



# Tuning Performance: Model Maintenance at NDR

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Editors: Lisa Michalski, CFA and Tim Frazer



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Welcome to the 7<sup>th</sup> edition of NDR's *Integrated Analyst*, a quarterly publication showcasing the wide-ranging capabilities of NDR's Custom Research Solutions (CRS) group.

Looking to settle a debate from your internal team meetings, increase the productivity of your organization, launch a new product suite, or quickly respond to an in-depth customer question? CRS can serve as an extension of your research team to assist with projects large or small. We build tailored solutions through direct engagement.

This issue of *Integrated Analyst* discusses the upkeep processes for NDR's asset allocation models. It is an extension of our [December 2025 \*Integrated Analyst\*](#) issue, where we demonstrated how to customize NDR's off-the-shelf models for individualized use.

**Q1:**

Who builds NDR's asset allocation models?

**A1:**

NDR's Custom Research Solutions (CRS) group has been building and maintaining NDR's flagship asset allocation models for many years (in some cases, decades). CRS analysts collaborate with [NDR's Strategists](#), who are specialists in their respective fields, to quantitatively evaluate trading signals, combine indicators into composite scores, and produce multi-component models, complete with adjustments for risk tolerance and rebalance preferences.

The development process, which requires both internal review and presentation to NDR's Index Committee<sup>1</sup> for final approval, can take many months, depending on the number of assets covered and components required. When complete, we deploy the finished model along with all relevant underlying indicators to NDR.com for use by our Strategists and valued clients.

CRS's modeling work is well-known throughout NDR's subscription service, most notably in our Global Balanced Account, Global Regional Equity, and U.S. Asset Allocation models, among others. The table below lists NDR's most popular models developed by CRS (in chronological order by inception date).

Model	Covered Assets	Inception Date	Last Revised
<a href="#">Global Balanced Account</a>	Global Stocks, Bonds, Cash	29-Jul-2005	26-Oct-2019
<a href="#">NDR Commodity</a>	GSCI Commodity Index	23-Nov-2009	1-Nov-2024
<a href="#">U.S. Cap and Style</a>	U.S. Growth, Value, small-caps, large-caps	30-Sep-2014	3-Mar-2021
<a href="#">Global Regional Equity</a>	7 Global Equity Regions	7-Apr-2015	18-Jan-2021
<a href="#">Global Fixed Income</a>	U.S., U.K., Europe, Japan Fixed Income	9-Apr-2015	14-Oct-2022
<a href="#">U.S. Sector</a>	11 S&P 500 Sectors	16-Feb-2017	15-May-2026
<a href="#">U.S. Stock Market</a>	S&P 500 Index	14-Sep-2017	3-Jan-2023
<a href="#">U.S. Asset Allocation</a>	U.S. Stocks, Bonds, Cash	3-May-2021	N/A
<a href="#">Europe Asset Allocation</a>	European Stocks, Bonds, Cash	18-Mar-2025	N/A
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<sup>1</sup> NDR's Index Committee consists of a diverse group of senior NDR analysts and Strategists who meet regularly to conduct due diligence on NDR's new and existing models.

For each model, we track the real-time performance since inception, also known as out-of-sample history. For example, our Global Balanced Account Model (top row in the table) has accumulated more than 20 years of out-of-sample performance since its inception in 2005! It has been revised 3 times since then, most recently in October 2019, including one major renovation and two less extensive updates.

**Q2:**

How do you decide when to update your models?

