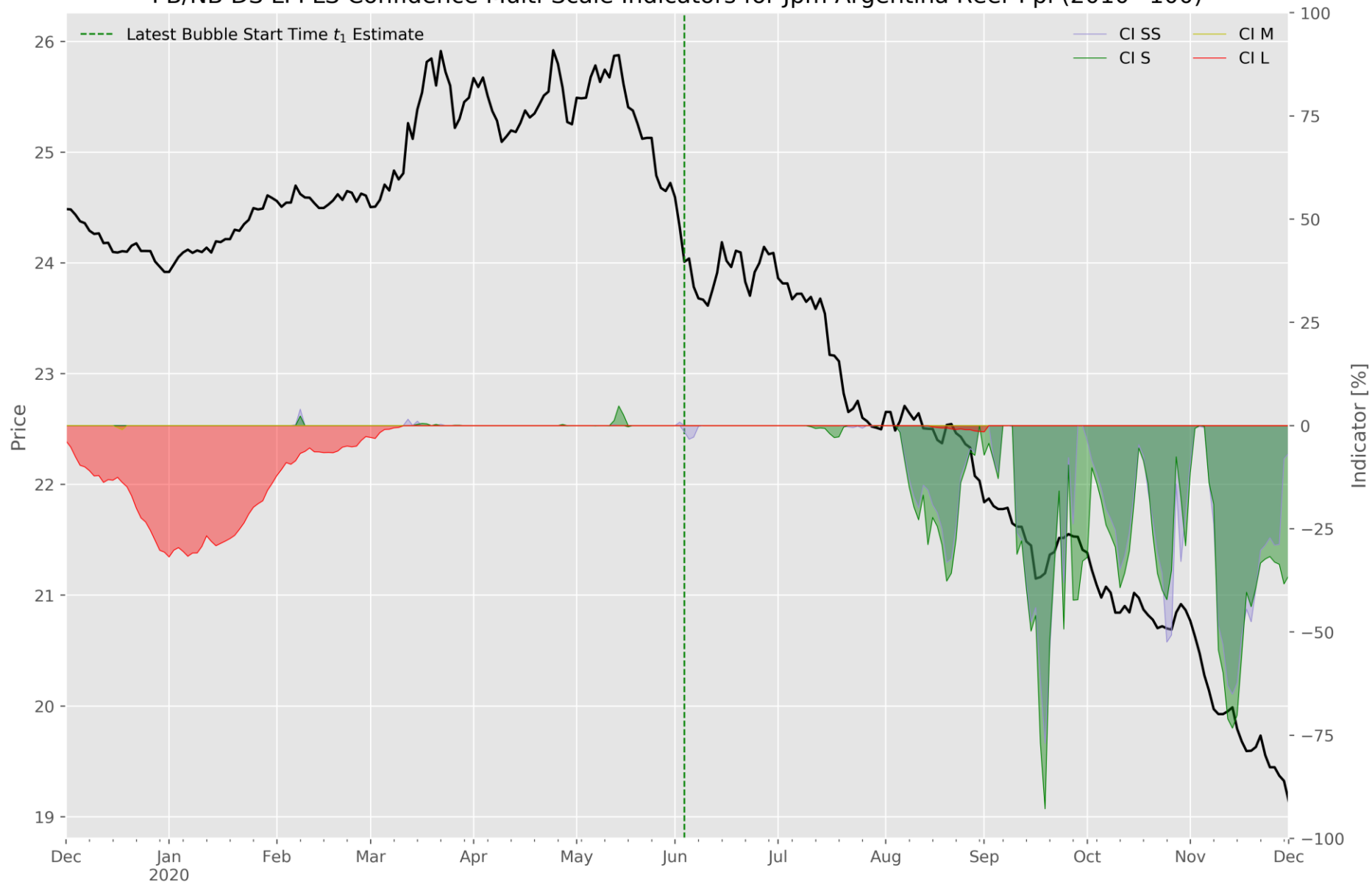
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PB/NB DS LPPLS Confidence Multi-Scale Indicators for Jpm Morocco Reer Ppi (2010=100)
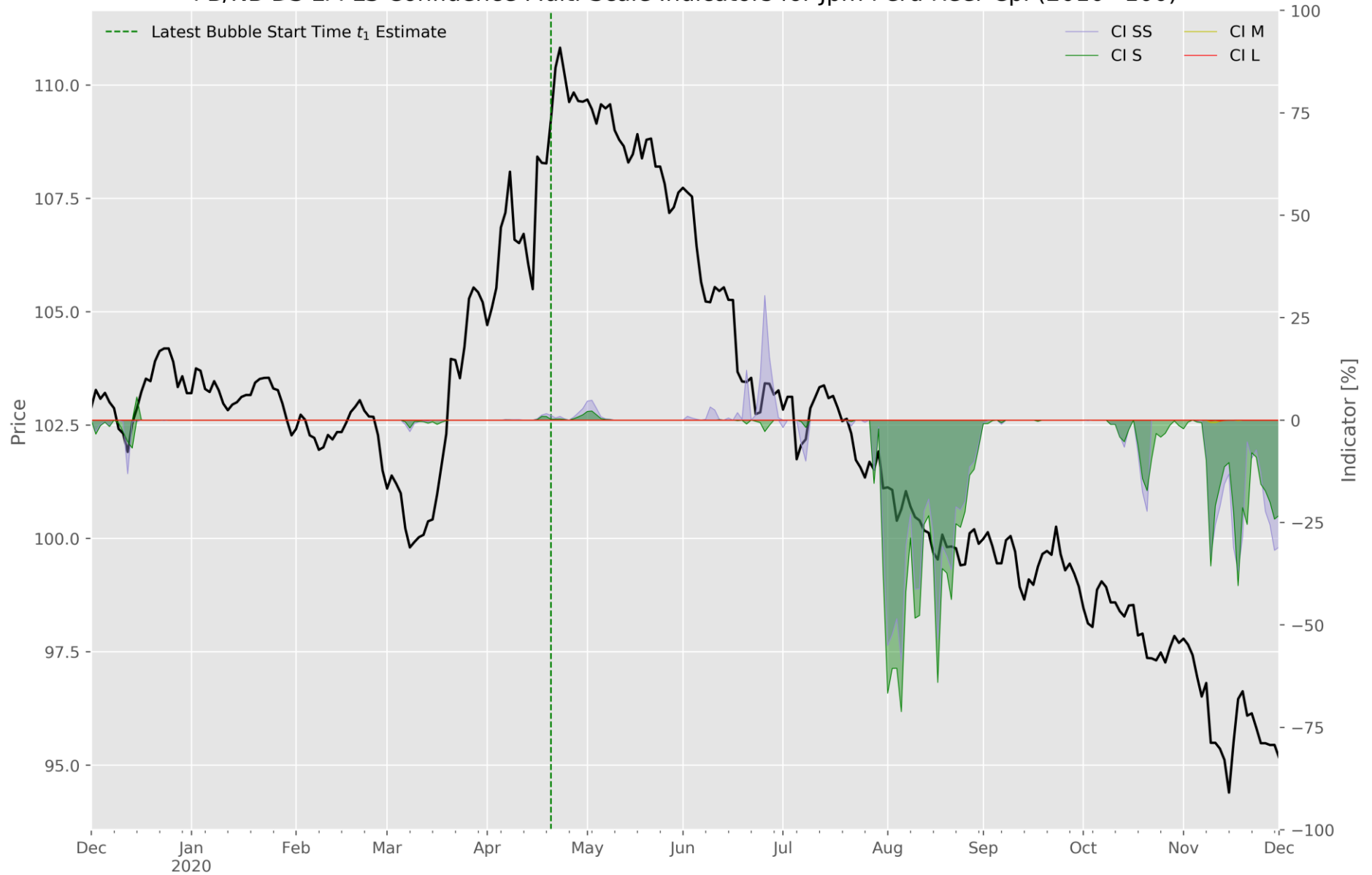
PB/NB DS LPPLS Confidence Multi-Scale Indicators for Jpm Venezuela Reer Cpi (2010=100)

