



## **ARC Commodity Factor Risk Model Monthly Report January 2023**

The Asset Risk Company (ARC) Commodity Model is a cross-sectional commodity factor model. The model contains 50 of the most widely traded commodity products with approximately 1,200 futures in total over all maturities. All futures in the model have exposures to sectors, sub-sectors, and style factors such as basis, momentum, and open interest. The model is estimated daily with 21 years of history. It provides a framework for managing risk and investment decision making.

In this report, you will find:

- Performance of Sectors, Sub-Sectors and Style Factors
- Examples of Style Tilted Portfolios (Low Vol, Value, Momentum, Backwardation)
- A historical review of Momentum
- Inflation prediction
- Risk Factor Decompositions of Popular Commodity Indexes (BCOM, GSCI)

The ARC Commodity Model is a powerful tool to help many constituencies in the financial industry, trading, and real economy. Some of the applications of the model are very straightforward, but some uses of the model are more nuanced. We recommend this short piece that provides details on both common and novel use cases for a commodity factor model: <https://www.assetriskcompany.com/whyfactor.html>. You can access our latest research at <https://www.assetriskcompany.com/library.html>.



## Sectors and Factors Performance Report:

Table 1. Sectors and Subsectors Performance\* Annualized 5 years

Sectors/Subsectors	Jan 23	2022	5-year Return	5-year Volatility*
<b>Agriculture</b>	<b>-1.8%</b>	<b>18.7%</b>	<b>14.2%</b>	<b>11.9%</b>
Grain And Oilseed	-1.7%	15.6%	15.7%	13.9%
Lumber And Pulp	14.0%	-52.1%	10.8%	50.9%
Proteins	-2.6%	34.6%	12.3%	10.5%
<b>Energy</b>	<b>-1.9%</b>	<b>13.7%</b>	<b>1.9%</b>	<b>15.7%</b>
Biofuels	-5.8%	18.6%	13.4%	21.9%
Coal	-0.4%	113.5%	25.0%	22.5%
Crude Oil	-1.5%	1.3%	-1.6%	18.6%
Natural Gas	-5.0%	27.9%	1.9%	15.5%
Petrochemicals	-0.5%	-5.9%	-2.1%	19.9%
Refined Products	1.4%	29.6%	3.9%	20.7%
<b>Metals</b>	<b>5.2%</b>	<b>9.9%</b>	<b>11.4%</b>	<b>15.1%</b>
Base	7.7%	-5.5%	12.1%	18.7%
Precious	-0.4%	37.1%	12.3%	17.3%

After two successive double digit years of outperformance for most commodities in 2021 and 2022, the first month of 2023 was a bit rough. With the exception of Base Metals (+7.7% in January) all sectors were down. Natural Gas volatility continues unabated in January. Time will tell if we are seeing a correction on the commodity market. As a reminder, ARC sectors and sub-sectors returns are not estimated using a static configuration of commodity weightings. The returns come naturally from a cross-sectional regression of the 1,200 assets in the model and therefore cover the entire term structure. For instance, Natural Gas has more than 120 maturities in the



model. The model uses all of that information to derive sector and subsector returns and one can think of our sectors as risk weighted on the entire curve.

**Table 2. Styles Performance \*Annualized 5 years**

<b>Factor</b>	<b>Jan 23</b>	<b>2022</b>	<b>5-year Return</b>	<b>5-year Volatility</b>
<b>Basis</b>	<b>1.3%</b>	<b>-14.7%</b>	<b>-6.4%</b>	<b>5.5%</b>
<b>Open Interest</b>	<b>-0.6%</b>	<b>13.3%</b>	<b>1.4%</b>	<b>4.1%</b>
<b>Momentum</b>	<b>-4.9%</b>	<b>2.7%</b>	<b>0.0%</b>	<b>6.0%</b>
<b>ST Momentum</b>	<b>-2.3%</b>	<b>-12.0%</b>	<b>-7.3%</b>	<b>5.9%</b>
<b>Trading Activity</b>	<b>0.5%</b>	<b>-6.0%</b>	<b>-0.2%</b>	<b>2.3%</b>
<b>Volatility</b>	<b>-4.3%</b>	<b>-4.6%</b>	<b>2.8%</b>	<b>8.5%</b>
<b>ST Volatility</b>	<b>1.2%</b>	<b>5.6%</b>	<b>-0.2%</b>	<b>8.3%</b>