**A2:**

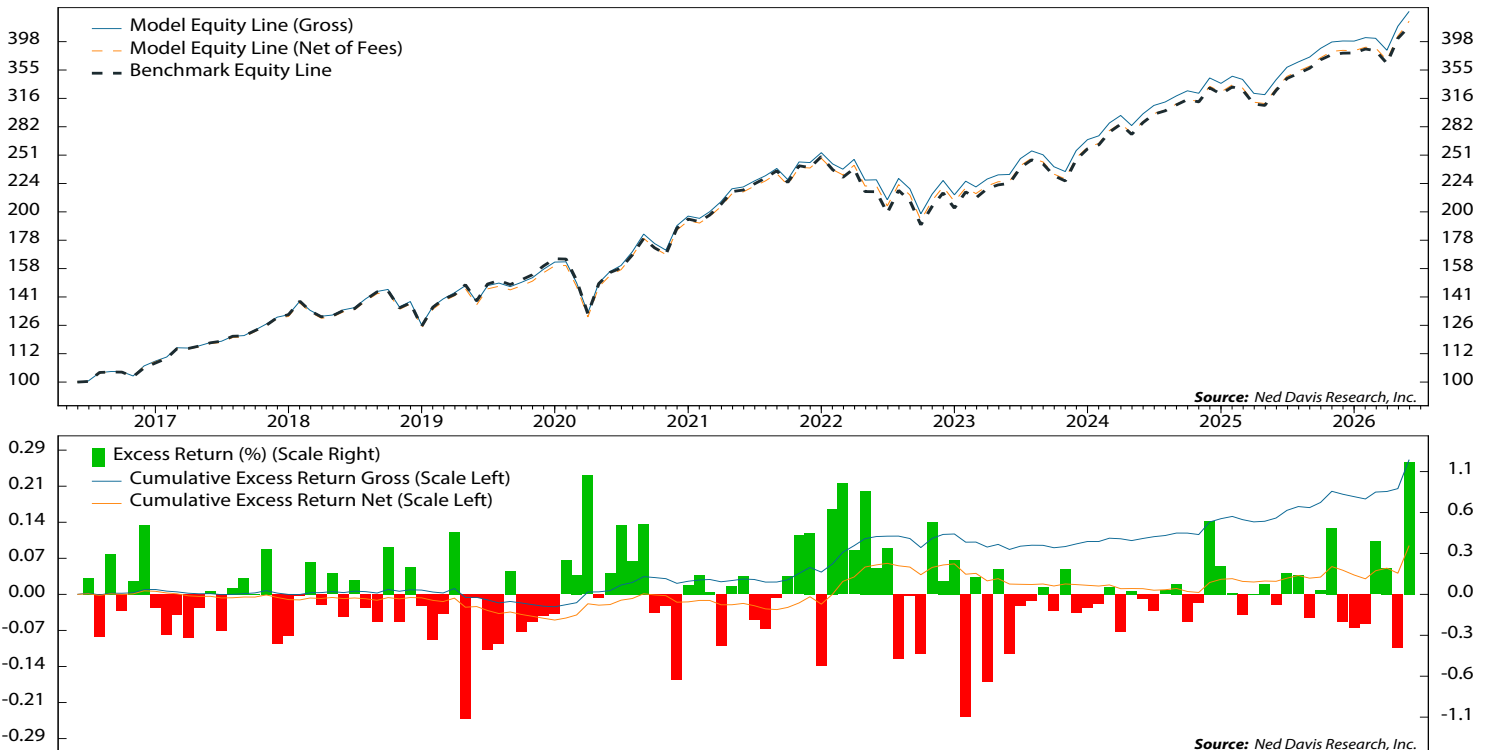
There are many reasons we decide to make changes to our models, including new data acquisition, improvement in tools and optimization techniques, structural changes in the investment environment, benchmark reconstitution, and performance. If one or more model components drag down overall performance vs. the benchmark for an extended period, we determine if, and to what extent, revisions are necessary.

Proactively, CRS runs monitoring processes behind the scenes to help us quickly identify components that are working as expected and those that are no longer reflective of market movements. We track performance attribution at each level of a model's hierarchy, starting with top-level allocations and moving down to sub-models and individual indicators.

Let's walk through a high-level example using our U.S. Sector Model, introduced in early 2017, which produces monthly tactical weightings for each of the 11 sectors in the S&P 500. The chart below displays the performance of NDR's Sector Model vs. its benchmark over the past 10 years.

**NDR U.S. Sector Model**

Monthly Data 2016-05-31 to 2026-05-29 (Log Scale)

