The FCO Cockpit
Global Bubble Status Report
November 2021

Entrepreneurial Risks

ETHzürich

SUSTech — Southern University of Science and Technology

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 **crowded** and to what degree they 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 applied to 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.

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Fraction of Positive / Negative Bubble Signals for different Asset Classes
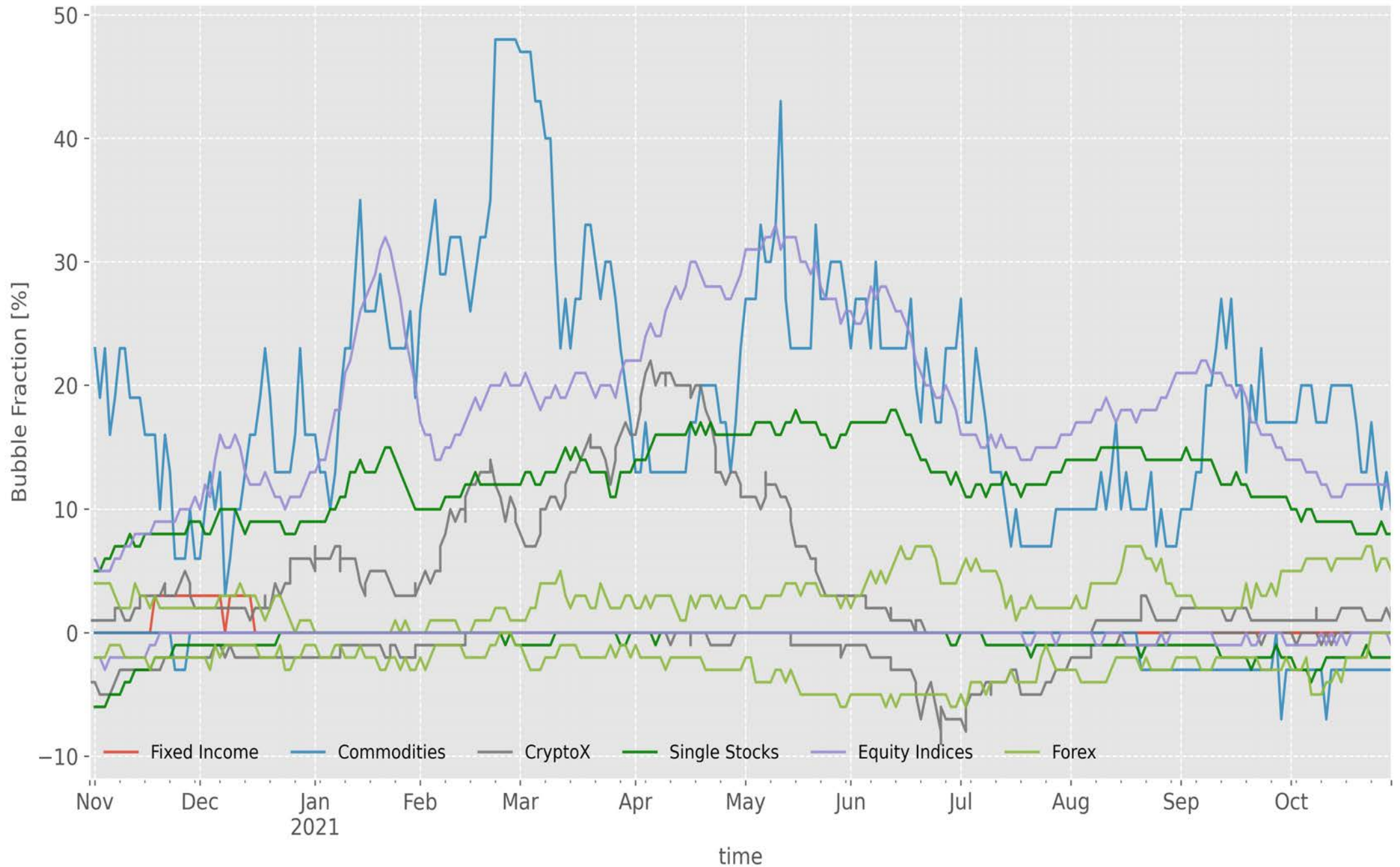
General Results as of 2021-10-31

	Region	Analyzed Assets	Fraction of Pos. Bubbles [%]	Fraction of Neg. Bubbles [%]
Fixed Income		33	0	0
Commodities		30	10	3
Single Stocks		1616	8	2
	Europe	943	7	2
	United States	660	10	1
Equity Indices		867	11	1
	Europe	57	14	0
	United States	377	11	1
	Global	383	11	1
Forex		99	5	0
CryptoX		474	1	0

▸ As of this month, the fixed income sector has zero bubble signals, as in all previous months this year.

▸ In the commodities sector, the negative bubble fraction continues to remain unchanged at 3% this month, yet the positive bubble fraction has experienced a substantial drop from 17% to 10% following a significant rise in the last month.

▸ For the single stock and equity indices sectors, their negative bubble signals still remain nearly zero while the positive bubble fractions record a continued drop of 3 percent each.

▸ In the Forex sector, the positive bubble fraction as of this month remains the same at a low level of 5% as the last month, while the negative counterpart drops to zero altogether.

▸ In the CryptoX sector, bubble signals remain nearly zero as in the last few months.

FCO Market Outlook

Cloudy Q4 for China

In line with our Oct FCO report, the recent PMI index is still weak. We notice that Beijing just announced a property tax for ten top-tier cities, which we believe is mainly due to the government fiscal deficit problem rather than the purpose of cooling down the real estate market. We reckon the most desirable situation for the property price is neither going up or down, but to remain stable, given that a 10% drop of the property price will directly lower by 1% the Chinese GDP in the short term (1-2 quarters), while a 15-20% drop could lead to a recession. It is estimated that a 20 percent fall in real estate activity could lead to a 5-10 percent fall in GDP. It is tough to predict what will come next, as the property market slowdown, energy crunch, regulation tightening, local COVID-19 spread, and even potential geopolitical risk (Taiwan issue) are developing simultaneously.

Climate-related financial risks

Climate-related financial risks refer to the set of risks resulting from climate change, classified as physical and transition risks. Physical risks indicate the potential economic costs and financial losses caused by the extreme climate-change-related events, such as the severe flood in Germany and China in the middle of this year and the hurricane two months ago in America. Transition impacts relate to the process of adjusting to a low-carbon economy. The current

Manufacturing Slump Continues
While services also softened in October

Source: National Bureau of Statistics — Bloomberg

global energy shortage results from the combination of low-Capex investment in the fossil fuel industry (due to COVID-19 and aggressive Carbon reduction policy) and over-relying on immature alternative green energy. We noticed that the Chinese authorities used their political power last month to cap the coal price, which also hammered the western energy prices (i.e., coal and natural gas).

Fix income: The European Centre Bank reckons that the current energy crunch and supply-chain problem are two significant reasons that are delaying the European economic recovery, so they still insist on keeping the previous taper schedule. The Australian RBA, on the contrary, abandons the yield curve control scheme to fight against inflation. The Bank of England might also take similar actions to the inflation risk.

U.S. equities: Our alarm signal suggests that Tesla might have a correction very soon. Elon Musk, who has just become the richest man globally, is a master of the bubbles. He took advantage of the dot-com bubble and became a millionaire by selling a website in the 1990s. Then thanks to the Fintech bubble, he co-created PayPal and thus became a billionaire. After that, he focuses on the EV and solar system, being the pioneer of the green energy bubble. Meanwhile, he also contributes and exploits the cryptocurrency bubble. Another recent piece of news is that Zuckerberg changed the Facebook name into Meta (and plan to invest $10 billion). This action shows Zuckerberg's ambition to become the Caesar of the Virtual world, aiming to lead a virtual bubble for the next decade. For Apple, the chip shortage problem is still unsolved, and the arising geopolitical risk of Taiwan might also shadow the potential chip supply. One funny thing about the ESG is that more than 400 global leaders took their private jets to Scotland to discuss how to reduce carbon emission, and it seems that they may fail to get objective results. May we suggest that a video meeting will be a better and greener option for the next meeting.

Commodities: The Coal price crashed due to the strict Chinese governmental intervention, which also hammered the natural gas price in Europe. However, given the low Capex investment in petrol exploration, oil might still face under-supply issues, especially when most countries reopen to get back to everyday life. In line with last month's report, we still worry about the global food price. The electricity shortage directly impacts fertilizer production, which will, in turn, push up future vegetable prices, while current vegetable prices are already up due to extreme rainfall and undesirable temperature in China, India, and East Asia. The price of the Big Mac is increasing as the ingredients cost surged and due to the labor shortage. The cotton price will remain elevated for now due to the coming cold winter. In addition, the copper price has corrected due to the Chinese weak PMI and slowdown of the property market. On the medium term. Copper prices can be expected to gather upward momentum due to the energy transition.

Some Thoughts on "Religious" Investors

Let's start with an ancient legend:

In the era when Columbus lived, people thought that the surface of the earth was flat. Some believed sea monsters lived under the Atlantic Ocean with a mouth big enough to swallow sailboats. And there was also a terrible waterfall on the edge of the Atlantic Ocean, where boats would fall and smash to pieces or be lost in an unknown abyss.

Most of the crew on the boat of Columbus, Santa Maria, could not sleep peacefully at night after sailing for two months since they were petrified, as no one had ever sailed this far. What's worse, the crew were also afraid that the ship might suddenly fall off the edge of the Earth at any time during the night when they sleep and disappear forever.

Columbus, motivated by gold and his own belief (he believed the Earth to be round, but no one could prove it at that time in the West), must first have overcome these terrifying ideas and persuaded the crew to keep the boats sailing further. Otherwise, after many weeks of sleepless nights, the restless crew could throw him into the sea to feed the sharks and ship back to port.

We all know his voyage eventually "discovered" the so-called "New World" — millions of people already lived there — Columbus mistakenly called all the indigenous people in the island "Indians," and he thought he might be somewhere near India.

From hindsight, no one can deny that he started the colonization age. After his "discovery," many bold people began to explore the world, bringing more advanced technology and knowledge to other parts of the Earth, albeit with guns and germs.

Investment is also like an exploration adventure. Almost all investors, at least sometimes in their investment life, have to suffer from an anxiety, like Columbus and his crew had during their first voyage. i.e., they do not know where is the edge of the world, but they have to sail, betting their boat is lucky enough to avoid a smash. However, if they ship back, their competitors might find the "new world," and no one will enjoy the success of a Columbus's journey. Likewise, a fund manager still holds the stocks before the big crash; all their endeavors (stock-picking skills, portfolio weighting skills, and years of cumulated luck) will be in vain. But if they sell, but no crash occurs, the fund performance will be shadowed by lots of "brave" competitors.

Every successful investor has to have an investment philosophy or style. They have to rely on their firm belief, like "religion," to go through the gain, overcome the fear and calm down their nerve, especially when the market does not favor them for a long time. For instance, Benjamin Graham & Warren Buffett believe in value investing; Paul Tudor Jones sticks to Chartism; Masayoshi Sun & Cathie Wood bet on disruptive technology investing; Peter Lynch is good at growth investing; George Soros chooses a combination style (value, growth, and speculation); Howard Marks is known for contrarian investing; Sequoia Venture Capital is famous for sector focus investing. Even the people who get rich from investing in the cryptocurrencies (including those who bet on the "air" coins) have their particular investment "religion," even if it seems ridiculous. Otherwise, they could not hold the positions when the market fluctuates. Many of them also have a strong philosophy but fail to make significant money in this investment game. It is also true that some make great money or lose big for some good, bad, or no reason at all (purely based on luck or bad luck). But for those who can go through the up and down of the wild market, suffering years of self-doubt as well as others' questions, enduring long nights and the cold winter must be very stubborn "religious" investors.

How to read the graphs and tables

DS LPPLS Multi-Scale Confidence Indicators:

▸ The graphs below use our extended 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 fit windows that describe different "timescales of thinking" of investors. 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 sets range from few months up to several years. For each range, 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, the indicator plots show the detailed positive and negative bubble indicator timeseries 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.

How to read the graphs and tables

Additional Bubble Metrics:

- We show the top positive and negative bubble signals, as well as the corresponding bubble characteristics.

- The "**bubble CAGR**" (bg) 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.

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

- The **bubble size** since the bubble start t1 is $bs = \frac{p_t}{p_1} - 1$ and the bubble duration is $bd = t - t_1$

- By estimation of 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:

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

- Thus, 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 divisor $t_c - t_1$ is the "**implied bubble duration**", implied by 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 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 and thus, the geometric average is a reasonable choice to rank bubble signals.

Fixed Income

No bubbles to report

Commodities

Mlcx Coffee Spot Index

Rank	Strongest Signal	DS-LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (ci, bg, bp)	Critical Time $\bar{t}_c$	Scenario Probability [%]
1	Medium Term	58.26	104.81	62.52	372	79.81	66.25	2022-01-31	84.61
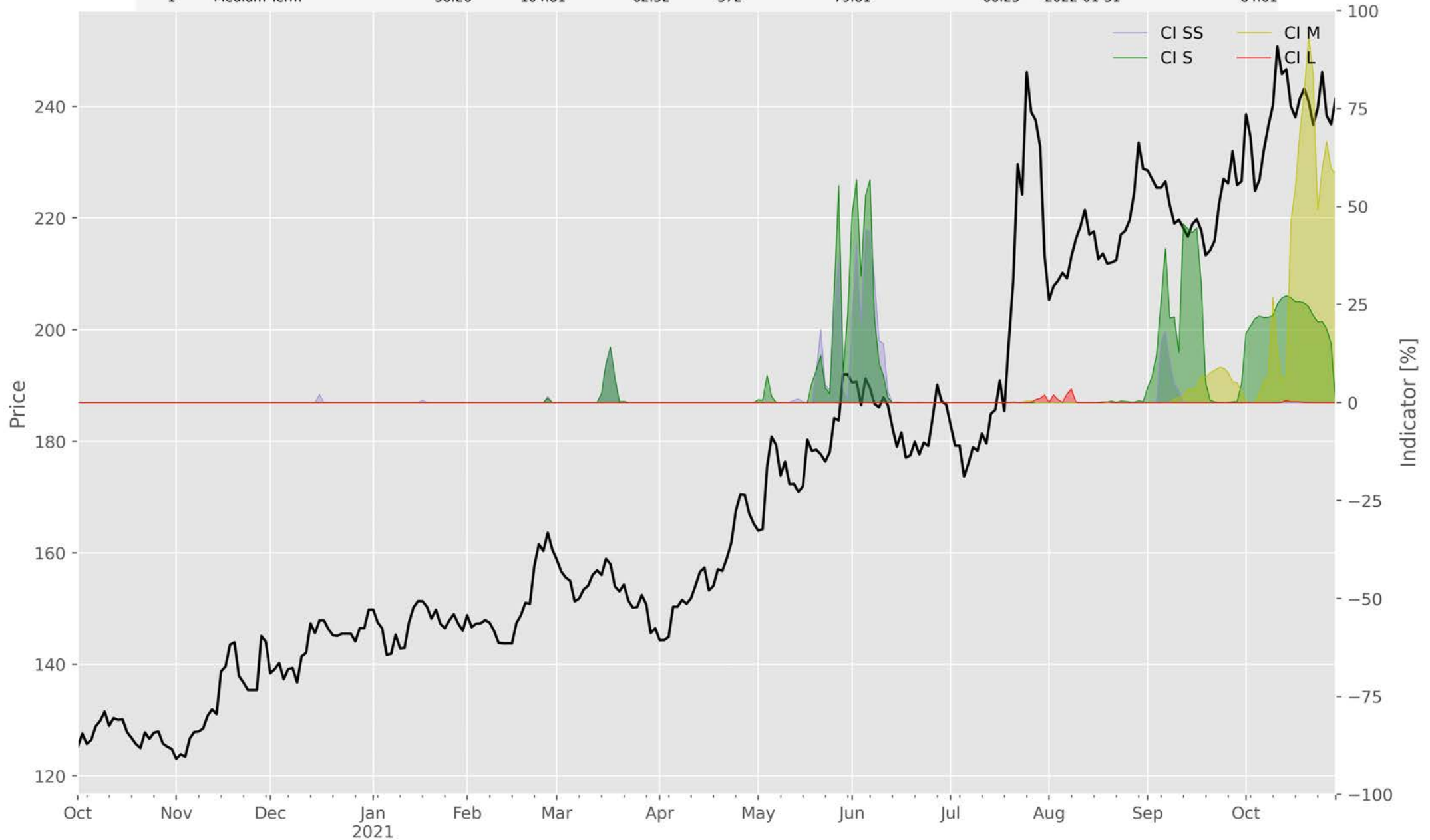
Mlcx Wheat Spot Index

Rank	Strongest Signal	DS-LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (ci, bg, bp)	Critical Time $\bar{t}_c$	Scenario Probability [%]
2	Long Term	47.46	66.05	20.03	700	97.38	45.24	2021-11-17	99.98

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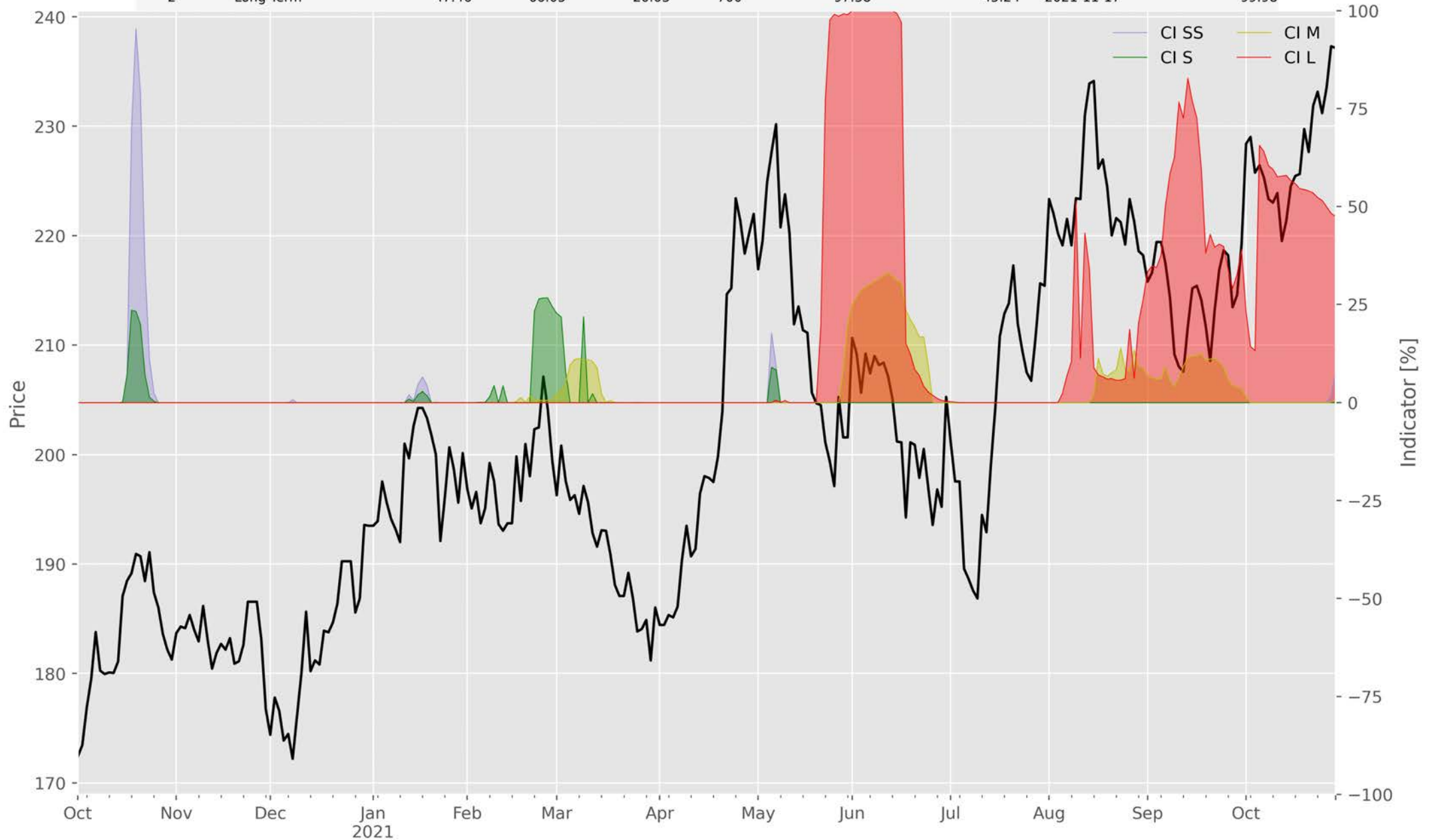
Single Stocks

Indivior

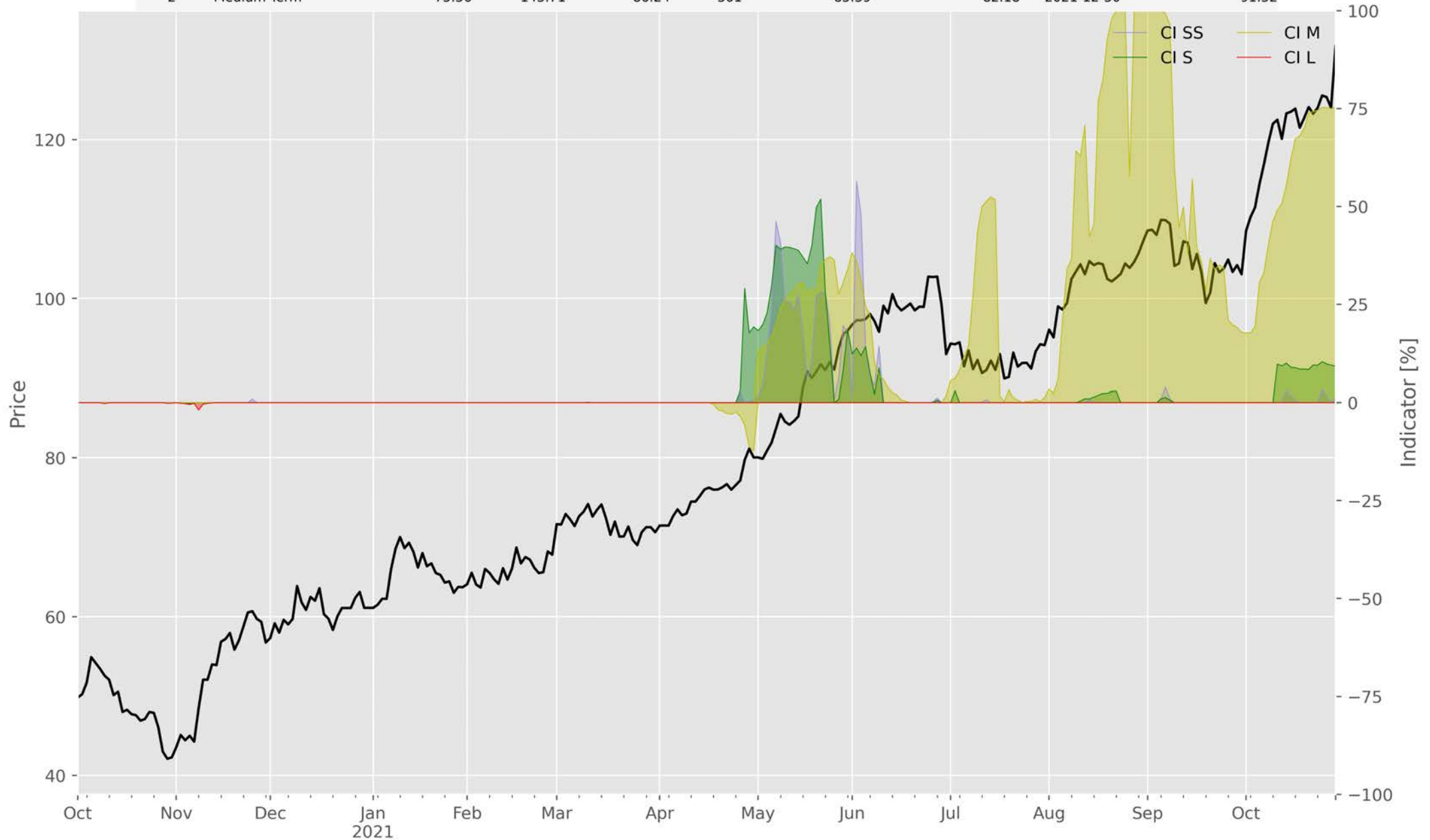| Rank	Strongest Signal	DS-LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (ci, bg, bp)	Critical Time $\tilde{t}_c$	Scenario Probability [%]
1	Super Short	85.6	36.25	323.5	54	69.07	124.13	2021-11-22	87.13

