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Measuring the Crowded Trade in Global Equities

Sector crowding mostly steady despite volatility

CITI'S TAKE

Overall sector crowding trends across regions held steady so far since last month, despite the volatility and large index level declines. The crowding trend remains delineated between Cyclical on one end (crowded) and Defensive on the other. However, some shifting is more noticeable among sectors in Europe where the equity markets are now outperforming the US (YTD), particularly in Financials which has become the most crowded sector there. Defensive Utilities and Consumer Staples are no longer extremely under-crowded in Europe, while Real Estate has seen its crowding increase.

Sector Crowding — Technology stocks were the most crowded (market cap basis) through the middle of February across the US, Europe and Asia ex JP, but have since declined to second place in Europe and Asia. This still leaves Tech at the top of the crowding ranks in the US, but it is more concentrated among the larger companies. In Europe, Tech is crowded on a market cap basis but not on an equal-weighted basis.

Factor Crowding — The most crowded quant style changed from Earnings Momentum to Price Momentum in Japan, while remaining stable across other regions (Figure 5).

Stocks to focus on — We overlay the Crowding Composite on the Citi Research Catalyst Watch system to help identify non-consensus calls.

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Figure 1. Citi Research Catalyst Watch with High/Low Crowding Scores

| RIC | Company Name | Region | Price (USD) (12-Mar-25) | Citi Rating | Start Date | Expiry Date/ Close Date | Call Direction | Long Crowding Composite | Short Crowding Composite |
|---|---------------------------------|--------|----------------------------|----------------|------------|----------------------------|-------------------|-------------------------------|--------------------------------|
| Upside Citi Catalyst Watch with Low Long Crowding Score (< 0.25) | | | | | | | | | |
| 300015.SZ | AIER EYE HOSPITAL 'A'CNV1 | AxJ | 1.91 | 3 | 10-Feb-25 | 12-May-25 | Upside | 2.4% | 92.3% |
| MGAS.BO | MAHANAGAR GAS LTD INR10 | AxJ | 14.89 | 1 | 5-Jan-25 | 6-Apr-25 | Upside | 5.8% | 51.1% |
| 0968.HK | XINYI SOLAR HLDGS HKD0.10 | AxJ | 0.43 | 2 | 12-Feb-25 | 14-May-25 | Upside | 7.4% | 99.7% |
| 2269.HK | WUXI BIOLOGICS (CA USD0.000000) | AxJ | 3.04 | 1 | 20-Feb-25 | 22-May-25 | Upside | 13.7% | 98.7% |
| 1114.HK | BRILLIANCE CHINA USD0.01 | AxJ | 0.49 | 1H | 3-Mar-25 | 3-Apr-25 | Upside | 15.1% | 3.7% |
| 002555.SZ | 37 INTERACTIVE ENT 'A'CNV1 | AxJ | 2.17 | 1 | 5-Mar-25 | 4-Jun-25 | Upside | 18.4% | |
| LRE.L | LANCASHIRE HLDGS COM SHS US | Europe | 7.71 | 1 | 26-Feb-25 | 28-Mar-25 | Upside | 18.7% | 53.4% |
| WEN.O | WENDYS CO COM | US | 15.25 | 2 | 20-Feb-25 | 22-Mar-25 | Upside | 19.2% | 85.2% |
| PNN.L | PENNON GROUP ORD GBP0.6105 | Europe | 5.36 | 1 | 10-Mar-25 | 9-Apr-25 | Upside | 19.9% | 79.6% |
| 6865.HK | FLAT GLASS GROUP C 'H' CNY0.20 | AxJ | 1.62 | 3 | 10-Feb-25 | 12-May-25 | Upside | 20.1% | 71.4% |
| CPRI.N | CAPRI HOLDINGS LIMITED SHS | US | 19.48 | 1 | 10-Jan-25 | 10-Apr-25 | Upside | 22.3% | 82.6% |
| Downside Citi Catalyst Watch with High Long Crowding Score (> 0.75) | | | | | | | | | |
| 2308.TW | DELTA ELECTRONIC TWD10 | AxJ | 11.76 | 1 | 17-Feb-25 | 20-Mar-25 | Downside | 95.4% | 26.3% |
| 259960.KS | KRAFTON INC KRW100 | AxJ | 237.95 | 2 | 11-Feb-25 | 13-May-25 | Downside | 92.5% | 25.8% |
| 8354.T | FUKUOKA FINANCIAL NPV | JP | 25.60 | 1 | 10-Mar-25 | 9-Jun-25 | Downside | 87.6% | 52.0% |

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Note: Priced as of 12 March close

Source: Citi Research, FactSet, Thomson Reuters, I/B/E/S, Compustat

See Appendix A-1 for Analyst Certification, Important Disclosures and Research Analyst Affiliations.

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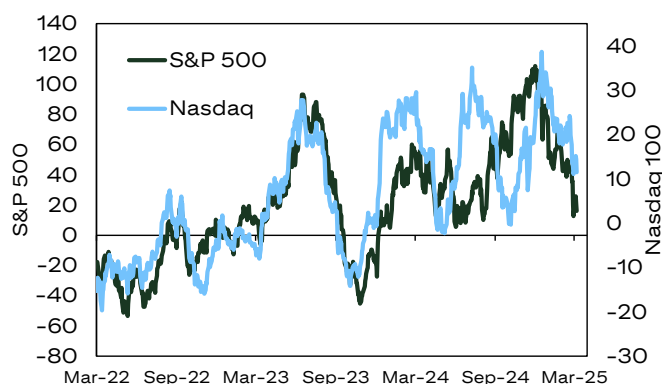
Global Crowding Model

What's New to Crowding

Positive takeaways from Fed speak and cooler inflation readings have taken a backseat to fears that escalating trade wars could bring an already expected slowdown in the US economy closer to the brink of a recession.

Positioning in the S&P 500 and Nasdaq coming into this week was surprisingly resilient despite a sharp decline across US markets the prior week. Looking at Figure 2, our top-down [equity market positioning model](#) (based on futures and ETF data) shows that the US equity market was well off the recent peak of positioning before heavy selling re-ignited at the start of this week. The ensuing retaliatory tariff threats between US and Canada and now Europe, coupled with tariff-related headwinds mentioned frequently on earnings calls, were some of the catalysts that sparked a further unease in the market amidst growing recession concerns. All of [this implies that it was not extreme positioning that was the primary cause of the market decline, rather a catalyst such as concerns over a trade war/recession](#) that was exacerbated by crowding in certain areas such as Growth, as well as Technology and Financials.

Figure 2. S&P 500 (ES) and Nasdaq 100 (NQ) futures net positioning



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Source: Citi Research

Sectors

Looking further into stock-level crowding, the overall crowding trend remains similar to last month across the developed regions where cyclical sectors remain the most crowded and defensives remain the least crowded by far. Technology stocks were the most crowded last month by market cap across the US, Europe and Asia ex JP, but have since declined to second place in Europe and Asia. This still leaves Tech at the top of the crowding ranks in the US, but it is more concentrated among the larger companies. On an equal-weighted basis in Europe, Technology is not crowded.

In the US, Materials and Energy moved higher up the sector crowding ranks since last month. Energy and Financials are the most crowded on an equal-weighted basis, while it is Technology and Communications Services on a cap-weighted basis. Consumer Staples and Utilities are the least crowded by a wide margin.

In Europe, Financials have become the most crowded sector by far with both the cap-weight and equal-weighted crowding scores well above other sectors. Larger cap Technology stocks are more crowded than their smaller cap counterparts. Defensive Utilities and Consumer Staples, along with Real Estate, moved higher off the bottom crowding ranks. The least crowded sector there is now Health Care.

Across Asia ex JP, Comm Services is now the most crowded sectors on a cap-weighted and equal-weighted basis, with Technology close behind. Consumer Staples and Utilities are the least crowded in that region.

In Japan, the crowded sectors remain similar to last month with Financials and Energy the most crowded by far, and Utilities the least crowded.

In Australia, Consumer Discretionary remains the most crowded on a cap-weighted basis, while it is Communications Services on an equal-weighted basis. The Industrials sector moved a significant bit higher in the crowding ranks, from sixth to third.

