



ARC Commodity Factor Risk Model Monthly Report September 2022

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 20 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
- Inflation prediction
- Examples of Style Tilted Portfolios (Low Vol, Value, Momentum, Backwardation)
- Momentum Comparison with 2008 pre-crisis
- 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	Sept. 22	YTD Perf	5-year Return	5-year Volatility*
Agriculture	-3.4%	13.5%	14.4%	11.9%
Grain And Oilseed	-3.7%	9.6%	15.8%	14.1%
Lumber And Pulp	-6.6%	-40.3%	16.5%	50.8%
Proteins	-2.3%	30.0%	12.1%	10.5%
Energy	-11.6%	10.1%	2.7%	15.8%
Biofuels	-0.9%	22.0%	15.0%	21.8%
Coal	-5.1%	111.9%	27.8%	22.3%
Crude Oil	-11.0%	-2.8%	-0.9%	18.5%
Natural Gas	-15.0%	20.6%	2.2%	15.7%
Petrochemicals	-15.5%	-4.7%	-1.4%	20.1%
Refined Products	-7.6%	15.7%	4.3%	20.9%
Metals	-1.9%	2.3%	11.6%	14.6%
Base	-5.8%	-9.6%	12.7%	18.2%
Precious	3.9%	21.5%	11.4%	16.9%

September saw a brutal correction in commodities with all sectors down. Noticeably the Energy sector was down 11.6% with Crude Oil (-11%) and Natural Gas (-15%). The Agriculture sector was down 3.6% and Base Industrial Metals were down 5.8% while Precious Metals were up 3.9%. 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 and Crude Oil have



more than 120 maturities each in the model. The model uses all of that information to derive sector and subsector returns.

Table 2. Styles Performance *Annualized 5 years

Factor	Aug-22	YTD Perf	5-year Return	5-year Volatility
Basis	-1.0%	-12.8%	-7.2%	5.7%
Open Interest	1.3%	12.2%	1.7%	4.0%
Momentum	0.7%	9.7%	2.1%	5.2%
ST Momentum	-0.5%	-6.0%	-5.8%	5.9%
Trading Activity	-0.7%	-5.3%	-0.5%	2.4%
Volatility	-0.7%	8.0%	5.8%	7.2%
ST Volatility	-1.6%	-0.6%	-0.9%	7.7%

Basis, Open Interest and Momentum are out performing their 5 year historical returns. High open interest futures tend to be the front month contracts. Remember that the factor returns are estimated through cross-sectional regression. 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.

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 August inflation number we forecast a CPI increase of 0.2% and year on year inflation decreasing to 8%.



Style Tilted Portfolios Performance Report:

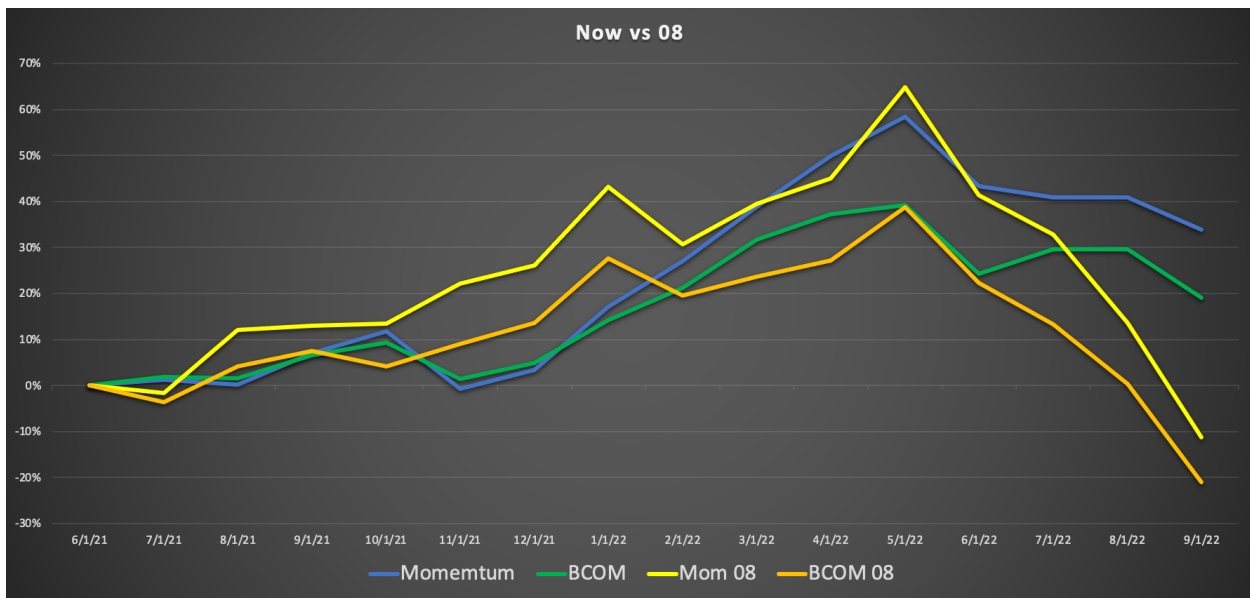
BCOM is down 8.1% while GSCI is down 7.8%. This was a massive correction and Year to date BCOM is up 13.6% and GSCI up 21.8%. All styles tilted portfolios were down this month but less than the indices. Over 5 years all tilted portfolios have better Sharpe than BCOM with Low Vol leading the way with 0.9.