Bank Polska Kasa Opieki

Rank	Strongest Signal	DS-LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (ci, bg, bp)	Critical Time $\bar{t}_c$	Scenario Probability [%]
2	Medium Term	75.36	143.71	86.24	361	85.39	82.18	2021-12-30	91.52

Asm International

Rank	Strongest Signal	DS-LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (ci, bg, bp)	Critical Time $\bar{t}_c$	Scenario Probability [%]
3	Long Term	47.94	969.4	116.09	775	96.22	81.21	2021-11-28	89.43
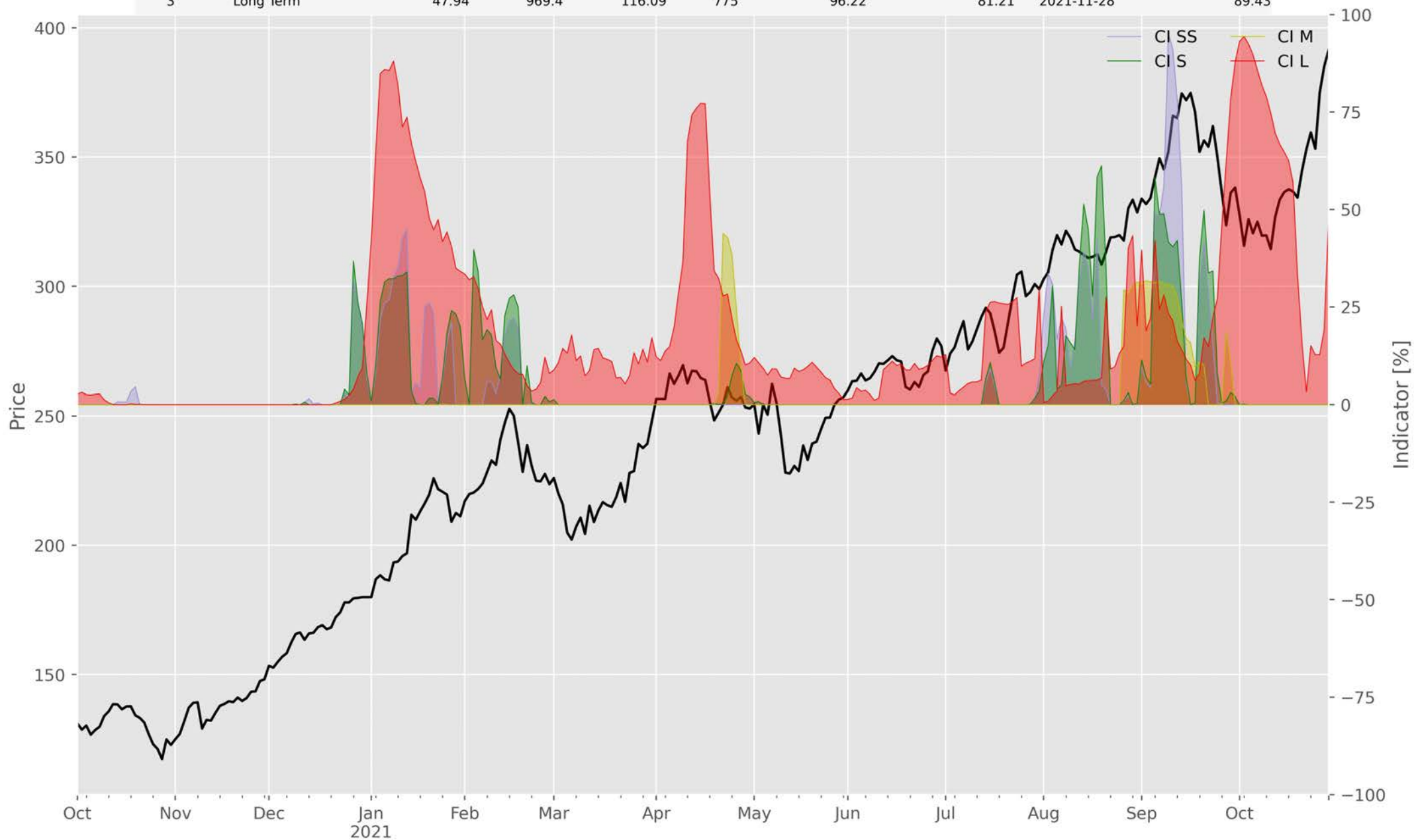
Koninklijke Vopak

Rank	Strongest Signal	DS-LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (ci, bg, bp)	Critical Time $\bar{t}_c$	Scenario Probability [%]
1	Medium Term	100	-31.88	-21.44	401	87.93	57.34	2021-12-23	83.05
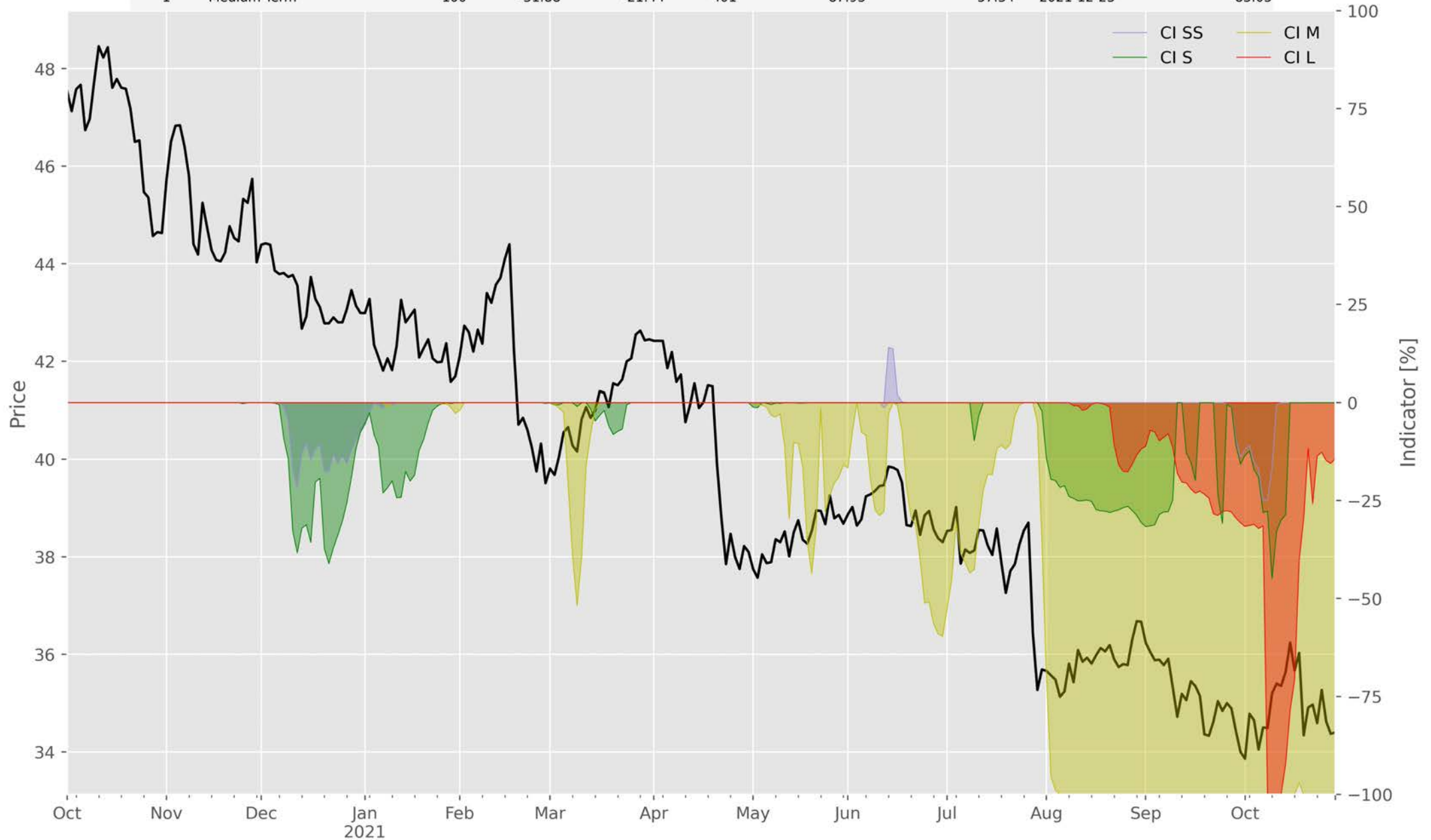
Associated Brit.Foods

Rank	Strongest Signal	DS-LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (ci, bg, bp)	Critical Time $\bar{t}_c$	Scenario Probability [%]
2	Super Short	38.63	-21.92	-39.52	124	92.85	52.14	2021-11-08	85.77

Tgs

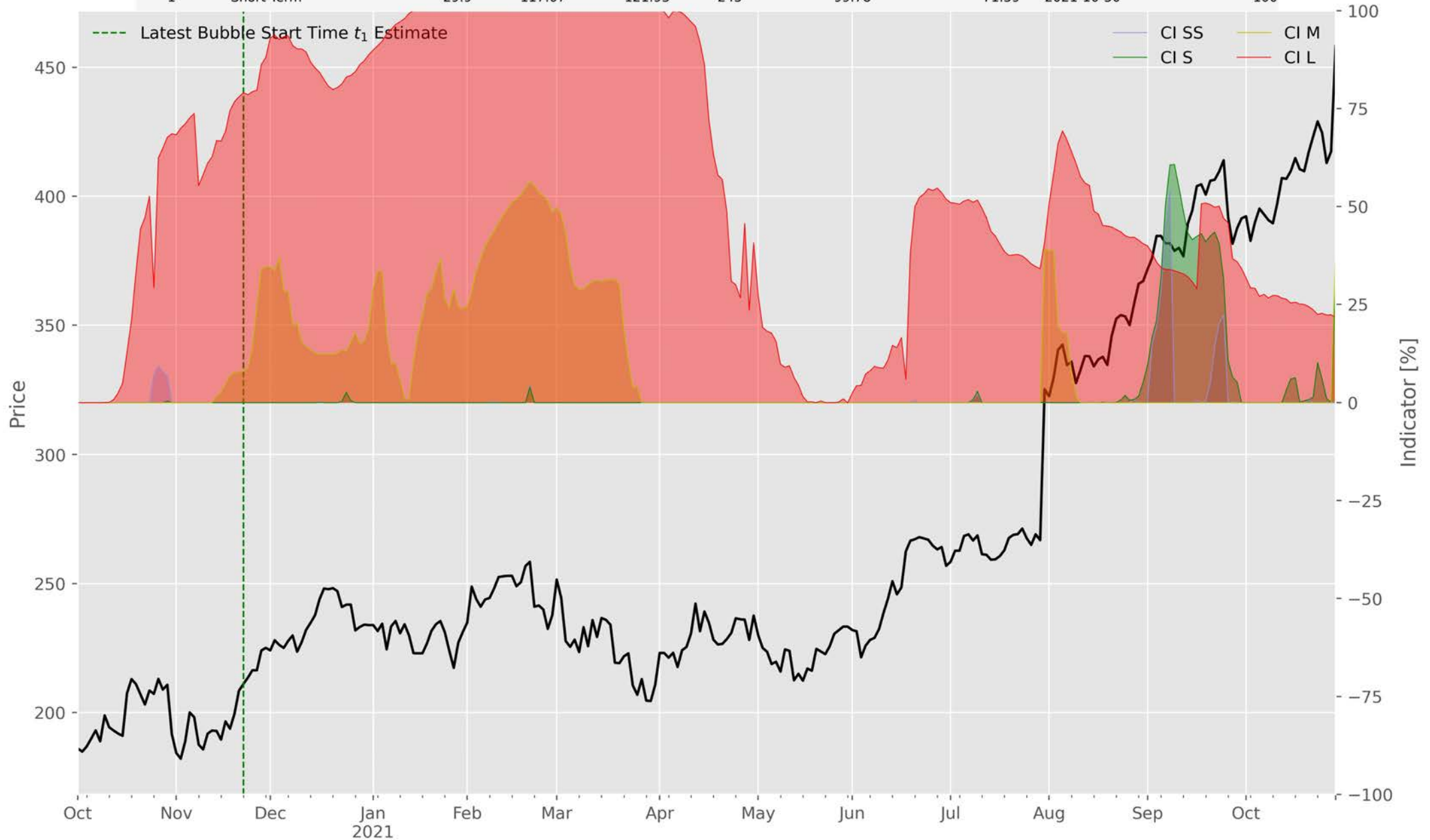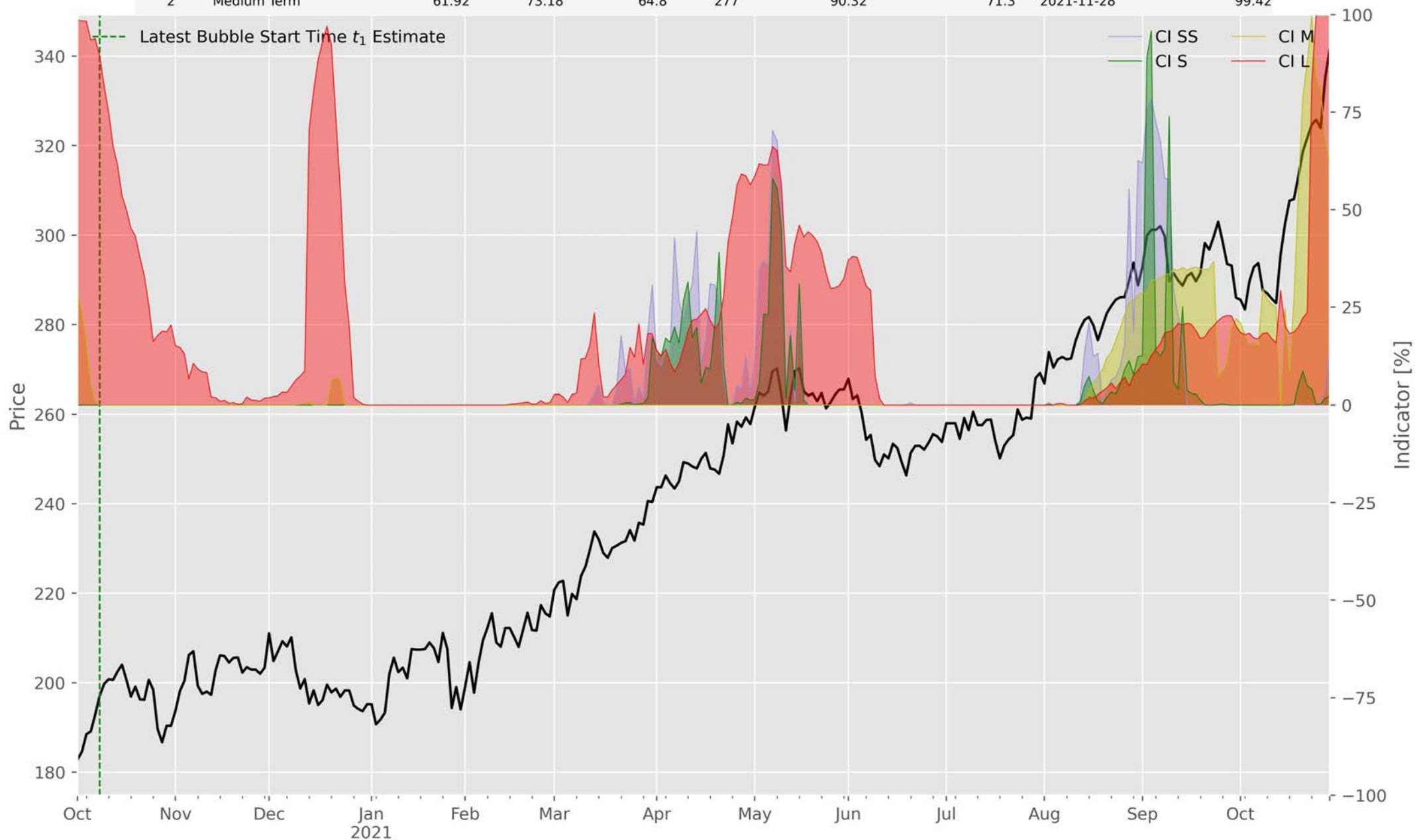| Rank	Strongest Signal	DS-LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (ci, bg, bp)	Critical Time $\bar{t}_c$	Scenario Probability [%]
3	Super Short	33.15	-34.3	-58.31	121	66.67	50.51	2021-12-28	68.56

Atlassian 'A'

Rank	Strongest Signal	DS-LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (ci, bg, bp)	Critical Time $\bar{t}_c$	Scenario Probability [%]
1	Short Term	29.9	117.07	121.93	245	99.78	71.39	2021-10-30	100

Old Dominion Fgt.Lines

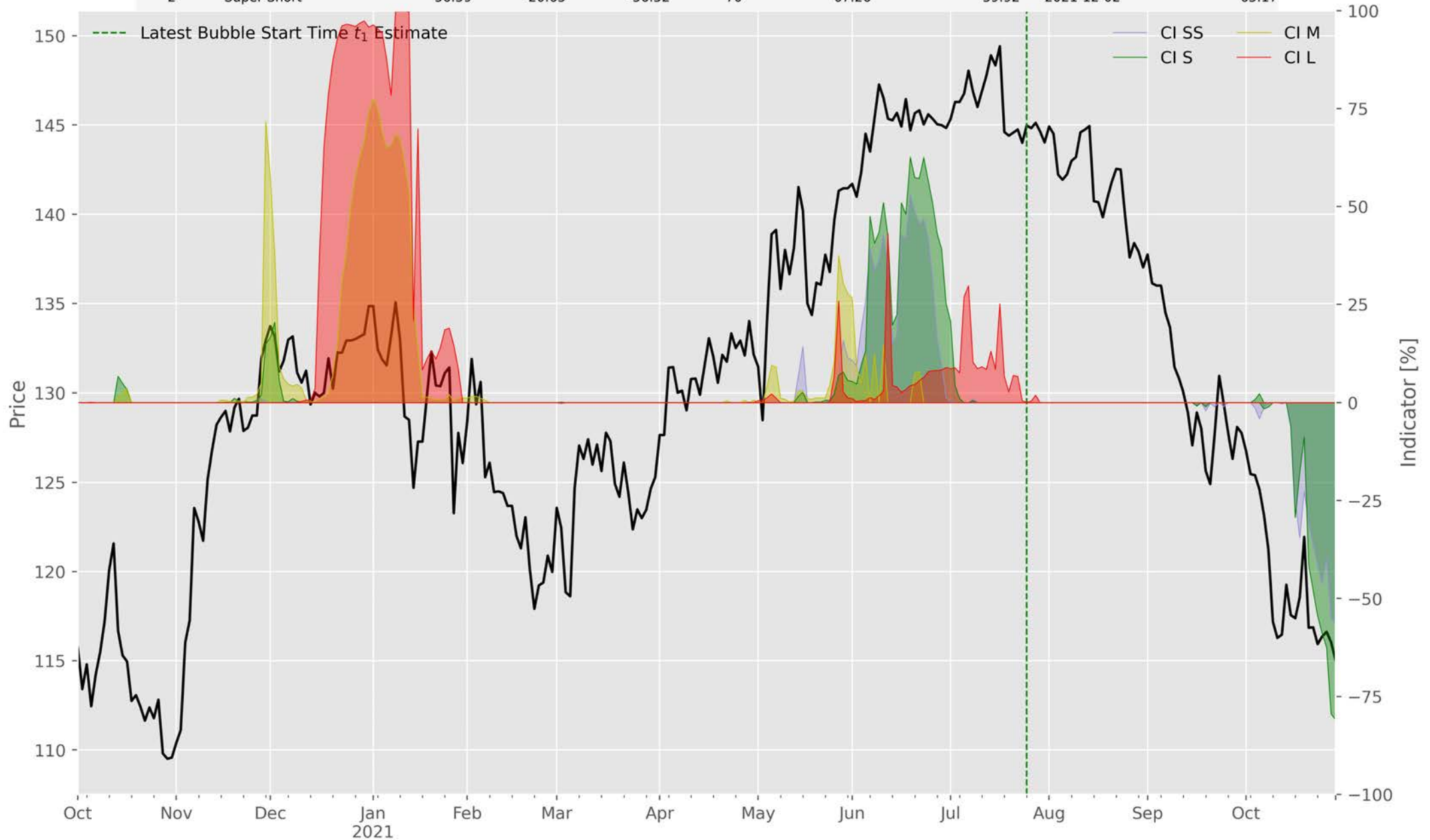| Rank	Strongest Signal	DS-LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (ci, bg, bp)	Critical Time $\bar{t}_c$	Scenario Probability [%]
2	Medium Term	61.92	73.18	64.8	277	90.32	71.3	2021-11-28	99.42

Republic Svs.'A'

Rank	Strongest Signal	DS-LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (ci, bg, bp)	Critical Time $\bar{t}_c$	Scenario Probability [%]
3	Medium Term	100	44.78	39.19	282	81.91	68.47	2021-12-30	99.99

Biogen

Rank	Strongest Signal	DS-LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (ci, bg, bp)	Critical Time $\bar{t}_c$	Scenario Probability [%]
1	Super Short	50.79	-32.63	-61.25	105	98.49	67.41	2021-10-31	99.99

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T-Mobile Us

Rank	Strongest Signal	DS-LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (ci, bg, bp)	Critical Time $\bar{t}_c$	Scenario Probability [%]
2	Super Short	56.59	-20.65	-56.52	70	67.26	59.92	2021-12-02	65.17

Pinnacle West Cap.