PB/NB DS LPPLS Confidence Multi-Scale Indicators for Jpm Argentina Reer Ppi (2010=100)

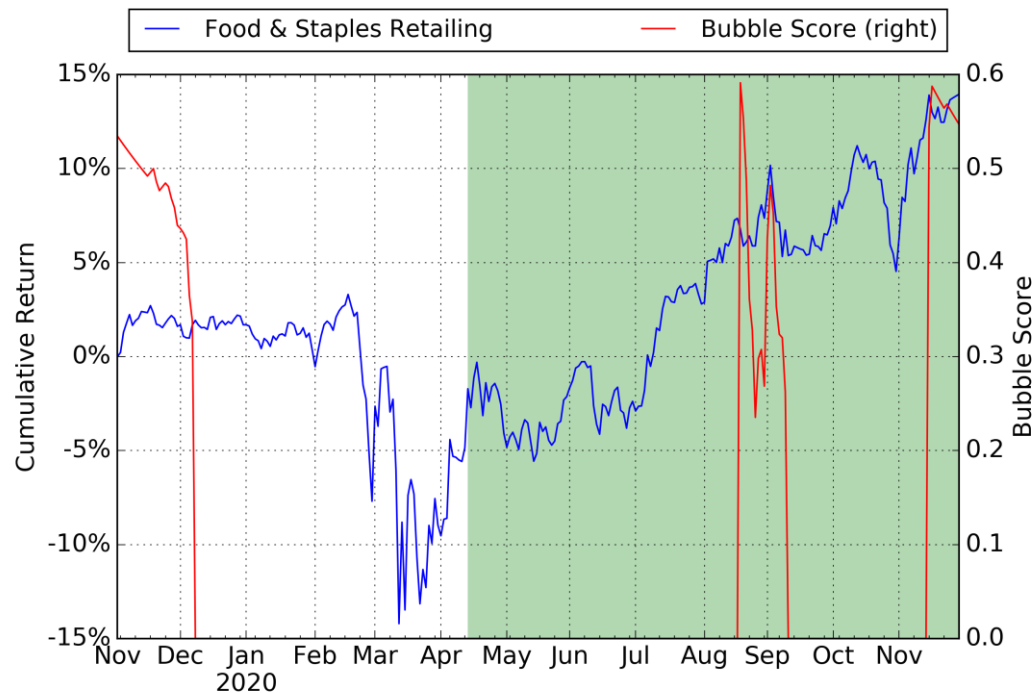PB/NB DS LPPLS Confidence Multi-Scale Indicators for Jpm Peru Reer Cpi (2010=100)

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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	7.7%	4.5%	0.0%	0.0%	0.0%	0.0%	64.1%	66.2%	49.0%	49.2%
Consumer Services	1.0%	-10.8%	0.0%	0.0%	0.0%	0.0%	29.0%	31.0%	42.9%	40.0%
Retailing	41.6%	35.3%	0.0%	0.0%	0.0%	0.0%	22.1%	21.6%	49.5%	49.5%
Transportation	16.2%	0.6%	0.0%	0.0%	0.0%	0.0%	54.7%	55.4%	49.2%	48.2%
Consumer Durables & Apparel	19.2%	6.1%	0.0%	0.0%	0.0%	0.0%	33.3%	33.0%	61.8%	62.3%
Semiconductors & Semiconductor Equipment	46.2%	26.5%	0.0%	0.0%	0.0%	0.0%	62.3%	60.8%	37.3%	38.8%
Technology Hardware & Equipment	47.5%	36.1%	0.0%	0.0%	0.0%	0.0%	67.9%	64.4%	44.5%	44.1%
Automobiles & Components	49.1%	14.0%	0.0%	0.0%	0.0%	0.0%	73.5%	73.8%	57.4%	55.6%
Telecommunication Services	-1.5%	-11.3%	0.0%	0.0%	0.0%	0.0%	59.5%	59.8%	45.4%	45.2%
Energy	-30.2%	-49.0%	0.0%	0.0%	0.0%	0.0%	51.3%	52.9%	63.8%	63.2%
Software & Services	32.9%	23.3%	0.0%	0.0%	0.0%	0.0%	33.8%	36.4%	50.8%	49.4%
Materials	16.0%	2.5%	0.0%	0.0%	0.0%	0.0%	52.4%	52.7%	52.1%	51.1%
Health Care Equipment & Services	17.6%	11.4%	0.0%	0.0%	0.0%	0.0%	53.3%	53.3%	53.4%	55.1%
Capital Goods	7.5%	-9.5%	0.0%	0.0%	0.0%	0.0%	47.8%	48.1%	47.4%	48.1%
Media & Entertainment	29.7%	19.0%	0.0%	0.0%	0.0%	0.0%	27.7%	28.4%	36.6%	38.8%
Commercial & Professional Services	11.5%	4.3%	0.0%	0.0%	0.0%	0.0%	28.4%	28.7%	55.0%	54.5%
Food & Staples Retailing	11.1%	2.1%	15.0%	0.0%	52.7%	0.0%	42.0%	40.3%	57.4%	56.9%
Household & Personal Products	10.3%	7.9%	0.0%	0.0%	0.0%	0.0%	33.1%	31.7%	45.5%	43.8%
Food, Beverage & Tobacco	0.0%	-7.6%	0.0%	0.0%	0.0%	0.0%	49.2%	48.7%	54.5%	54.5%
Utilities	0.8%	-0.3%	0.0%	0.0%	0.0%	0.0%	46.9%	47.6%	46.0%	46.3%
Insurance	-4.6%	-19.9%	0.0%	0.0%	0.0%	0.0%	-	-	-	-
Real Estate	-5.9%	-15.5%	0.0%	0.0%	0.0%	0.0%	-	-	-	-
Diversified Financials	8.7%	-5.5%	0.0%	0.0%	0.0%	0.0%	-	-	-	-
Banks	-14.5%	-30.6%	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.