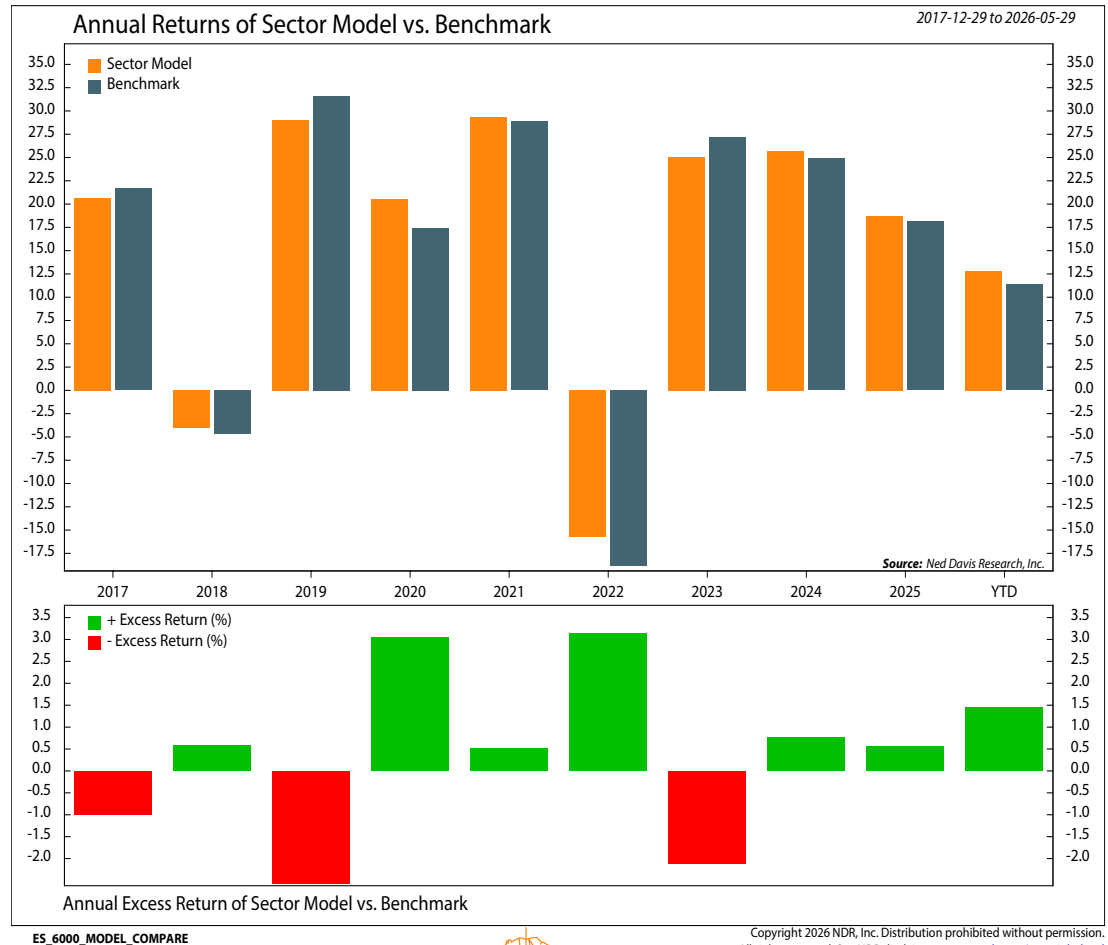


Results before 16-Feb-2017 represent hypothetical back-tested model performance. Results since 16-Feb-2017 are hypothetical model performance (not back-tested).

	Full History (2016-05-31-2026-05-29)		Go Live Date (2017-02-16-2026-05-29)		1-Year		5-Year		10-Year	
	Gain/Annum	Std. Dev	Gain/Annum	Std. Dev	Gain/Annum	Std. Dev	Gain/Annum	Std. Dev	Gain/Annum	Std. Dev
<b>Model (Gross)</b>	16.2%	69.1%	15.9%	71.3%	32.1%	59.5%	15.3%	71.3%	16.2%	69.1%
<b>Model (Net)</b>	15.8%	69.2%	15.5%	71.5%	31.7%	59.7%	14.9%	71.5%	15.8%	69.2%
<b>Benchmark</b>	15.5%	70.7%	15.2%	73.0%	29.8%	59.7%	14.2%	72.8%	15.5%	70.7%

In its 9-year real-time history, the model has logged 70 bps of positive excess return per annum vs. the benchmark (15.9%, gross, vs 15.2%, table). How consistent was the model's outperformance? Let's take a closer look.

The bar chart at right shows year-by-year performance of the model vs. the benchmark since its inception date in 2017. The green bars in the bottom clip make it easy to see the best performing years were 2020 and 2022 (each with 300 bps of excess return), while in 2017, 2019, and 2023, the model underperformed the benchmark to varying degrees, as shown in the red bars.



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What were the drivers behind those wins and losses? Did certain sectors consistently generate wins, while others detracted from performance? To find out, we need to drill deeper into the model and calculate the contribution of each sector to the total return. Since the model recommends monthly tactical weights relative to the cap-weighted S&P 500, we can precisely calculate sector contribution for each month according to the table below.

		Sector Performance vs. Benchmark	
		Outperform	Underperform
Model Weight vs. Benchmark Weight	Overweight	Positive	Negative
	Underweight	Negative	Positive