Mag 7

Figure 3. Long Crowding Scores for the “Magnificent Seven” stocks

| RIC | Company | current | 19-Feb | Jan | Dec | Q3'24 | Q2'24 | Q1'24 |
|---------|----------------|---------|--------|-----|-----|-------|-------|-------|
| NVDA.O | NVIDIA | 95% | 94% | 94% | 90% | 68% | 98% | 97% |
| MSFT.O | Microsoft | 69% | 68% | 66% | 36% | 56% | 93% | 89% |
| GOOGL.O | Alphabet | 81% | 62% | 93% | 93% | 81% | 97% | 76% |
| AAPL.O | Apple | 91% | 95% | 95% | 53% | 86% | 94% | 73% |
| META.O | Meta Platforms | 93% | 98% | 98% | 86% | 92% | 97% | 99% |
| AMZN.O | Amazon.com | 69% | 75% | 77% | 75% | 32% | 68% | 77% |
| TSLA.O | Tesla | 38% | 57% | 87% | 95% | 42% | 16% | 23% |

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Source: Citi Research

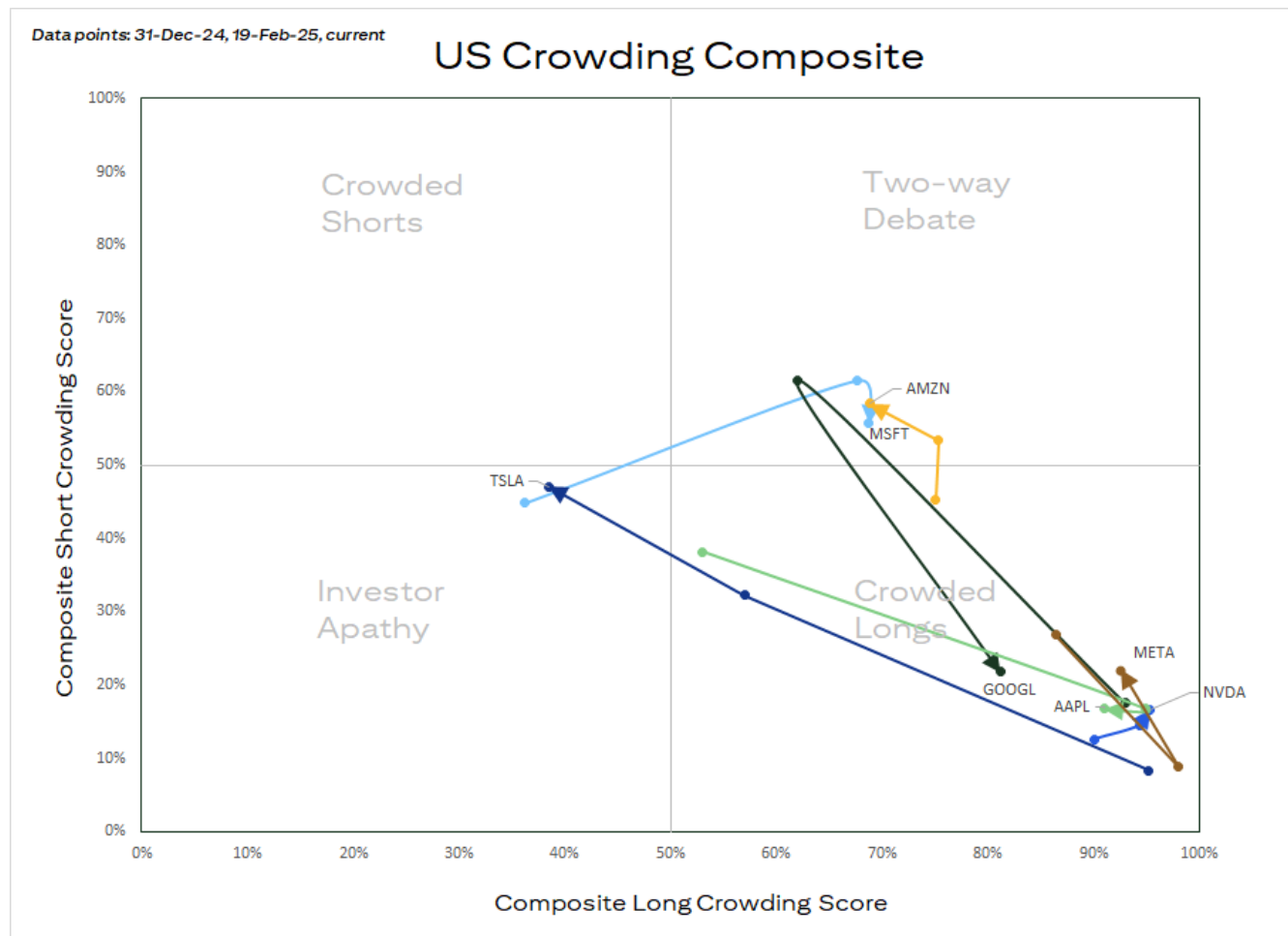
Only three of the Mag 7 stocks currently have very high “long crowding” scores. Four of them declined since the US equity market peaked on February 19th. However, they have been reasonably stable with the exception of Tesla, which declined the most following its recent earnings miss and disappointing sales numbers.

In Figure 4, we intersect these long crowding scores with the short crowding score for each stock in the Mag 7 to gauge the investor appetite for both a long and short investor type. We plot three crowding scores for each stock, representing the start of this year, February 19th which was the peak of the US equity market, and the current score (weekly data through March 7th).

We use a 50% cut-off on both the long and short crowding scores to classify the type of crowding that is associated with each stock, thus resulting in four quadrants. NVDA (NVDA.O; US\$115.58; 1; 13 Mar 25; 16:00), META (META.O; US\$590.64; 1; 13 Mar 25; 16:00), AAPL (AAPL.O; US\$209.68; 1; 13 Mar 25; 16:00), and GOOGL (GOOGL.O; US\$162.76; 1; 13 Mar 25; 16:00) remain crowded longs as they have a high “long” crowding score and a low “short” crowding score. Though MSFT (MSFT.O; US\$378.77; 1; 13 Mar 25; 16:00) and AMZN (AMZN.O; US\$193.89; 1; 13 Mar 25; 16:00) have moderately high “long” crowding scores, they also have a similarly high “short” crowding score which means there is a two-way debate among investors over these stocks. However, it is not extreme and is close to the “Crowded Long” quadrant. On the other hand, TSLA's (NR) “long” crowding score

continued to decrease, while its “short” crowding score has been increasing. It is currently in the quadrant of “Investor Apathy” towards the stock, however, its trajectory is putting it on a path towards becoming a “Crowded Short”.

Figure 4. Mag-7 Crowding Quadrant (YTD change)



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Source: Citi Research

Most Crowded Quant Factor

The most crowded quant style changed to Price Momentum in Japan and remains stable in the other regions. In the US, valuations for Growth have come down recently to its historical average level, which could eventually be a tailwind for this style. However, credit risk has overtaken interest rates and is the single biggest risk for Growth in the US.

For the methodology of identifying the most crowded Quant factor, see [Searching for Alpha: Style Crowding in Asia: Getting Ahead of the Crowd](#).