▸ There is one positive bubble identified in the 24 MSCI World Industry Group Indices: *Food & Staples Retailing*. The recent rebound of the Food & Staples industry is mainly due to the expectation of the end of the pandemic soon in 2021, given the positive news of several vaccine developments.
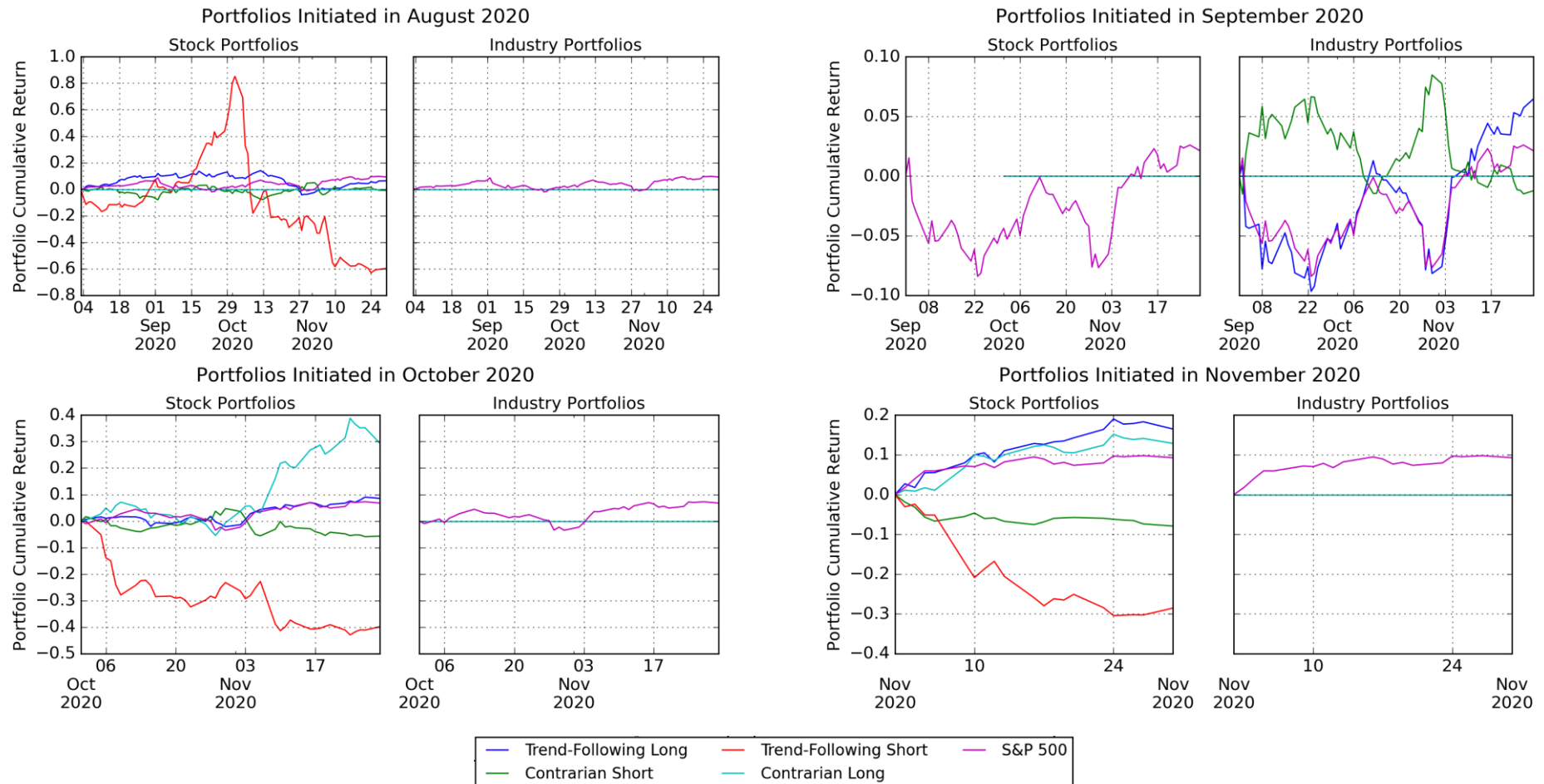
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Portfolio Construction & Performance

▶ 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.
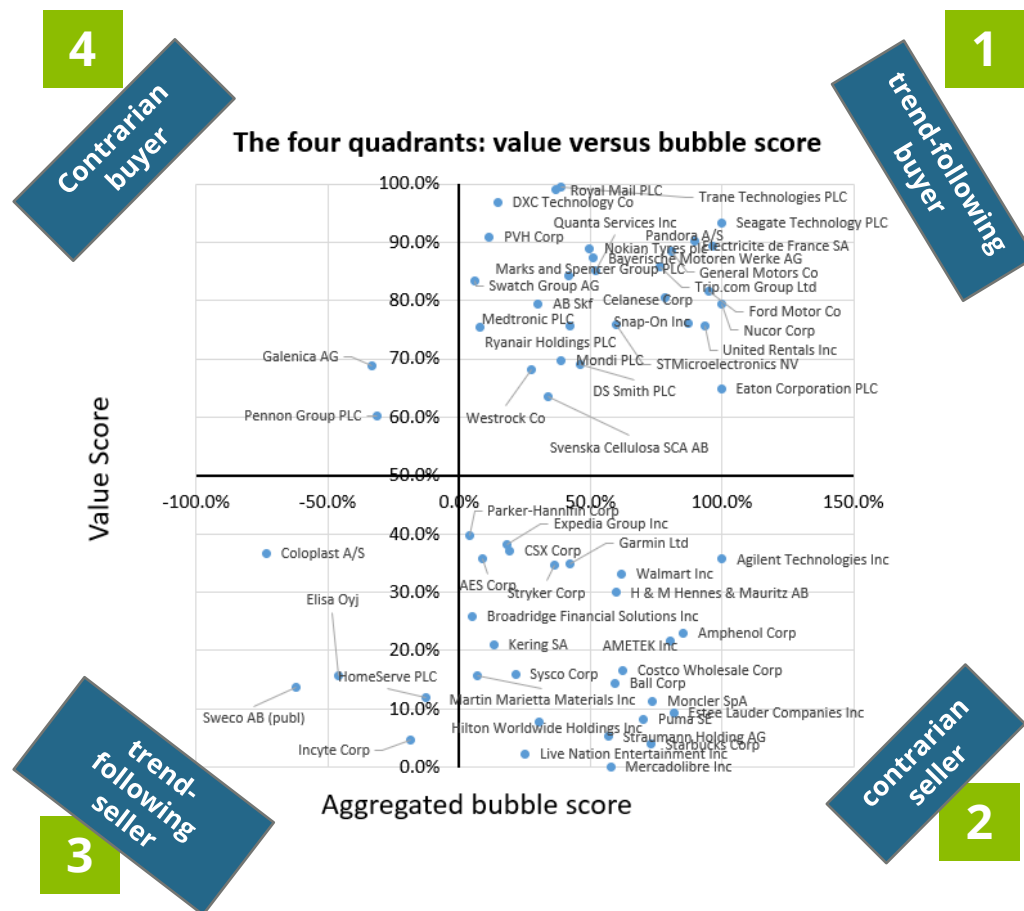
Portfolio Construction & Performance

▸ We observe large variations in some portfolios (e.g. Trend-Following Short) due to the limited number of stocks dominating the portfolio. The Long portfolios have performed well in the past month due to the market reaction of the positive news of vaccine developments. Contrarian Portfolios are more delicate to use due to their sensitivity to timing the expected reversal and exhibit very volatile performances. 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.

Single Stocks

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

The four quadrants: value versus bubble score

▸ **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. PVH Corp.