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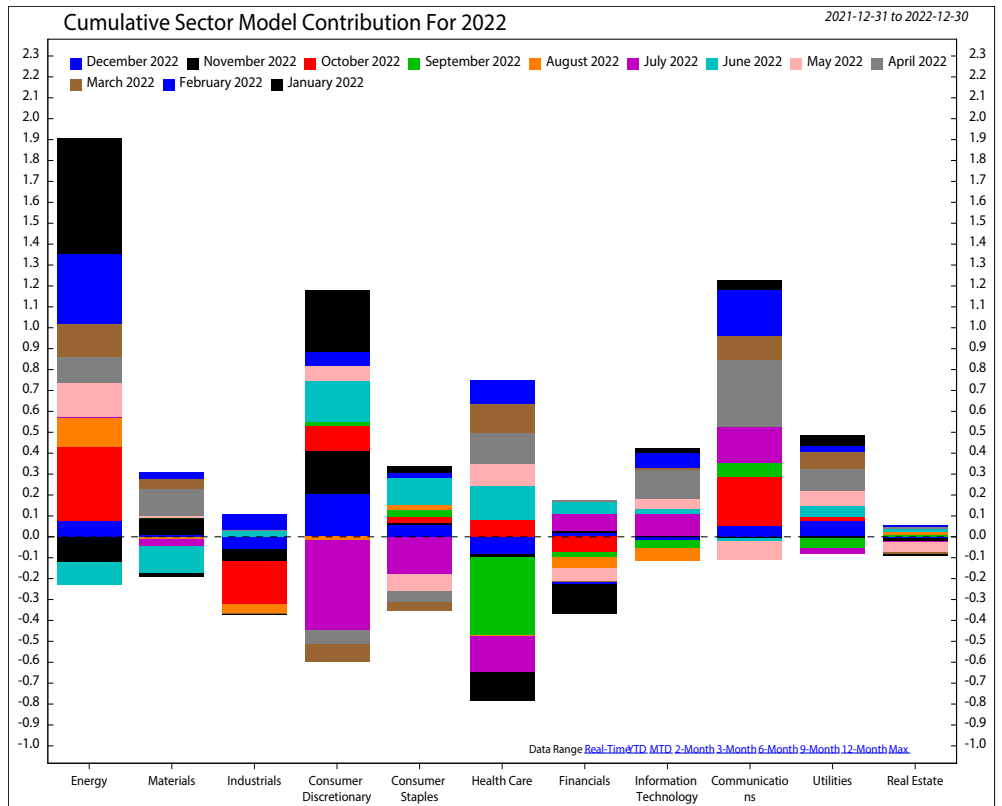
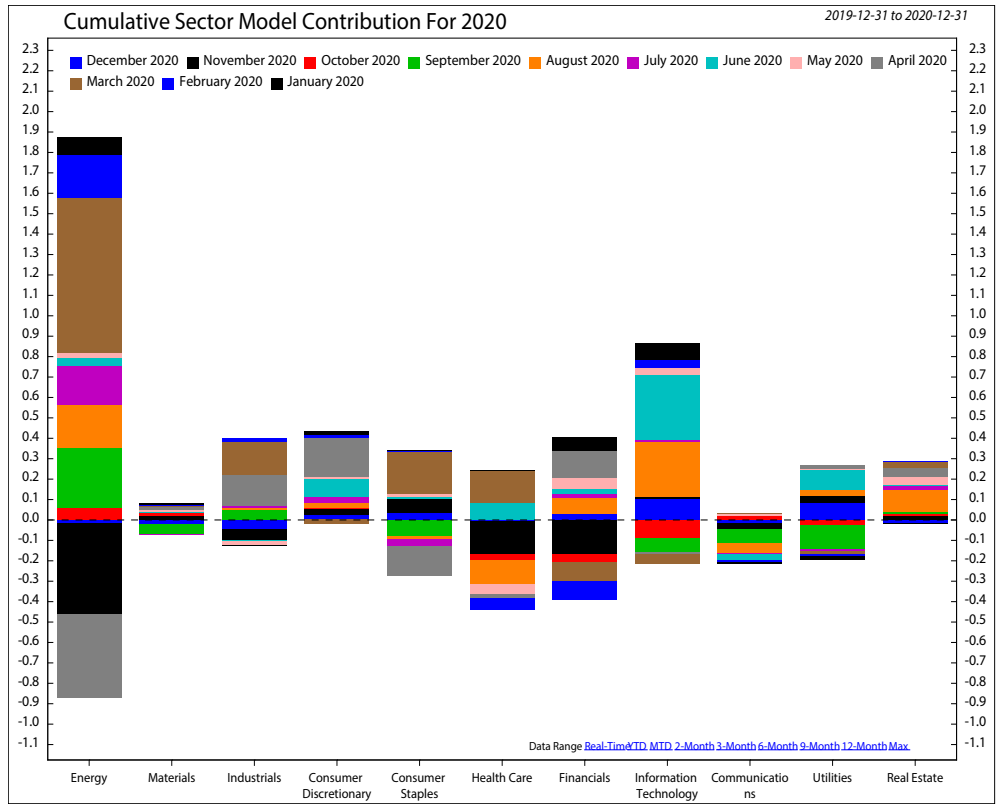
The monthly contribution is a function of both the relative weight and relative performance of the asset. The larger the deviation of relative weight, relative return, or both, the larger the contribution, and vice versa.