Figure 5. Most Crowded Quant Factor by region

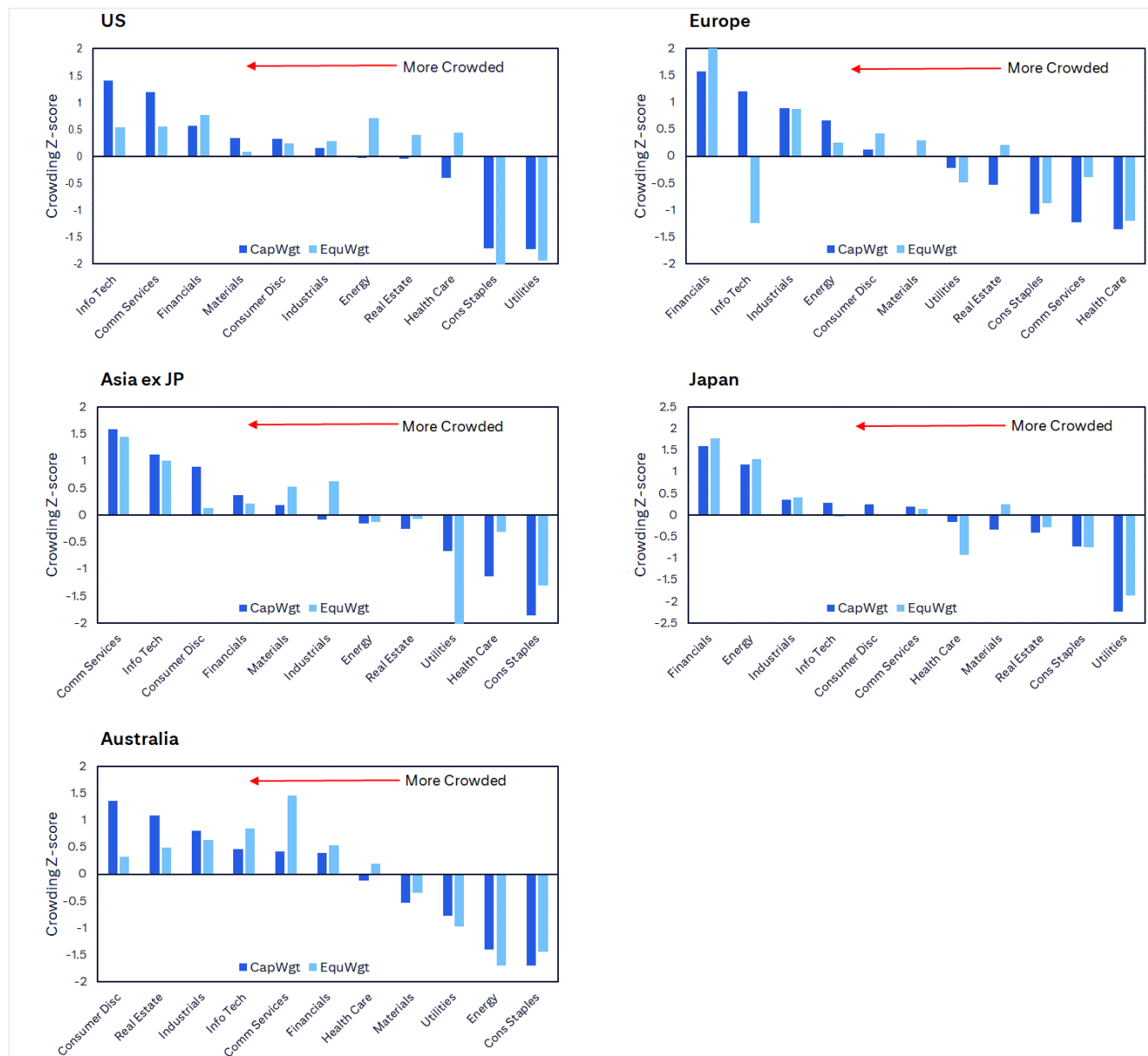
| Region | Most Crowded Style | |
|---------------|--------------------|----------------|
| | February'25 | March'25 |
| Asia ex Japan | Growth | Growth |
| Australia | Growth | Growth |
| Europe | Quality | Quality |
| Japan | Earnings Momentum | Price Momentum |
| US | Growth | Growth |

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Source: Citi Research

Note: Citi Ratings included in the tables of this report are current as of March 12, 2025. They are for illustrative purposes only and do not reflect the most recent Citi fundamental ratings.

Sector Crowding Scores by Region

Figure 6. Aggregate Sector Crowding (MSCI)



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Source: Citi Research

Model Overview

Measuring the Crowd

Stock crowding is an ambiguous concept and could be considered both an alpha or risk signal. We take the more consensus view that crowding is something that often happens in the latter stages of the life cycle of a stock, where the market has a consistent view on the stock – a risk factor. Defining what crowding actually means is tricky so we look at a range of different factors to help us rank stocks according to their level of crowding. The output from the model is not intended to be a buy/sell signal but more as a conditional variable that may help investors better size their stock exposures.

Long & Short Crowding

The following table shows the factors used and the interpretation of the factors for both models. The five metrics below, for each model, are percentile-ranked individually across a broad universe of stocks for different regions. These rankings are then equally weighted to create the final Crowding Composite score for each stock. We require at least four of these five metrics to have data in order to calculate the crowding composite score. A higher (lower) composite rank indicates a higher (lower) amount of crowding compared to the rest of the universe. (see Background and Methodology for more detail)

Figure 7. Stock Crowding Models – Factor Differences and Interpretation

| Stock Crowding Models – Factor Differences and Interpretation | | | |
|---|--------------|-------------------------------|--------------|
| Long Model Factors | Direction | Short Model Factors | Direction |
| Historical Relative Valuation | Expensive | Historical Relative Valuation | Cheap |
| Short Interest Ratio | Low | Short Interest Ratio | High |
| Sentiment | Positive | Sentiment | Negative |
| Macro Exposure | Concentrated | Macro Exposure | Concentrated |
| Ranking of the most crowded factor | High | Historical Price Momentum | Low |

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Source: Citi Research

Model Delivery

Both the Long and Short Stock Crowding Models are published weekly, early in the week based on the previous week's last business day close data. The data is presented as a spreadsheet and clients can subscribe to the distribution list via Citi Velocity, or request to receive this model output by contacting gqrlondon@citi.com. Users of this spreadsheet can navigate to the relevant model and region and by clicking on 'Run Screen', the relevant data will be shown in a new sheet. For those clients interested in getting the historical data, please contact the team.

The latest weekly model output can be accessed via [Measuring the Crowded Trade – Global Scores: 11-March-2025 Interim Update \(Excel\)](#).

Overlay of Crowding with Citi Research Catalyst Watch by Region

In Figure 8 & Figure 9, we overlay the Crowding Composites on the Citi Research Catalyst Watch system (see appendix for [description](#)). Stocks with a downside catalyst that are deemed more crowded (long) may have more difficulty finding marginal investors and are subject to greater risk if a negative inflection emerges. To the contrary, stocks with an upside catalyst that are less crowded (long) could react more positively to constructive fundamental catalysts.

Figure 8. Citi Research Catalyst Watch with Crowding Composite (Sorted by Expiry Date)

US

| Primary Analyst | Company Name | Country | RIC | Sector | Price (USD) (12-Mar-25) | Citi Rating | Start Date | Expiry Date/ Close Date | Time Frame (Days) | Call Direction | Long Crowding | Short Crowding |
|-------------------|---------------------------------|-----------------------|--------|------------------------|----------------------------|-------------|------------|----------------------------|----------------------|----------------|------------------|-------------------|
| Jon Tower | WENDYS CO COM | UNITED STATES | WEN.O | Consumer Discretionary | 15.25 | 2 | 20-Feb-25 | 22-Mar-25 | 30 | Upside | 19.2% | 85.2% |
| Vikram Bagri | GENERAC HLDGS INC COM | UNITED STATES | GNRC.N | Industrials | 131.27 | 2H | 8-Jan-25 | 8-Apr-25 | 90 | Downside | 62.8% | 48.9% |
| Christopher Allen | SCHWAB CHARLES CORP COM | UNITED STATES | SCHW.N | Financials | 74.22 | 2 | 10-Jan-25 | 10-Apr-25 | 90 | Downside | 63.9% | 40.0% |
| Paul Lejuez | CAPRI HOLDINGS LIMITED SHS | VIRGIN ISLANDS (BRIT) | CPRI.N | Consumer Discretionary | 19.48 | 1 | 10-Jan-25 | 10-Apr-25 | 90 | Upside | 22.3% | 82.6% |
| Fatima Boolani | OKTA INC CL A | UNITED STATES | OKTA.O | Information Technology | 108.78 | 2H | 16-Jan-25 | 16-Apr-25 | 90 | Upside | 68.1% | 28.1% |
| Fatima Boolani | CROWDSTRIKE HLDGS INC CL A | UNITED STATES | CRWD.O | Information Technology | 346.76 | 1 | 16-Jan-25 | 16-Apr-25 | 90 | Downside | 55.3% | 38.7% |
| Steve Enders | WORKVA INC COM CL A | UNITED STATES | WKV.N | Information Technology | 86.73 | 1 | 27-Jan-25 | 27-Apr-25 | 90 | Upside | 83.4% | 19.3% |
| Ygal Arounian | IAC INC COM NEW | UNITED STATES | IAC.O | Communication Services | 43.94 | 1 | 4-Feb-25 | 5-May-25 | 90 | Upside | 89.3% | 71.7% |
| Ygal Arounian | VERISIGN INC COM | UNITED STATES | VRSN.O | Information Technology | 235.60 | 1 | 4-Feb-25 | 5-May-25 | 90 | Upside | 43.1% | 52.5% |
| Jason B Bazinet | SPORTRADAR GROUP AG CLASS A ORD | SWITZERLAND | SRAD.O | Consumer Discretionary | 20.33 | 1 | 6-Feb-25 | 7-May-25 | 90 | Upside | 100.0% | 10.1% |
| Jason B Bazinet | NEWS CORP NEW CL A | UNITED STATES | NWSA.O | Communication Services | 26.77 | 1 | 18-Feb-25 | 19-May-25 | 90 | Upside | 98.3% | 38.7% |
| Jon Tower | CHIPOTLE MEXICAN GRILL INC COM | UNITED STATES | CMG.N | Consumer Discretionary | 50.05 | 1 | 20-Feb-25 | 21-May-25 | 90 | Upside | 64.8% | 57.9% |
| Michael Rollins | LUMEN TECHNOLOGIES INC COM | UNITED STATES | LUMN.N | Communication Services | 4.98 | 1H | 26-Feb-25 | 27-May-25 | 90 | Upside | 43.9% | 2.8% |