▸ **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. Walmart 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. Coloplast A/S

▸ **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. Galenica 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.
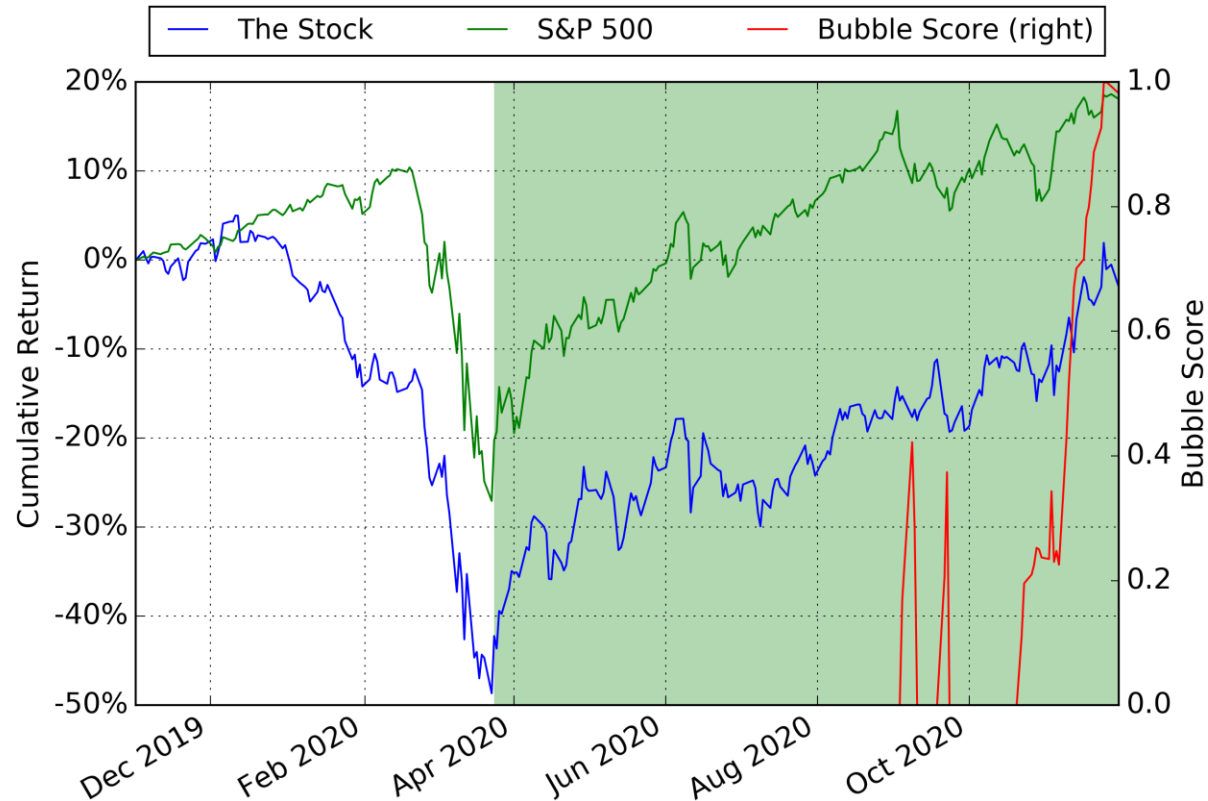
Single Stocks

Quadrant 1 stocks: strong positive bubble signals with strong fundamentals

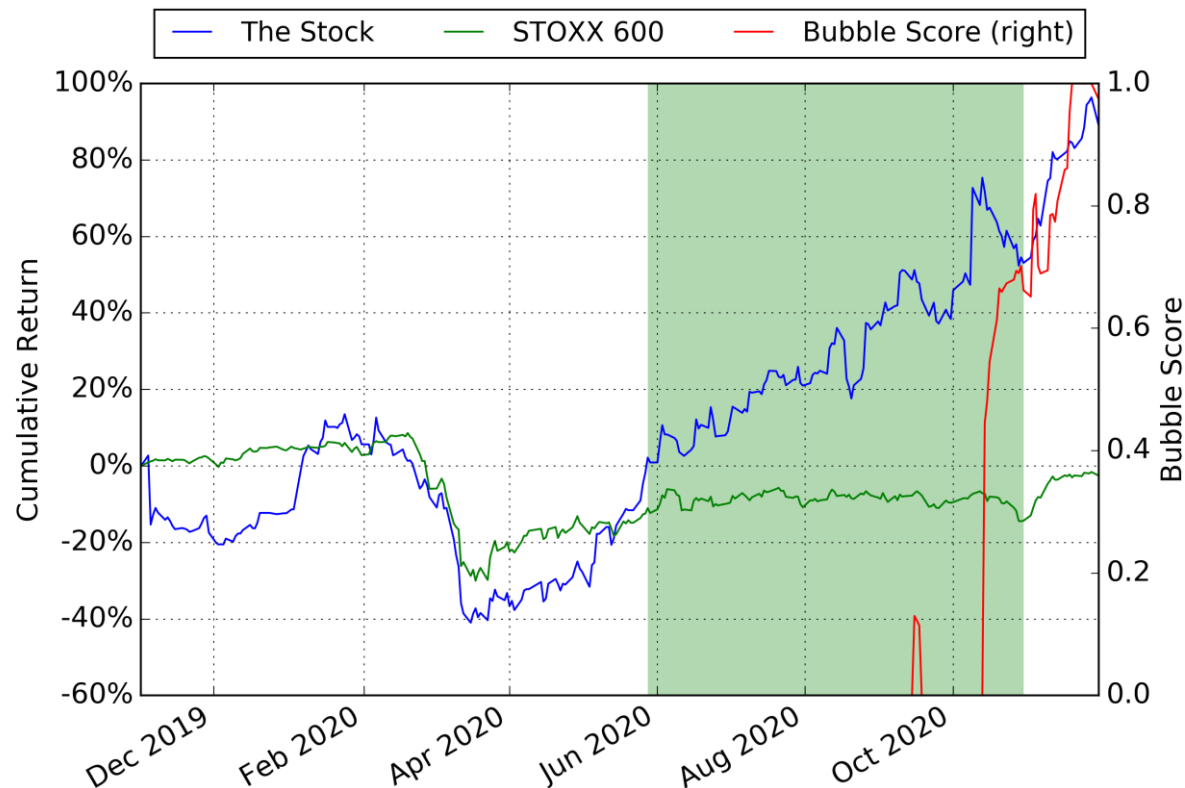| Company Name	Country of Headquarters	GICS Industry Group Name	Yearly Return	Bubble Size	Bubble Start	Bubble Score	Value Score	Growth Score
Swatch Group AG	Switzerland	Consumer Durables & Apparel	-19.6%	17.7%	May-20	5.8%	83.5%	94.4%
Bayerische Motoren Werke AG	Germany	Automobiles & Components	-1.2%	54.3%	Apr-20	51.1%	87.2%	46.0%
Pandora A/S	Denmark	Consumer Durables & Apparel	116.8%	86.8%	May-20	89.4%	90.3%	22.0%
Nokian Tyres plc	Finland	Automobiles & Components	20.8%	42.2%	May-20	49.6%	88.9%	83.9%
Electricite de France SA	France	Utilities	36.1%	60.5%	Mar-20	96.6%	89.4%	0.7%
DS Smith PLC	United Kingdom	Materials	-13.5%	17.2%	Jul-20	46.0%	69.1%	40.9%
Marks and Spencer Group PLC	United Kingdom	Retailing	-37.7%	43.0%	Jul-20	41.5%	84.2%	42.7%
Mondi PLC	United Kingdom	Materials	-2.5%	29.5%	Mar-20	38.9%	69.7%	14.8%
Royal Mail PLC	United Kingdom	Transportation	32.3%	148.2%	Mar-20	36.7%	98.9%	12.9%
Seagate Technology PLC	Ireland; Republic of	Technology Hardware & Equipment	8.5%	34.5%	Jun-20	99.8%	93.3%	73.5%
Eaton Corporation PLC	Ireland; Republic of	Capital Goods	26.3%	45.0%	May-20	99.6%	64.8%	67.8%
Trane Technologies PLC	Ireland; Republic of	Capital Goods	37.1%	59.5%	May-20	38.6%	99.4%	73.8%
Medtronic PLC	Ireland; Republic of	Health Care Equipment & Services	-0.6%	31.1%	Mar-20	42.1%	75.5%	79.1%
Ryanair Holdings PLC	Ireland; Republic of	Transportation	17.3%	67.7%	May-20	8.1%	75.4%	96.0%
STMicroelectronics NV	Switzerland	Semiconductors & Semiconductor Equipment	39.3%	65.7%	Apr-20	59.7%	75.8%	23.6%
AB Skf	Sweden	Capital Goods	8.4%	28.3%	May-20	30.1%	79.4%	15.0%
Svenska Cellulosa SCA AB	Sweden	Materials	43.2%	41.2%	Mar-20	33.6%	63.6%	61.8%
Celanese Corp	United States of America	Materials	7.2%	82.0%	Mar-20	78.5%	80.4%	79.8%
DXC Technology Co	United States of America	Software & Services	-32.6%	100.1%	Mar-20	14.7%	96.8%	3.6%
Ford Motor Co	United States of America	Automobiles & Components	-0.5%	52.4%	Jun-20	94.9%	81.6%	91.7%
General Motors Co	United States of America	Automobiles & Components	23.0%	111.4%	Mar-20	80.5%	88.3%	10.0%
Nucor Corp	United States of America	Materials	-0.1%	68.2%	Mar-20	100.0%	79.3%	10.7%
PVH Corp	United States of America	Consumer Durables & Apparel	-12.4%	124.6%	Mar-20	11.5%	90.9%	29.4%
Quanta Services Inc	United States of America	Capital Goods	73.9%	156.3%	Mar-20	51.9%	85.2%	30.2%
Snap-On Inc	United States of America	Capital Goods	5.8%	37.3%	Jul-20	87.2%	76.0%	66.5%
Trip.com Group Ltd	China	Retailing	2.8%	39.8%	Mar-20	76.3%	85.8%	4.1%
United Rentals Inc	United States of America	Capital Goods	48.7%	55.2%	Jun-20	93.2%	75.7%	28.3%
Westrock Co	United States of America	Materials	8.8%	77.5%	May-20	27.7%	68.1%	22.7%
Xerox Holdings Corp	United States of America	Technology Hardware & Equipment	-36.6%	46.1%	Mar-20	9.5%	97.3%	3.5%