Let's start by looking at the model's biggest winning years, 2020 and 2022. The charts at right and below show calendar year accumulated monthly contribution by sector. Positive contribution stacks above zero, negative below zero.

In 2020 (chart, right), the Energy tactical positions were the largest contributor to the model's outperformance. This is clearly visible in the leftmost column, with the accumulation of nine months of positive contribution. The 2<sup>nd</sup> biggest contributor was Information Technology (8<sup>th</sup> column), also with significant net positive accumulated contribution.

Performance in 2022 (chart, bottom right) tells a similar story, with the model's best calls accumulating in Energy, Consumer Discretionary, and Communications. Health Care is a mixed bag, since the positive accumulation offsets the negative accumulation.

CRS maintains precise calculations behind the scenes, but we regularly consult charts like these to obtain a quick and comprehensive performance assessment for each tactical asset recommendation across our entire suite of models.



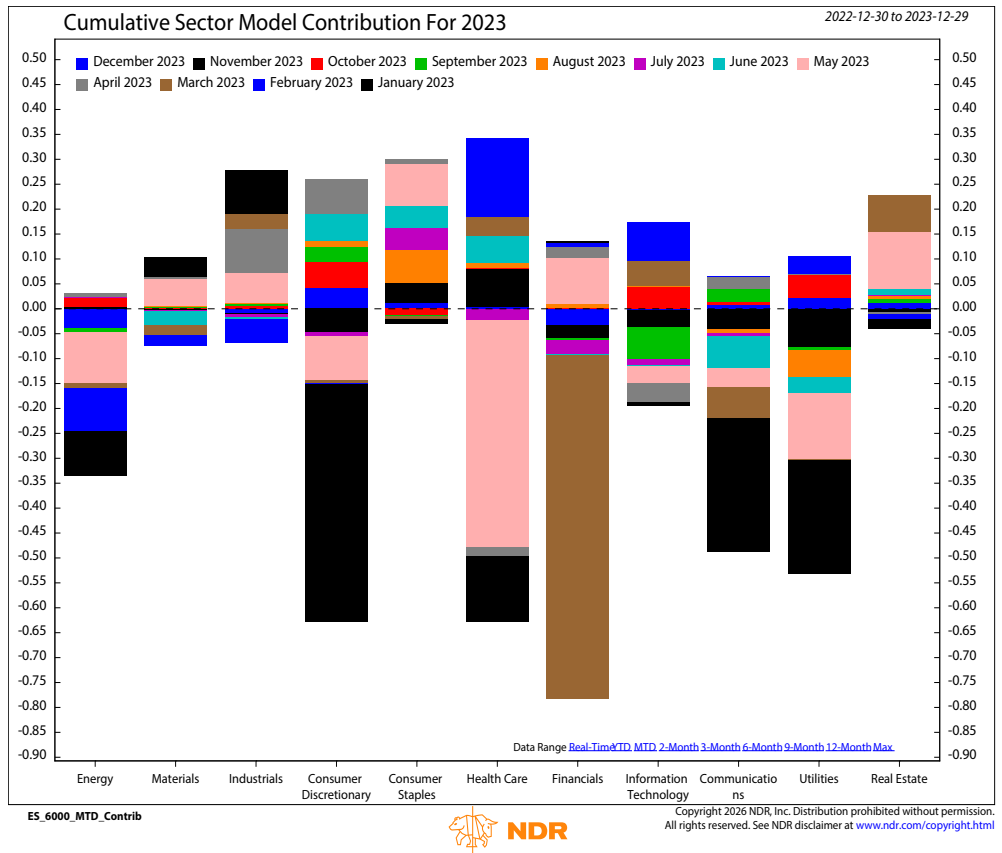
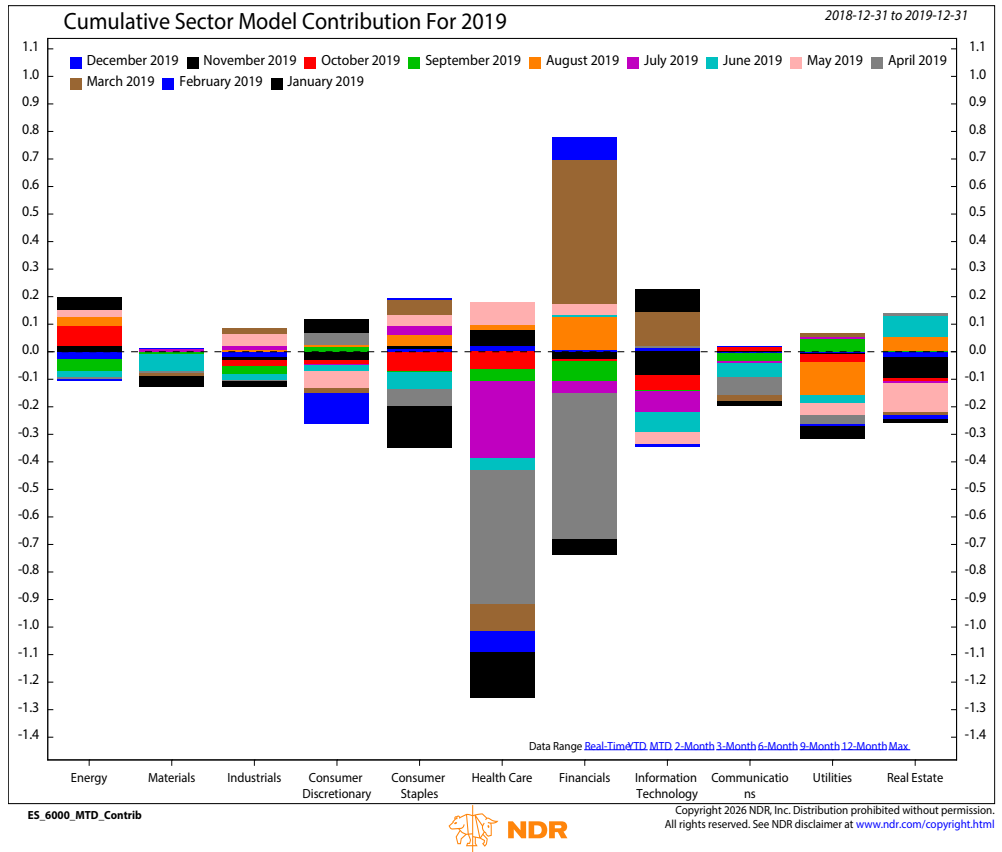
Now let's look at two underperforming years, 2019 and 2023, in the charts at right and below, respectively.

