

# Navigating turbulence by tracking market sentiment

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- Behavioural science helps us understand investor sentiment and how it drives markets
- Market sentiment is captured from news and social media using natural language processing
- We use the resulting sentiment data in our AI Equity and Multi Asset strategies to navigate market turbulence and generate alpha

# Navigating turbulence by tracking market sentiment

Now more than ever, understanding the direction of aggregate business conditions is crucial for investment professionals and asset allocators, but the future has rarely ever been murkier. In recent weeks, the coronavirus crisis has turned markets upside down by introducing extreme levels of uncertainty. Though the scale of this event is almost unprecedented, this is not the first time an unclear outlook has caused Mr Market's mood to swing wildly. The tech bubble, the financial crisis, unexpected election outcomes, the Brexit vote – all created market volatility stemming from deep investor uncertainty. When the outlook is cloudy, investors tend to fall prey to emotions and biases that can result in suboptimal investment decisions.

To navigate challenging markets, we combine behavioural science, artificial intelligence and sentiment data, in addition to our in-depth fundamental research. These tools help anticipate market movements and strengthen our decision-making processes.

In particular, we make use of sentiment data to support our alpha generation – or the excess return relative to the overall market – and to gain improved visibility on new challenges that could arise. Our Automated Intelligence Equity team uses a signal built on sentiment data to help steer the industry group positioning through the ongoing market turbulence. This has already paid off: the sentiment-driven industry group positioning was a substantial contributor to the overall strategy's positive active performance for March.

Our Multi Asset investors are also using sentiment data to gauge when equity markets are likely to bottom out. At times of crisis, when markets are more sentiment-driven than ever, relying on traditional sentiment inputs can be insufficient. With this in mind, we have created a proprietary “bottoming-out indicator” for equity markets. This indicator combines a wide range of sentiment data points, ranging from traditional survey-based inputs to market-based information and data harvested from news and social media. By integrating this indicator into our investment process, we are better positioned to navigate the current volatility in equity markets and predict when a sustained rise might be on its way.

## Understanding sentiment

To better understand how we use sentiment data to deliver outperformance in our strategies, it is first helpful to under-

stand how sentiment can affect market behaviours.<sup>1</sup> Aggregate business conditions are not immune to the effects of “sentiment shocks”.<sup>2</sup> This observation is built on the idea that consumer beliefs can lead to economic fluctuations, and so sentiment itself can drive economic activity. As a result, investment professionals can analyse and exploit consumer and business sentiment to identify patterns in market prices. These patterns arise because humans process information based on preconceived beliefs and attitudes, rather than solely through rational analysis. Certain kinds of information provoke emotional reactions that affect judgment and behaviour, both individually and collectively.

The development of sentiment in humans has been an evolutionary process, whereby sentiments that motivate certain behaviours helped our ancestors to survive and pass on their genes. A classic example is the “fight-or-flight response”, where an external threat, such as a lion, causes a release of certain chemicals in the brain. This in turn drives physical reactions such as increased heart rate and respiration. The associated sentiment (fear) leads to “adaptive” behaviours, like running away. Without this fear and the resulting behaviour, our ancestors may not have survived.<sup>3</sup>

Today, the context surrounding sentiment has changed, but it is still subject to the same cause-and-effect process. For example, sunshine tends to make us feel active and happy. In prehistoric times, these feelings motivated our ancestors to seek food. But what happens when we swap this hunter-gatherer for a modern-day financial professional? Hirshleifer and Shumway show that sunshine makes investors happy and optimistic – which is reflected in more positive stock returns on sunny days than on cloudy days, even though local weather conditions bear

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<sup>1</sup>For the purposes of this paper, the terms “sentiment” and “emotion” should be viewed interchangeably

<sup>2</sup>Angeletos and La'O (2013), Dees and Gimic (2016)

<sup>3</sup>Cosmides, L., & Tooby, J. (2000). Evolutionary psychology and the emotions. *Handbook of emotions*, 2(2), 91-115.

little relevance to global markets.<sup>4</sup> This “sunshine effect” illustrates how sentiments can drive micro-behaviours and market outcomes in ways that do not always align with the rational market hypothesis.

Sentiments such as fear and anger also drive market behaviours, often in predictable ways.<sup>5</sup> As a result, investors have learned to harvest sentiment data to project market movements. This can be done by clustering emotions into categories based on whether they motivate action or passiveness, and whether they correspond to negative or positive conditions. “Anger” is classified as active and negative, while “calm” is passive and positive. Data analysts use this classification scheme, among others, to make sense of the vast quantity of sentiments expressed about market-relevant topics on a daily basis.