Single Stocks

Quadrant 1 Stocks Current Month Example – Nucor 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 delineates the time interval within which the positive bubble is identified. The Bubble Score of this eight-month bubble has reached 100% with a bubble size 68.2%.

Single Stocks

Quadrant 1 Stocks Last Month Example – Pandora A/S.

▸ 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 stock price has continued to climb up in the past month, leading to a 100% DS LPPLS Bubble signal recently. We expect this stock to have a correction in the near future due to the maturing bubble signal, before growing in the long term due to the strong fundamentals.
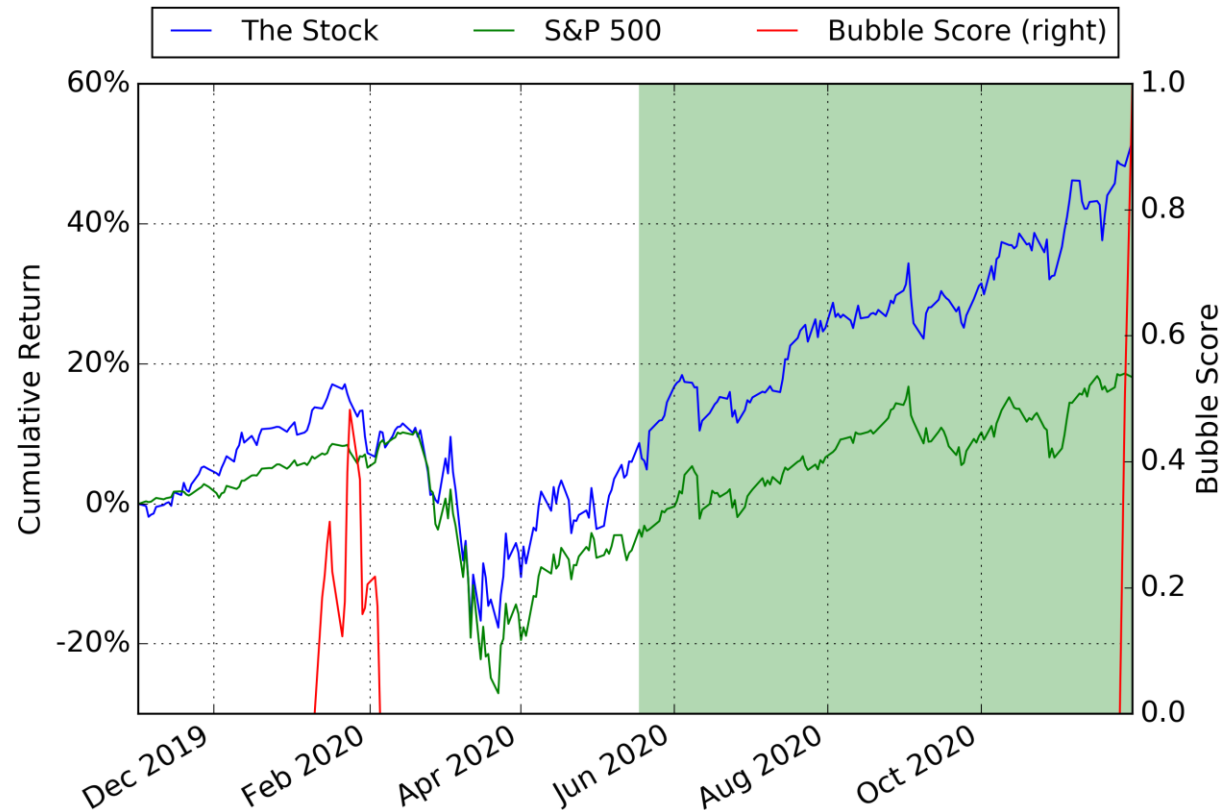
Single Stocks