In 2019, Health Care and Financials suffered large relative accumulated losses (chart, right, columns six and seven), detracting from the model's performance. As mentioned earlier, CRS calculates performance attribution at all levels of the model hierarchy. During our performance review in 2019, we identified individual components in both the Health Care and Financials sectors in need of repair.

In January 2020, after testing and refining our updates and consulting with NDR colleagues, CRS revised selected indicators in both the Health Care and Financials sectors and [released an updated model](#) to NDR.com. The update included more responsive price-based indicators as well as new data for non-price-based indicators (full details in referenced link). The updated model outperformed the benchmark for the next two years.

The first few months of 2023, however, brought setbacks again for Health Care and Financials, as well as Consumer Discretionary, as shown in the chart at right. Were these systemic or isolated incidents? We had revised the Health Care and Financials sub-models just two years prior with improved results. What, in hindsight, should the model have recognized?

March 2023 brought the failure of Silicon Valley Bank on March 10, delivering a blow to the Financials sector and the largest negative contribution for the year (brown bar, 7<sup>th</sup> column at right). This event was unlikely for a quantitative model to foresee and mitigate.



Likewise, in May 2023 (pink bar, 6<sup>th</sup> column on prior page), “the health care sector experienced a monumental shift ... primarily defined by the official end of the COVID-19 pandemic as a global public health emergency and significant shifts in corporate retail and drug spending<sup>2</sup>.” This atypical event caught us on the wrong side of a significantly overweight position in Health Care, generating negative contribution.

Additionally, the model was on the wrong side of Consumer Discretionary in January 2023, recommending an underweight position while the sector tremendously outperformed the index. This was driven by a significantly bearish trend-following model score for Consumer Discretionary after three consecutive months of dismal returns in Q4, 2022 (-10.18% for the sector vs. +6.99% for the benchmark).

**Q3:**

How much of a model do you rebuild? Just the parts that aren't working or do you upgrade the entire framework?

**A3:**

Sometimes, model renovations can be major, while other times changes may impact just a few components. The extent of any renovation is a judgment call and depends on the age of the model, how widely the model is used by NDR's clients and investment partners, as well as available resources, data and tools.

Over the past 18 months, CRS updated and streamlined the entire Sector Model, [releasing a major upgrade](#) to NDR.com at the end of May, 2026, impacting all 11 sectors. At its inception in 2017, the Sector Model consisted of 22 independent sub-models, 2 for each of the 11 sectors, totaling 135 unique indicators, rendering it a cumbersome process to manage.

Since then, we carefully evaluated every component of the model, tested new ideas, pruned indicators that weren't working, retained the successful indicators, and revised indicators with financially sound concepts that we wanted to keep.

We also updated the architecture to a more flexible framework with one sub-model (rather than two) for each of the 11 sectors. The single composites reduced the total number of indicators to 111, from 135, making model more adaptable to future incremental changes.

**Q4:**

How do you decide which indicators make the cut for inclusion in the updated model?