We witnessed a very large drop in one month for the Momentum factor, certainly an outlier compared to the historical data<sup>1</sup>. Short Term Momentum continues to perform exceptionally (from the short perspective). Also we note a large correction for the Volatility factor. The factor returns here come from large portfolios of what are known as “factor replicating” portfolios. The factor replicating portfolios are not a practical way to trade and consist of positions (both long and short) in most of the instruments in the model’s universe. We provide a much more parsimonious factor tilted (long only) portfolios later in this analysis.

## **Style Tilted Portfolios Performance Report:**

Similar to the cross-sectional Momentum factor, we see a correction for the long only tilted Momentum portfolio (-2%). Value which we define as a short position on Momentum is starting the year with a strong +3.4% after a tough 2022 performance

<sup>1</sup> In a previous note on momentum we warned that the momentum train breaks down abruptly and brutally.



Note that over the past 5 years all tilted portfolios have better Sharpe ratios than BCOM, with Low Vol and Value leading the way.

**Table 3. Factor Tilted Portfolios and BCOM Performance**

Perf	Value	Momentum	Low Vol	Backwardation	BCOM
January 2023	3.4%	-2.0%	-0.5%	-2.9%	-0.5%
2022	3.3%	33.7%	12.5%	23.8%	16.1%
Annualized*	12.3%	8.9%	9.3%	10.8%	5.9%
Volatility*	15.5%	17.5%	9.7%	16.7%	15.8%

\*Annualized 5 years

## Momentum Historical Perspective

2022 was a very rough year for most managers, whether they managed a long only portfolio or long short in the hedge fund space. However we saw some exceptional performance in CTA and systematic macro hedge funds, who took advantage of trend following and Momentum in prices of commodities, equities and rates. Having developed the first commercial cross-sectional commodity factor model with 2 momentum factors, we investigated their performance over two decades. Our model is a cross-section factor model. We start by computing and standardizing exposures. The two momentum exposures are defined as the return over 12 months minus one month (Momentum) and a 30 day return change (Short Term Momentum).