Quadrant 2 stocks: strong positive bubble signals with weak fundamentals

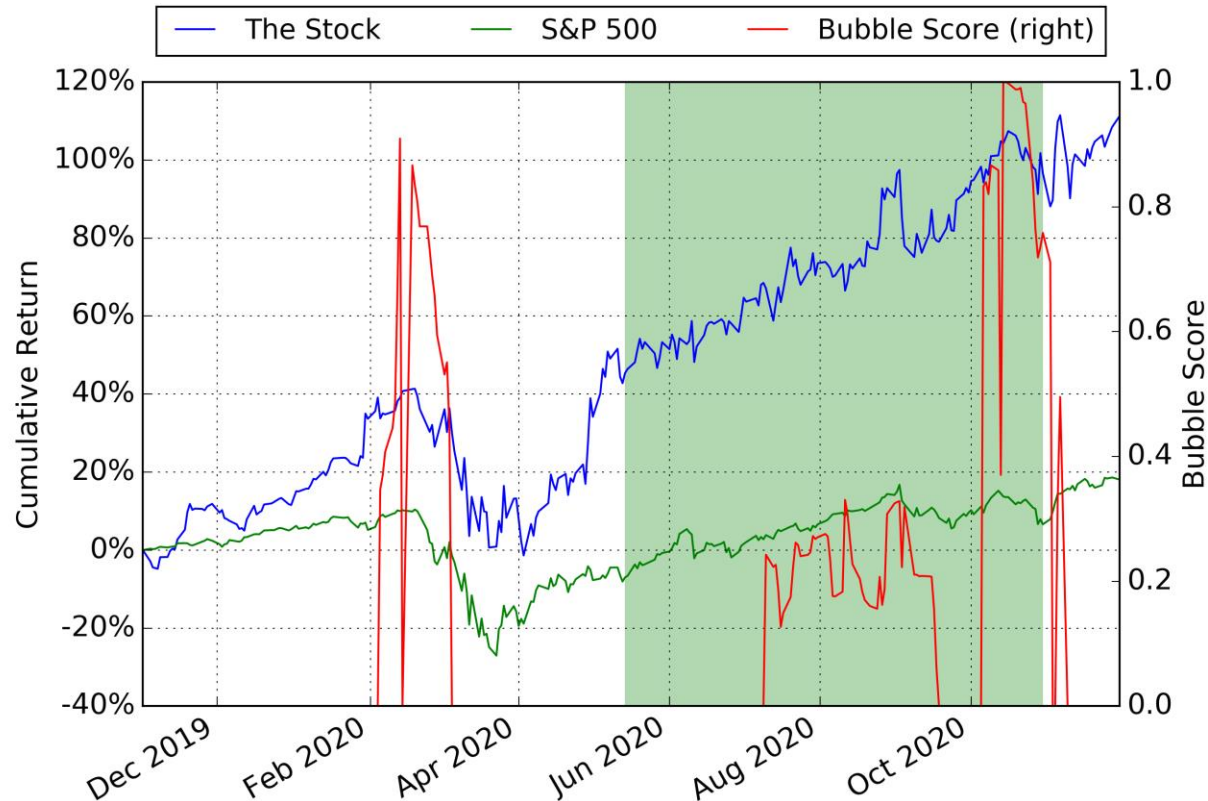| Company Name	Country of Headquarters	GICS Industry Group Name	Yearly Return	Bubble Size	Bubble Start	Bubble Score	Value Score	Growth Score
Straumann Holding AG	Switzerland	Health Care Equipment & Services	9.6%	49.3%	Mar-20	56.7%	5.2%	79.0%
Garmin Ltd	Switzerland	Consumer Durables & Apparel	24.1%	72.4%	Mar-20	42.2%	34.9%	16.5%
Puma SE	Germany	Consumer Durables & Apparel	30.0%	73.7%	Mar-20	70.1%	8.2%	72.9%
Kering SA	France	Consumer Durables & Apparel	4.0%	34.2%	Mar-20	13.1%	20.9%	38.3%
Moncler SpA	Italy	Consumer Durables & Apparel	7.2%	33.1%	Mar-20	73.5%	11.3%	43.8%
H & M Hennes & Mauritz AB	Sweden	Retailing	-3.6%	42.4%	Mar-20	59.5%	29.9%	43.6%
AES Corp	United States of America	Utilities	8.8%	77.5%	Mar-20	8.9%	35.8%	22.5%
Agilent Technologies Inc	United States of America	Pharmaceuticals, Biotechnology & Life Sciences	36.4%	35.5%	May-20	100.0%	35.6%	47.0%
AMETEK Inc	United States of America	Capital Goods	17.7%	32.2%	May-20	80.3%	21.7%	51.7%
Amphenol Corp	United States of America	Technology Hardware & Equipment	23.3%	41.4%	May-20	85.3%	23.0%	39.4%
Ball Corp	United States of America	Materials	47.2%	40.2%	Jun-20	59.3%	14.4%	51.5%
Broadridge Financial Solutions Inc	United States of America	Software & Services	23.4%	40.9%	Apr-20	5.0%	25.8%	58.0%
CSX Corp	United States of America	Transportation	26.2%	65.5%	Mar-20	19.3%	37.1%	48.1%
Costco Wholesale Corp	United States of America	Food & Staples Retailing	30.6%	32.0%	Mar-20	62.2%	16.5%	52.9%
Expedia Group Inc	United States of America	Retailing	12.6%	62.4%	May-20	18.0%	38.2%	45.3%
Hilton Worldwide Holdings Inc	United States of America	Consumer Services	2.2%	59.4%	Mar-20	30.6%	7.7%	41.7%
Estee Lauder Companies Inc	United States of America	Household & Personal Products	19.6%	30.9%	May-20	81.5%	9.4%	79.4%
Live Nation Entertainment Inc	United States of America	Media & Entertainment	10.1%	80.0%	Apr-20	25.2%	2.3%	87.0%
Martin Marietta Materials Inc	United States of America	Materials	3.8%	56.5%	Mar-20	7.0%	15.6%	77.5%
Mercadolibre Inc	Argentina	Retailing	167.5%	109.6%	May-20	57.6%	0.1%	74.9%
Parker-Hannifin Corp	United States of America	Capital Goods	32.8%	49.5%	Jun-20	3.8%	39.8%	13.4%
Starbucks Corp	United States of America	Consumer Services	15.2%	57.6%	Mar-20	72.9%	3.9%	28.7%
Stryker Corp	United States of America	Health Care Equipment & Services	17.3%	44.6%	Apr-20	36.3%	34.5%	63.3%
Sysco Corp	United States of America	Food & Staples Retailing	-7.3%	71.1%	Mar-20	21.4%	15.9%	42.9%
Walmart Inc	United States of America	Food & Staples Retailing	23.5%	14.0%	Jul-20	61.7%	33.1%	71.8%
Xilinx Inc	United States of America	Semiconductors & Semiconductor Equipment	53.5%	64.8%	Jun-20	81.3%	22.1%	46.5%
Xylem Inc	United States of America	Capital Goods	27.3%	34.2%	Jul-20	77.1%	19.7%	69.1%

Single Stocks

Quadrant 2 Stocks Current Month Example – Agilent Technologies 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 six-month bubble has reached 100% with a bubble size 35.5%. The strong positive bubble signal and weak fundamentals indicate a high probability of correction in the future.

Single Stocks

Quadrant 2 Stocks Last Month Example – ServiceNow Inc.