### Harvesting sentiment data

With recent technological advances, analysing big data – particularly large volumes of text – is easier and more accessible than ever. As a result, information about the public’s perceptions of the labour market, business activity, policy uncertainty and other economic conditions is readily available.

With news analytics technology, analysts can efficiently extract, aggregate and categorise large volumes of news using natural language processing (NLP). Thomson Reuters’ MarketPsych Indices (TRMI) is based on such a technology. TRMI comprises a data feed of sentiment data linked to macroeconomic topics in social and news media, covering a broad database of equities, countries, currencies and commodities. By trawling immense quantities of text within news coverage, blogs, and social media feeds, TRMI captures and classifies sentiment data related to various asset classes. It then uses a rigorous analytic process to convert this textual data into quantitative indices. Investors who understand how sentiment steers choice and judgment can better gauge how a specific news item will affect markets, in terms of both direction and intensity.

The data in its direct consumable form consists of emotional indicators, macroeconomic metrics and buzz metrics derived from news and social media sources. Each indicator provides a specific perspective on the analysed data. For example, the Buzz Indicator represents the sum of all words and phrases that reference a specific company. The Sentiment Indicator shows what proportion of these company-specific references are classified as either positive, neutral or negative. Finally, the EmotionVsFact Indicator shows what proportion of these references are classified as emotional rather than factual information.

So, how do we apply this systematic harvesting and classification of sentiment data to improving our investment decisions?

### Applying sentiment data to investment decisions

Active asset managers can no longer ignore sentiment data. Particularly in uncertain times, a clear understanding of business and consumer sentiment is essential to understanding where markets are heading next, and thus generating sustainable alpha. To this end, our Automated Intelligence Equity and Multi Asset teams integrate TRMI indicators into their proprietary research to help them make better-informed investment decisions.

### How sentiment data leads to better industry group positioning in AI Equity

Our Automated Intelligence Investing team has developed a sentiment-driven signal to guide industry positioning in its global equity strategies. The team’s investment approach is data-driven and systematic, allowing for comprehensive analysis of a large set of investment opportunities across more than 1,600 equities worldwide.

To assess the information value within the stock-level sentiment data, we tested the signal generated by the Buzz, Sentiment and EmotionVsFact indicators on a monthly basis for the period from 1998 to 2020. When we first tested the indicators to simply predict which stocks would outperform the market, the results were inconclusive. We found that this approach might be too naïve, as sentiment alone might be insufficient to drive the future returns of an individual stock.

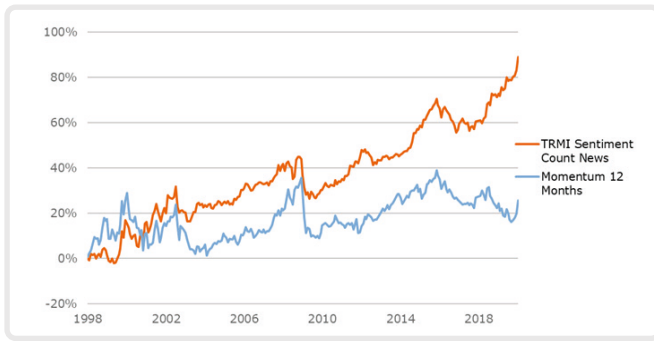
We assumed that a collective stock sentiment might offer more informational value. Stock-level sentiment data is harvested from raw text derived from news stories and social media outlets. This means that an article about a particular company could reflect the views of that company’s peer group or industry group. To counteract this, we developed an algorithm that aggregates the stock-specific sentiment data. The simplest way to do this would be to simply add together the data inputs, but we applied a more sophisticated approach that accounts for the potential underlying bias to generate a more meaningful signal. We then used this synthesised signal to indicate which industry groups should be positioned as underweight and which should be overweighted.

We found that this signal adds value to a sector relative positioning in a global equity market. In addition, it is more timely and less prone to crashes than a momentum strategy. Our research showed that the synthesised sentiment signal for industry positioning has a positive information coefficient (IC) that is 10 times larger than the IC of a comparable momentum signal (see Figure 1 for overall returns).

<sup>4</sup> Hirshleifer, D., & Shumway, T. (2003). Good day sunshine: Stock returns and the weather. *The Journal of Finance*, 58(3), 1009-1032.

<sup>5</sup> Lerner, J. S., Li, Y., Valdesolo, P., & Kassam, K. S. (2015). Emotion and decision making. *Annual review of psychology*, 66, 799-823.

