ARC Commodity Factor Risk Model
Monthly Report July 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:

- <u>Performance of Sectors, Sub-Sectors and Style and Trading Factors</u>
- Examples of <u>Factor Tilted Portfolios</u> (Low Vol, Value, Momentum, Backwardation)
- <u>Factor Based Risk Decomposition</u> of Popular Commodity Indexes (<u>BCOM, GSCI</u>)
- <u>Inflation prediction</u>

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	July 24	2024	5-year Return	5-year Volatility
Agriculture	**-1.7%**	**-4.6%**	**13.6%**	**13.4%**
Grain And Oilseed	-3.1%	-11.5%	12.7%	16.3%
Lumber And Pulp	4.7%	-16.6%	4.7%	50.7%
Proteins	-0.2%	1.2%	10.2%	11.0%
Softs	-0.3%	10.0%	13.0%	13.8%
Energy	**-2.5%**	**0.9%**	**2.3%**	**15.9%**
Biofuels	-2.5%	0.9%	12.9%	22.3%
Coal	-2.5%	0.9%	23.0%	25.0%
Crude Oil	-2.2%	0.0%	-1.9%	18.5%
Natural Gas	-3.1%	0.0%	2.9%	16.5%
Petrochemicals	-2.5%	0.9%	0.5%	18.4%
Refined Products	-1.9%	3.8%	2.5%	20.2%
Metals	**-3.2%**	**7.4%**	**10.5%**	**16.0%**
Base	-5.6%	7.9%	11.1%	20.1%
Precious	-1.0%	7.0%	12.2%	18.2%

All 3 sectors and subsectors (except Lumber & Pulp) were down in July. Overall this was the worst month of the year thus far. Excluding Metals, Energy and Ags are either flat or negative for the year. 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	June 24	2024	5 Year Return	5 Year Volatility
Basis	0.4%	-1.0%	-6.1%	5.6%
Open Interest	-1.4%	-0.8%	1.0%	4.4%
Momentum	1.4%	7.5%	1.4%	5.9%
ST Momentum	-0.8%	-2.4%	-8.1%	5.6%
Trading Activity	0.4%	-1.0%	-0.2%	2.4%
Volatility	-0.2%	2.1%	2.5%	8.8%
ST Volatility	-0.1%	-4.1%	0.3%	8.1%

Our Momentum factor (12 month cumulative return minus the current month's return) had another strong showing in July (+1.4%). As explained below the model factors are long short portfolios composed of 100s of Futures, displaying a 7.5% YTD return is very unusual. 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. However in order to take advantage of these trends, ARC has created long-only tilted versions. Our findings, based on 23 years of data, are:

- Low Volatility and Low Momentum (Value), Low Basis (Extreme Backwardation) are reliable and produce much better performance and risk than traditional indices
- High Momentum performed well over the last 5 years

Contact info@assetriskcompany.com for more information, or visit us at www.assetriskcompany.com

- High Basis is reliable in underperforming the indices

Table 3: Top 5 Futures Tilted Portfolios and BCOM Performance

	Low Vol	Low Mom/Value	Low Basis	Hi Mom	BCOM
July 2024	-1.1%	-5.2%	-0.4%	0.0%	-4.5%
2024	7.3%	-6.4%	6.5%	13.3%	0.1%
Annualized	14.9%	15.3%	7.9%	15.8%	4.6%
Volatility	7.5%	24.3%	18.2%	16.7%	16.1%

*Annualized 5 years

Table 3 shows the performance of tilted equi-weighted portfolios composed of 5 liquid futures, rebalanced once a month. While July was a tough month for commodities in general (BCOM -4.5%), High Momentum was flat in July and still outperforming in 2024 (+13.3%). Please note that a portfolio of just 5 Low Vol Futures generates a Sharpe Ratio of 2 over 5 years! To give the reader 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. We encourage you to reach out to us with specific parameters you might require. We can generate a theoretical portfolio for any set of constraints. 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.