**A4:**

Selecting indicators for inclusion in a composite model is analogous to building a diversified investment portfolio, and we have developed a process for measuring individual indicator contribution to increase confidence in our decisions.

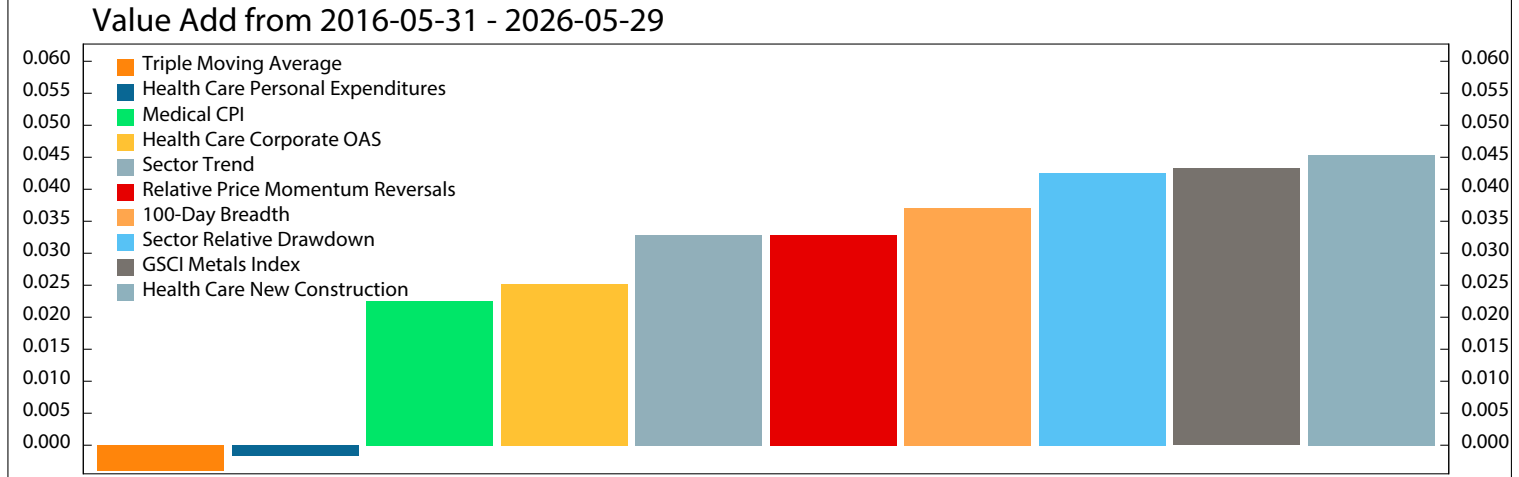
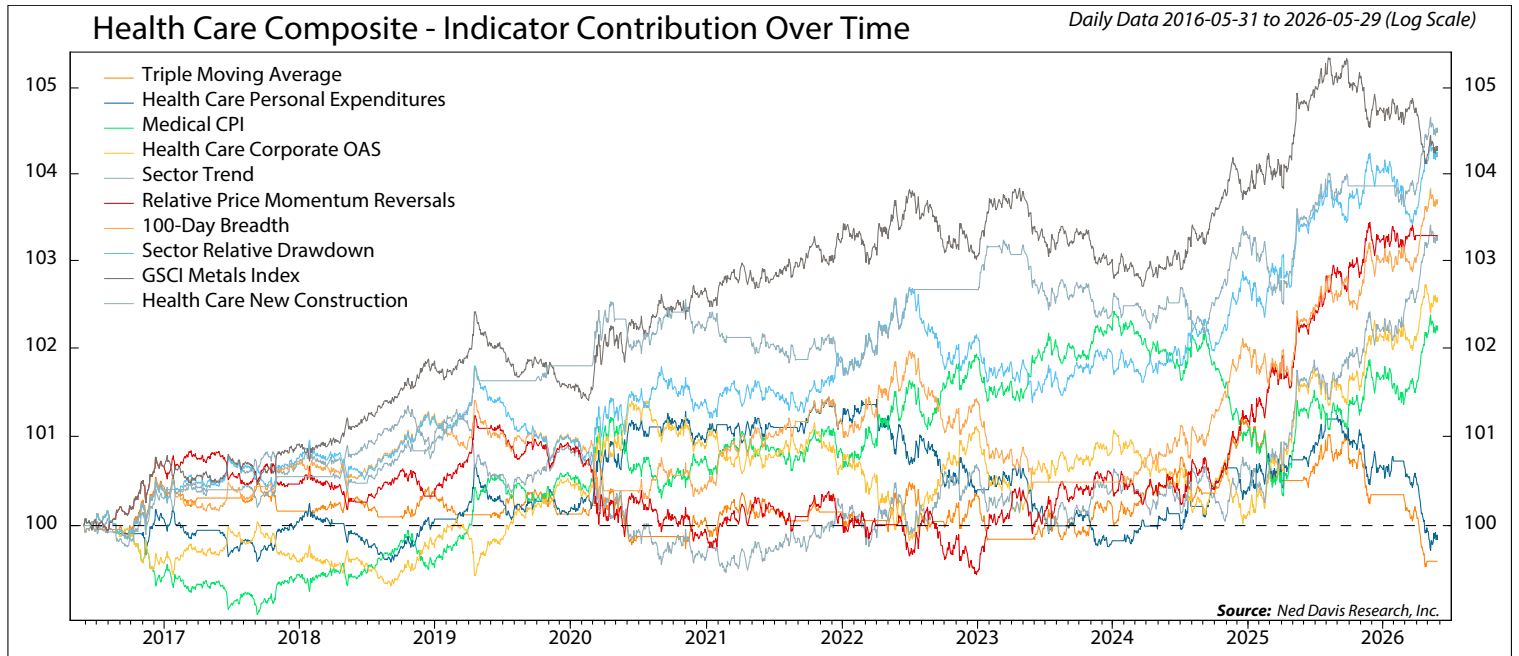
Evaluating indicator interaction at the composite level is just as important as evaluating the efficacy of each indicator on a stand-alone basis. After all, we know that no single indicator will make profitable calls 100% of the time. This is why NDR touts a weight-of-the-evidence model building approach, combining technical, fundamental, macroeconomic and sentiment indicators into well-diversified composite models.