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 a strong positive bubble has been identified and reported last month. The stock has continued to appreciate and outperform the market. The current bubble is not yet reaching the tipping point and may continue to mature.
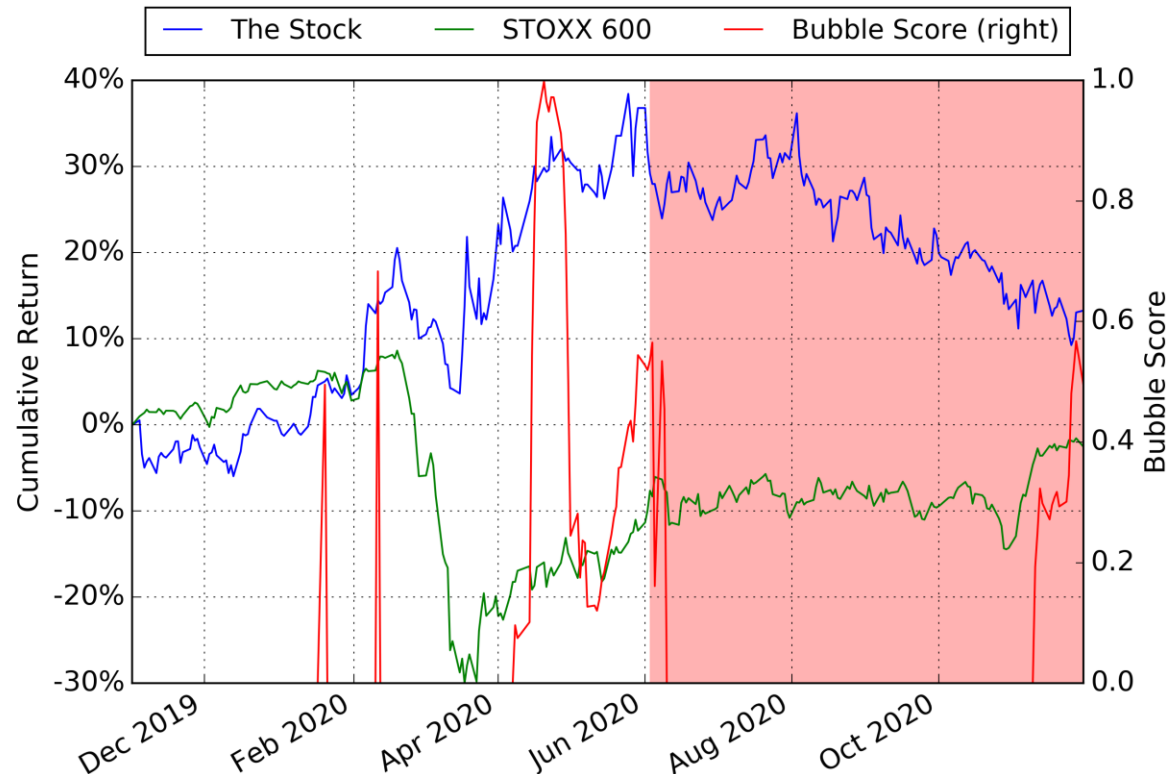
Single Stocks

Quadrant 3 stocks: strong negative bubble signals with weak fundamentals

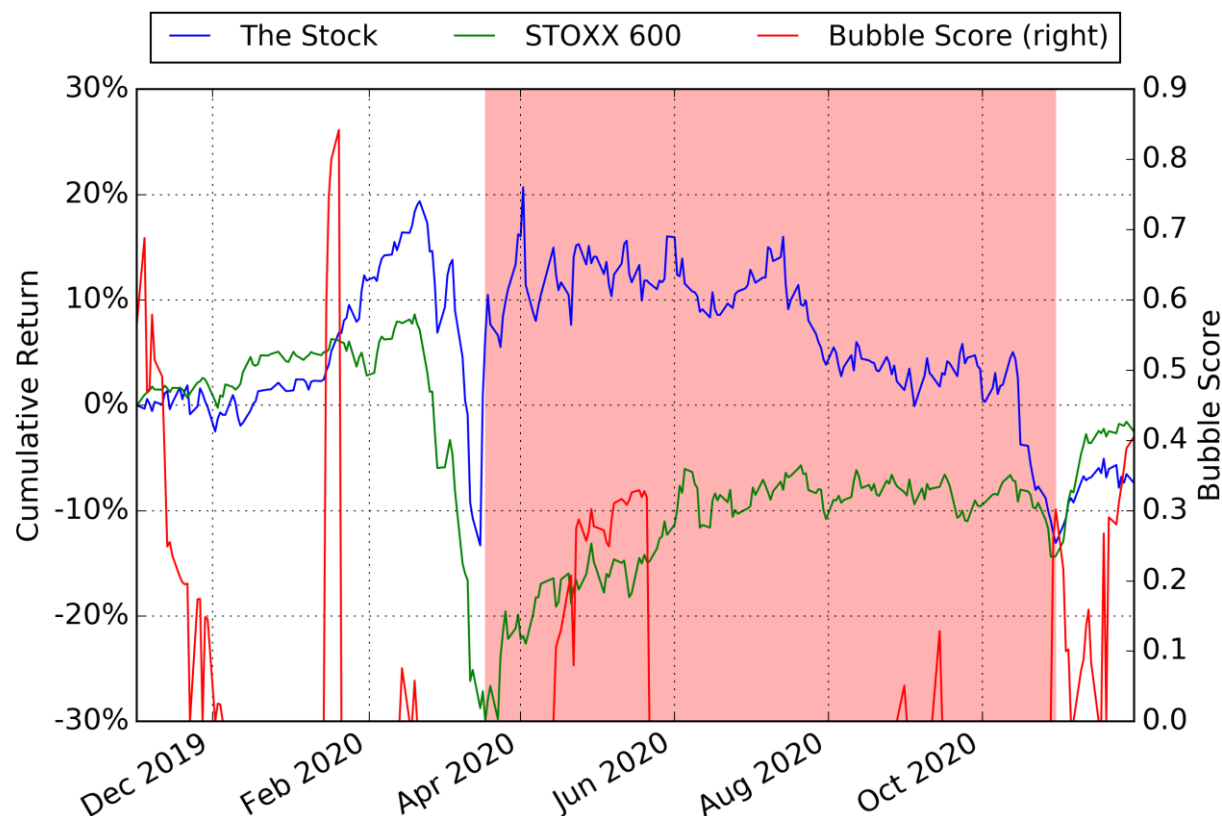| Company Name	Country of Headquarters	GICS Industry Group Name	Yearly Return	Bubble Size	Bubble Start	Bubble Score	Value Score	Growth Score
Coloplast A/S	Denmark	Health Care Equipment & Services	11.0%	-18.2%	May-20	-73.3%	36.6%	78.2%
Elisa Oyj	Finland	Telecommunication Services	-8.5%	-18.0%	Mar-20	-46.0%	15.7%	35.6%
HomeServe PLC	United Kingdom	Commercial & Professional Services	-15.2%	-14.5%	May-20	-12.5%	11.9%	48.2%
Sweco AB (publ)	Sweden	Capital Goods	25.2%	-11.7%	Jul-20	-61.9%	13.6%	16.2%
Incyte Corp	United States of America	Pharmaceuticals, Biotechnology & Life Sciences	-10.3%	-13.1%	Apr-20	-18.5%	4.7%	78.3%

Single Stocks

Quadrant 3 Stocks Current Month Example – Coloplast A/S.

▸ 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 six-month bubble has reached 73.3% with a bubble size -18.2%.

Single Stocks

Quadrant 3 Stocks Last Month Example – Elisa Oyj.