Figure 1: Cumulative industry group long-short portfolio returns



Source: NN Investment Partners

We benefited from this sentiment-driven strategy during the recent market turmoil. We rebalanced our portfolios using this signal at the end of February, amid the heightening social and economic strain from the coronavirus outbreak. The signal led us to move to an overweight position for eight industry groups, six of which outperformed the market in March. Among these were food and staples retailing, household and personal products, and healthcare equipment and services. We moved to an underweight position for eight industry groups, where three out of eight underweights underperformed the market: energy, banks and consumer services. In March, our sentiment-driven industry group positioning contributed substantially to our positive active performance.

**In March, our sentiment-driven industry group positioning contributed substantially to our positive active performance.”**

**Rani Piputri**  
Head of Automated Intelligence Investing

Table 1 offers an overview of our positioning and outcome using this strategy over the course of March. We were overweight on the red groups, underweight on the blue ones, and neutral on the green ones.

Table 1: Industry group positioning at end-February and subsequent active return relative to benchmark (bps)

Sector	Benchmark return	Active return*
<b>Equity</b>	<b>-1,318.97</b>	<b>121.26</b>
Food & Staples Retailing	-110.76	249.80
Household & Personal Products	-175.74	48.71
Pharmaceuticals, Biotechnology & Life Sciences	-183.95	403.88
Health Care Equipment & Services	-637.45	-40.21
Food, Beverage & Tobacco	-742.56	-85.01
Technology Hardware & Equipment	-792.58	244.34
Retailing	-846.45	83.02
Telecommunication Services	-961.38	727.75
Software & Services	-963.48	73.84
Semiconductors & Semiconductor Equipment	-975.53	-185.58
Transportation	-1,129.32	-573.40
Utilities	-1,151.76	359.51
Media & Entertainment	-1,273.93	-236.62
Materials	-1,332.70	277.80
Consumer Durables & Apparel	-1,580.31	-314.87
Commercial and Professional Services	-1,636.58	-114.90
Diversified Financials	-1,743.94	-494.75
Real Estate	-1,809.56	317.24
Insurance	-1,935.22	-29.24
Automobiles & Components	-2,003.36	-312.59
Capital Goods	-2,027.72	340.92
Consumer Services	-2,411.43	116.07
Banks	-2,663.40	281.14
Energy	-2,930.73	153.58

Overweight Neutral Underweight

Source: NN Investment Partners. Data as of March 2020.

Benchmark: MSCI World.

\* Active return including stock selection

Sentiment can change rapidly. While adapting to a changing landscape can be valuable, simplistic application of this strategy will incur high turnover and lead to low net alpha. With this in mind, we apply this sentiment signal only in conjunction with other stock-picking signals.

### How sentiment data helps our multi-asset team forecast the market bottom

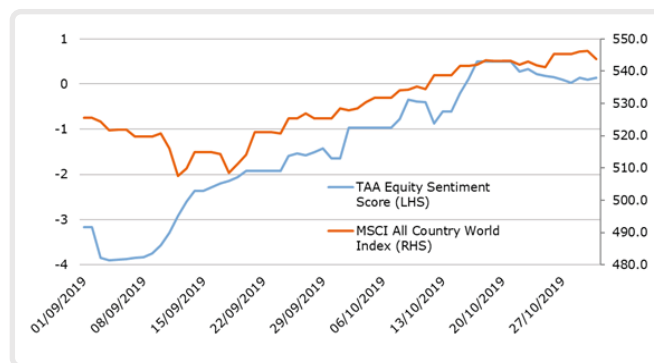
Asset allocators are no strangers to sentiment data; for decades, they have used survey-based sentiment indicators such as Purchasing Managers Indices (PMI) alongside hard economic data. Our multi-asset team supplements these traditional sentiment measures with TRMI data. The TRMI indicators provide real-time information sourced from news and social media and are often more forward-looking than PMI surveys. They also typically cover a broader range of economic actors, so they offer a more comprehensive view of where markets might head next.

We begin integrating the TRMI data into our asset allocation by grouping market and macroeconomic sentiment indicators based on the topics they cover. To assess macroeconomic sentiment for a country, for example, we first merge indicators that capture sentiment around business expansion, unemployment, trade balance, monetary policy, and so on. We then use our proprietary three-step methodology to test the constructed indicators. This methodology not only focuses on the information ratio but also takes into account the structural stability of the relationship and our unique way of measuring market timing ability.

First, we use our proprietary market timing test in conjunction with information ratio to see if the indicator we have constructed can generate consistent alpha. Second, we use structural break tests to assess the robustness of the statistical relationship between the signal and the market. This is particularly essential in relation to social-media-based indicators, which can be very noisy and can have unstable relationships over time. Finally, we assess the relative importance of different indicators together and assign a higher weight to indicators that have stronger predictive power when used in combination with all other signals.