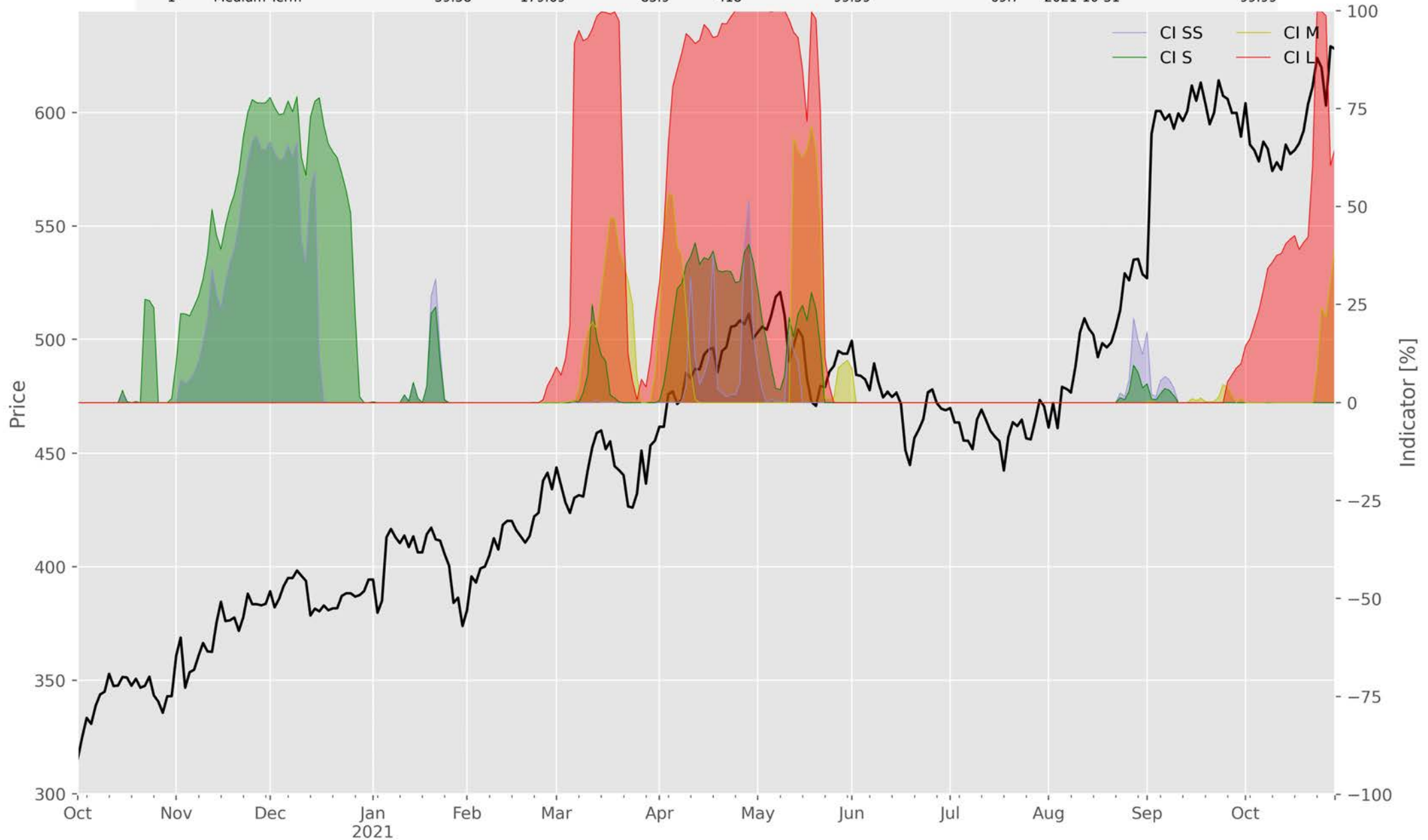| Rank	Strongest Signal	DS-LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (ci, bg, bp)	Critical Time $\bar{t}_c$	Scenario Probability [%]
3	Super Short	34.86	-20.36	-59.2	64	67.33	51.79	2021-11-29	66.22

Equity Indices

Omx Tallinn (Omxt)

Rank	Strongest Signal	DS-LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (ci, bg, bp)	Critical Time $\bar{t}_c$	Scenario Probability [%]
1	Medium Term	41.39	100.87	51.37	424	78.4	55.03	2022-02-23	74.49
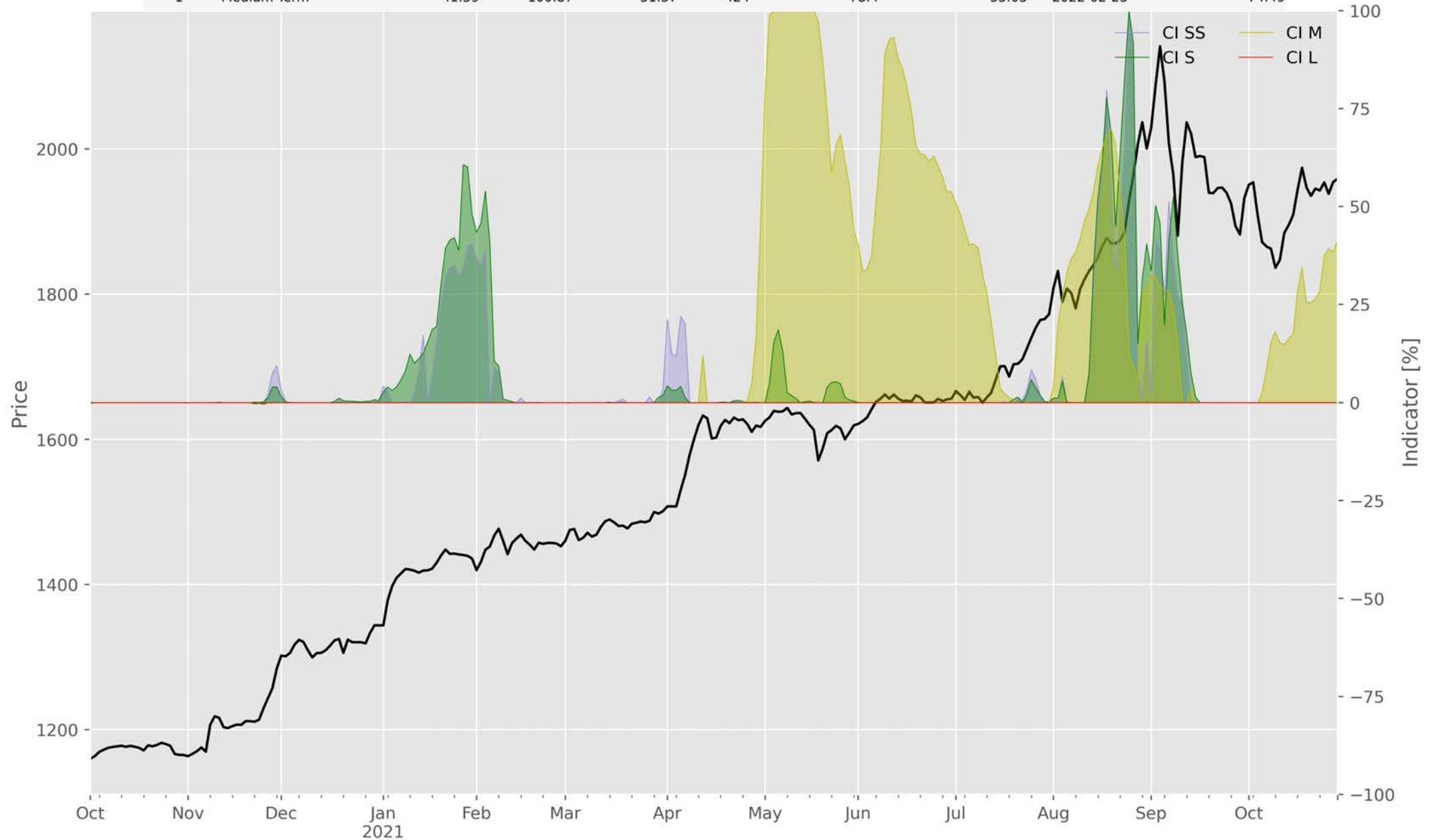
Warsaw General Index

Rank	Strongest Signal	DS-LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (ci, bg, bp)	Critical Time $\tilde{t}_c$	Scenario Probability [%]
2	Short Term	35.18	22.6	41.14	149	82.57	49.26	2021-11-29	99.98

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Romania Bet (L)

Rank	Strongest Signal	DS-LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (ci, bg, bp)	Critical Time $\bar{t}_c$	Scenario Probability [%]
3	Super Short	34.34	11.9	30.97	105	66.73	41.4	2021-12-20	62.78
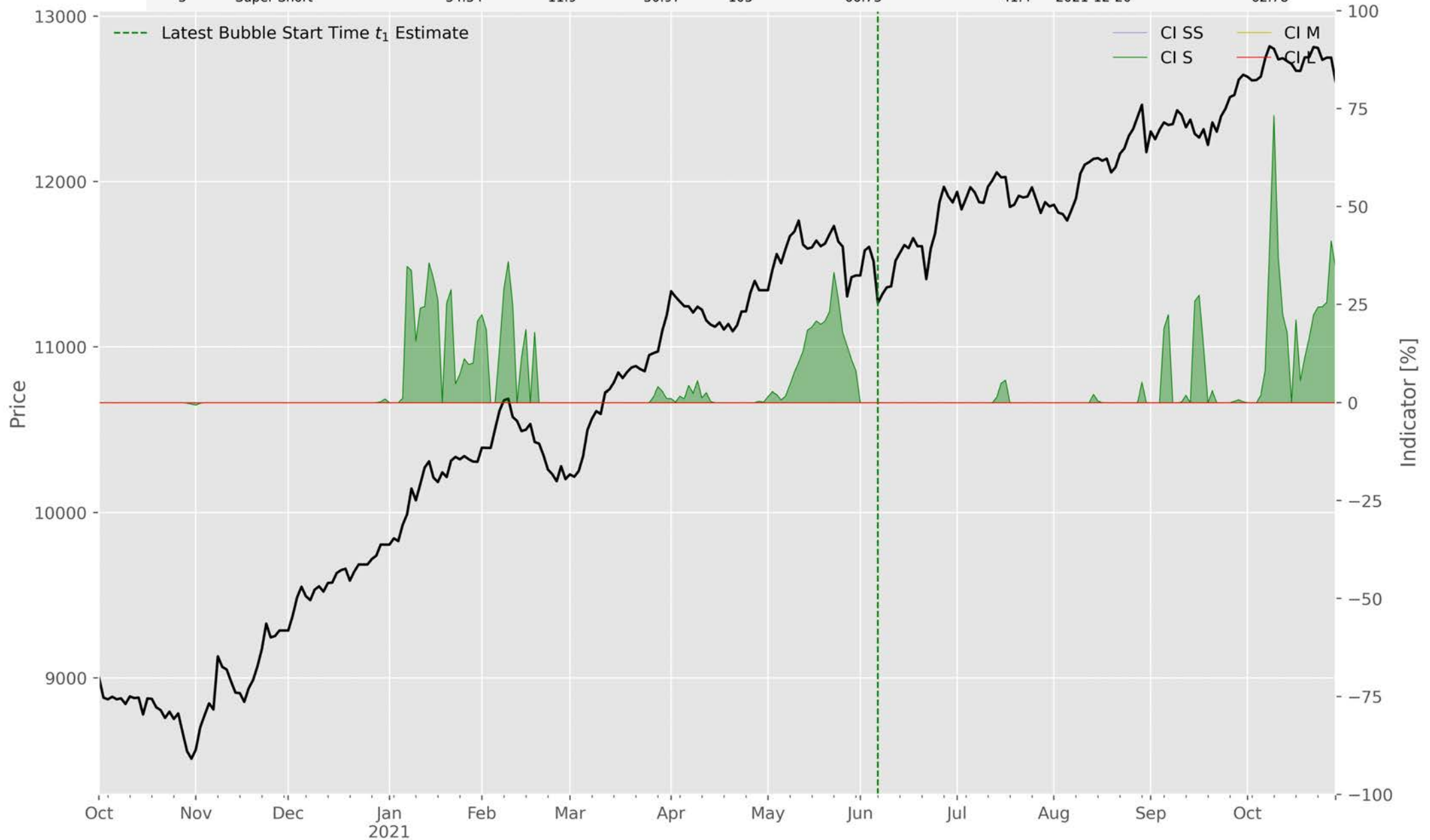
S&P500 Construction & Engineer Si

Rank	Strongest Signal	DS-LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (ci, bg, bp)	Critical Time $\bar{t}_c$	Scenario Probability [%]
1	Medium Term	39.58	179.69	85.9	418	99.59	69.7	2021-10-31	99.99

S&P500 Construction & Engineering
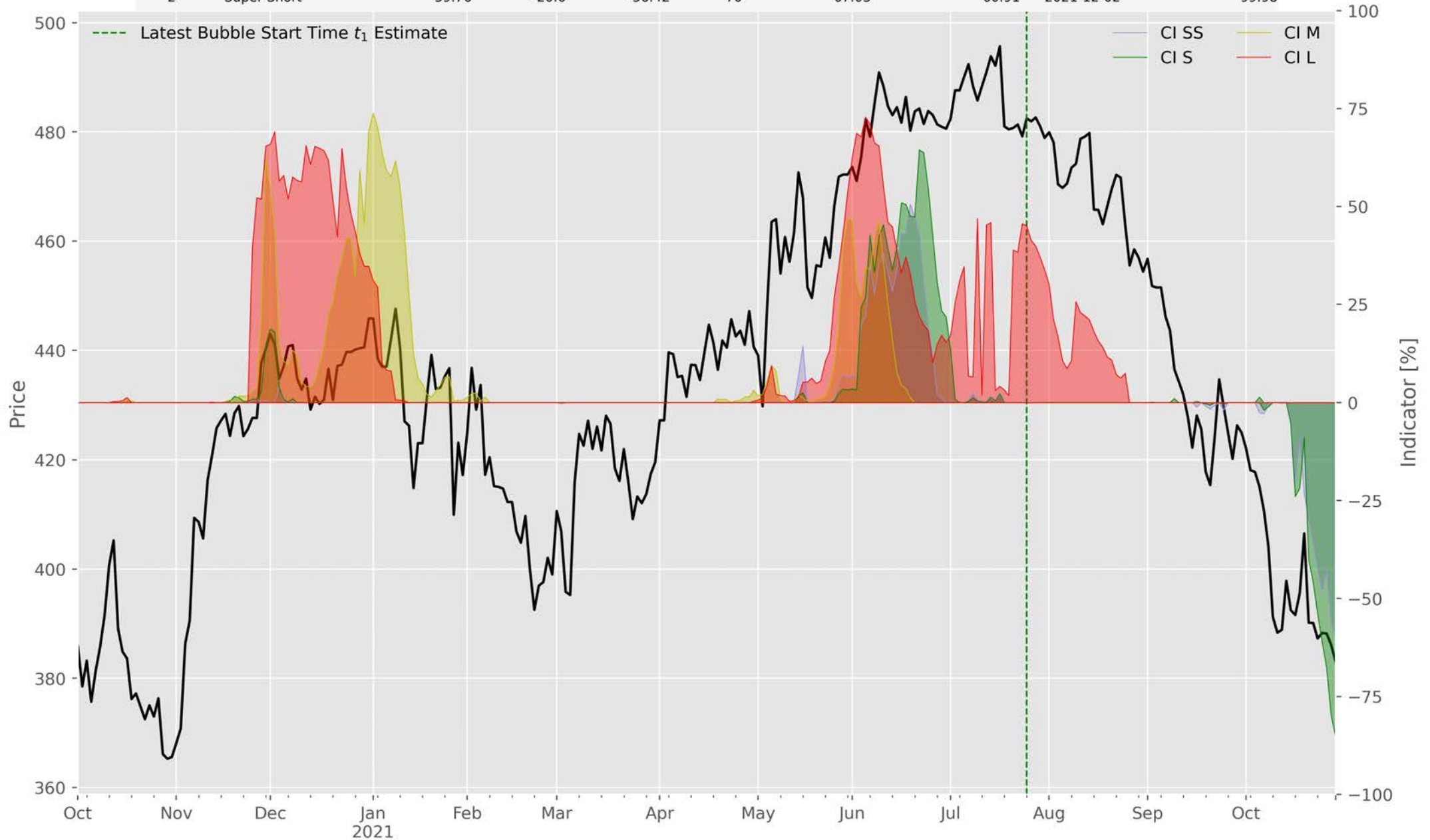
Rank	Strongest Signal	DS-LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (ci, bg, bp)	Critical Time $\bar{t}_c$	Scenario Probability [%]
2	Medium Term	39.52	179.69	85.9	418	99.59	69.66	2021-10-31	99.99
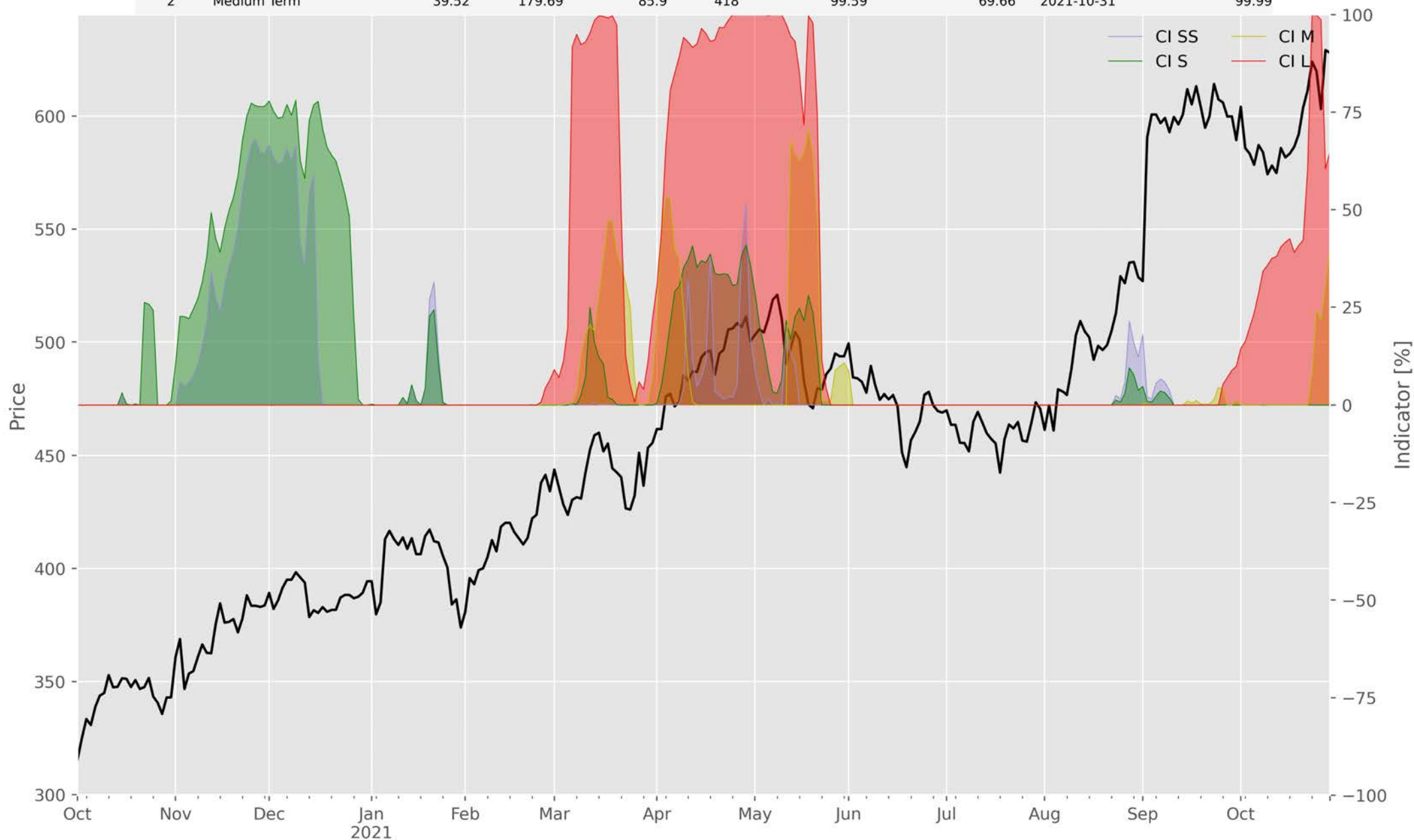
S&P500 Hr & Empl Oyment Serv