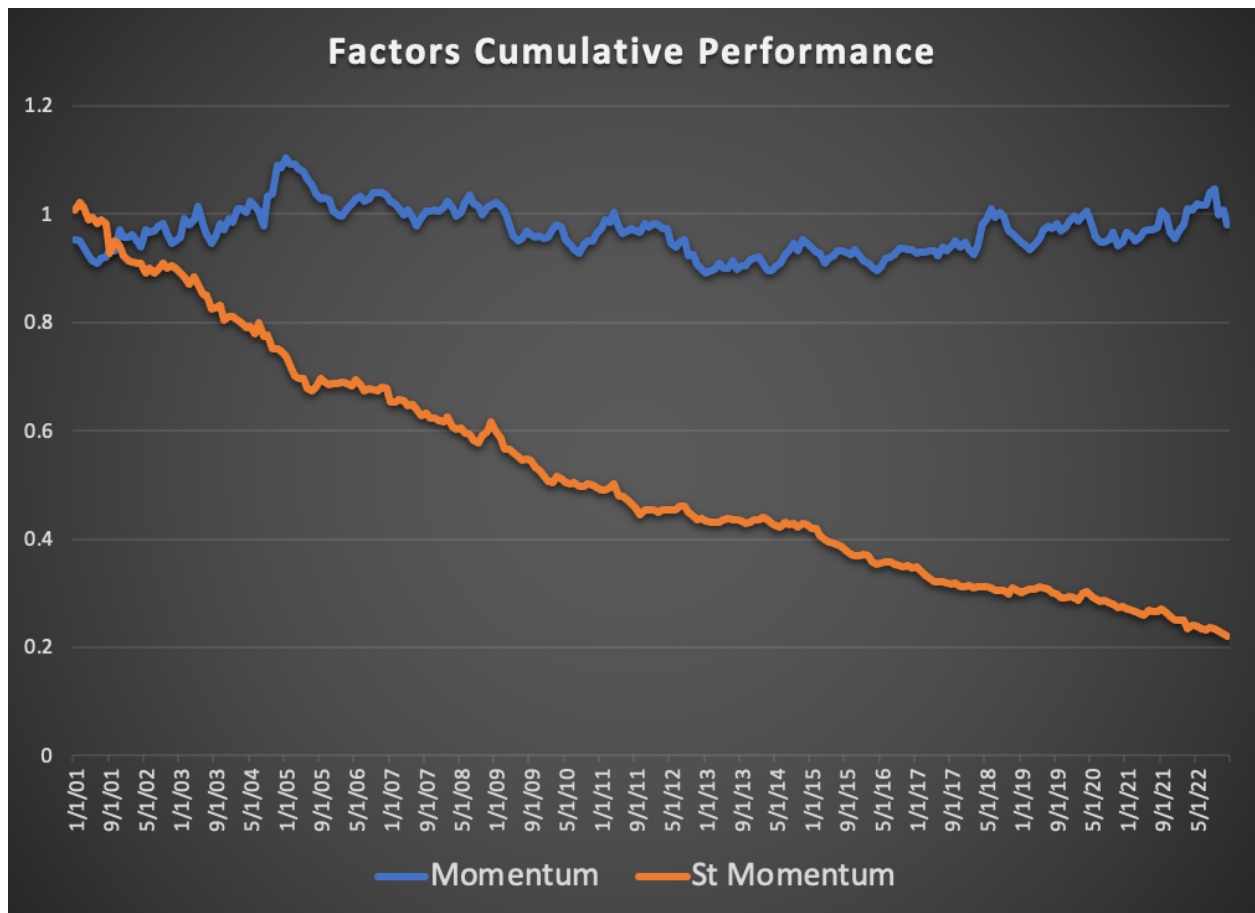
We look at the two factors as followed from two perspectives:

1. [Cross-Sectional] Through cross-sectional regression we extract a daily factor return for both Momentum and Short Term Momentum. These factors are long short portfolios with hundreds of futures and limiting making their direct application



2. [Time Series Approach] Long tilted portfolios which take the 10 highest z-scores (exposures) to the two factors at the start of every month and held for one calendar month. The futures have a maturity of 6 weeks from the rebalancing date and open interest which exceeds a preset bound. These are indicative “indices” or tilted portfolios for Momentum and ST Momentum (or any of the other facts).

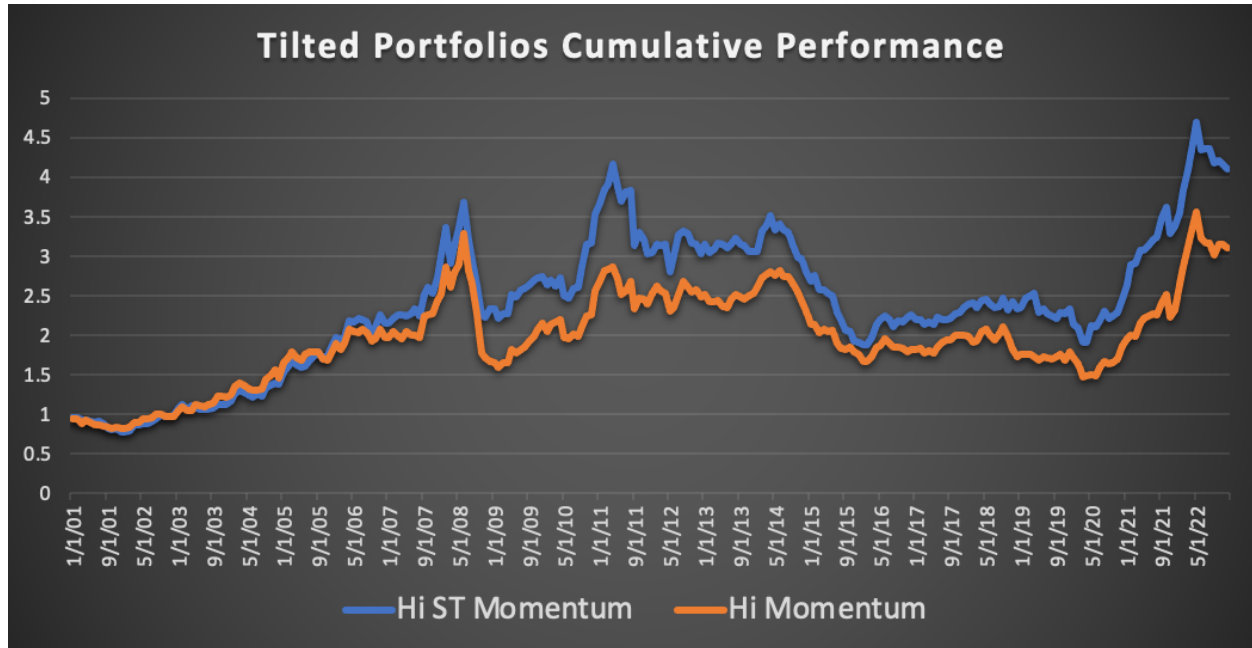
In Graph 1 we plot the cumulative performance of the model Momentum and ST Momentum. There is no clear signal from Momentum, but clearly a very strong signal for ST Momentum.



