ARC Commodity Factor Risk Model
Monthly Report January 2024

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, style and trading factors such as basis, momentum, and open interest. The model is estimated daily with 23 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 & Trading Factors
- Examples of Factor Tilted Portfolios (Low Vol, Value, Momentum, Backwardation)
- Factor Based Performance Decompositions of Popular Commodity Indexes (BCOM, GSCI)
- Inflation prediction

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

Sectors	Jan. 24	2023	5-year Return	5-year Volatility
Agriculture	**-1.4%**	**-9.0%**	**13.2%**	**12.8%**
Grain And Oilseed	-3.6%	-15.3%	13.2%	15.2%
Lumber And Pulp	-0.4%	-16.8%	8.1%	51.4%
Proteins	3.6%	-9.1%	10.8%	11.2%
Softs	1.3%	23.7%	9.6%	13.9%
Energy	**1.2%**	**-9.3%**	**1.6%**	**15.9%**
Biofuels	1.2%	-4.9%	14.8%	22.2%
Coal	1.2%	-10.9%	21.8%	25.4%
Crude Oil	1.4%	-5.4%	-1.8%	18.6%
Natural Gas	-0.1%	-10.1%	2.0%	16.3%
Petrochemicals	1.2%	-10.4%	-2.0%	18.5%
Refined Products	2.9%	-14.8%	2.4%	20.6%
Metals	**-2.0%**	**-9.2%**	**8.1%**	**15.7%**
Base	0.1%	-9.7%	8.4%	19.2%
Precious	-3.7%	-7.0%	11.0%	18.5%

After a tough 2023, January exhibited a slow start. Ags and Metals are negative for the month while Energy is slightly up. Natural Gas end of month return does not reflect the volatility it displayed in January. Crude Oil is up 1.4% for the month. Precious Metals are down 3.4% for the month. Interestingly, Grains & Oil Seeds are down 3.6% and Proteins are up 3.6%. 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/Trading Factors Performance

Factor	Jan. 24	2023	5 Year Return	5 Year Volatility
Basis	**-1.3%**	**-9.1%**	**-6.4%**	**5.3%**
Open Interest	**1.1%**	**-3.5%**	**1.2%**	**4.2%**
Momentum	**2.5%**	**-0.6%**	**1.0%**	**5.8%**
ST Momentum	**-0.1%**	**-6.7%**	**-7.4%**	**5.7%**
Trading Activity	**-0.7%**	**2.2%**	**-0.2%**	**2.4%**
Volatility	**0.0%**	**-7.6%**	**1.9%**	**8.9%**
ST Volatility	**-0.9%**	**2.7%**	**1.1%**	**8.1%**

Our Momentum factor (12 months return of the actual future) was up 2.5% in January, an outlier compared to its historical returns. 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) portfolio later in this analysis.

Factor Tilted Portfolios Performance Report:

As shown above there are some clear patterns emerging for the ARC Commodity Styles and Trading Factors. Unfortunately, as with all cross sectional factor models, these factors are not tradable because the replicating portfolios are made up of hundreds of futures, some of them not liquid. However in order to take advantage of these trends, ARC created long only tilted versions. Our findings, based on 23 years of data, are:

- Low Volatility and Low Momentum (Value) are reliable and produce much better performance and risk than traditional indices
- High Momentum is not a reliable factor premia unless you can time it
- High Basis is reliable in underperforming the indices

Table 3. Top 10 Futures Tilted Portfolios and BCOM Performance

	Value	Momentum	Low Vol	Backwardation	BCOM
Jan 24	**-0.5%**	**4.9%**	**2.7%**	**3.2%**	**0.4%**
2023	**3.3%**	**-10.1%**	**0.8%**	**-13.6%**	**-7.9%**
Annualized*	**9.7%**	**10.8%**	**10.6%**	**8.9%**	**6.2%**
Volatility*	**17.7%**	**16.5%**	**9.7%**	**16.9%**	**15.8%**

*Annualized 5 years

Table 3 shows the performance of tilted equi-weighted portfolios made of 10 liquid futures, rebalanced once a month. The High Momentum portfolio had a very strong month. Conversely, Low Momentum (Value) had a negative month. Low Volatility and Low Basis tilted Futures outperformed BCOM (+0.4%). GSCI had a strong month (+4.5%).

To give the reader a motivation for what types of positions these strategies require, the list below (table 4) shows the futures for our 5 component factor tilted portfolios. If you believe High Momentum will continue, we provide the list of the futures with the highest exposure. On the other hand, if you believe Momentum will reverse we publish the list of futures with the lowest momentum exposures. We understand that practitioners do not necessarily trade all these markets, but there are currently 1,200 futures in the model you can choose from. The methodology is very straightforward with the ARC model in hand.

Please note that these products are typically well traded and are not close to expiry. We do this by design to mitigate the effects of thinly traded futures and to avoid all sorts of expiry plays.