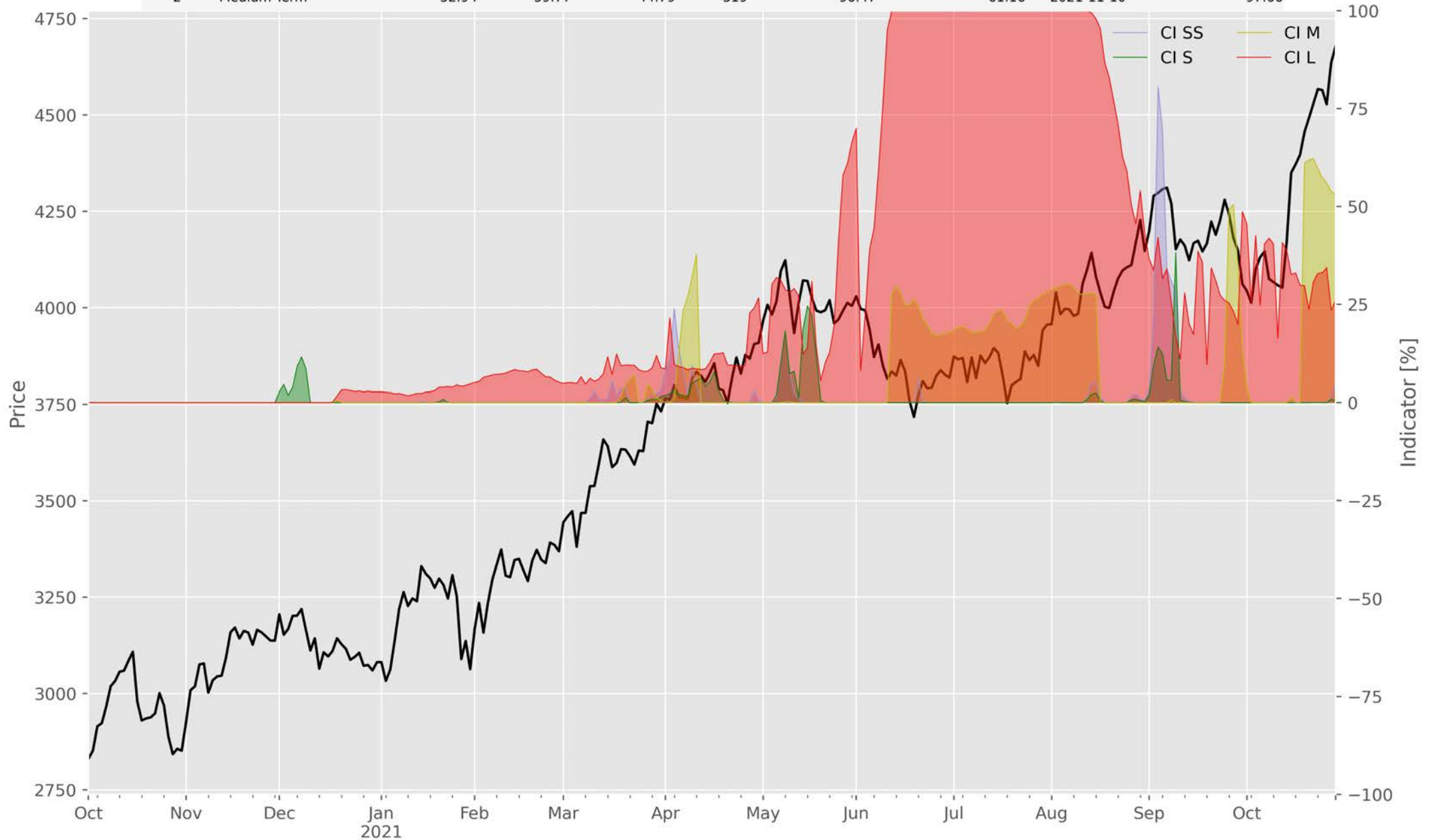| Rank	Strongest Signal	DS-LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (ci, bg, bp)	Critical Time $\bar{t}_c$	Scenario Probability [%]
3	Short Term	41.31	83.88	83.88	252	89.81	67.77	2021-11-27	67.82

S&P1500 Wireless Telecom Serv

Rank	Strongest Signal	DS-LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (ci, bg, bp)	Critical Time $\bar{t}_c$	Scenario Probability [%]
1	Super Short	59.76	-20.6	-56.42	70	67.03	60.91	2021-12-02	99.98

S&P1500 Wireless Telecom Serv Si

Rank	Strongest Signal	DS-LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (ci, bg, bp)	Critical Time $\bar{t}_c$	Scenario Probability [%]
2	Super Short	59.76	-20.6	-56.42	70	67.03	60.91	2021-12-02	99.98

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S&P500 Wireless Telecom Serv

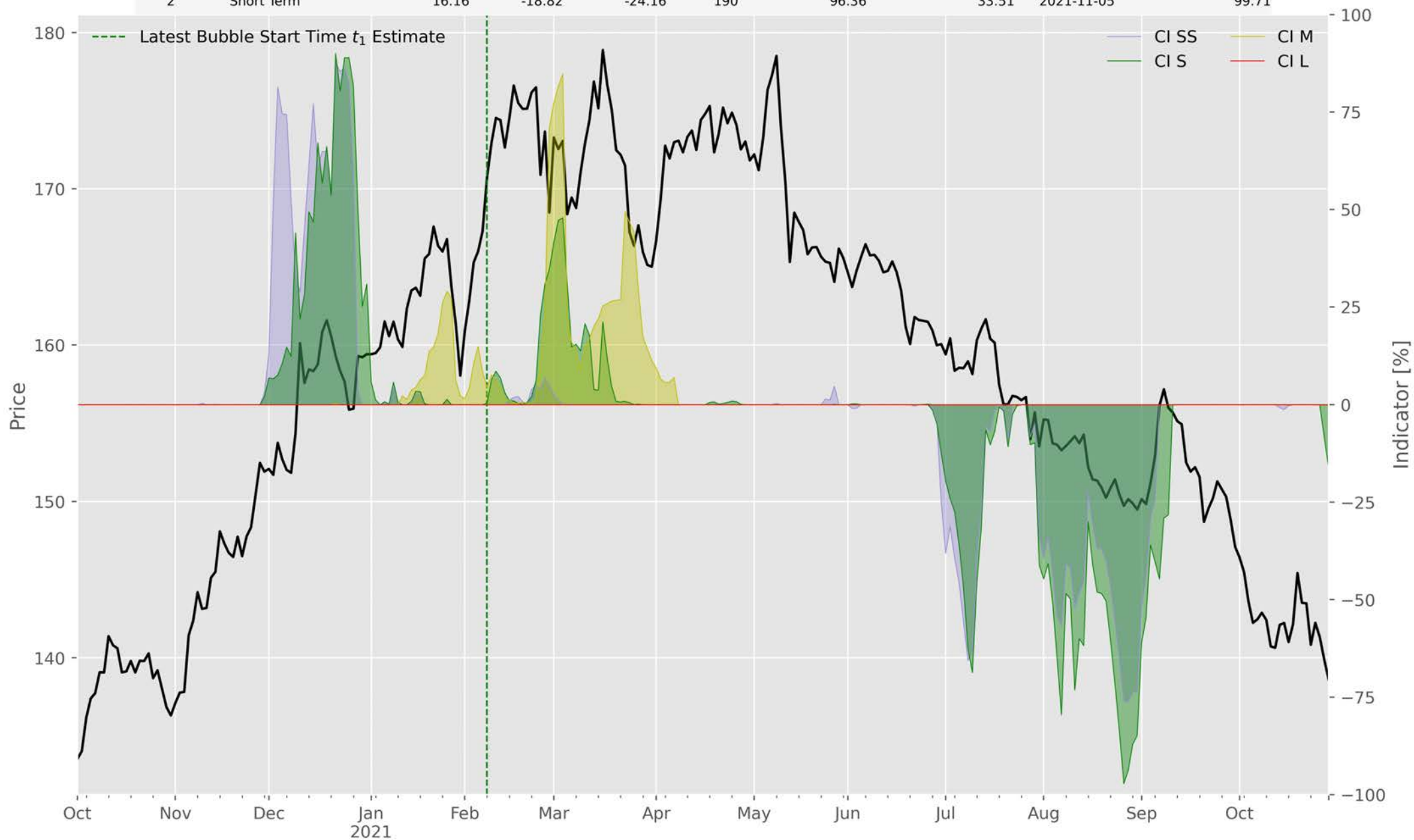| Rank	Strongest Signal	DS-LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (ci, bg, bp)	Critical Time $\bar{t}_c$	Scenario Probability [%]
3	Super Short	56.59	-20.66	-56.52	70	67.26	59.92	2021-12-02	66.47

S&P Global 1200 Auto Retail

Rank	Strongest Signal	DS-LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (ci, bg, bp)	Critical Time $\bar{t}_c$	Scenario Probability [%]
1	Medium Term	66.58	101.53	54	409	99.08	70.89	2021-11-02	92.95

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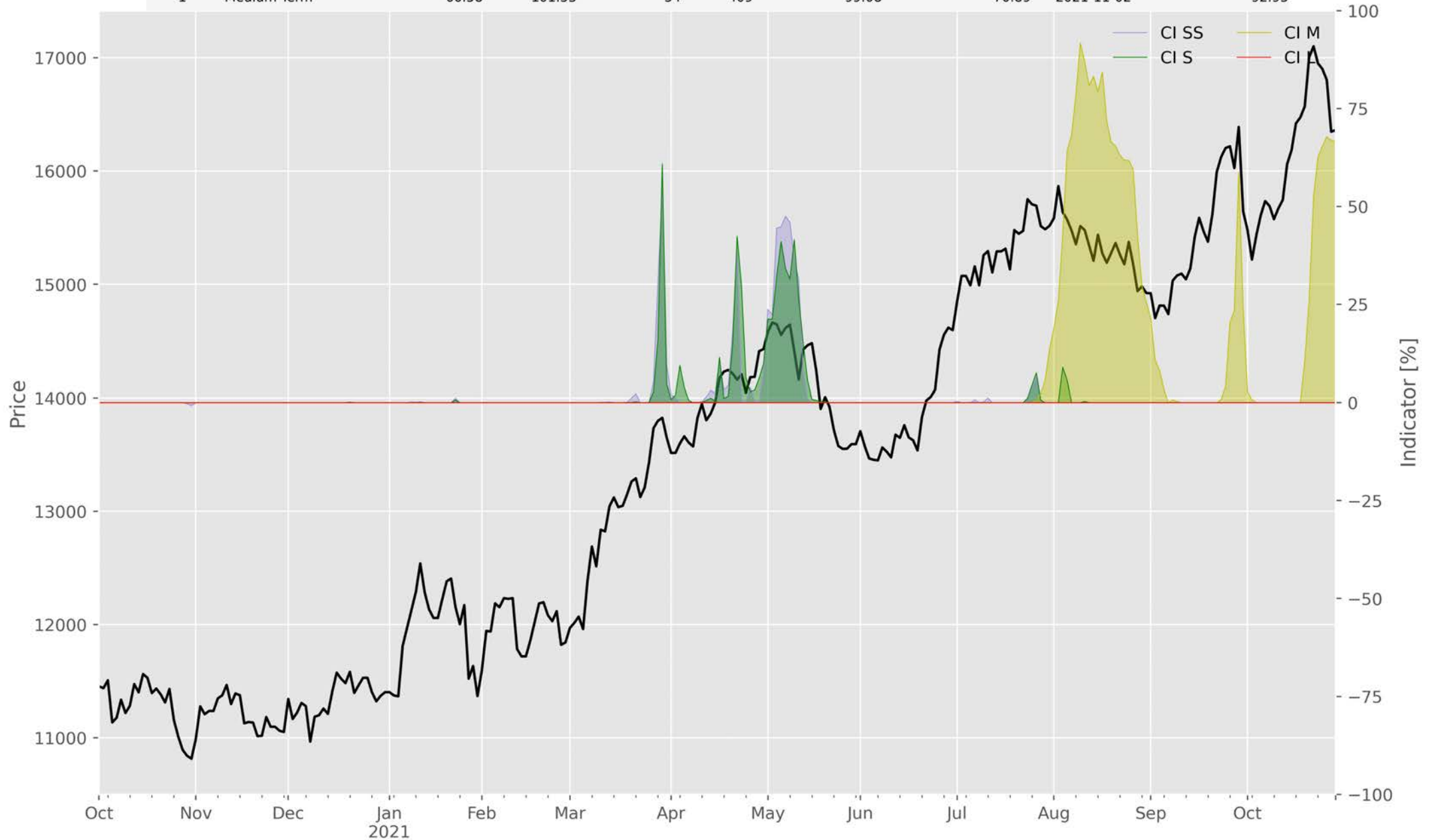
S&P Global 1200 Trucking

Rank	Strongest Signal	DS-LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (ci, bg, bp)	Critical Time $\bar{t}_c$	Scenario Probability [%]
2	Medium Term	52.94	59.77	44.79	319	96.47	61.16	2021-11-10	97.66

S&P Global 1200 Env & Fac Svs

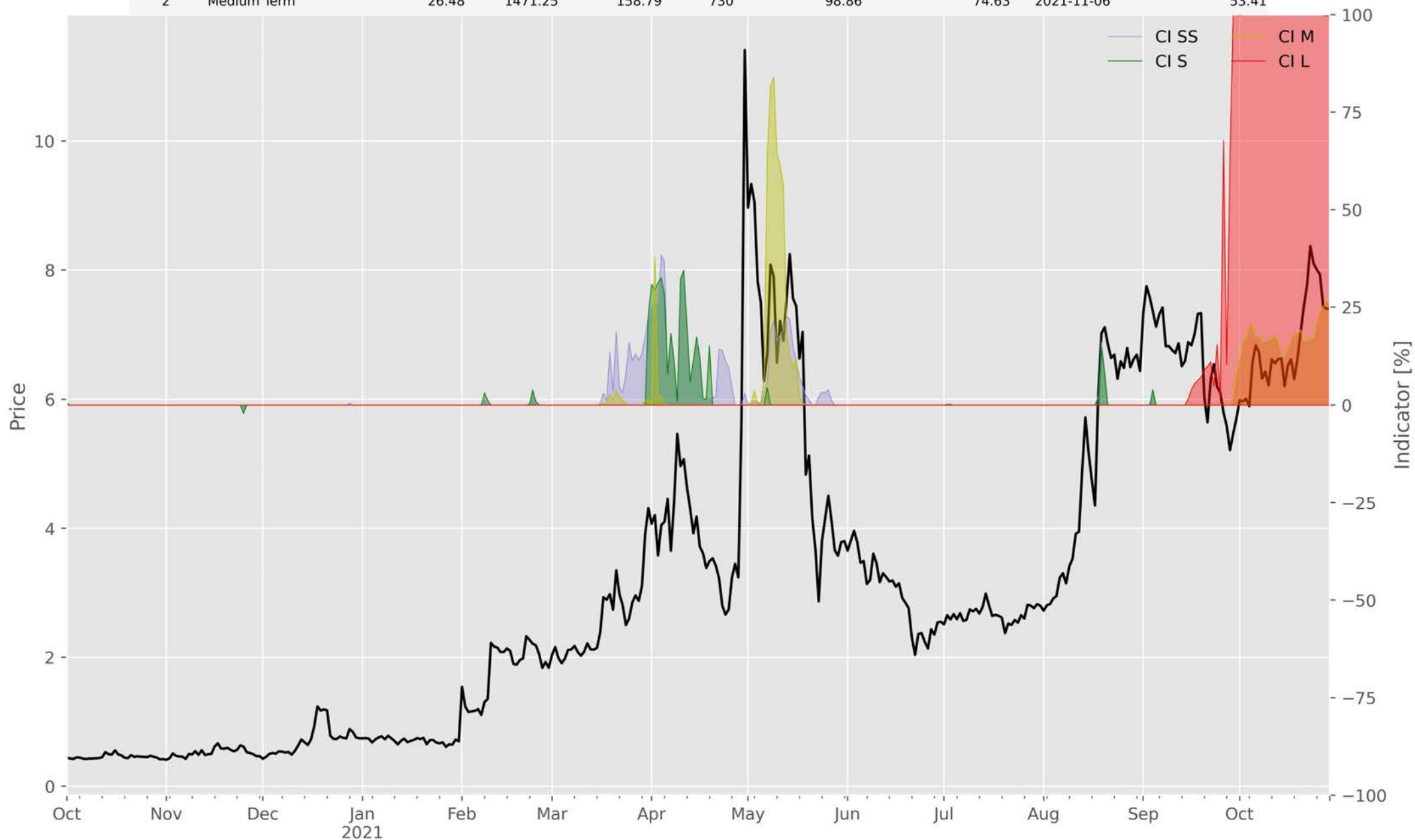| Rank	Strongest Signal	DS-LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (ci, bg, bp)	Critical Time $\bar{t}_c$	Scenario Probability [%]
3	Medium Term	71.8	51.42	33.49	362	94.15	60.95	2021-11-20	88.97
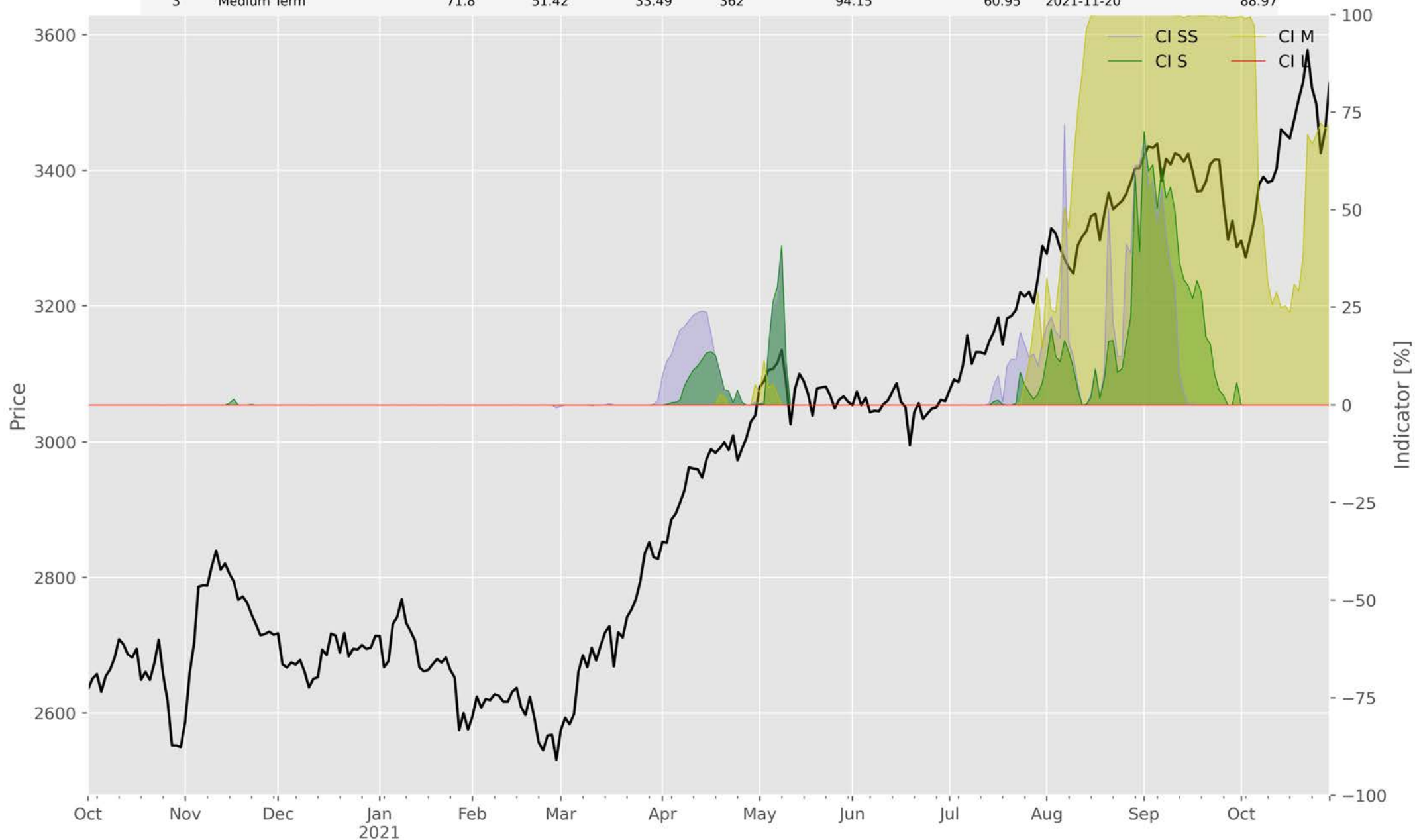
S&P Global 1200 W/L Telecom Svs

Rank	Strongest Signal	DS-LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (ci, bg, bp)	Critical Time $\bar{t}_c$	Scenario Probability [%]
1	Short Term	17.75	-18.9	-24.26	190	95.8	34.55	2021-11-06	99.99
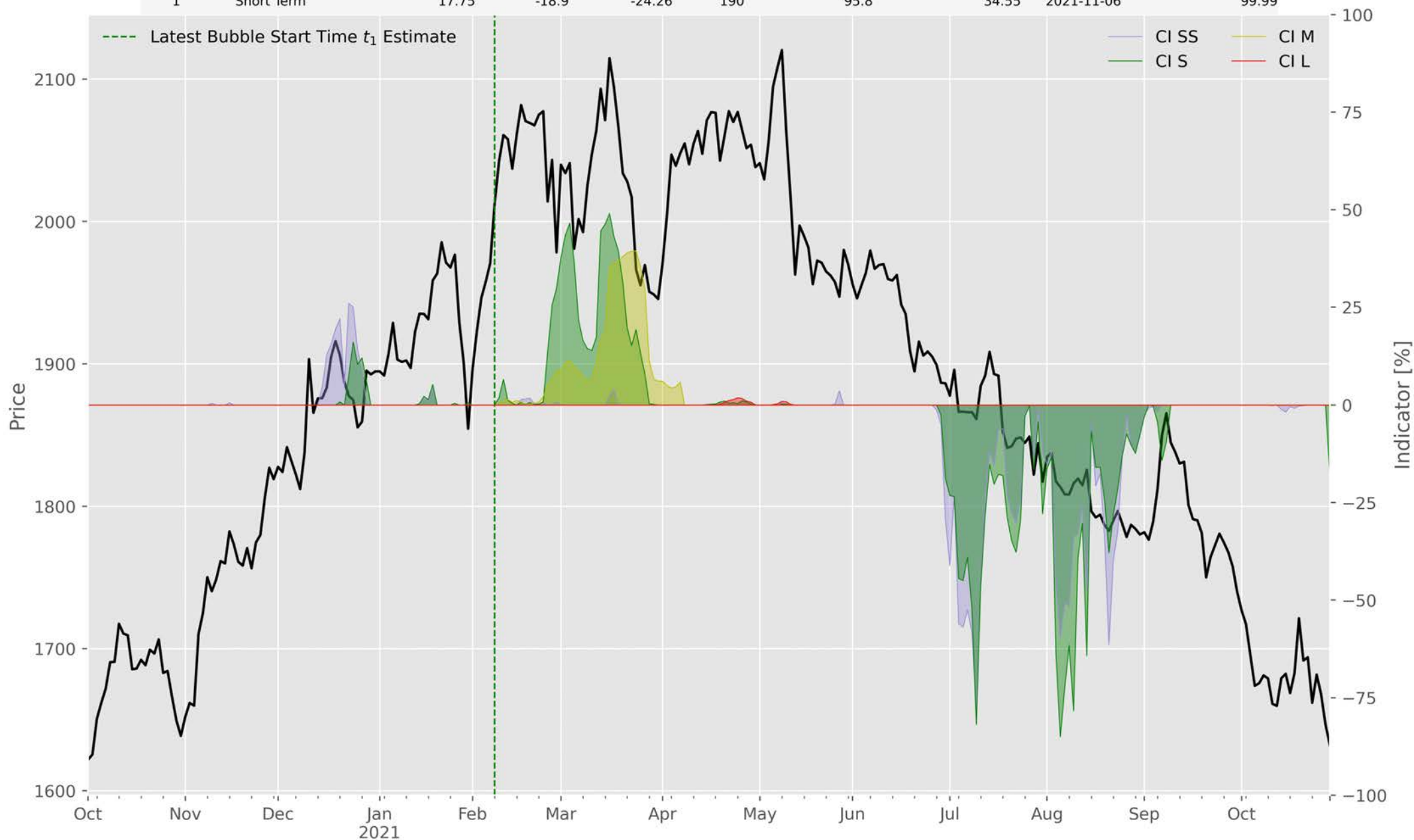
Msci World W/L T/Cm Svs $