Europe

| Primary Analyst | Company Name | Country | RIC | Sector | Price (USD) (12-Mar-25) | Citi Rating | Start Date | Expiry Date/ Close Date | Time Frame (Days) | Call Direction | Long Crowding | Short Crowding |
|--------------------|-----------------------------------|----------------|-----------|------------------------|----------------------------|-------------|------------|----------------------------|----------------------|----------------|------------------|-------------------|
| Arthur Truslove | INCHCAPE ORD GBP0.10 | UNITED KINGDOM | INCH.L | Consumer Discretionary | 9.26 | 1 | 20-Feb-25 | 23-Mar-25 | 30 | Upside | 47.7% | 57.3% |
| James A Shuck | LANCASHIRE HLDGS COM SHS USD0.50 | BERMUDA | LRE.L | Financials | 7.71 | 1 | 26-Feb-25 | 28-Mar-25 | 30 | Upside | 18.7% | 53.4% |
| Andrew Lowe, CFA | 3i GROUP ORD GBP0.738636 | UNITED KINGDOM | III.L | Financials | 48.83 | 1 | 6-Jan-25 | 6-Apr-25 | 90 | Upside | 92.1% | 28.5% |
| Jenny Ping | PENNON GROUP ORD GBP0.6105 | UNITED KINGDOM | PNN.L | Utilities | 5.36 | 1 | 10-Mar-25 | 9-Apr-25 | 30 | Upside | 19.9% | 79.6% |
| Cedric Besnard | HENKEL AG&CO. KGAA NON-VTG PRF NP | GERMANY | HNKG.p.DE | Consumer Staples | 81.63 | 2 | 10-Jan-25 | 10-Apr-25 | 90 | Upside | 48.3% | 49.0% |
| Simon Hales | ANHEUSER-BUSCH INB NPV | BELGIUM | ABIBR | Consumer Staples | 62.45 | 1 | 10-Jan-25 | 10-Apr-25 | 90 | Upside | 86.0% | 38.2% |
| Doyinsola Sanyaolu | AUTO1 GRP NPV | GERMANY | AG1G.DE | Consumer Discretionary | 23.36 | 1 | 6-Feb-25 | 7-May-25 | 90 | Upside | 58.2% | 0.4% |
| Jason B Bazinet | SPORTRADAR GROUP AG CLASS A ORD | SWITZERLAND | SRAD.O | Consumer Discretionary | 20.33 | 1 | 6-Feb-25 | 7-May-25 | 90 | Upside | 98.8% | 10.3% |

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Source: Citi Research

Figure 9. (Cont.) Citi Research Catalyst Watch with Crowding Composite (Sorted by Expiry Date)