The chart on the next page shows one way CRS evaluates the contribution and interaction of individual indicators in the Health Care composite of our most recently revised Sector Model, launched to NDR.com on May 27, 2026.

<sup>2</sup> Summary provided by Google AI.

Each line in the top clip of the chart tracks the contribution over time of each indicator in the new composite for the Health Care sector, comparing the relative performance of the full composite over time with the performance of the same composite without that indicator in it. When the line slopes upward, the original composite is outperforming, demonstrating cumulative value add for the indicator. When the line moves down, the indicator is detracting from the overall composite performance.

The goal is to measure net positive contribution of each indicator over different timeframes (note the positive bars in the bottom clip of the chart), and for more indicator contribution lines in the top clip to slope upward than downward over time, generating positive sector contribution. We use interactive tools behind the scenes to examine different timeframes throughout the back-tested history.



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**Q5:**

How do these changes benefit me?

**A5:**

If you are using the model, either in our subscription service or a customized version, you automatically benefit from the due diligence and regular maintenance we build into our model upkeep processes.

You also receive the best of what NDR has to offer with ongoing incorporation of new data, improved optimization techniques, as well as continued collaboration between CRS analysts and NDR's senior Strategists.

NDR prioritizes transparency and communication with clients for model upgrades. Strategists discuss the details of new and revised indicators in featured publications. In some cases, as with the most recent update of the Sector Model, NDR will hold a live webinar with clients and prospects to review changes in even more detail. [The webinar for the Sector Model](#) will be hosted by NDR's U.S. Sector Strategist, Rob Anderson, in coordination with CRS, on June 11, 2026.

NDR's models are incrementally updated and evolve over time. New updates are linked with the prior history since inception so we can report continuous out-of-sample performance and build our track record.

Lastly, NDR's Strategists, analysts and Custom Research staff are also happy to discuss model updates and customizations one-on-one with clients. We work alongside numerous partners to turn our models into investible vehicles with [NDR Investment Solutions](#), and we encourage clients to send us their feedback at any time.

***To learn more about NDR's expansive options for model customization and maintenance, along with many other research offerings, contact us at [CRSQuestions@ndr.com](mailto:CRSQuestions@ndr.com).***

## NED DAVIS RESEARCH

NDRsales@ndr.com  
www.ndr.com  
(800) 241-0621

### SARASOTA

3665 Bee Ridge Road Suite 306

Sarasota, FL 34233

United States

800 241 0621 (U.S. & Canada)

941 412 2300

### NEW YORK

1270 Avenue of the Americas

11<sup>th</sup> Floor

New York, NY 10020

(800) 241-0621

### LONDON

4 Bouverie Street

Temple, London

EC4Y 8AX

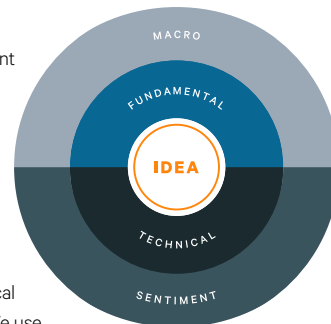
+44 20 7779 8454



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