Rank	Strongest Signal	DS-LPPLS Confidence c_i [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (c_i, bg, bp)	Critical Time $\bar{t}_c$	Scenario Probability [%]
2	Short Term	16.16	-18.82	-24.16	190	96.36	33.51	2021-11-05	99.71

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Forex

New Turkish Lira To Us $ 1M Fwd

Rank	Strongest Signal	DS-LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (ci, bg, bp)	Critical Time $\bar{t}_c$	Scenario Probability [%]
1	Long Term	91.74	66.99	20.89	681	90.89	55.85	2022-01-05	99.4

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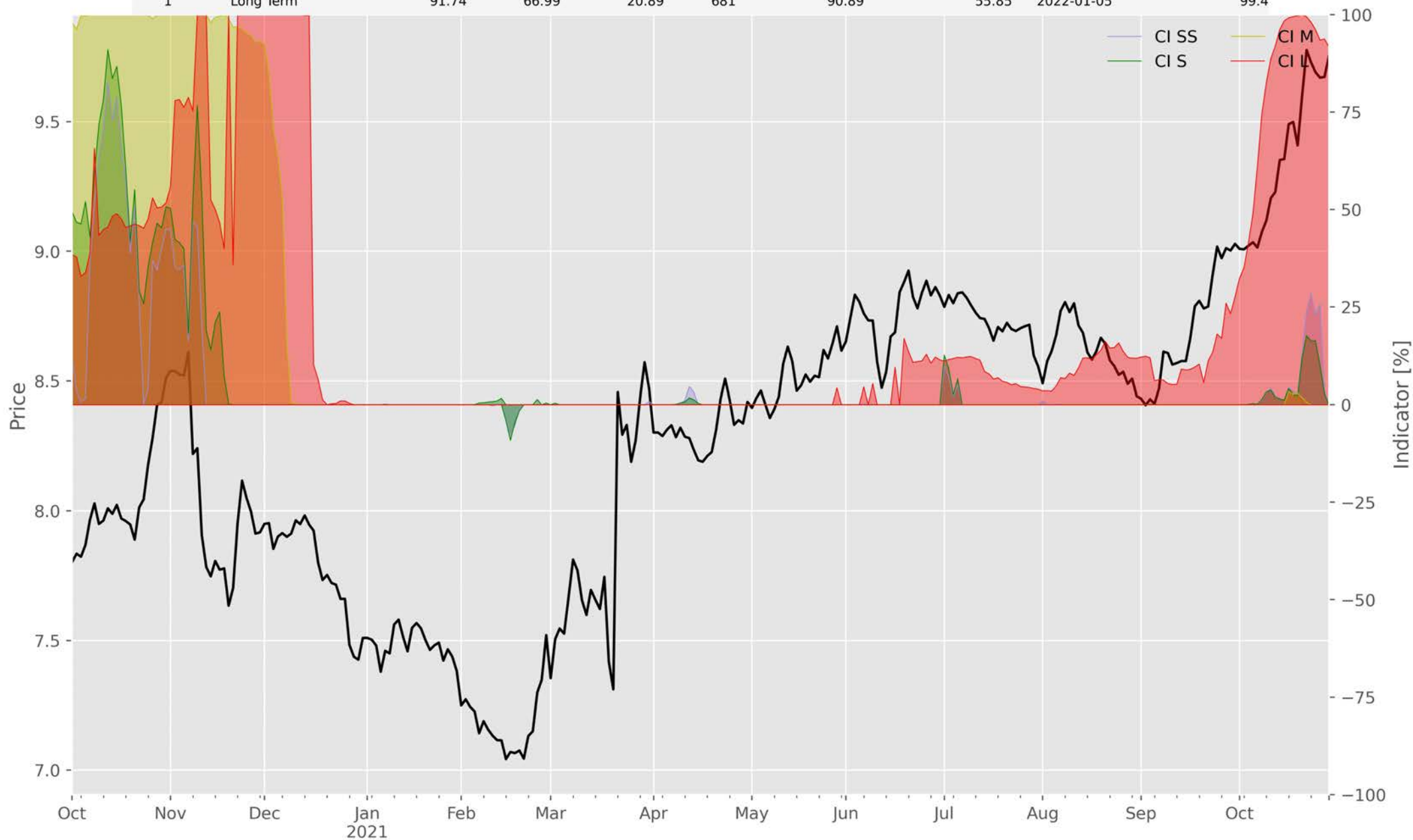
Jpm Argentina Reer Cpi (2010=100)

Rank	Strongest Signal	DS-LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (ci, bg, bp)	Critical Time $\bar{t}_c$	Scenario Probability [%]
2	Short Term	46.52	15.65	16.72	237	82.43	40.02	2021-12-19	93.62
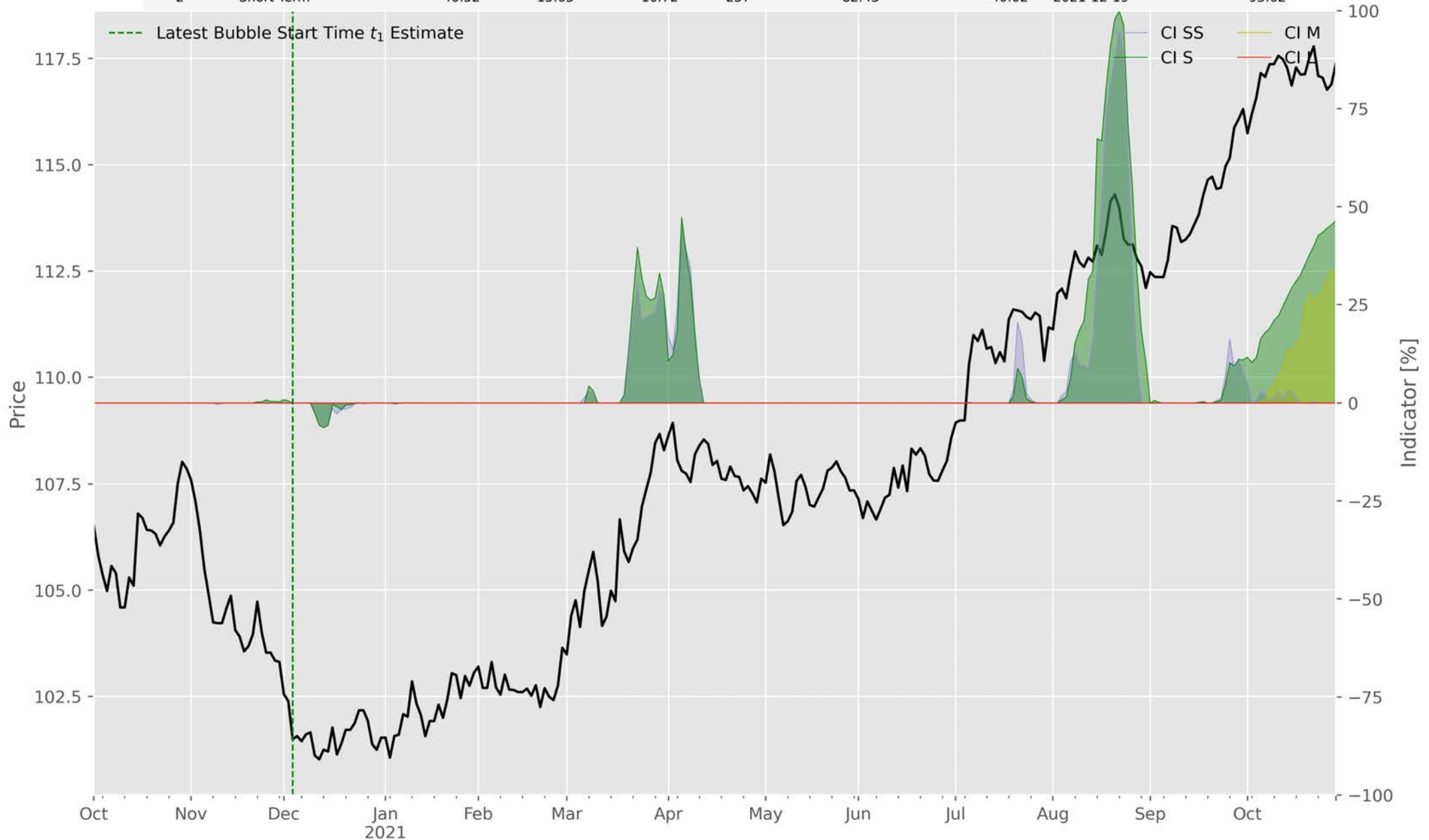
CryptoX

Quark/USD

Rank	Strongest Signal	DS-LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (ci, bg, bp)	Critical Time $\bar{t}_c$	Scenario Probability [%]
1	Super Short	49.38	102.72	188.63	168	98.99	97.33	2021-10-31	99.98

The FCO Cockpit - Global Bubble Status Report

Radium/USD

Rank	Strongest Signal	DS-LPPLS Confidence c_i [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (ci, bg, bp)	Critical Time $\bar{t}_c$	Scenario Probability [%]
2	Medium Term	26.48	1471.25	158.79	730	98.86	74.63	2021-11-06	53.41

Crypto.com Coin/USD

Rank	Strongest Signal	DS-LPPLS Confidence ci [%]	Bubble Size bs [%]	Bubble CAGR bg [%]	Duration [days]	Bubble Progress bp [%]	Geometric Average (ci, bg, bp)	Critical Time $\bar{t}_c$	Scenario Probability [%]
3	Super Short	20.42	83.78	162.35	159	99.95	69.19	2021-10-29	100
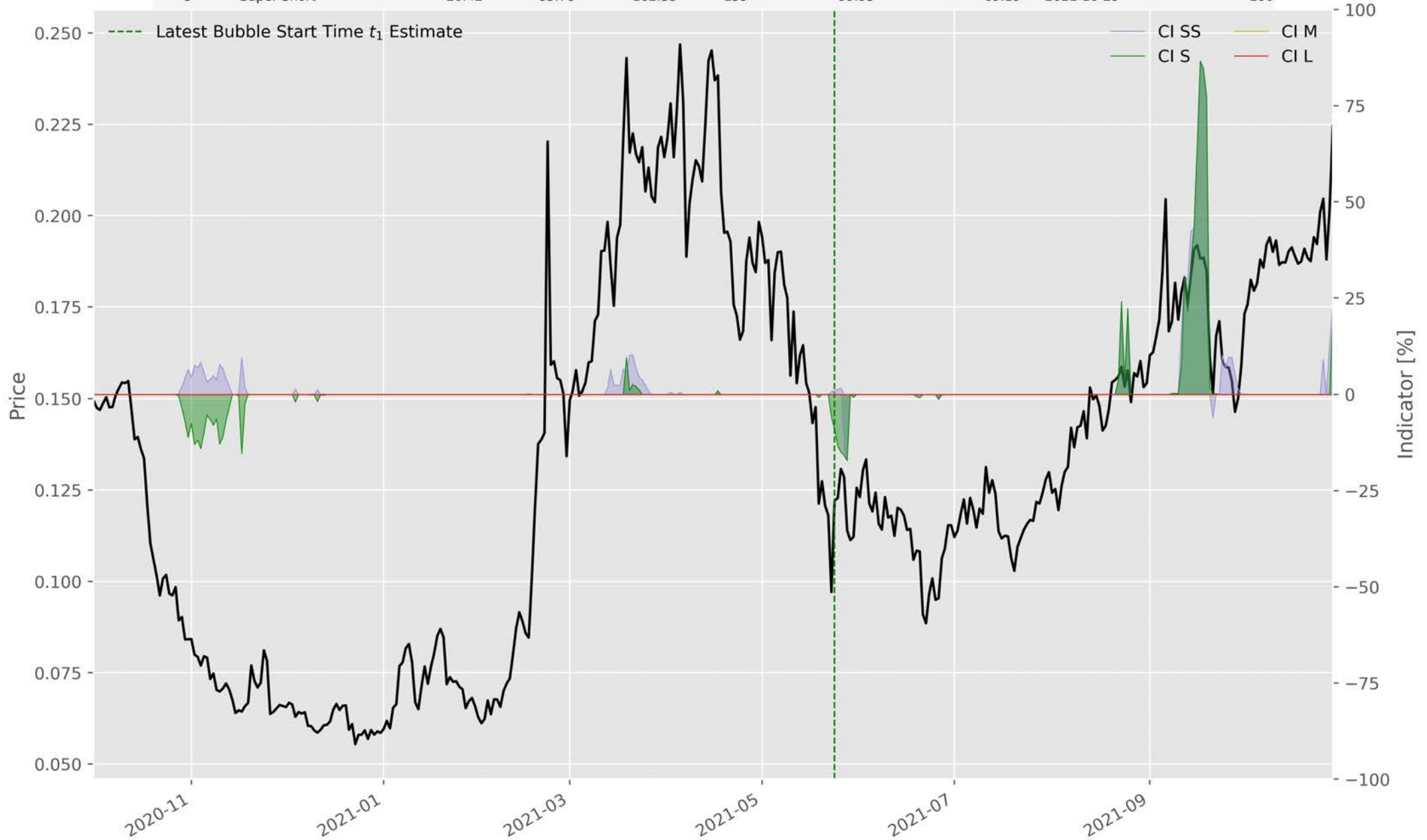
Sectors

GICS Industry Group Name	Yearly Return		Bubble Size		Bubble Score		Value Score		Growth Score	
	Nov 1st	Oct 1st	Nov 1st	Oct 1st	Nov 1st	Oct 1st	Nov 1st	Oct 1st	Nov 1st	Oct 1st
Pharmaceuticals, Biotechnology & Life Sciences	15.9%	12.6%	0.0%	0.0%	0.0%	0.0%	62.3%	64.7%	56.8%	57.1%
Consumer Services	18.2%	22.8%	0.0%	0.0%	0.0%	0.0%	26.0%	24.2%	59.6%	59.5%
Retailing	17.4%	7.8%	0.0%	0.0%	0.0%	0.0%	17.9%	18.3%	45.5%	44.8%
Transportation	18.4%	10.7%	0.0%	-6.6%	0.0%	-81.6%	43.3%	42.9%	55.4%	54.3%
Consumer Durables & Apparel	27.0%	23.4%	0.0%	0.0%	0.0%	0.0%	33.5%	33.7%	48.6%	48.6%
Semiconductors & Semiconductor Equipment	48.5%	36.8%	0.0%	0.0%	0.0%	0.0%	56.2%	54.5%	42.3%	42.0%
Technology Hardware & Equipment	27.6%	22.2%	0.0%	0.0%	0.0%	0.0%	77.3%	50.8%	55.7%	51.3%
Automobiles & Components	75.2%	49.9%	0.0%	0.0%	0.0%	0.0%	52.8%	52.3%	42.3%	42.6%
Telecommunication Services	-3.9%	4.1%	-10.7%	0.0%	-4.7%	0.0%	60.4%	58.9%	43.0%	43.5%
Energy	61.1%	60.5%	0.0%	0.0%	0.0%	0.0%	50.0%	50.7%	70.1%	70.3%
Software & Services	33.1%	18.1%	0.0%	0.0%	0.0%	0.0%	38.2%	36.8%	50.8%	51.8%
Materials	18.4%	14.9%	0.0%	0.0%	0.0%	0.0%	49.1%	49.4%	51.2%	51.2%
Health Care Equipment & Services	19.9%	19.1%	0.0%	0.0%	0.0%	0.0%	48.4%	48.1%	52.7%	52.5%
Capital Goods	20.4%	24.2%	0.0%	0.0%	0.0%	0.0%	48.7%	48.8%	49.4%	49.4%
Media & Entertainment	34.7%	37.2%	0.0%	0.0%	0.0%	0.0%	27.6%	30.2%	32.2%	32.5%
Commercial & Professional Services	22.4%	19.8%	23.7%	0.0%	3.9%	0.0%	30.1%	29.1%	52.7%	52.2%
Food & Staples Retailing	14.8%	11.3%	0.0%	0.0%	0.0%	0.0%	37.7%	38.8%	60.8%	62.3%
Household & Personal Products	-3.6%	-5.0%	0.0%	0.0%	0.0%	0.0%	27.9%	27.7%	53.6%	53.5%
Food, Beverage & Tobacco	9.4%	7.5%	0.0%	0.0%	0.0%	0.0%	49.1%	47.8%	56.9%	57.0%
Utilities	1.4%	-0.9%	0.0%	0.0%	0.0%	0.0%	44.5%	44.8%	53.6%	53.5%
Insurance	25.3%	29.1%	0.0%	0.0%	0.0%	0.0%	-	-	-	-
Real Estate	23.2%	20.4%	0.0%	0.0%	0.0%	0.0%	-	-	-	-
Diversified Financials	45.3%	40.1%	0.0%	0.0%	0.0%	0.0%	-	-	-	-
Banks	49.1%	58.4%	0.0%	0.0%	0.0%	0.0%	-	-	-	-

Sectors

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

▸ This month we observe two industry group indices with a small bubble score: *Commercial & Professional Services* (positive bubble) and *Telecommunication Services* (negative bubble). This means that the bubbles are not yet matured and there is a scenario in which they continue to develop.

▸ The industry group *Transportation* was identified with a strong negative bubble signal last month, and we see a strong rebound in the past month, in agreement with our diagnostic.
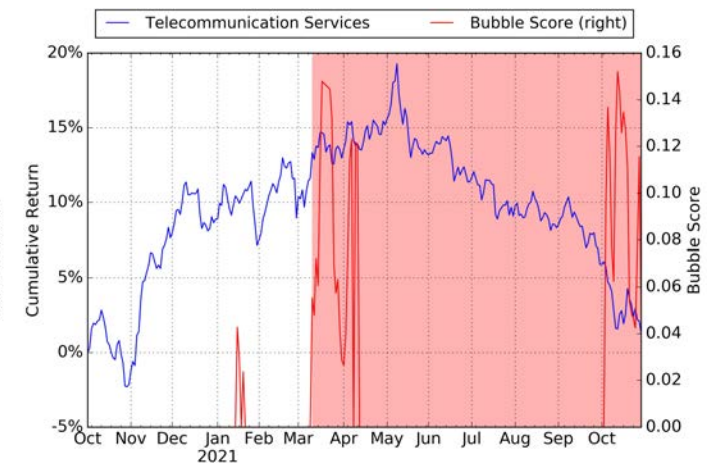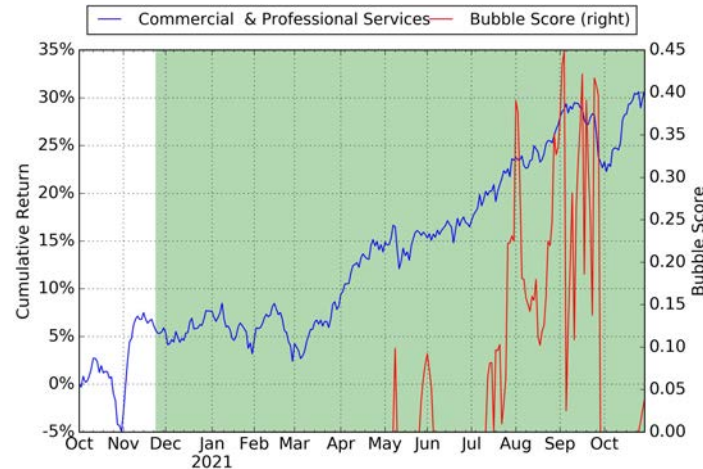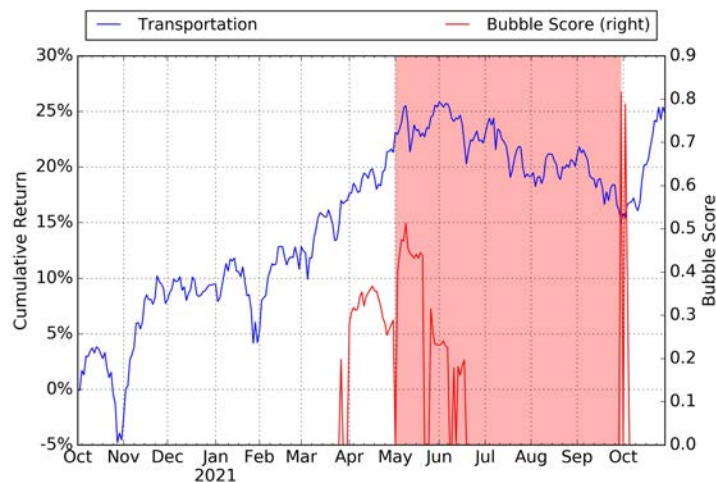
Portfolio Construction & Performance

▶ Here we illustrate the methodology of the portfolio construction process based on the results of our previous analyses.

▶ For individual stocks that we identified in the 4 quadrants, we constructed 4 portfolios based on the 4 quadrants defined in the last report. Each portfolio consists of all the stocks listed in the corresponding quadrant.

1. **Trend-Following Long Stock Portfolio (TFLSP)** is made of the stocks that have a positive bubble signal as well as a strong value score. For instance, TFLSP November consists of all the stocks listed in quadrant 1, identified in slide 37 of November 2017 FCO Report.

2. **Trend-Following Short Stock Portfolio (TFSSP)** is made of the stocks that have a negative bubble signal as well as a weak value score.

3. **Contrarian Long Stock Portfolio (CLSP)** is made of the stocks that have a negative bubble signal as well as a strong value score.

4. **Contrarian Short Stock Portfolio (CSSP)** is made of the stocks that have a positive bubble signal as well as a weak value score.

Portfolio Construction & Performance

▸ At the same time, we also classified 20 industries into 4 quadrants, and constructed 4 type of industry portfolios based on the 4 industry quadrants. Each portfolio consists of all the stocks in the industries listed in the corresponding quadrant. Following the same definitions as above, we have Trend-Following Long Industry Portfolio (TFLIP), Trend-Following Short Industry Portfolio (TFSIP), Contrarian Long Industry Portfolio (CLIP), and Contrarian Short Industry Portfolio (CSIP).

▸ In each month, we initiated 8 new portfolios based on the updated results. The performance of every 8 portfolios we initiated since November 2017 are presented in the next slide. All of the stocks in our portfolios are weighted by their market capitalizations and we don't consider transaction cost in the portfolio performance.