Asia ex Japan

| Primary Analyst | Company Name | Country | RIC | Sector | Price (USD) (12-Mar-25) | Citi Rating | Start Date | Expiry Date/ Close Date | Time Frame (Days) | Call Direction | Long Crowding | Short Crowding |
|-------------------|--------------------------------|---------------------------|-----------|------------------------|----------------------------|-------------|------------|----------------------------|----------------------|----------------|------------------|-------------------|
| Carrie Liu | DELTA ELECTRONIC TWD10 | TAIWAN, PROVINCE OF CHINA | 2308.TW | Information Technology | 11.76 | 1 | 17-Feb-25 | 20-Mar-25 | 30 | Downside | 96.4% | 26.3% |
| Angela Hsu | NIEN MADE ENTERPRI TWD10 | TAIWAN, PROVINCE OF CHINA | 8464.TW | Consumer Discretionary | 12.69 | 1 | 21-Feb-25 | 24-Mar-25 | 30 | Upside | 70.1% | 64.2% |
| Preenapa Detchsri | CP ALL PCL THB1(L)LOCAL | THAILAND | CPALL.BK | Consumer Staples | 1.50 | 1 | 28-Feb-25 | 29-Mar-25 | 30 | Upside | 63.3% | 62.5% |
| Raashi Chopra | GRASIM INDUSTRIES INR2 | INDIA | GRAS.BO | Materials | 27.47 | 1 | 2-Jan-25 | 2-Apr-25 | 90 | Upside | 80.5% | 41.6% |
| Kunal Shah | KOTAK MAHINDRA BAN INR5 | INDIA | KTKM.BO | Financials | 22.73 | 1 | 1-Jan-25 | 2-Apr-25 | 90 | Upside | 62.5% | 65.1% |
| Saurabh Handa | PETRONET LNG INR10 | INDIA | PLNG.BO | Energy | 3.26 | 3 | 1-Jan-25 | 2-Apr-25 | 90 | Downside | 25.1% | 81.3% |
| Jeff Chung | BRILLIANCE CHINA USD0.01 | BERMUDA | 1114.HK | Consumer Discretionary | 0.49 | 1H | 3-Mar-25 | 3-Apr-25 | 30 | Upside | 15.1% | 3.7% |
| Oscar Lau | FU SHOU YUAN INTL USD0.01 | CAYMAN ISLANDS | 1448.HK | Consumer Discretionary | 0.58 | 1 | 3-Mar-25 | 3-Apr-25 | 30 | Upside | 57.0% | 80.7% |
| Oscar Yee | ECOPROBM CO.LTD KRW500 | KOREA, REPUBLIC OF | 247540.KQ | Industrials | 82.23 | 3H | 3-Mar-25 | 3-Apr-25 | 30 | Downside | 19.0% | 85.6% |
| Michelle Ma | CHINA LIFE INSURAN 'HCNY1 | CHINA | 2628.HK | Financials | 2.01 | 1 | 4-Mar-25 | 4-Apr-25 | 30 | Upside | 72.2% | 37.9% |
| Michelle Ma | PING AN INSURANCE 'HCNY1 | CHINA | 2318.HK | Financials | 6.06 | 1 | 4-Mar-25 | 4-Apr-25 | 30 | Downside | 62.9% | 66.8% |
| Michelle Ma | PING AN INSURANCE 'ACNY1 | CHINA | 601318.SS | Financials | 7.07 | 1 | 4-Mar-25 | 4-Apr-25 | 30 | Downside | 27.1% | 84.5% |
| Michelle Ma | NEW CHINA LIFE INS 'HCNY1 | CHINA | 601336.SS | Financials | 6.79 | 2 | 4-Mar-25 | 4-Apr-25 | 30 | Downside | 14.6% | 78.7% |
| Michelle Ma | NEW CHINA LIFE INS 'HCNY1 | CHINA | 1336.HK | Financials | 3.58 | 2 | 4-Mar-25 | 4-Apr-25 | 30 | Downside | 10.0% | 83.7% |
| Tiffany Feng | CHOW TAI FOOK JEWEL HKD1 | CAYMAN ISLANDS | 1929.HK | Consumer Discretionary | 1.18 | 1 | 4-Mar-25 | 4-Apr-25 | 30 | Upside | 51.2% | 96.3% |
| Vicky Wei | MAOYAN ENTERTAINME USD0.00002 | CAYMAN ISLANDS | 1896.HK | Communication Services | 0.99 | 1 | 4-Mar-25 | 4-Apr-25 | 30 | Upside | 81.0% | 67.0% |
| Griffin Chan | KE HLDS INC SPONSORED ADS | CAYMAN ISLANDS | BEKE.N | Real Estate | 22.46 | 1 | 6-Mar-25 | 5-Apr-25 | 30 | Upside | 94.3% | 17.6% |
| Griffin Chan | GREENTOWN CHINA HO HKD0.10 | CAYMAN ISLANDS | 3900.HK | Real Estate | 1.59 | 1 | 6-Mar-25 | 6-Apr-25 | 30 | Upside | 81.3% | 15.9% |
| Griffin Chan | C&D INTERNATIONAL HKD0.1 | CAYMAN ISLANDS | 1908.HK | Real Estate | 2.04 | 1 | 6-Mar-25 | 6-Apr-25 | 30 | Upside | 35.1% | 48.2% |
| Saurabh Handa | MAHANAGAR GAS LTD INR10 | INDIA | MGAS.BO | Utilities | 14.89 | 1 | 5-Jan-25 | 6-Apr-25 | 90 | Upside | 5.8% | 51.1% |
| Griffin Chan | KE HOLDINGS INC USD0.00002 A | CAYMAN ISLANDS | 2423.HK | Real Estate | 7.57 | 1 | 6-Mar-25 | 6-Apr-25 | 30 | Upside | 88.6% | 39.9% |
| Pierre Lau, CFA | CHINA LONGYUAN POW 'HCNY1 | CHINA | 0916.HK | Utilities | 0.78 | 1 | 5-Jan-25 | 7-Apr-25 | 90 | Downside | 6.0% | 94.7% |
| Pierre Lau, CFA | ENN NATURAL GAS CO 'ACNY1 | CHINA | 600803.SS | Utilities | 2.66 | 2 | 10-Jan-25 | 11-Apr-25 | 90 | Downside | 26.3% | 63.0% |
| Louis Tsang | SUZHOU TFC OPTICAL 'ACNY1 | CHINA | 300394.SZ | Information Technology | 12.59 | 1 | 11-Mar-25 | 11-Apr-25 | 30 | Upside | 72.1% | 31.5% |
| Louis Tsang | T AND S COMMUNICAT A CNY1 | CHINA | 300570.SZ | Information Technology | 12.99 | 1 | 11-Mar-25 | 11-Apr-25 | 30 | Upside | 79.1% | |
| Xiaoqi Wei | TOPSPORTS INTERNAT HKD0.000001 | CAYMAN ISLANDS | 6110.HK | Consumer Discretionary | 0.50 | 1 | 10-Jan-25 | 11-Apr-25 | 90 | Upside | 30.8% | 76.7% |
| Nelson Cheung | HANGZHOU SF INTRA- CNY1 H | CHINA | 9699.HK | Industrials | 1.19 | 1 | 15-Jan-25 | 16-Apr-25 | 90 | Upside | 84.8% | 7.7% |
| Pierre Lau, CFA | BEIJING ENT WATER HKD0.10 | BERMUDA | 0371.HK | Utilities | 0.29 | 1 | 16-Jan-25 | 17-Apr-25 | 90 | Downside | 24.4% | 36.9% |
| Cynthia Wu | MAANSHAN IRON&STL 'HCNY1 | CHINA | 0323.HK | Materials | 0.24 | 1 | 20-Jan-25 | 21-Apr-25 | 90 | Upside | 27.8% | 71.8% |
| Kunal Shah | AAVAS FINANCIERS L INR10 | INDIA | AVAS.NS | Financials | 20.84 | 1 | 20-Jan-25 | 21-Apr-25 | 90 | Upside | 46.7% | 47.5% |
| Dipanjani Ghosh | PB FINTECH LTD INR2.00 | INDIA | PBFINL | Financials | 16.13 | 1 | 22-Jan-25 | 23-Apr-25 | 90 | Upside | 84.4% | 49.5% |
| Dipanjani Ghosh | HDFC LIFE INSURANC INR10 | INDIA | HDFL.BO | Financials | 7.24 | 1 | 24-Jan-25 | 24-Apr-25 | 90 | Upside | 45.3% | 36.7% |
| Preenapa Detchsri | CARABAO GROUP PCL THB1 (LOCAL) | THAILAND | CBG.BK | Consumer Staples | 1.75 | 3 | 29-Jan-25 | 30-Apr-25 | 90 | Downside | 68.0% | 74.2% |
| Lakshmi Rowler | KALBE FARMA IDR10 | INDONESIA | KLBF.JK | Health Care | 0.07 | 1 | 5-Feb-25 | 7-May-25 | 90 | Upside | 36.8% | 88.2% |
| Eva Zhao | AIER EYE HOSPITAL 'ACNY1 | CHINA | 300015.SZ | Health Care | 1.91 | 3 | 10-Feb-25 | 12-May-25 | 90 | Upside | 2.4% | 92.3% |
| Pierre Lau, CFA | SUNGROW POWER SUPP 'ACNY1 | CHINA | 300274.SZ | Industrials | 9.33 | 3 | 10-Feb-25 | 12-May-25 | 90 | Downside | 18.3% | 72.7% |
| Pierre Lau, CFA | FLAT GLASS GROUP C 'H' CNY0.25 | CHINA | 6865.HK | Information Technology | 1.62 | 3 | 10-Feb-25 | 12-May-25 | 90 | Upside | 20.1% | 71.4% |
| John Yu | KRAFTON INC KRW100 | KOREA, REPUBLIC OF | 250960.KS | Communication Services | 237.95 | 2 | 11-Feb-25 | 13-May-25 | 90 | Downside | 92.5% | 25.8% |
| Air Ma | XINYI SOLAR HLDS HKD0.10 | CAYMAN ISLANDS | 0968.HK | Information Technology | 0.43 | 2 | 12-Feb-25 | 14-May-25 | 90 | Upside | 7.4% | 99.7% |
| Kyle Wu | YADEA GROUP HOLDIN USD0.00001 | CAYMAN ISLANDS | 1585.HK | Consumer Discretionary | 1.74 | 1 | 16-Feb-25 | 18-May-25 | 90 | Upside | 46.2% | 60.1% |
| Lakshmi Rowler | SUMBER ALFARIA IDR10 | INDONESIA | AMRT.JK | Consumer Staples | 0.15 | 1 | 19-Feb-25 | 21-May-25 | 90 | Upside | 79.4% | 10.3% |
| Desmond Law | YANTAI JEREH OILFI 'ACNY1 | CHINA | 002353.SZ | Energy | 4.92 | 1 | 19-Feb-25 | 21-May-25 | 90 | Upside | 86.5% | |
| Kyle Wu | MINTH GRP HKD0.1 | CAYMAN ISLANDS | 0425.HK | Consumer Discretionary | 2.89 | 1 | 20-Feb-25 | 22-May-25 | 90 | Upside | 95.3% | 16.9% |
| John Yung | WUXI BIOLOGICS (CA USD0.000083 | CAYMAN ISLANDS | 2269.HK | Health Care | 3.04 | 1 | 20-Feb-25 | 22-May-25 | 90 | Upside | 13.7% | 98.7% |
| John Yung | WUXI APPTCC CO LTD CNY1 H | CHINA | 2359.HK | Health Care | 7.93 | 1 | 20-Feb-25 | 22-May-25 | 90 | Upside | 25.8% | 90.4% |
| Zoe Bian | PHARMARON BEIJING CNY1 H | CHINA | 3759.HK | Health Care | 2.00 | 1 | 20-Feb-25 | 22-May-25 | 90 | Upside | 41.5% | 79.7% |
| Arvind Sharma | INTERGLOBE AVIATIO INR10 | INDIA | INGL.NS | Industrials | 54.26 | 1 | 21-Feb-25 | 23-May-25 | 90 | Upside | 87.1% | 59.3% |
| Desmond Law | SINOPEC ENGINEERIN 'H' CNY1 | CHINA | 2386.HK | Industrials | 0.75 | 1 | 23-Feb-25 | 26-May-25 | 90 | Upside | 91.6% | 2.0% |
| Alicia Yap | TENCENT HLDS LTD HKD0.00002 | CAYMAN ISLANDS | 0700.HK | Communication Services | 65.90 | 1 | 26-Feb-25 | 28-May-25 | 90 | Upside | 90.3% | 36.2% |
| Peter Lee | SK HYNIX INC KRW5000 | KOREA, REPUBLIC OF | 000660.KS | Information Technology | 136.98 | 1 | 3-Mar-25 | 2-Jun-25 | 90 | Upside | 37.5% | 79.0% |
| Zoe Bian | YIDU TECH INC USD0.00002 | CAYMAN ISLANDS | 2158.HK | Health Care | 0.90 | 1H | 3-Mar-25 | 2-Jun-25 | 90 | Upside | 95.6% | 16.1% |
| Vivek Agrawal | TORRENT PHARM INR5 | INDIA | TORP.NS | Health Care | 35.53 | 1 | 6-Mar-25 | 4-Jun-25 | 90 | Upside | 36.4% | 30.2% |
| Nelson Cheung | 37 INTERACTIVE ENT 'ACNY1 | CHINA | 002555.SZ | Communication Services | 2.17 | 1 | 5-Mar-25 | 4-Jun-25 | 90 | Upside | 18.4% | |