Graph 1: Cumulative performance of the two momentum factors of the commodity model



In Graph 2 we look at the performance of the long only version tilted portfolios.



Graph 2: Cumulative performance of the long only tilted portfolios

In Tables 4 and 5 we compute the annualized returns and Sharpe ratios for the tilted portfolios and compare them with BCOM. Clearly Momentum tilted portfolios had excellent returns over the last 3 years but decay as we go back in time. On average though they do better than BCOM.

Annualized Returns	Hi Momentum	Hi ST Momentum	BCOM
1 yr	33.7%	21.3%	16.1%
3 yr	20.2%	20.6%	12.7%
5 yr	9.2%	11.7%	6.4%
10 yr	2.3%	3.1%	-1.3%
Since 2001	5.6%	7.0%	

Table 4: Annualized returns for the tilted portfolios and BCOM as a benchmark

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Sharpe Ratio	Hi Momentum	Hi ST Momentum	BCOM
1 yr	1.5	1.2	0.8
3 yr	1	1.1	0.7
5 yr	0.5	0.7	0.4
10 yr	0.2	0.2	-0.1
Since 2001	0.3	0.4	

Table 5: Sharpe ratios for the tilted portfolios and BCOM as a benchmark

As we can see, Momentum will not always perform and we caution about drawing conclusions on the Momentum factor, at least in commodities. Many of today's hot hands will struggle as the Momentum train derails. As always a manager will have to prove skills over a long period of time to extract an alpha in a systematic way.

## Inflation:

Another application of a commodity factor model is inflation, forecasting, or attribution. We find that the ARC Commodity Model is a good predictor for breakout moves in the headline number, both in bouts of inflation and deflation. For the upcoming January inflation number we forecast an increase of 0.1% for CPI and year on year inflation decreasing to 5.9%.

## Factor Correlations:

Long term correlations between sectors and style factors are also relatively low. The model is able to separate sector allocation risk from style risk providing key insights in the real key drivers of risk and performance of a portfolio.