Portfolio Construction & Performance

▸ The market has rebounded strongly in the past month while our portfolios seem to have difficulties in outperforming the market. 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.
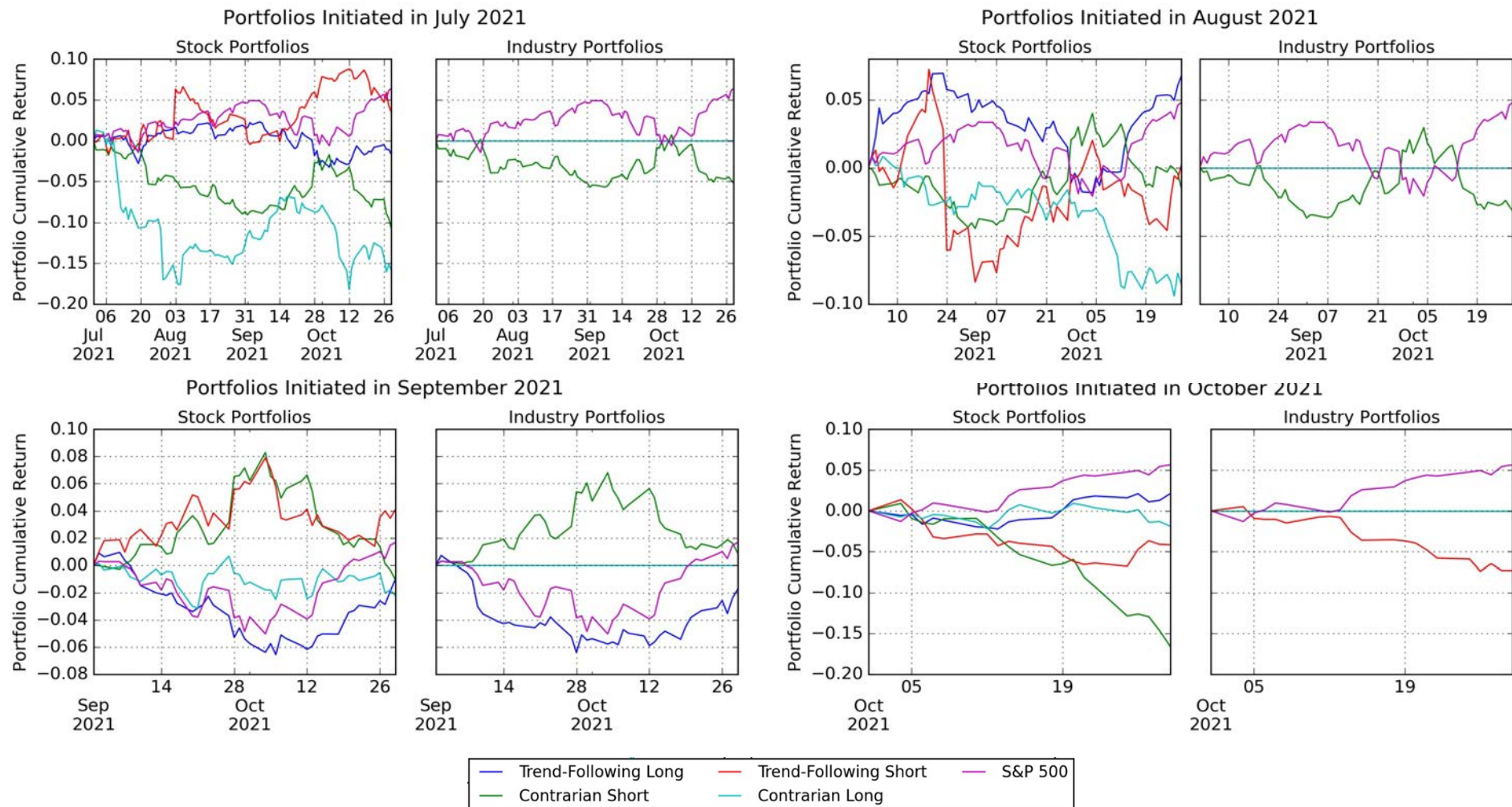
Single Stocks

We can divide the stocks into four quadrants[1]

The four quadrants: value versus bubble score
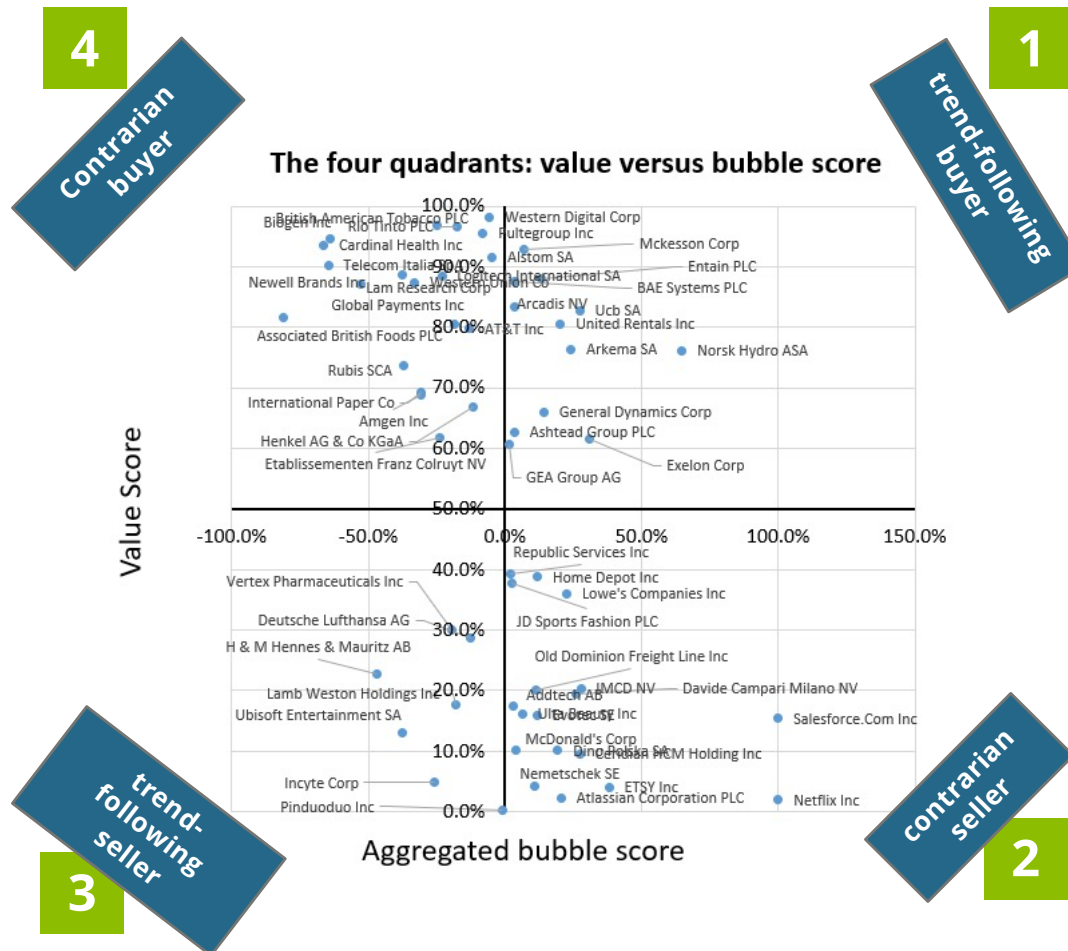
- ▸ **Quadrant 1**: Stocks with a strong value score are cheap relative to their earnings potential. The strong positive bubble signal should be interpreted as a momentum indicator possibly the consequence of a repricing based on the fundamentals. As an investor, one could be a **trend-following buyer**. E.g. Exelon 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. Netflix Inc

- ▸ **Quadrant 3**: These stocks are expensive relative to their earnings potential. On top of that, there are clear negative bubble signals. Such stocks should be considered as falling knives. As an investor, one could be a **trend-following seller**. E.g. Incyte Corp

- ▸ **Quadrant 4**: These stocks are cheap relative to their financial performance. The strong negative bubble signal is an indication of sentiment and herding. These stocks can be considered as over-sold. As an investor, one could be a **contrarian buyer**. E.g. Rubis SCA.

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
Exelon Corp	United States of America	Utilities	22.8%	24.6%	Nov-20	30.7%	61.5%	27.8%
General Dynamics Corp	United States of America	Capital Goods	37.8%	15.0%	Mar-21	14.2%	65.9%	69.7%
Mckesson Corp	United States of America	Health Care Equipment & Services	16.5%	16.2%	Jan-21	7.1%	92.8%	61.0%
United Rentals Inc	United States of America	Capital Goods	84.2%	39.3%	Feb-21	20.3%	80.5%	22.9%
Ashtead Group PLC	United Kingdom	Capital Goods	92.0%	20.6%	May-21	3.4%	62.7%	48.4%
BAE Systems PLC	United Kingdom	Capital Goods	24.9%	11.7%	Dec-20	3.6%	87.6%	15.5%
Norsk Hydro ASA	Norway	Materials	97.7%	29.9%	Feb-21	64.7%	76.0%	90.6%
Entain PLC	Isle of Man	Consumer Services	109.7%	55.4%	Feb-21	13.1%	87.9%	82.9%
Arkema SA	France	Materials	29.9%	25.3%	Nov-20	24.2%	76.3%	17.7%
Arcadis NV	Netherlands	Capital Goods	84.4%	73.7%	Nov-20	3.3%	83.3%	14.9%
GEA Group AG	Germany	Capital Goods	47.7%	47.1%	Dec-20	1.5%	60.7%	83.5%
Ucb SA	Belgium	Pharmaceuticals, Biotechnology & Life Sciences	8.2%	15.1%	Nov-20	27.4%	82.7%	8.9%
Uniper SE	Germany	Utilities	37.3%	26.8%	May-21	21.5%	89.8%	6.8%
Novo Nordisk A/S	Denmark	Pharmaceuticals, Biotechnology & Life Sciences	63.8%	57.7%	Apr-21	13.6%	94.4%	72.2%

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Single Stocks

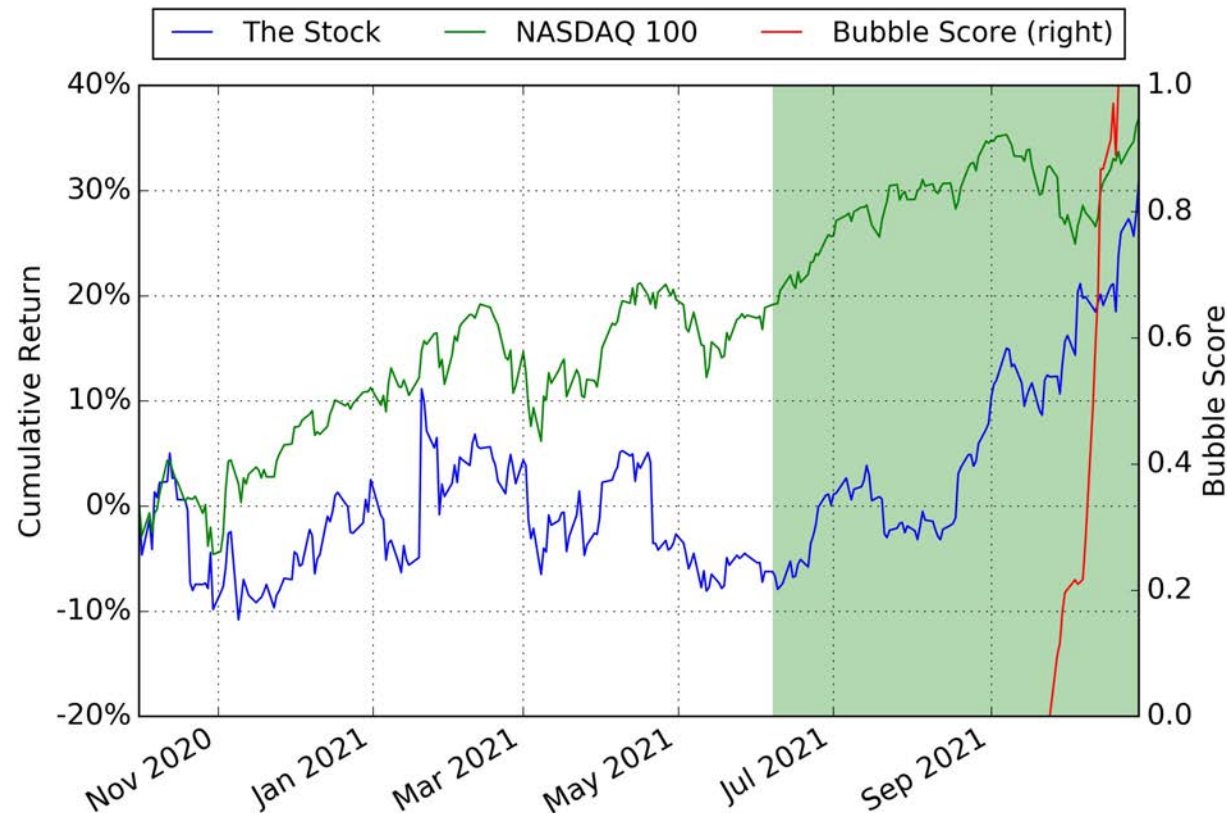Quadrant 1 Stocks Current Month Example – Norsk Hydro ASA
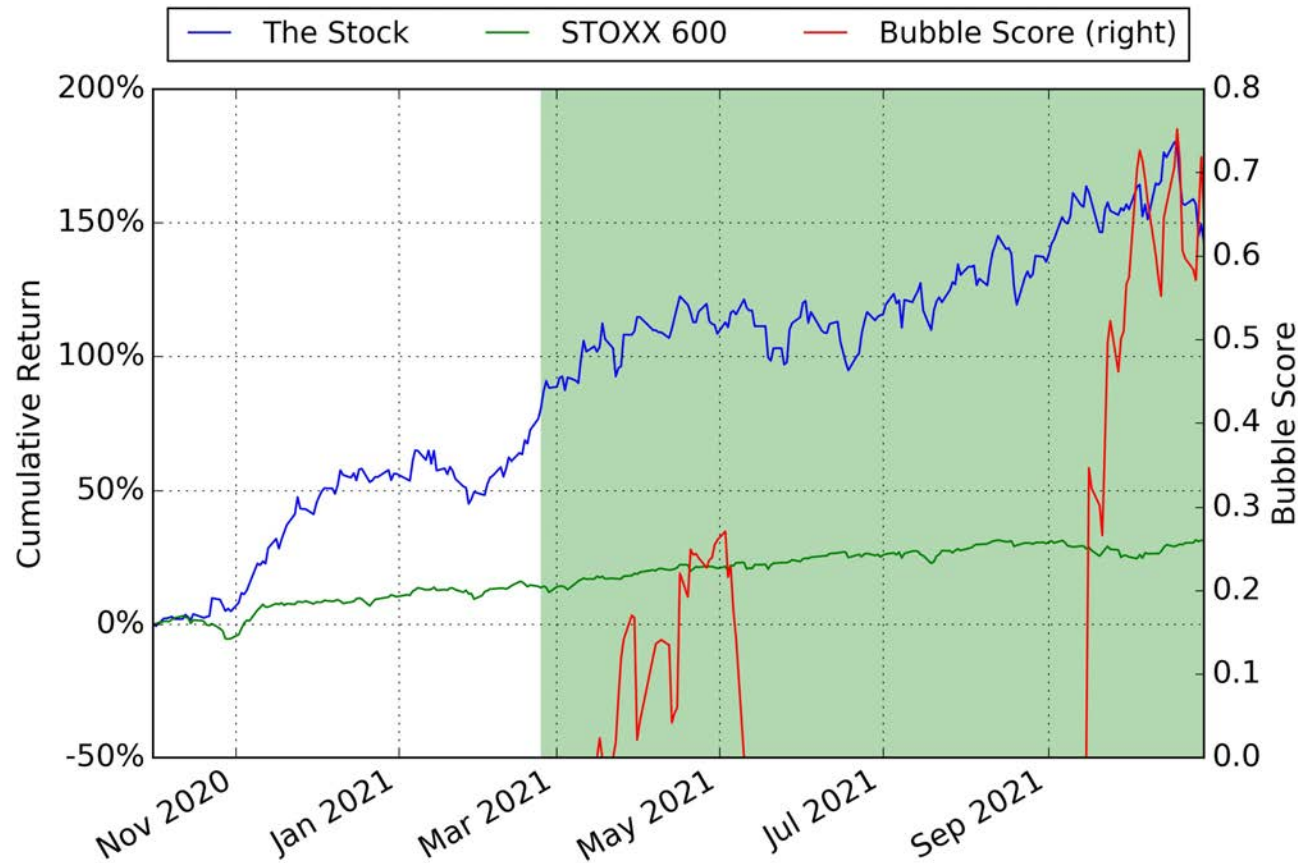
▶ The above graph shows the one-year cumulative return of the stock in blue (left hand scale), STOXX 600 in green (left hand scale) and the calculated DS LPPLS Bubble Score in red (right hand scale). The green shaded period delineates the time interval within which the positive bubble is identified. The Bubble Score of this eight-month bubble has reached 64.7% with a bubble size 29.9%.

Single Stocks

Quadrant 1 Stocks Last Month Example – EssilorLuxottica SA.
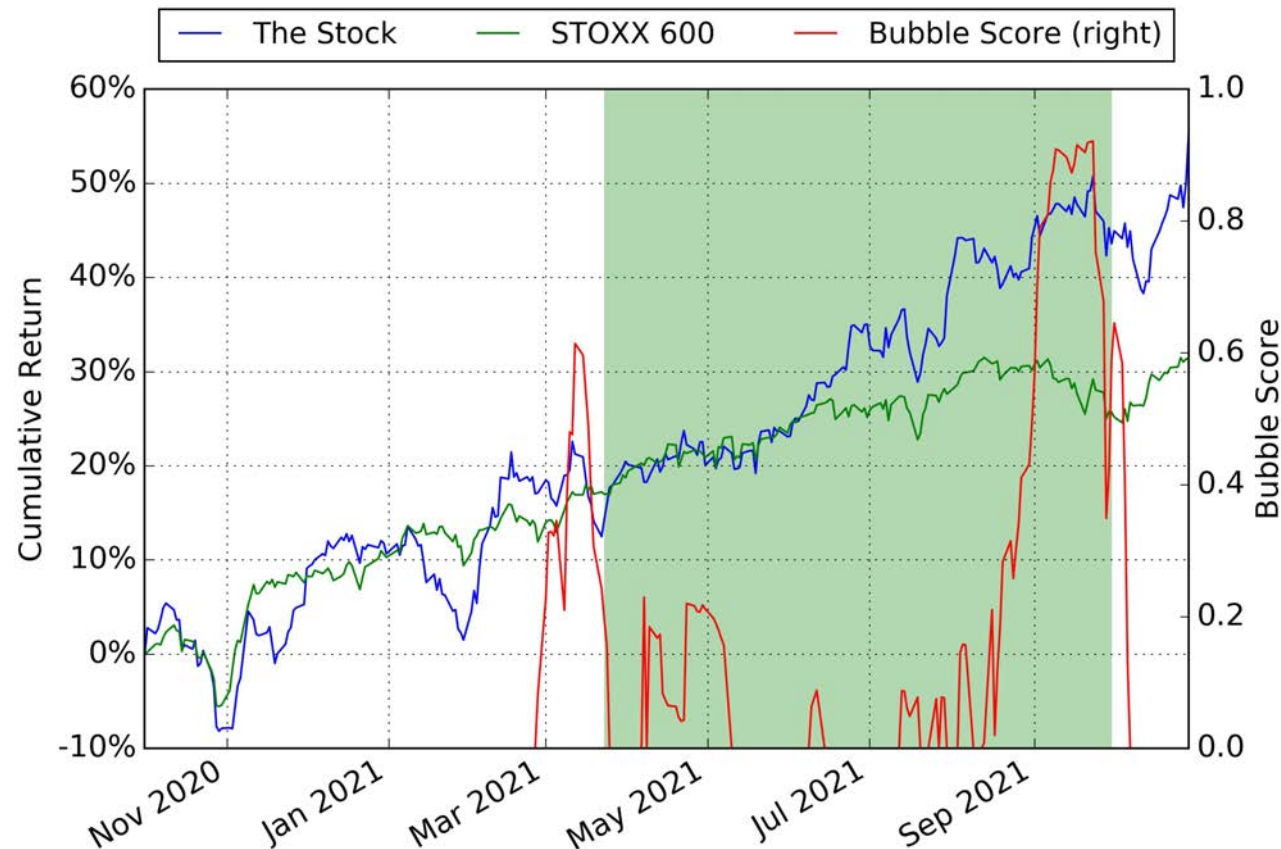
▸ The figure above plots the one-year cumulative return of the stock (blue), STOXX 600 (green) and LPPLS Bubble Score (red lines on the right y-axis). The green shaded period delineates the time interval within which a strong positive bubble has been identified and reported last month. The stock has rebounded to its previous high after a 10% drawdown in synchronization with the market drawdown. Our bubble signal has disappeared due to this drawdown and one should keep cautious as the stock may continue to develop into a larger bubble, or end this current bubble regime.

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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
McDonald's Corp	United States of America	Consumer Services	15.2%	9.6%	Mar-21	3.8%	10.2%	74.3%
Home Depot Inc	United States of America	Retailing	37.7%	17.3%	May-21	11.9%	38.7%	56.2%
Lowe's Companies Inc	United States of America	Retailing	52.4%	20.4%	May-21	22.6%	36.0%	53.4%
Ceridian HCM Holding Inc	United States of America	Software & Services	32.9%	41.0%	May-21	27.4%	9.5%	78.5%
Ulta Beauty Inc	United States of America	Retailing	48.6%	33.4%	Nov-20	6.3%	16.1%	22.1%
Republic Services Inc	United States of America	Commercial & Professional Services	34.1%	23.8%	May-21	2.0%	39.3%	39.6%
Netflix Inc	United States of America	Media & Entertainment	46.7%	42.1%	Jun-21	100.0%	1.9%	59.5%
Old Dominion Freight Line Inc	United States of America	Transportation	71.3%	69.0%	Jan-21	11.2%	20.1%	63.1%
ETSY Inc	United States of America	Retailing	106.8%	59.0%	May-21	38.1%	4.0%	26.6%
Salesforce.Com Inc	United States of America	Software & Services	15.6%	38.0%	May-21	100.0%	15.3%	42.7%
Atlassian Corporation PLC	United Kingdom	Software & Services	144.3%	105.4%	Apr-21	20.5%	2.2%	65.1%
Addtech AB	Sweden	Capital Goods	77.8%	77.8%	Nov-20	2.9%	17.4%	85.4%
Dino Polska SA	Poland	Food & Staples Retailing	37.1%	43.9%	Apr-21	19.3%	10.1%	72.5%
JD Sports Fashion PLC	United Kingdom	Retailing	34.2%	33.6%	Dec-20	2.6%	37.6%	51.2%
Evotec SE	Germany	Pharmaceuticals, Biotechnology & Life Sciences	75.1%	28.8%	Jan-21	11.8%	15.8%	86.1%
Davide Campari Milano NV	Italy	Food, Beverage & Tobacco	28.3%	10.3%	Jun-21	26.1%	19.4%	82.0%
Nemetschek SE	Germany	Software & Services	51.5%	63.2%	Dec-20	10.9%	4.2%	83.3%
IMCD NV	Netherlands	Capital Goods	81.4%	84.5%	Nov-20	27.7%	20.3%	33.2%
Nibe Industrier AB	Sweden	Capital Goods	107.9%	119.0%	Nov-20	14.2%	20.4%	43.5%

Single Stocks

Quadrant 2 Stocks Current Month Example – Netflix Inc.