Japan

| Primary Analyst | Company Name | Country | RIC | Sector | Price (USD) (12-Mar-25) | Citi Rating | Start Date | Expiry Date/ Close Date | Time Frame (Days) | Call Direction | Long Crowding | Short Crowding |
|---------------------|------------------------|---------|--------|-------------|----------------------------|-------------|------------|----------------------------|----------------------|----------------|------------------|-------------------|
| Hiidemaru Yamaguchi | ASTELLAS PHARMA NPV | JAPAN | 4503.T | Health Care | 9.83 | 1 | 6-Feb-25 | 8-May-25 | 90 | Upside | 50.5% | 66.3% |
| Koichi Niwa | FUKUOKA FINANCIAL NPV | JAPAN | 8354.T | Financials | 25.60 | 1 | 10-Mar-25 | 9-Jun-25 | 90 | Downside | 87.6% | 52.0% |
| Koichi Niwa | T&D HOLDINGS INC NPV | JAPAN | 8795.T | Financials | 19.97 | 2 | 11-Mar-25 | 10-Jun-25 | 90 | Upside | 98.4% | 28.0% |
| Koichi Niwa | SOMPO HOLDINGS INC NPV | JAPAN | 8630.T | Financials | 29.98 | 2 | 11-Mar-25 | 10-Jun-25 | 90 | Upside | 98.1% | 15.3% |

Australia

| Primary Analyst | Company Name | Country | RIC | Sector | Price (USD) (12-Mar-25) | Citi Rating | Start Date | Expiry Date/ Close Date | Time Frame (Days) | Call Direction | Long Crowding | Short Crowding |
|-----------------|---|-----------|--------|-------------|----------------------------|-------------|------------|----------------------------|----------------------|----------------|------------------|-------------------|
| Howard Penny | SCENTRE GROUP LTD NPV STAPLED UNF AUSTRALIA | AUSTRALIA | SCG.AX | Real Estate | 2.09 | 1 | 12-Jan-25 | 13-Apr-25 | 90 | Upside | 79.7% | 54.7% |
| James Byrne | WORLEY LIMITED NPV | AUSTRALIA | WOR.AX | Industrials | 9.13 | 1 | 22-Jan-25 | 24-Apr-25 | 90 | Upside | 93.9% | 43.5% |
| James Byrne | KAROOON ENERGY LTD NPV | AUSTRALIA | KAR.AX | Energy | 0.99 | 1 | 30-Jan-25 | 1-May-25 | 90 | Upside | 45.2% | 82.2% |

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Source: Citi Research

Background

Since the global financial crisis over a decade ago, quantitative investors have been concerned about crowding of systematic investment strategies. Or more simply stated, is everyone looking at the same factors and investing in the same stocks. While sympathetic to the view, we would be much more worried if the entire investment community, including fundamental and quant investors as well as hedge funds and multi-strategy funds, were investing in the same theme or set of stocks. The tech bubble in late 1990s, defensive positioning during the GFC period, and the chasing yields and low-volatility stocks in early 2010s are a few obvious examples of extreme crowding or consensus trades in the equity market. With the proliferation of hedge funds and increased flows into ETFs and factor investing (including smart beta indices), crowding has become an increasing concern among a broad range of investors. We think that it's timely and important to consider a systematic way to measure crowding in the global equity market.

Over the last few years, we have developed a framework to evaluate crowdedness in quantitative factors, based on their correlations with short interest, factor valuation, inter-quantile correlation, and macro risk contribution. Looking to extend this framework to quantify crowdedness at the stock level has its own set of challenges with the lack of public information on investors' holdings and much-delayed (45+ days) 13F filings in U.S.

We have been considering other more timely market-based indicators to measure crowding at the stock level. With more and more investors chasing the same set of stocks, we would expect the prices of these stocks to move higher, resulting in abnormally high valuations. Also, the short interest data from prime brokerage business may provide more timely information from tactical investors with demands for shorting or hedging.

Given that the majority of the equity assets are managed by active investors with a fundamental approach, a common view on stocks helped with sell-side analyst consensus recommendations could be one of the key factors that contribute to crowding. With macro factors continuing to drive equity market rotation and risk (please see [Global RAM](#) report), common macro concerns can also lead to consensus trades. These metrics, along with our analysis on factor crowding, can help quantify the degree of crowdedness at the stock level.

Conventional thinking is to avoid buying long crowded stocks (high crowding composite), as they may become harder to attract marginal investors, especially the longer they remain crowded and/or a negative fundamental inflection emerges. However, there are times when stocks become crowded and remain so for good investment reasons. There could be a new development in the company or a change in view by fundamental analysts that causes the stock to attract an even larger base of investors.

Similar thinking can be applied to stocks that are non-consensus (low long crowding composite). Typically, stocks that are less crowded longs are prone to react more positively to fundamental catalysts, as they can attract a larger set of new investors. However, on the flip side, not all fundamental catalysts are created equal and may not lead to upward consensus ratings changes or a significant change in valuation.

We do not intend the crowding composite to be a buy/sell signal by itself and do not recommend that investors rely on a crowding composite score as the sole factor in making an investment decision but rather consider it as one factor among

many. For example, we believe that it could make sense to buy the shares of a company with a lower long crowding composite score when comparing otherwise similarly situated companies (i.e., where an investor otherwise has a similar expectation of performance – positive or negative). Conversely, we would not recommend buying a company with a lower long crowding composite score if an investor otherwise has more positive expectations of performance with respect to another company (e.g., expected total return). Accordingly, investors should consider other fundamental or quantitative factors in evaluating the expected performance of a particular company and then consider the crowding composite score as an additional measure of possible investment risk.

Methodology

Long and Short Crowding

The first generation of our Stock Crowding Model was published in 2018 ([Measuring the Crowded Trade – Introduction to our Crowding Composite for individual stocks](#)), and at that time focused more on the long side of crowding. Low crowded stocks within the first iteration of the model did not necessarily imply that these stocks were crowded from a short perspective. In order to address this, in 2023 we adapted our Long model for the short context ([Measuring the Crowded Trade in Global Equities – Introducing our Short Stock Crowding Model](#)).

Four of the five factors are the same for each model. Three have the opposite interpretation while the fourth is a ‘risk-based’ factor where the interpretation is consistent across the two models. Where the short model differs is that we do not consider whether a stock is a constituent of the crowded factor as we do not determine what a low crowded factor is in our [Factor Crowding Model](#). Instead, we replace this factor with the historical relative Price Momentum. While we have avoided using a price-based metric for the long model, for the short model, we believe that weak price performance is a feature of crowded short stocks. Specific to the short stock crowding model, those stocks that are cheap, have a high short interest, sentiment is low/poor, price momentum is low, and the macro concentration is high, all things equal, stocks with these characteristics are likely to be crowded shorts.