Contact info@assetriskcompany.com for more information, or visit us at www.assetriskcompany.com

Table 4: List of Futures for tilted portfolios as of 7/31/2024

CME	Live Cattle	20250430	Low Vol
CBT	Corn	20251212	Low Vol
CBT	Soybeans	20250714	Low Vol
COMEX	Gold	20241029	Low Vol
ICEEU	Brent Crude	20261102	Low Vol
CME	Lean Hogs	20241217	Low Basis
ICEUS	Cocoa	20250314	Low Basis
NYMEX	Gasoline RB	20241129	Low Basis
NYMEX	Crude Oil	20261120	Low Basis
CBT	Soybean Meal	20241014	Low Basis
ICEUS	Cocoa	20241213	High Mom
ICEUS	Coffee	20240918	High Mom
COMEX	Silver	20240926	High Mom
COMEX	Gold	20241227	High Mom
CME	Lean Hogs	20241217	High Mom

Contact info@assetriskcompany.com for more information, or visit us at www.assetriskcompany.com

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.

Table 5: Factor Exposures

Factors Exposures	BCOM	GSCI
Agriculture	0.33	0.25
Energy	0.29	0.57
Metals	0.39	0.18
Basis	-0.31	-0.31
Open Interest	2.37	2.36
Momentum	0.07	0.01
ST Momentum	-0.18	-0.12
Trading Activity	0.63	1.17
Volatility	0.16	0.20
ST Volatility	0.04	-0.14

Exposures, z-scores for BCOM and GSCI as of 7/31/2024

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 that 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. <u>The model is able to separate risk due to sector allocation and styles risk.</u> 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

Contact info@assetriskcompany.com for more information, or visit us at www.assetriskcompany.com

driven by the "crowd" expressing some thematic bet. The systematic risk is related to market risk.

Table 6: Risk Attribution of BCOM and GSCI

Index	BCOM	GSCI
Total Risk	**13.9%**	**14.0%**
Agriculture	1.0%	0.6%
Energy	1.6%	4.3%
Metals	3.8%	1.1%
Basis	0.8%	0.7%
Open Interest	6.6%	6.9%
Momentum	0.0%	0.0%
ST Momentum	0.0%	0.1%
Trading Activity	-0.4%	-0.7%
Volatility	0.2%	0.2%
ST Volatility	-0.1%	0.2%
Specific Risk	3.8%	4.1%

Ex-Ante Annual Volatility Decomposition for BCOM and GSCI as of 7/31/2024

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 July, we predict a flatish CPI, and a small decrease year-on-year (Inflation), potentially putting it below 3% for the first time since March 21. Reach out to info@assetriskcompany.com for our estimate.

Contact info@assetriskcompany.com for more information, or visit us at www.assetriskcompany.com

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	0.23	0.25	0.04	(0.04)	(0.05)	(0.07)	0.01	0.21	0.12
Energy	0.16	1.00	0.25	(0.04)	0.26	(0.17)	(0.13)	(0.17)	0.02	0.19
Metals	0.26	0.16	1.00	(0.19)	0.00	(0.05)	(0.05)	(0.03)	0.12	0.06
Basis	0.02	0.04	(0.19)	1.00	(0.27)	(0.04)	(0.12)	0.20	0.01	(0.05)
Open Interest	(0.03)	0.11	(0.08)	(0.34)	1.00	(0.29)	(0.05)	(0.61)	(0.24)	(0.08)
Momentum	0.00	(0.06)	(0.09)	(0.07)	(0.12)	1.00	0.22	0.16	0.36	(0.10)
ST Momentum	0.06	(0.19)	0.00	(0.22)	(0.10)	0.35	1.00	0.14	(0.01)	0.13
Trading Activity	0.04	(0.12)	0.03	0.18	(0.56)	0.03	0.16	1.00	0.13	0.05
Volatility	0.17	0.04	0.34	(0.18)	(0.09)	0.32	(0.09)	0.07	1.00	(0.59)
ST Volatility	0.19	0.11	(0.02)	0.12	(0.37)	0.04	0.33	0.14	(0.51)	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.

Contact info@assetriskcompany.com for more information, or visit us at www.assetriskcompany.com