▸ The above graph shows the one-year cumulative return of the stock in blue (left hand scale), NASDAQ 100 in green (left hand scale) and the calculated DS LPPLS Bubble Score in red (right hand scale). The green shaded period delineates the time interval within which the positive bubble is identified. The Bubble Score of this five-month bubble has reached 100% with a bubble size 42.1%. The strong positive bubble signal and weak fundamentals may indicate a high probability of correction in the future.

Single Stocks

Quadrant 2 Stocks Last Month Example – Bollore SE.
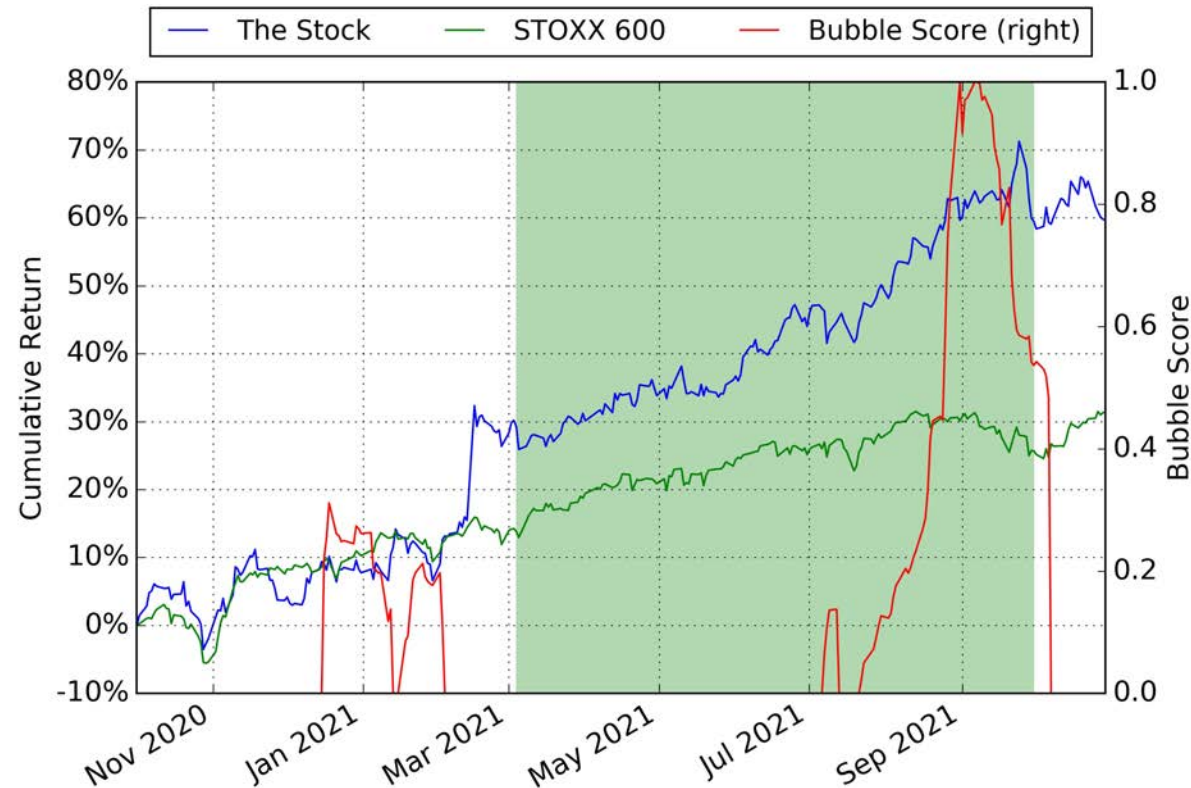
The figure above plots the one-year cumulative return of the stock (blue), STOXX 600 (green) and LPPLS Bubble Score (red lines on the right y-axis). The green shaded period delineates the time interval within which a strong positive bubble has been identified and reported last month. The stock price has undergone a change of regime, which is in agreement with the LPPLS signal. The weak fundamentals suggests that the correction may continue, as we can see from the weak performance of the stock even under the backdrop of the overall rebound of the STOXX 600 index.

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
Lamb Weston Holdings Inc	United States of America	Food, Beverage & Tobacco	-25.6%	-30.0%	Apr-21	-17.8%	17.7%	87.1%
Vertex Pharmaceuticals Inc	United States of America	Pharmaceuticals, Biotechnology & Life Sciences	-17.0%	-20.3%	Dec-20	-19.5%	30.1%	35.0%
Incyte Corp	United States of America	Pharmaceuticals, Biotechnology & Life Sciences	-17.6%	-19.5%	Apr-21	-25.7%	4.8%	22.3%
Pinduoduo Inc	China	Retailing	-16.2%	-41.2%	Nov-20	-1.1%	0.2%	71.3%
Deutsche Lufthansa AG	Germany	Transportation	-10.2%	-33.7%	Feb-21	-12.5%	28.7%	99.4%
Ubisoft Entertainment SA	France	Media & Entertainment	-40.4%	-33.4%	Feb-21	-37.8%	13.1%	89.3%
H & M Hennes & Mauritz AB	Sweden	Retailing	-5.1%	-20.6%	Mar-21	-47.1%	22.8%	46.9%

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Single Stocks

Quadrant 3 Stocks Current Month Example – H & M Hennes & Mauritz AB.
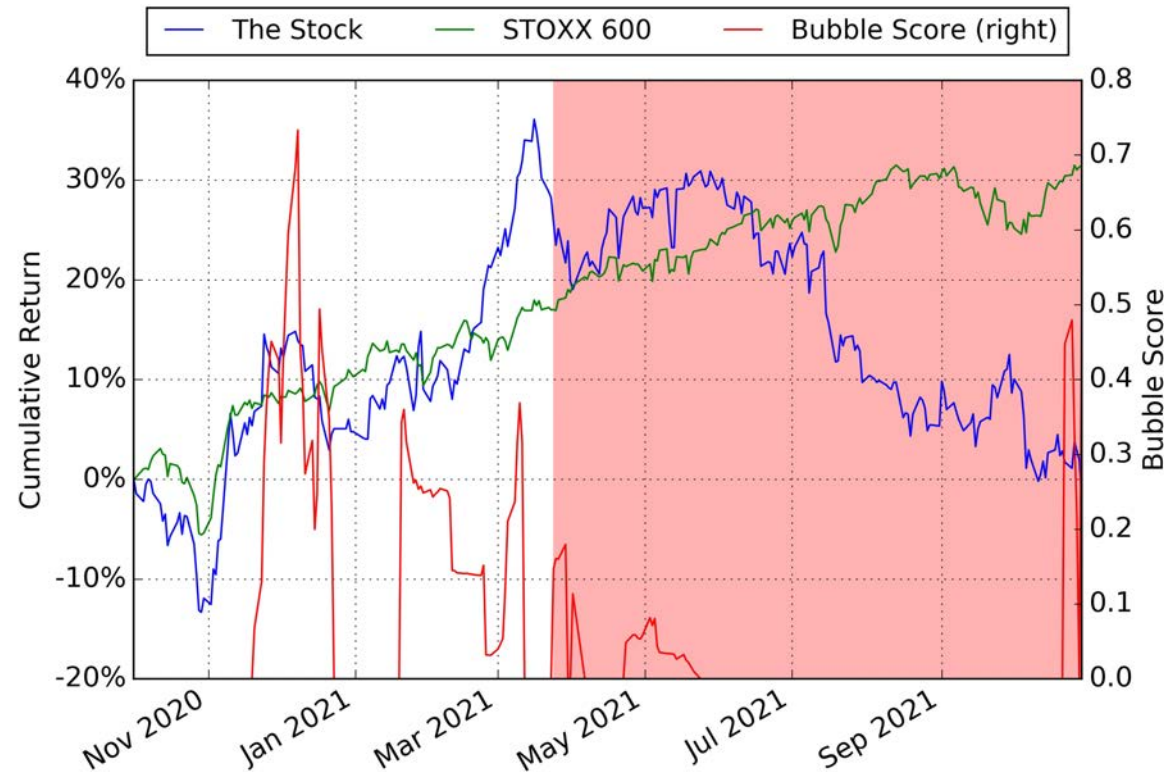
▶ The above graph shows the one-year cumulative return of the stock in blue (left hand scale), STOXX 600 in green (left hand scale) and the calculated DS LPPLS Bubble Score in red (right hand scale). The red shaded period delineates the time interval within which the negative bubble is identified. The Bubble Score of this seven-month bubble has reached 47.1% with a bubble size -20.6%.

Single Stocks

Quadrant 3 Stocks Last Month Example – Koninklijke Vopak NV.
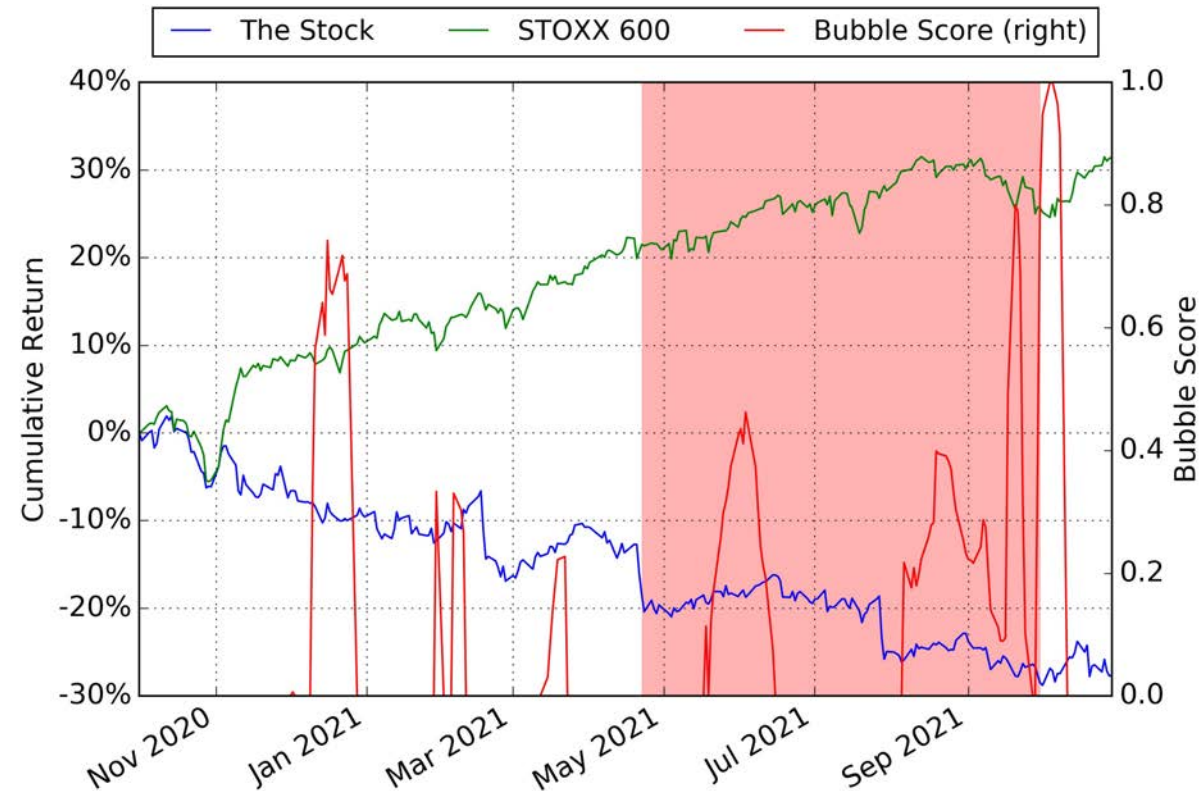
▸ The figure above plots the one-year cumulative return of the stock (blue), STOXX 600 (green) and LPPLS Bubble Score (red line on the right y-axis). The red shaded period delineates the time interval within which the strong negative bubble was identified and reported last month. The stock price has lost its downward momentum in the past month and rebounded a bit in the past month. One should remain cautious given the weak fundamentals of this stock, which may indicate a continuation of the negative bubble in the future.

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
Western Digital Corp	United States of America	Technology Hardware & Equipment	26.1%	-26.7%	Apr-21	-5.7%	98.1%	5.2%
Newell Brands Inc	United States of America	Consumer Durables & Apparel	19.8%	-21.3%	May-21	-52.5%	87.1%	9.1%
Cardinal Health Inc	United States of America	Health Care Equipment & Services	-13.7%	-20.8%	Mar-21	-66.3%	93.5%	15.3%
AT&T Inc	United States of America	Telecommunication Services	-10.7%	-15.8%	Mar-21	-13.0%	79.7%	34.3%
Western Union Co	United States of America	Software & Services	-15.0%	-25.8%	May-21	-33.1%	87.3%	68.0%
Pultegroup Inc	United States of America	Consumer Durables & Apparel	18.3%	-10.1%	Apr-21	-8.0%	95.6%	14.1%
Global Payments Inc	United States of America	Software & Services	-26.2%	-29.7%	Mar-21	-18.3%	80.6%	58.3%
Amgen Inc	United States of America	Pharmaceuticals, Biotechnology & Life Sciences	-11.9%	-13.6%	Jun-21	-30.9%	68.8%	26.5%
International Paper Co	United States of America	Materials	10.8%	-13.1%	May-21	-30.6%	69.3%	66.8%
Biogen Inc	United States of America	Pharmaceuticals, Biotechnology & Life Sciences	12.9%	-32.6%	Jun-21	-63.9%	94.6%	30.3%
Lam Research Corp	United States of America	Semiconductors & Semiconductor Equipment	35.4%	-11.2%	May-21	-37.5%	88.7%	35.1%
Telecom Italia SpA	Italy	Telecommunication Services	-8.4%	-26.8%	May-21	-64.7%	90.3%	0.6%
British American Tobacco PLC	United Kingdom	Food, Beverage & Tobacco	-1.0%	-9.2%	May-21	-25.0%	96.8%	33.1%
Rubis SCA	France	Utilities	-13.5%	-32.3%	Mar-21	-37.1%	73.6%	87.4%
Rio Tinto PLC	United Kingdom	Materials	1.6%	-18.1%	Jan-21	-17.4%	96.6%	7.4%
Etablissementen Franz Colruyt NV	Belgium	Food & Staples Retailing	-12.9%	-18.0%	Jan-21	-23.6%	61.8%	12.0%
Logitech International SA	Switzerland	Technology Hardware & Equipment	3.5%	-35.8%	Jun-21	-23.1%	88.5%	6.5%
Alstom SA	France	Capital Goods	-22.2%	-27.9%	Mar-21	-4.7%	91.5%	97.5%
Associated British Foods PLC	United Kingdom	Food, Beverage & Tobacco	-9.6%	-27.1%	Apr-21	-81.3%	81.5%	33.9%
Henkel AG & Co KGaA	Germany	Household & Personal Products	-16.0%	-19.0%	Mar-21	-11.5%	66.8%	55.4%
Vodafone Group PLC	United Kingdom	Telecommunication Services	-3.6%	-14.0%	Nov-20	-42.6%	87.4%	94.2%
Pearson PLC	United Kingdom	Media & Entertainment	3.4%	-27.1%	May-21	-48.4%	87.5%	17.1%
ITV PLC	United Kingdom	Media & Entertainment	24.0%	-13.4%	May-21	-34.4%	92.6%	2.3%
KGHM Polska Miedz SA	Poland	Materials	11.6%	-19.3%	Mar-21	-17.3%	89.2%	98.4%

Single Stocks

Quadrant 4 Stocks Current Month Example – Associated British Foods PLC.
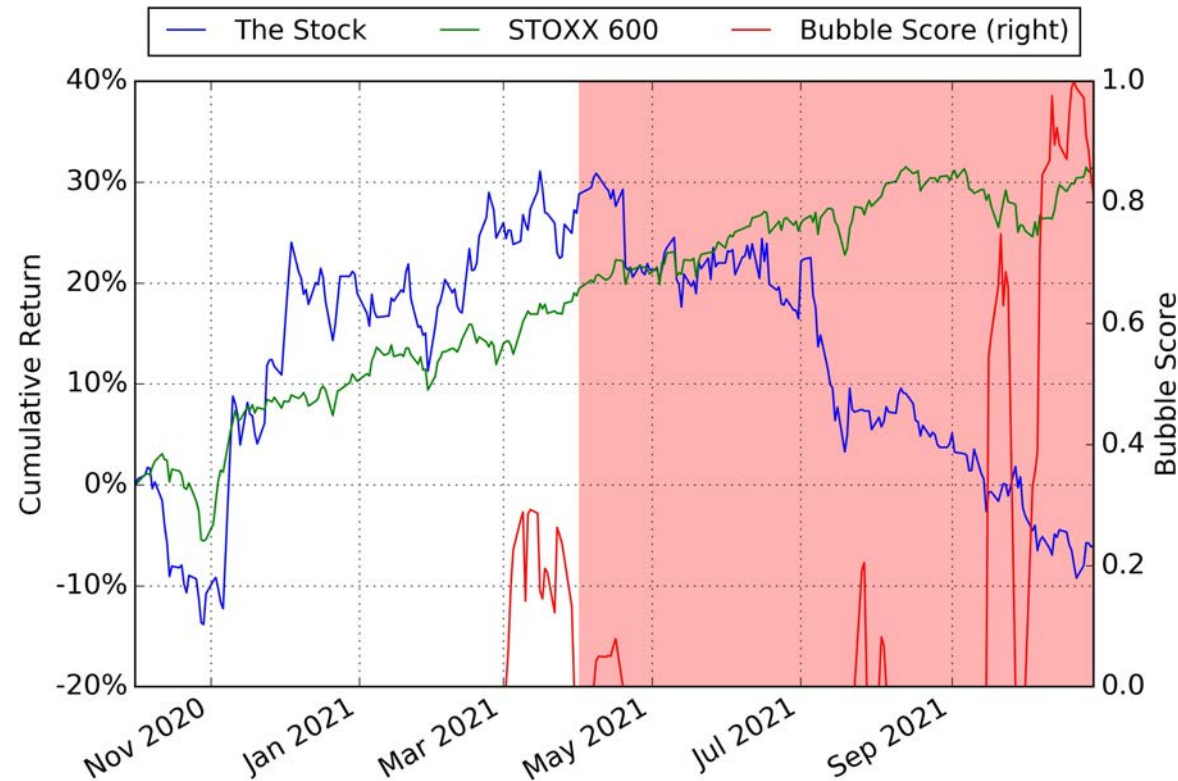
▸ The above graph shows the one-year cumulative return of the stock in blue (left hand scale), STOXX 600 in green (left hand scale) and the calculated DS LPPLS Bubble Score in red (right hand scale). The red shaded period delineates the time interval within which the strong negative bubble is identified. The Bubble Score of this seven-month bubble has reached 81.3% with a negative bubble size -27.1%. We expect a rebound in the future when the negative bubble is mature, given our diagnostic of a negative bubble signal with strong fundamentals, calling for a contrarian buyer position.