Table 4: List of Futures for tilted portfolios as of 1/31/2024

Exchange	Contract	Maturity	Factor Tilt
CME	Live Cattle	20241031	Low Vol
COMEX	Gold	20240426	Low Vol
ICEEU	Brent Crude	20261102	Low Vol
ICEUS	Cocoa	20241213	Low Vol
CBT	Soybean	20241114	Low Vol
ICEUS	Cocoa	20240515	High Mom
ICEUS	Coffee	20240319	High Mom
CME	Feeder Cattle	20240401	High Mom
ICEUS	Sugar	20240628	High Mom
CME	Live Cattle	20240628	High Mom
NYMEX	Palladium	20240326	Low Mom
NYMEX	Natural Gas	20241126	Low Mom
NYMEX	Refined Gasoline	20240430	Low Mom
CBT	Corn	20240514	Low Mom
NYMEX	Heating Oil	20240328	Low Mom

Indices Factor Based Performance Attribution:

We investigate the factor based decomposition of BCOM and GSCI for 2023 (table 5). The 3 sectors returns for the year were similar (around -9%). As expected their contributions then for BCOM were similar (BCOM exposure to the 3 sectors is equi-weighted) while Energy cost more to GSCI (the index is overweighted in energy futures).

Table 5: BCOM and GSCI performance attribution by sectors/factors for 2023

Sectors/Factors	BCOM	GSCI	Factor Returns
	-7.9%	-4.3%	
Agriculture	-3.0%	-2.2%	-9.0%
Energy	-2.8%	-5.4%	-9.3%
Metals	-3.4%	-1.5%	-9.2%
Basis	0.8%	0.9%	-9.1%
Open Interest	-8.4%	-7.6%	-3.5%
Momentum	-1.5%	-2.2%	-0.6%
ST Momentum	0.3%	0.8%	-6.7%
Trading Activity	3.0%	2.9%	2.2%
Volatility	-3.7%	-5.6%	-7.6%
ST Volatility	0.9%	0.6%	2.7%

To summarize, the indices were hurt on the sector allocation. This was not a selection problem, just that the entire commodity world lost ground. Their selection of thematic or stule bets was actually not bad. The worst performer, basis, was a net positive for both indices and neither index took the brunt of the volatility performance. They also managed to avoid the falling anvil called short term momentum (last year)!

Commodity Indices Risk Decomposition

Energy is the largest sector in GSCI but the smallest in BCOM. 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.

Table6. Factor Exposures

Factors Exposures	BCOM	GSCI
Agriculture	0.36	0.26
Energy	0.29	0.57
Metals	0.34	0.17
Basis	-0.25	-0.26
Open Interest	2.36	2.33
Momentum	-0.31	-0.33
ST Momentum	0.12	0.62
Trading Activity	0.99	1.65
Volatility	0.36	0.49
ST Volatility	0.10	0.08

Exposures, z-scores for BCOM and GSCI as of 1/31/2024

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. A portfolio which is long/short would be evaluated on the breakout between systematic exposures and whether idiosyncratic risk. Long only managers will want to find their exposures relative to their benchmark. As shown below 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.

Table 7. Risk Attribution of BCOM and GSCI

Index	BCOM	GSCI
Total Risk	**15.0%**	**15.2%**
Agriculture	1.6%	0.9%
Energy	1.9%	5.0%
Metals	3.0%	1.1%
Basis	0.7%	0.7%
Open Interest	7.3%	6.9%
Momentum	0.4%	0.3%
ST Momentum	-0.1%	-0.1%
Trading Activity	-0.7%	-1.0%
Volatility	0.5%	0.7%
ST Volatility	-0.1%	-0.1%
Specific Risk	3.9%	4.6%

Ex-Ante Annual Volatility Decomposition for BCOM and GSCI as of 1/31/2024

Inflation:

Empirical testing finds that the ARC Commodity Model is an excellent predictor of breakout moves in the headline number, both in bouts of inflation and deflation. For January, we predict a higher CPI level, but a decrease for year-on-year change (Inflation). Reach out to info@assetriskcompany.com for our estimate.

Factor Correlations:

Long term correlations between sectors and style factors are very 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 9. Factor Correlations

Correlations	Agriculture	Energy	Metals	Basis	Open Interest	Momentum	ST Momentum	Trading Activity	Volatility	ST Volatility
Agriculture	1.00	0.24	0.24	0.03	(0.00)	(0.09)	(0.13)	(0.03)	0.21	0.11
Energy	0.14	1.00	0.25	(0.05)	0.28	(0.19)	(0.15)	(0.22)	(0.00)	0.23
Metals	0.26	0.08	1.00	(0.22)	0.06	(0.04)	(0.08)	(0.04)	0.05	0.11
Basis	(0.01)	0.09	(0.26)	1.00	(0.26)	(0.06)	(0.07)	0.23	0.02	(0.04)
Open Interest	0.07	0.07	(0.01)	(0.37)	1.00	(0.34)	(0.03)	(0.65)	(0.25)	(0.03)
Momentum	(0.11)	(0.02)	(0.12)	(0.16)	(0.13)	1.00	0.16	0.24	0.40	(0.19)
ST Momentum	(0.05)	(0.36)	(0.04)	(0.15)	(0.08)	0.27	1.00	0.11	0.02	0.05
Trading Activity	(0.03)	(0.22)	0.07	0.25	(0.59)	0.13	0.08	1.00	0.16	0.03
Volatility	0.11	(0.00)	0.22	(0.31)	0.03	0.46	(0.01)	0.12	1.00	(0.62)
ST Volatility	0.21	0.17	0.07	0.37	(0.50)	(0.22)	0.23	0.18	(0.58)	1.00

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

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.