**Table 6. Factor Correlations**

Correlations	Agriculture	Energy	Metals	Basis	Open Interest	Momentum	ST Momentum	Trading Activity	Volatility	ST Volatility
<b>Agriculture</b>	1.00	0.46	0.41	(0.12)	0.05	0.04	0.03	0.02	0.11	0.19
<b>Energy</b>	0.28	1.00	0.46	(0.01)	0.43	(0.18)	0.11	(0.11)	(0.11)	0.44
<b>Metals</b>	0.16	0.41	1.00	(0.29)	0.25	0.08	0.21	(0.06)	(0.06)	0.31
<b>Basis</b>	0.29	(0.04)	(0.31)	1.00	(0.28)	(0.18)	(0.21)	0.22	0.01	0.02
<b>Open Interest</b>	(0.15)	0.60	0.34	(0.11)	1.00	(0.29)	(0.11)	(0.70)	(0.33)	0.12
<b>Momentum</b>	0.13	0.04	0.11	(0.45)	(0.33)	1.00	0.25	0.17	0.36	(0.18)
<b>ST Momentum</b>	(0.03)	(0.01)	(0.42)	0.09	(0.18)	0.44	1.00	0.18	0.09	0.17
<b>Trading Activity</b>	(0.11)	(0.58)	(0.43)	0.19	(0.70)	0.28	0.51	1.00	0.20	0.04
<b>Volatility</b>	0.44	0.44	0.08	(0.07)	(0.22)	0.63	0.39	0.06	1.00	(0.65)
<b>ST Volatility</b>	(0.11)	(0.35)	0.06	(0.05)	0.09	(0.35)	(0.40)	(0.00)	(0.80)	1.00

1 yr correlations on the right (above the diagonal), 30 days on left (below the diagonal).

## Commodity Indices Risk Decomposition

GSCI is overweight in Energy and BCOM is roughly equally weighted between sectors. Both indices have high z-scores with respect to Open Interest reflecting the fact that the indices' constituents are weighted more heavily on the front month contract. GSCI is more sensitive to Short Term Momentum than BCOM.

**Table7. Factor Exposures**

Factors Exposures	BCOM	GSCI
<b>Agriculture</b>	0.35	0.26
<b>Energy</b>	0.29	0.58
<b>Metals</b>	0.36	0.16
<b>Basis</b>	0.17	0.18
<b>Open Interest</b>	2.52	2.20
<b>Momentum</b>	-0.11	-0.32
<b>ST Momentum</b>	0.31	0.55
<b>Trading Activity</b>	0.32	1.09
<b>Volatility</b>	0.24	0.44
<b>ST Volatility</b>	0.07	0.15

Exposures, z-scores for BCOM and GSCI as of 1/31/2023





**Table 8. Risk Attribution of BCOM and GSCI**

<b>Index</b>	<b>BCOM</b>	<b>GSCI</b>
<b>Total Risk</b>	<b>21.7%</b>	<b>22.2%</b>
<b>Agriculture</b>	2.2%	1.6%
<b>Energy</b>	4.0%	9.0%
<b>Metals</b>	4.2%	1.5%
<b>Basis</b>	-0.2%	-0.1%
<b>Open Interest</b>	11.1%	8.2%
<b>Momentum</b>	0.2%	0.5%
<b>ST Momentum</b>	0.2%	0.9%
<b>Trading Activity</b>	-0.4%	-0.8%
<b>Volatility</b>	-0.2%	0.1%
<b>ST Volatility</b>	0.2%	0.6%
<b>Specific Risk</b>	4.9%	5.6%

Ex-Ante Annual Volatility Decomposition for BCOM and GSCI as of 1/31/2023

We use a 6 month half life for this risk decomposition so the model is fairly reactive to market conditions. Despite different sector allocations, both indices have similar risk and exposures to styles. If your portfolio is long/short you want to see if you have systematic exposures or whether idiosyncratic risk predominates. For long only managers, you want to find your exposures versus your benchmark. As shown above in the correlation tables, sector correlations with style factors are relatively small. The model is able to separate risk due to sector allocation and styles risk. All risk is not equal. Systematic risk can display non normal behavior when compared to specific or idiosyncratic risk. Both types of risks are driven by fluctuation, but systematic risk is driven by the “crowd” expressing some thematic bet. The systematic risk is related to market risk.



## **Conclusion:**

In this report, we have shown the factor performance driving the commodity markets. Using the ARC Commodity model, style tilted portfolios have shown great performance and seem to be suitable benchmarks for active managers to track. We then conducted an analysis into the risk dynamics of two major commodity indices. The view of commodities as diversifiers is quite accurate. All of this was possible with the ARC model. The model enables the user to look at their book or portfolio and how it fits into their thesis as well as how it fits in the broader economic landscape.