Single Stocks

Quadrant 4 Stocks Last Month Example – Western Union Co.
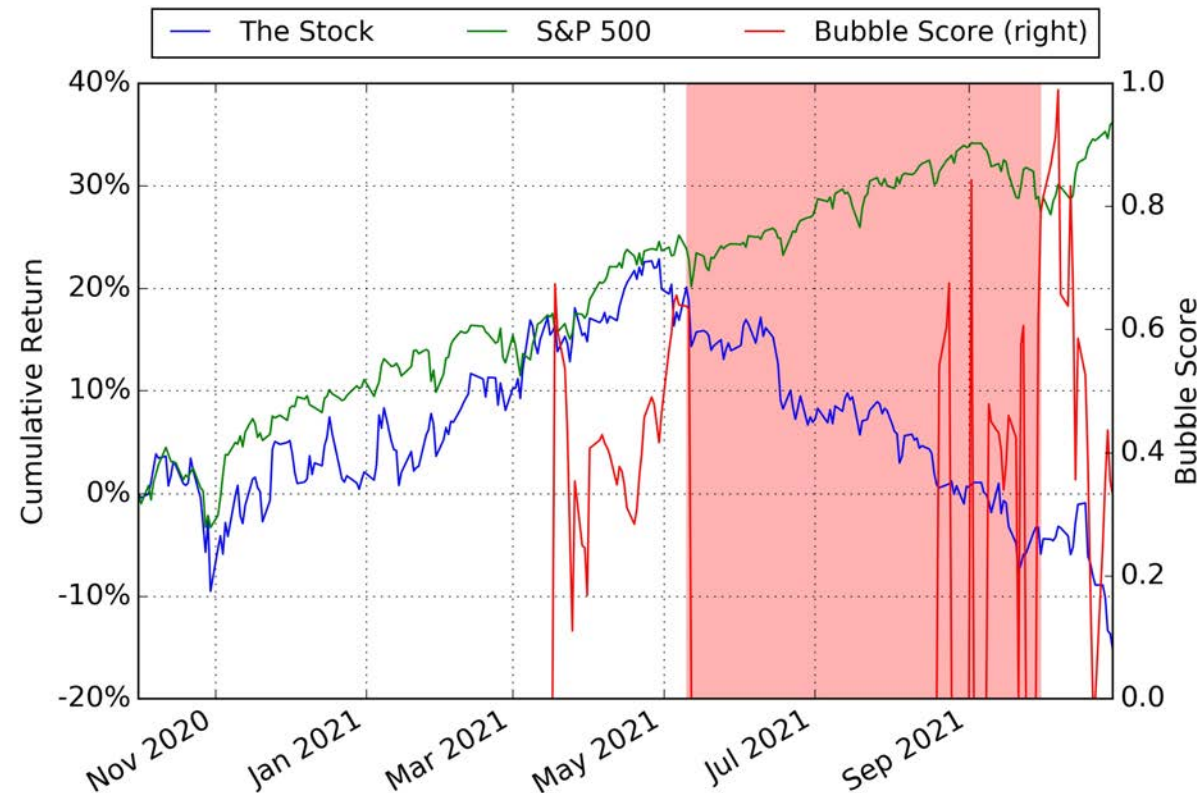
The figure above plots the one-year cumulative return of the stock (blue), S&P 500 (green) and LPPLS Bubble Score (red line on the right y-axis). The red shaded period delineates the time interval within which the strong negative bubble was identified and reported last month. The stock price continued to go down in the past month, which means that the strong negative bubble signal we identified last month may be a false positive or that the negative bubble has not matured yet and a rebound can still be expected. The bubble score is still running at 33%, marking the negative bubble as still developing.
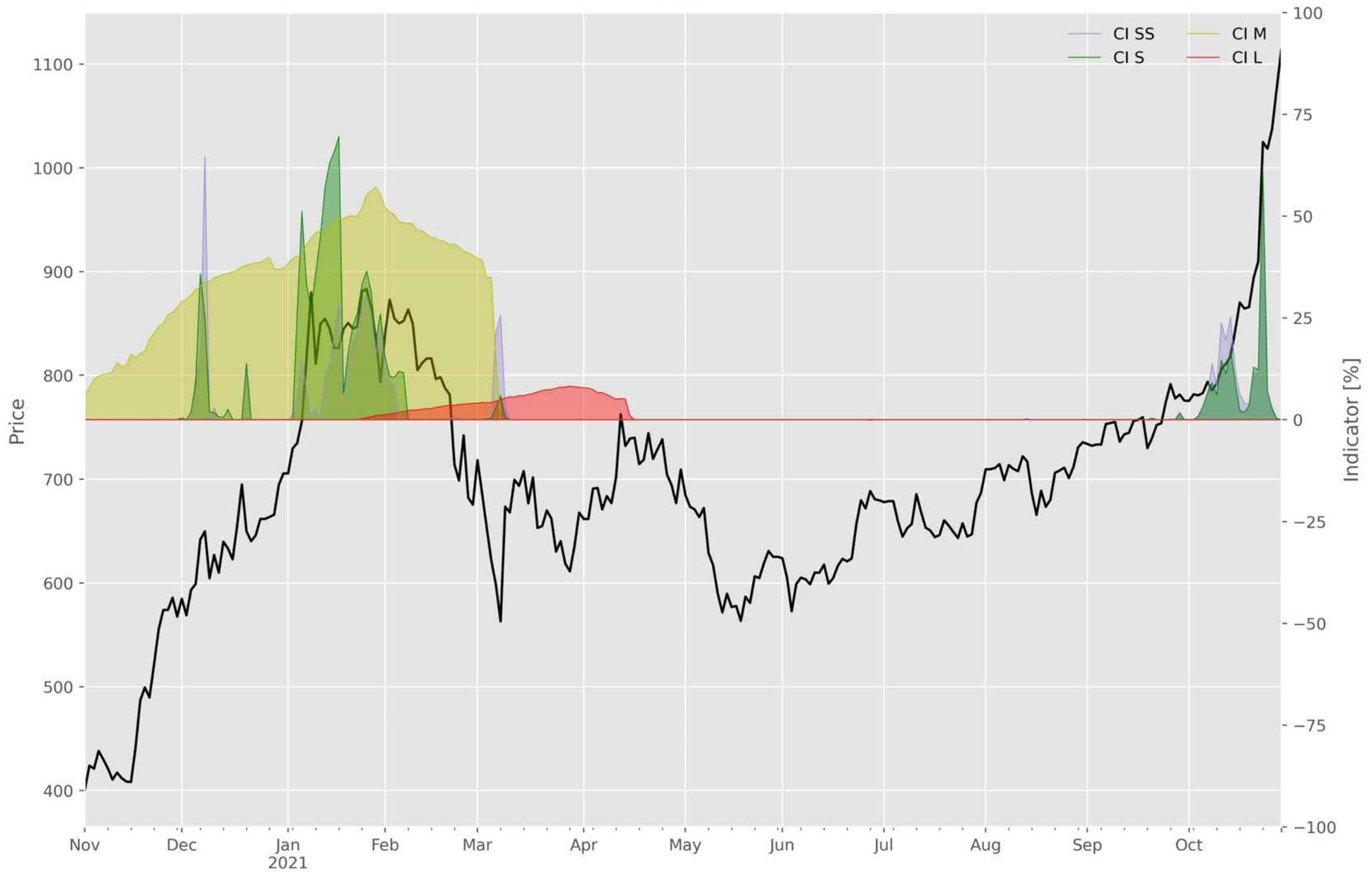
ETH zürich   SUSTech
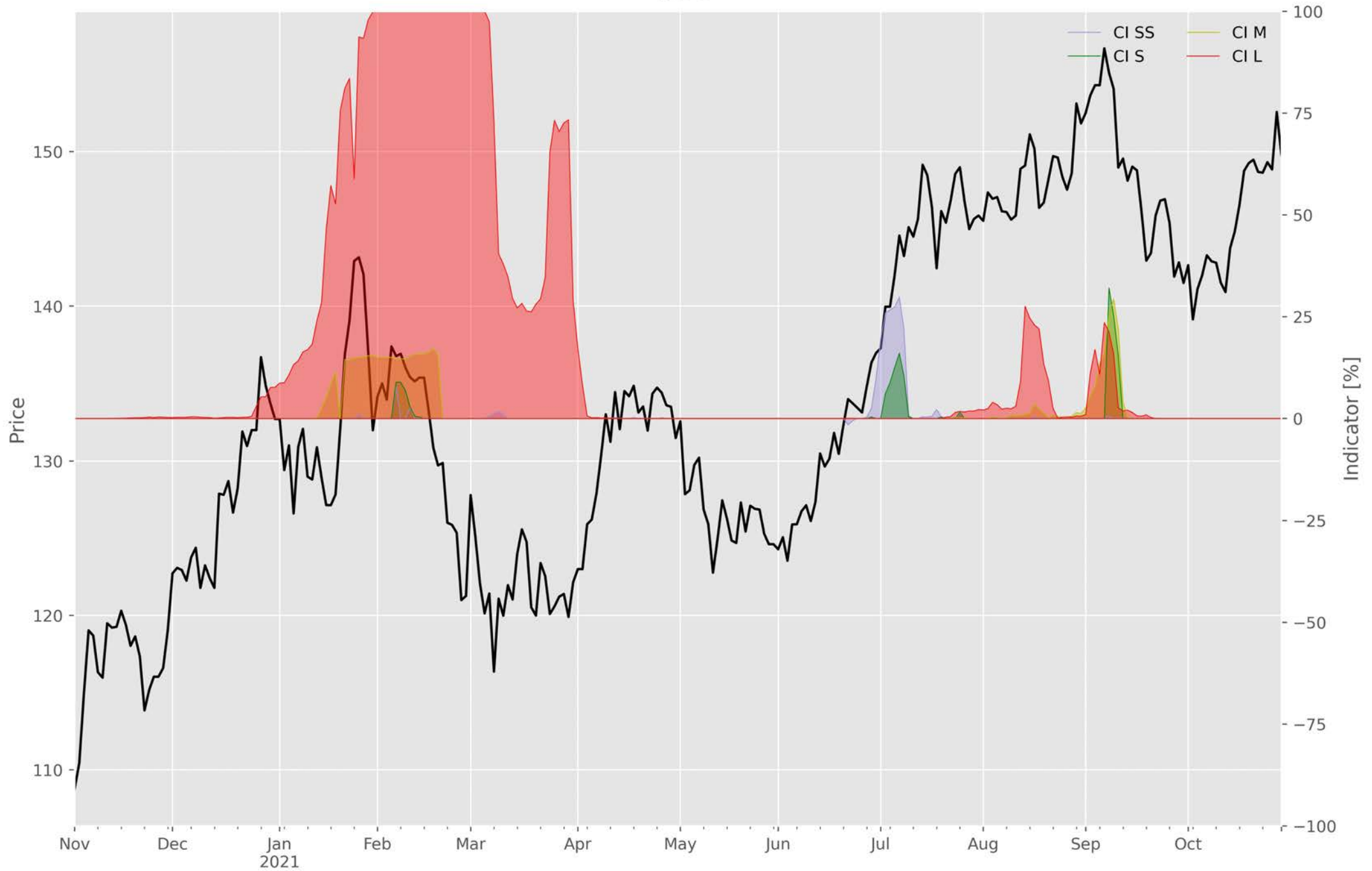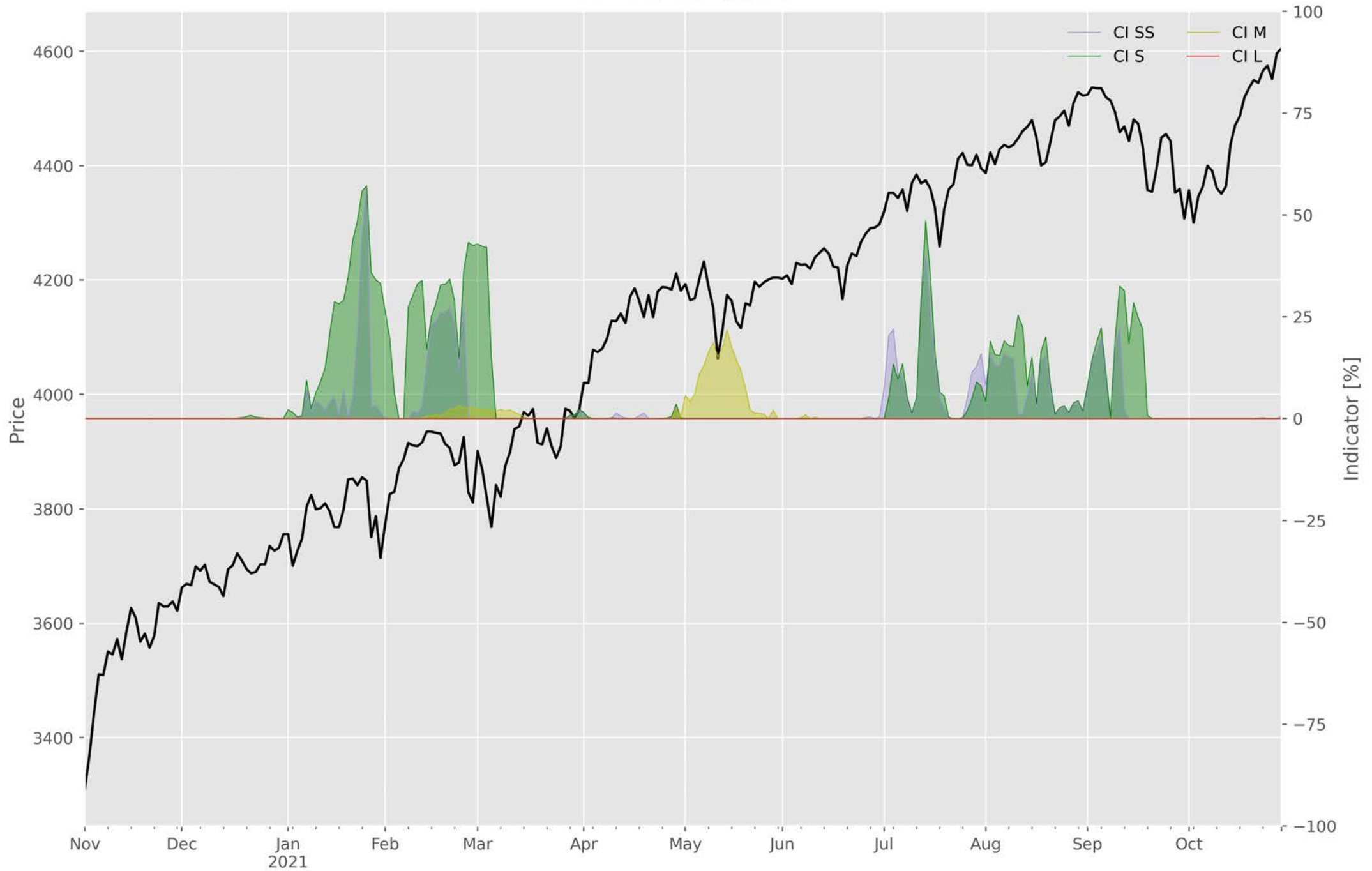
Appendix

Amazon.Com

The FCO Cockpit - Global Bubble Status Report
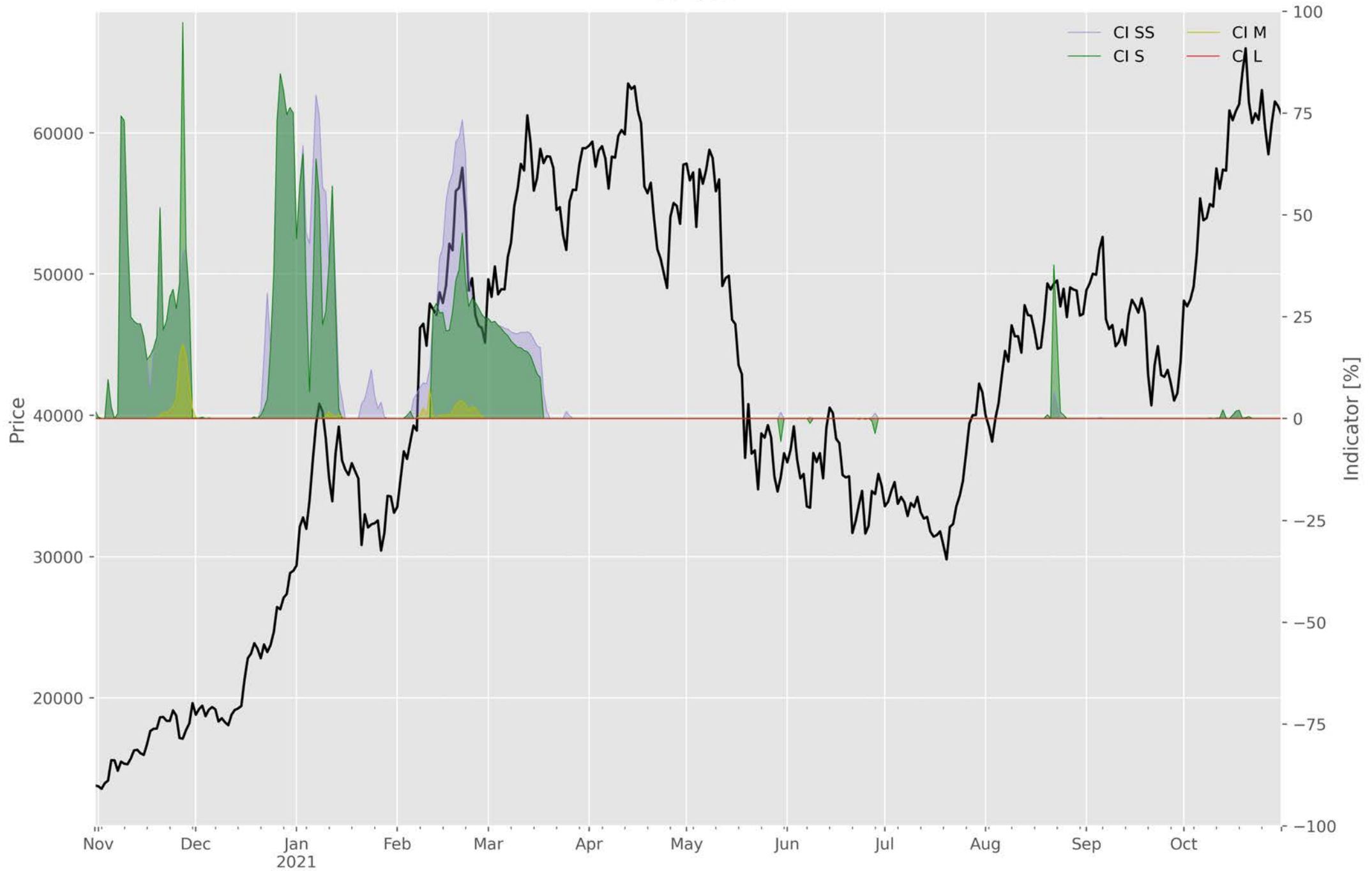
Microsoft
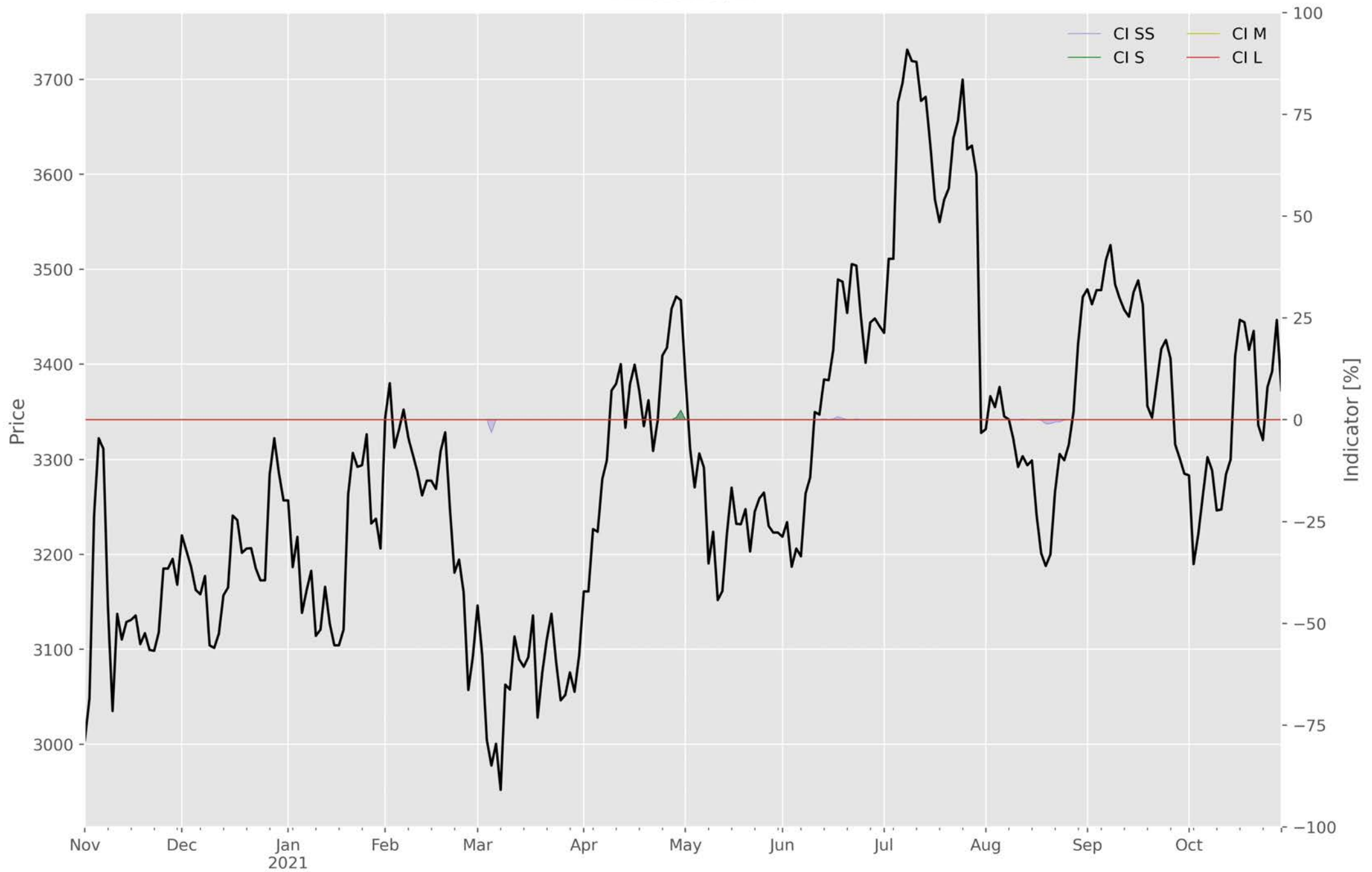
The FCO Cockpit - Global Bubble Status Report
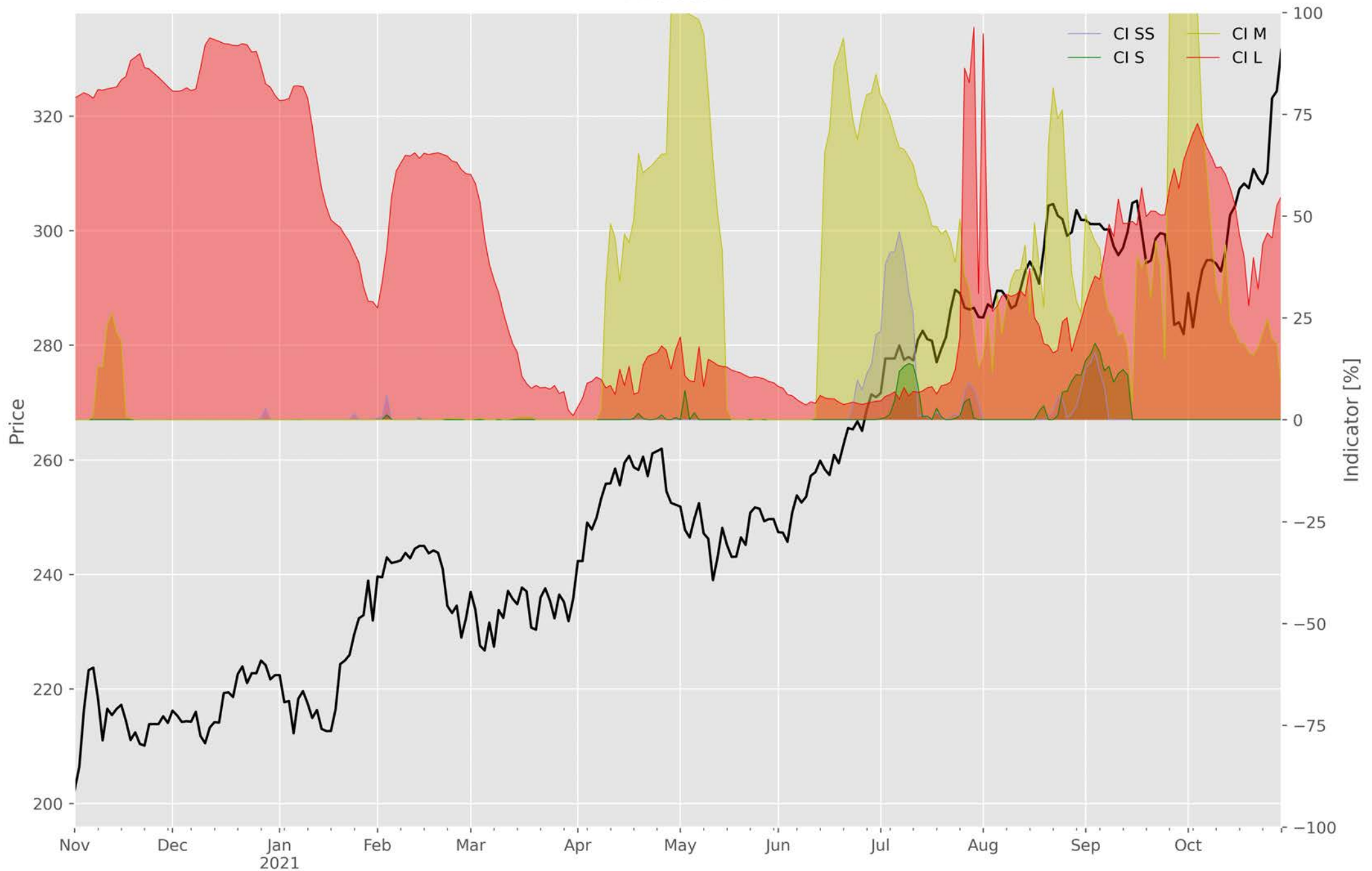
Tesla

Apple

S&P 500 Composite

Bitcoin/USD

More Information

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

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

▸ **Contacts ETH Zurich**

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