▸ 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 rebounded in the past month. However, the Bubble Score is still around 40% now, meaning that the rebound in the past month may not be sustainable and could be part of a larger negative bubble. The investor should still be cautious about this stock given the bubble score and the weak fundamentals.
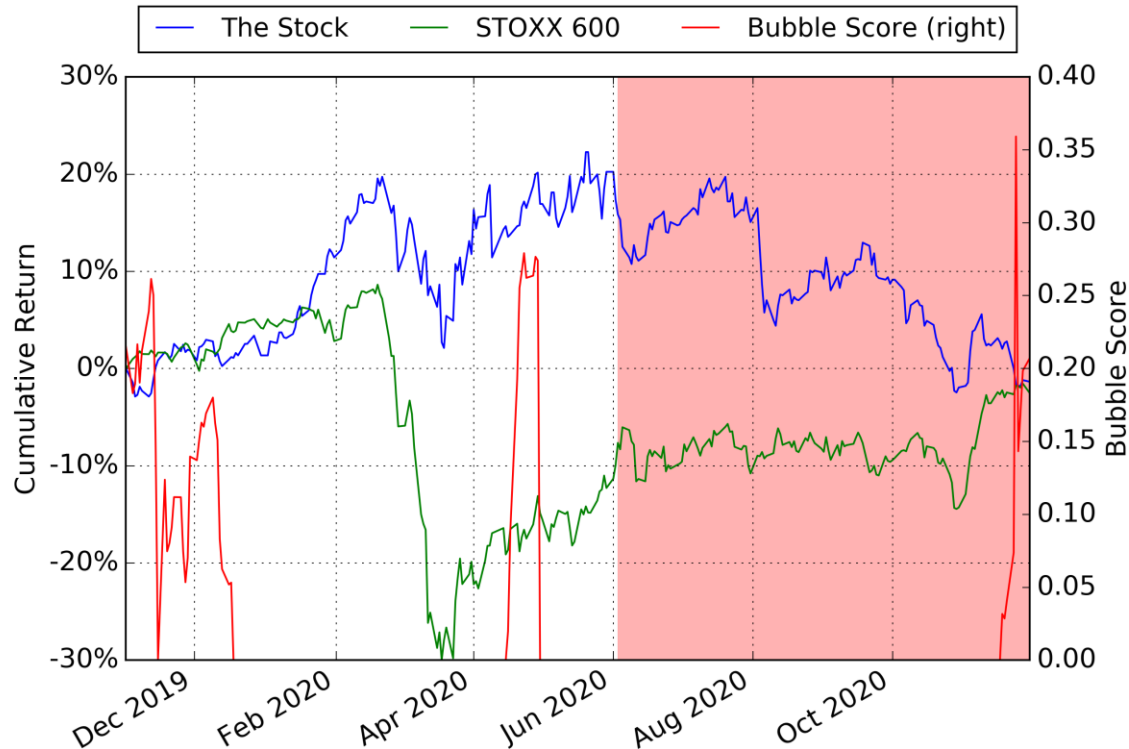
Single Stocks

Quadrant 4 stocks: strong negative bubble signals with strong fundamentals

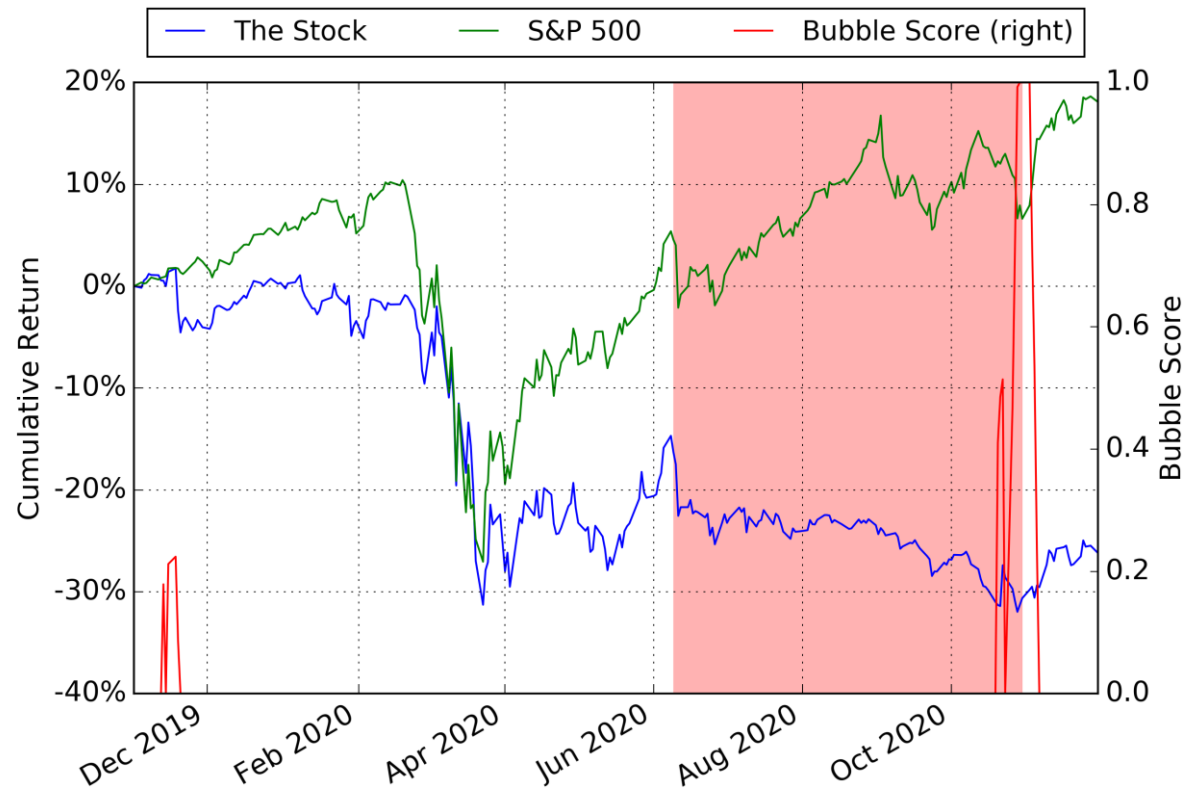| Company Name	Country of Headquarters	GICS Industry Group Name	Yearly Return	Bubble Size	Bubble Start	Bubble Score	Value Score	Growth Score
Galenica AG	Switzerland	Health Care Equipment & Services	-1.0%	-13.7%	Jun-20	-33.4%	68.9%	10.3%
Pennon Group PLC	United Kingdom	Utilities	-7.0%	-11.9%	Apr-20	-31.3%	60.2%	6.6%

Single Stocks

Quadrant 4 Stocks Current Month Example – Galenica 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 33.4% with a negative bubble size -13.7%. 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 – AT&T 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 ended the negative bubble regime with a rebound of 10% in the past month, which is in agreement with our bubble signal and the diagnostic of the strong fundamentals.

More Information

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

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

> **Contacts ETH Zurich**

Jan-Christian Gerlach, Didier Sornette, Ke Wu & Dongshuai Zhao

Chair of Entrepreneurial Risks
Department of Management, Technology and Economics

ETH Zurich
Scheuchzerstrasse 7
8092 Zurich, Switzerland