After passing the rigorous approach described above, TRMI indicators form a significant part of our investment process; their weights in our proprietary asset allocation models range from 26% to 35%. We make them a substantial part of our investment process because we believe that understanding sentiment is key to predicting where markets will head next. This is validated by real-world results, as the use of TRMI sentiment indicators has helped us generate alpha on multiple occasions. In fourth-quarter 2019, a sharp improvement in these indicators pushed us to increase our equity exposure as the US-China trade war came to a close. Figure 2 shows how the equity sentiment indicators in our tactical asset allocation model (TAA) improved from the most negative score of -4 to neutral well before the deal was outlined in mid-October.

Figure 2: TAA equity sentiment score improved well in advance of trade deal (range between +4 and -4)



Source: NN Investment Partners

At times of market crisis, however, relying on standard sentiment inputs can be insufficient. This is the case when markets are hit by exogenous shocks – that is, shocks with an external origin, like the current coronavirus crisis. Such shocks have become more frequent in the past decade. These shocks create an environment of fundamental uncertainty that leads markets to become much more sentiment-driven, largely because they struggle to find an anchor while the future is in limbo. In times like these, strategies that combine traditional ways of measuring sentiment with big data and alternative data-based are likely to enjoy an edge.

**“In times of exogenous shocks, markets become much more sentiment-driven because they struggle to find an anchor while the future is in limbo.”**

**Aviral Utkarsh  
Multi-Asset Strategist**

With this in mind, we have created a proprietary bottoming-out indicator that focuses purely on sentiment information to navigate the current crisis. This indicator combines sentiment information from all three categories – traditional survey-based inputs; market/derivative-based information; and TRMI indicators based on news and social media analytics. The model gives 12.5% weight to TRMI indicators.

For this model, we selected the TRMI indicators that we view as most informative for the current crisis: priceDirection and marketRisk. The priceDirection indicator assesses price increases relative to price decreases, while marketRisk assesses positive emotion and expectations relative to nega-

tive emotion and expectations. The latter is also known as the mini-“bubble-o-meter”, as it can be a valuable tool in predicting speculative bubbles. These indicators have been tested for robust statistical relationship and predictive power, and have formed an important component of our quantitative models for several years. We also incorporated sentiment scores from our tactical asset allocation equity scorecards: a set of big data and alternative data-based indicators that have been tested for statistical significance.

The resulting indicator, a compilation of all the various inputs, helps us to estimate when we can expect the “bottom” for markets. Among other things, this model is helping us navigate the highly volatile equity markets during the coronavirus crisis. Table 2 gives a basic overview of the structure of this indicator.

Table 2: Our bottoming-out indicator for equity markets

Indicators	
What are people buying in equity markets?	Bottoming not in sight
Traditional technical indicators	Bottoming out soon
TRMI sentiment indicators	Bottoming out soon
Valuations	Bottoming not in sight
Liquidity stress	Bottoming out soon
Drawdowns	Bottoming not in sight
High-frequency economic activity data	Bottoming not in sight
Investor capitulation	Bottoming out soon
Final verdict	Mixed Signals

Source: NN Investment Partners

We will use this indicator as a signal to help us oscillate between underweight and neutral positioning until virus cases begin to peak and the road to economic normalisation becomes clearer. Our view as a multi-asset team is that a sustainable bounce in equities is unlikely to materialise until there is clarity about the human and economic impact of the coronavirus.

**“Our combination of human creativity and machine rigour has helped us to avoid drawdowns and identify investment opportunities despite turbulence, be it the US-China trade war or the recent coronavirus turmoil.”**

**Ewout van Schaick**  
Head of Multi Asset

As we move towards economic normalisation, we will continue to focus on our in-depth quantitative and qualitative inputs in conjunction with a broader set of real-time economic activity indicators. Our philosophy of combining fundamental and behavioural insights using human creativity and machine rigour has held us in good stead over the past decade. This approach has helped to avoid drawdowns and identify investment opportunities despite turbulence, be it the US-China trade war or the recent coronavirus turmoil.

#### The importance of independent analysis

There is no one-size-fits-all approach to implementing sentiment data into the investment approach. Our AI Equity and Multi Asset strategies use sentiment data in different ways and for different purposes. But when it comes to delivering outperformance and predicting future developments, relying on standard sentiment inputs without the support of proprietary research is insufficient. Investors who use sentiment data blindly, without careful assessment or clear understanding, can find themselves lost at sea during times of market turbulence. Meanwhile, those who conduct in-depth research and testing before implementing sentiment into their investment processes will be better placed to forge a smooth path through the storm.

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