Addition of News Sentiment Indicator and Changes to Most Crowded Factor

At the beginning of Sep’24 we introduced the News Sentiment factor to our stock crowding model. This factor complements the current Consensus Ratings, in offering a perspective of crowding through the lens of a different set of market participants. Whereas consensus ratings provide a view across sell-side analysts, news sentiment offers a perspective from a potentially wider cohort of investors. We associate a high (low) concentration/volume of positive news with increased Long (Short) crowding. To this end, we changed the current ‘Consensus Ratings’ factor to a factor called ‘Sentiment.’ This is a combination of the current consensus rating skew and the new News Sentiment factor. Both signals are normalized and combined on an equal weighted basis to form a new composite ‘Sentiment’ factor. For more details about this and changes to the selection of the most crowded factor, see [Measuring the Crowded Trade in Global Equities: Changes to Stock Crowded Model: News Sentiment, Factor Crowding & Extended Coverage](#).

The five metrics below, for each model, are percentile-ranked individually across a broad universe of stocks for different regions (i.e. country neutral). These rankings are then equally weighted to create the final Crowding Composite score for each

stock. We require at least four of these five metrics to have data in order to calculate the crowding composite score. A higher (lower) composite rank indicates a higher (lower) amount of crowding compared to the rest of the universe.

Figure 10. Stock Crowding Models - Factor Differences and Interpretation

| Stock Crowding Models - Factor Differences and Interpretation | | | |
|---|--------------|-------------------------------|--------------|
| Long Model Factors | Direction | Short Model Factors | Direction |
| Historical Relative Valuation | Expensive | Historical Relative Valuation | Cheap |
| Short Interest Ratio | Low | Short Interest Ratio | High |
| Sentiment | Positive | Sentiment | Negative |
| Macro Exposure | Concentrated | Macro Exposure | Concentrated |
| Ranking of the most crowded factor | High | Historical Price Momentum | Low |

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Source: Citi Research

Factor Definitions

1. **Historical Relative Valuation** – an equal-weighted composite of historical relative Price to Book, Price to FY1 Earnings, and EV/EBITDA (for exFin). We require 24 months of historical data. A higher (lower) valuation score indicates more long (short) crowding.
2. **Short Interest Ratio** – historical relative short interest ratio (the amount of short interest as % of available inventory). We require 24 months of historical data. Lower (higher) short interest ratio indicates a higher consensus long (short) trade.
3. **Sentiment** – a combination of the consensus rating skew and the News Sentiment factor. Both signals are normalized and combined on an equal weighted basis to form a new composite 'Sentiment' factor. We associate high (low) sentiment with a higher consensus long (short) trade.
4. **Macro Exposure** – macro contribution of individual stock risk based on our Risk Attribute Model (RAM). Higher macro exposures in stocks may lead to consensus positions.
5. **Ranking of the Most Crowded Factor** –based on our style crowding model. See research.
6. **Historical Price Momentum** – historical accumulated total return over a period of 12 months. A lower score indicates more short crowding.

Description of Citi Catalyst Watch

The Catalyst Watch system allows our fundamental analysts to provide tactical insights around events while maintaining a 12-month rating and target price. Analysts can highlight catalysts 30 or 90 days out and offer a view on how the shares will trade around the event (upside or downside) in the context of their longer-term ratings. Calls expire automatically at the 30- or 90-day mark or can be closed ahead of time by the analyst. As shares rarely trade in a straight line, the Catalyst Watch system is a helpful tool for analysts to add value for investors around near-term volatility. The catalyst associated with each stock below is accessible on Citi Velocity.

Previously Published Research

Figure 11. Research Reports (since 2009)

| Date | Research Theme | Report Link |
|-----------|------------------|---|
| 05-Dec-24 | Factor | Searching for Alpha: Stock Selection and Enhanced Growth Strategies with Option-Implied Volatility |
| 29-Oct-24 | Misc. | Searching for Alpha: Macro Sector Selection – Using Macro Regimes & News Sentiment to Forecast Sector Returns |
| 27-Aug-24 | Positioning | Measuring the Crowded Trade in Global Equities News Sentiment, Factor Crowding & Extended Coverage |
| 20-Aug-24 | Misc. | Global Risk Attribute Model: A Framework for Equity Macro Risk Analysis |
| 10-Apr-24 | Misc. | Searching for Alpha: European Industry-Specific Return Drivers |
| 11-Jan-24 | Allocation | Searching for Alpha - Are PMIs Leading or Misleading? |
| 04-Dec-23 | Factor | Searching for Alpha: Leveraging Option Information to Improve Factor Performance |
| 26-Sep-23 | Allocation | Searching for Alpha: Macro Regimes and Systematic Equity Investing |
| 10-Aug-23 | Allocation | Searching for Alpha: Exposure to Macro via Equities |
| 26-Jun-23 | Positioning | Measuring the Crowded Trade in Global Equities: Introducing our Short Stock Crowding Model |
| 16-May-23 | Machine Learning | Searching for Alpha: From Machine Learning to Stock Screens – A Rulefit Model |
| 24-Mar-23 | Factor | Searching for Alpha: A Bottom-Up Approach to Evaluating Market Overbought/Oversold Conditions |
| 20-Jan-23 | Factor | What Works in Equity Markets: The Enduring Appeal of Income Investing |
| 13-Jan-23 | Factor | What Works in Equity Markets: Return on Equity, a different perspective through Revisions |
| 31-Oct-22 | Event | Searching for Alpha: Systematic M&A Strategies that Outperform Discretionary Event-Driven Approaches |
| 26-Oct-22 | Allocation | What Works in Equity Markets: Sector Selection – A Bottom-up, Factor Approach |
| 09-Jun-22 | Event | Searching for Alpha: M&A – Identifying Potential Takeover Targets |
| 24-Feb-22 | Event | What Works in Equity Markets: Buy Backs – Back in Vogue |
| 26-Jul-21 | Factor | What Works in Equity Markets: Risky Value vs. Quality Value Revisited |
| 26-Jul-21 | Machine Learning | Searching for Alpha: Practical Considerations in Building Neural Networks for Stock Selection |
| 22-Jul-21 | ESG | ESG Insights: Indexed ESG Funds – A Widespread Implementation Choice |
| 22-Jun-21 | Factor | Searching for Alpha: Go with the Stock Connect Flow, for a Sharpe of 4 |
| 18-Jun-21 | Factor | Searching for Alpha: Overlaying Price Mo. and Short Interest to avoid drawdowns and improve returns |
| 15-Jun-21 | ESG | ESG Insights: ESG Fundamental Characteristics |
| 13-Apr-21 | ESG | ESG Insights: Following the ESG Herd: Has ESG become a Crowded Trade? |
| 29-Mar-21 | Machine Learning | Searching for Alpha: Pairs Trading: Applying Machine Learning to Pairs Trading |
| 09-Mar-21 | Positioning | Regime Modelling using Futures Positioning: Futures vs. Cash – A Distant but Meaningful Relationship |
| 18-Feb-21 | ESG | ESG Insights: The ESG 'Premium': How does ESG compare to other Factors? |
| 01-Feb-21 | Event | Searching for Alpha: Asia Earnings Surprise: Predicting Asia Earnings Surprises |
| 14-Jan-21 | ESG | ESG Insights: Where Machines do it Better: Inferred ESG Ratings Data |
| 30-Oct-20 | Factor | Searching for Alpha: China A Alpha – Smoothing Price Momentum |
| 16-Oct-20 | Factor | Under the Microscope: Overlapping Momentum |
| 14-Sep-20 | Positioning | Equity Markets Positioning Model: Introducing the EMP |
| 11-Sep-20 | Factor | Searching for Alpha: Combining ESG and Risk Premia Investment: A Double Screen Approach |
| 08-Sep-20 | Factor | Searching for Alpha: Factoring Short Interest: Measuring and Profiting from Information in Shorts |
| 28-May-20 | Machine Learning | Searching for Alpha: Machine Learning - SHAP Value as Factor Selection Criterion |
| 28-Feb-20 | Machine Learning | Searching for Alpha: Machine Learning: Leveraging Return Forecasts |
| 21-Feb-20 | Factor | Searching for Alpha: China A Alpha – Sector-rel. Value Is Powerful, Choose Sector Mappings Wisely |
| 03-Oct-19 | Machine Learning | Searching for Alpha: Machine Learning: Beyond Random Forest for Stock Selection |
| 23-Sep-19 | Event | Searching for Alpha: Earnings Surprise: Managing Expectations |
| 05-Mar-19 | Machine Learning | Searching for Alpha: Machine Learning: Interpreting Machine Learning Predictions |
| 07-Feb-19 | Misc. | Searching for Alpha: GAAP vs. Non-GAAP: Which Earnings does the Market Price? |
| 21-Nov-18 | Positioning | Searching for Alpha: Style Crowding in Asia: Getting Ahead of the Crowd |
| 17-Sep-18 | Event | Searching for Alpha: Earnings Surprise: Using ML to Forecast Earnings Surprises & Returns |
| 13-Sep-18 | ESG | Searching for Alpha: The ESG Edge: ESG Investing – A Step Forward |
| 03-Sep-18 | Machine Learning | Searching for Alpha: Machine Learning: Interacting Machine Learning and Factors |
| 03-May-18 | Positioning | Measuring the Crowded Trade: Introduction to our Crowding Composite for individual stocks |
| 14-Mar-18 | Factor | Searching for Alpha: Profiting from Capex: Look To Capex Announcements |
| 07-Sep-17 | Rotation | Searching for Alpha: Tactical Style Rotation: Using Risk and Return to Manage Style Exposure |
| 10-Mar-17 | Misc. | Searching for Alpha: Big Data: Navigating New Alternative Datasets |
| 13-Feb-17 | Factor | Searching for Alpha: Betting Against (Accurate) Beta |
| 19-Sep-16 | Factor | Searching for Alpha: Competitive Advantage: Survival of the Fittest |
| 09-Sep-16 | Factor | Searching for Alpha: Financial Strength Redux |
| 14-Apr-16 | Rotation | Searching for Alpha: Dynamic Style Weighting: Risk-Based Equity Style Allocation |
| 04-Mar-16 | Smart Beta | Long-Only Pure Style Portfolios: No Shorts Please |
| 18-Feb-16 | Factor | Industry Alpha Insights: Banks: One Size Does Not Fit All |
| 21-Sep-15 | Factor | Under the Microscope: Stock Momentum Conflation |
| 15-Sep-15 | Allocation | Searching for Alpha: Macro Moves Markets: Economic Data, Expectations and Market Pricing |
| 23-Mar-15 | Rotation | Searching for Alpha: Style Timing: Style Performance, Trading Volumes and Investor Agreement |
| 13-Mar-15 | Misc. | World Radar Screen: Refining Our Global Search for Alpha |
| 18-Feb-15 | Factor | Searching for Alpha: Networking with Analysts: Modelling Analyst Forecast Dependence |
| 01-Oct-14 | Smart Beta | The Rise of Low Risk Investing: Is It Getting Crowded Out There? |
| 27-Mar-14 | Factor | Under the Microscope: Five Innovations in Momentum Investing |
| 07-Mar-14 | Factor | Searching for Alpha: Timing Price Momentum: When Does Momentum Move? |
| 27-Nov-13 | Smart Beta | Equity Risk Premia Investing: A New Methodology for Monitoring Style Performance |