Table 3. Factor Tilted Portfolios and BCOM Performance

Perf	Value	Momentum	Low Vol	Backwardation	BCOM
September	-4.8%	-5.0%	-4.3%	-6.1%	-8.1%
YTD	-5.7%	29.5%	5.4%	13.9%	13.6%
Annualized	11.6%	9.1%	8.8%	10.9%	7.0%
Volatility	15.5%	17.4%	9.6%	16.5%	16.3%

Momentum: The Canary In The Mine For Commodities

In July we wrote a note entitled “Is Momentum The Canary In The Mine For Commodities” where we compared our long tilted momentum portfolio drop in the summer of 2008, pre financial crisis, with the summer of 2022. There were eerie similarities but we cautioned at the time that “history doesn’t repeat itself, but it often rhymes”. We plotted BCOM and the tilted momentum portfolio Cumulative returns from June 2007 throughout 2008 and from June 2021 to current. We see some differences but also some similarities. We like to keep an eye on the long momentum tilted portfolio.



Comparison of Momentum tilted portfolio in 2008 and current

Factor Correlations:

There is much to note in the factor correlations matrix. First, along the top level sectors note that correlations stay roughly consistent between Agriculture, Energy and Metals. 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 4. Factor Correlations

Correlations	Agriculture	Energy	Metals	Basis	Open Interest	Momentum	ST Momentum	Trading Activity	Volatility	ST Volatility
Agriculture	1.00	0.45	0.45	(0.17)	0.09	0.10	0.03	(0.00)	0.01	0.22
Energy	0.45	1.00	0.43	0.05	0.45	(0.13)	0.06	(0.13)	(0.21)	0.47
Metals	0.32	0.54	1.00	(0.29)	0.24	0.14	0.27	(0.04)	(0.07)	0.31
Basis	0.01	0.06	(0.23)	1.00	(0.16)	(0.18)	(0.24)	0.10	(0.06)	0.04
Open Interest	(0.07)	0.50	0.26	0.01	1.00	(0.12)	(0.07)	(0.70)	(0.32)	0.10
Momentum	(0.16)	(0.33)	(0.22)	(0.10)	(0.61)	1.00	0.32	0.06	0.20	(0.14)
ST Momentum	(0.32)	(0.06)	(0.01)	(0.22)	(0.19)	0.30	1.00	0.12	0.07	0.16
Trading Activity	(0.13)	(0.10)	(0.03)	(0.35)	(0.42)	0.51	0.42	1.00	0.18	0.02
Volatility	0.18	0.17	(0.33)	0.42	(0.39)	0.37	(0.13)	0.01	1.00	(0.65)
ST Volatility	0.15	0.44	0.69	(0.19)	0.36	(0.44)	0.28	(0.07)	(0.56)	1.00

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



Commodity Indices Risk Decomposition

In terms of sector exposures, GSCI is overweight in Energy and while BCOM was equal weighted at the beginning of the year it is now 30/40/30 for Agriculture, Energy and Metals. Despite very different sector allocation, it is interesting to note that both indices have a similar Style profile, highlighting how the model can separate both sectors and styles risk. 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 6. Factor Exposures

Factors Exposures	BCOM	GSCI
Agriculture	0.34	0.25
Energy	0.36	0.61
Metals	0.29	0.13
Basis	1.08	1.04
Open Interest	2.46	2.19
Momentum	-0.05	0.02
ST Momentum	0.20	0.34
Trading Activity	0.20	0.20
Volatility	0.51	0.65
ST Volatility	0.63	0.84

Exposures, z-scores for BCOM and GSCI as of 9/30/2022



Table 7. Risk Attribution of BCOM and GSCI

Index	BCOM	GSCI
Total Risk	27.0%	29.3%
Agriculture	2.7%	1.9%
Energy	6.3%	11.2%
Metals	3.1%	1.3%
Basis	0.8%	1.0%
Open Interest	9.6%	7.6%
Momentum	0.0%	0.0%
ST Momentum	0.1%	0.4%
Trading Activity	-0.2%	-0.2%
Volatility	-1.6%	-2.0%
ST Volatility	5.1%	7.5%
Specific Risk	7.2%	6.6%

Ex-Ante Annual Volatility Decomposition for BCOM and GSCI as of 9/30/2022

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. 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.