| | | |
|-----------|------------|--|
| 23-Jul-13 | Allocation | Stock Market Country Selection: Changes to a Well-Established Model |
| 02-Jul-13 | Factor | Searching For Alpha: Digging For Dividends: QUARI - QQuality with A Reliable Income |
| 24-Jun-13 | Misc | Global Theme Machine: An Objective Way of Identifying Attractive Investment Themes |
| 25-Mar-13 | Factor | Searching for Alpha: Purifying Analyst Recommendations: Removing Beta to get to the Alpha |
| 06-Nov-12 | Factor | Searching for Alpha: Tangible Benefits of Intangibles: Brand, Respect & Intellectual Capital |
| 09-Mar-12 | Smart Beta | Low-Risk Portfolio Strategies: Sharpe Ratio Maximisation and Multi-Asset Applications |
| 28-Feb-12 | Rotation | Macro Risk and Style Rotation: A Guide Rather than a Prescription |
| 14-Sep-11 | Factor | Searching for Alpha: Accruals Volatility - A New Approach to Quality Investing |
| 24-Aug-11 | Allocation | Industry Alpha Insights: Four Approaches to Tactical Industry Selection |
| 17-Mar-11 | Misc | Industry Alpha Insights: Quantifying Industry-Specific Fundamentals |
| 18-Nov-10 | Smart Beta | Low-Risk Equity Portfolios: More than just Minimum Variance |
| 15-Nov-10 | Allocation | Under the Microscope: Measuring Systemic Risk - The Absorption Ratio |
| 14-Jun-10 | Factor | Under the Microscope: Optionality in Valuation |
| 31-Mar-10 | Event | Searching for Alpha: Earnings Surprise: Still Profiting from Surprises |
| 29-Jan-10 | Factor | Momentum in Japan: Looking at Price, Trading Values and Earnings |
| 15-Oct-09 | Rotation | Searching for Alpha: Style Rotation: Optimising Style Rotation Strategies |

Source: Citi Research

Citi Quant Research Team

Figure 12. Citi Quantitative Research Teams (For Informational Purposes Only)

| Global Quantitative Research | | |
|--------------------------------|------------------|------------------------------|
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Source: Citi Research

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Appendix A-1

ANALYST CERTIFICATION

The research analysts primarily responsible for the preparation and content of this research report are either (i) designated by "AC" in the author block or (ii) listed in bold alongside content which is attributable to that analyst. If multiple AC analysts are designated in the author block, each analyst is certifying with respect to the entire research report other than (a) content attributable to another AC certifying analyst listed in bold alongside the content and (b) views expressed solely with respect to a specific issuer which are attributable to another AC certifying analyst identified in the price charts or rating history tables for that issuer shown below. Each of these analysts certify, with respect to the sections of the report for which they are responsible: (1) that the views expressed therein accurately reflect their personal views about each issuer and security referenced and were prepared in an independent manner, including with respect to Citigroup Global Markets Inc. and its affiliates; and (2) no part of the research analyst's compensation was, is, or will be, directly or indirectly, related to the specific recommendations or views expressed by that research analyst in this report.

IMPORTANT DISCLOSURES

The Firm has made a market in the publicly traded equity securities of China Life Insurance Co Ltd on at least one occasion since 1 Jan 2024.

The Firm has made a market in the publicly traded equity securities of Chow Tai Fook Jewellery Group Ltd on at least one occasion since 1 Jan 2024.

An employee of Citigroup Global Markets Inc or its affiliates is a Director of Microsoft Corp

The Firm has made a market in the publicly traded equity securities of WuXi AppTec Co Ltd on at least one occasion since 1 Jan 2024.

The Firm has made a market in the publicly traded equity securities of New China Life Insurance Company Ltd on at least one occasion since 1 Jan 2024.

The Firm has made a market in the publicly traded equity securities of Xinyi Solar Holdings Ltd on at least one occasion since 1 Jan 2024.

The Firm has made a market in the publicly traded equity securities of Ping An Insurance Group Co of China Ltd on at least one occasion since 1 Jan 2024.

The Firm has made a market in the publicly traded equity securities of Tencent Holdings Ltd on at least one occasion since 1 Jan 2024.

The Firm has made a market in the publicly traded equity securities of China Longyuan Power Group Corp Ltd on at least one occasion since 1 Jan 2024.

The Firm has made a market in the publicly traded equity securities of WuXi Biologics (Cayman) Inc on at least one occasion since 1 Jan 2024.

Richard W Schlatter, Analyst, holds a long position in the securities of Meta Platforms Inc.

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|--|-----------------|------|------|----------------|------|------|
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| % of companies in each rating category that are investment banking clients | 43% | 44% | 35% | 47% | 40% | 42% |
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| % of companies in each rating category that are investment banking clients | 29% | 18% | 15% | | | |
| Citi Research Quantitative Latam Radar Screen Model Coverage | 21% | 58% | 21% | | | |
| % of companies in each rating category that are investment banking clients | 48% | 50% | 45% | | | |
| Citi Research Quantitative Asia Radar Screen Model Coverage | 20% | 60% | 20% | | | |
| % of companies in each rating category that are investment banking clients | 24% | 12% | 6% | | | |
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