



ARC Commodity Factor Risk Model Monthly Report September 2021

The Asset Risk Company (ARC) Commodity model is a cross-sectional commodity factor model. The model contains 50 of the most 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, open interest. The model is estimated daily with 20 years of history. It provides a framework for managing risk and investment decisions.

In this report, you will find:

- Performance of Sectors, Sub-Sectors and Style Factors
- Examples of Styles Tilted Portfolios (Low Vol, Value, Momentum, Backwardation)
- Risk Factor Decomposition of some 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, 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>.



Sectors and Factors Performance Report:

Table 1. Sectors and Subsectors Performance

Factor	Sep 2021	YTD Perf	Historical Returns*	Volatility*
Agriculture	3.1%	27.5%	10.4%	9.8%
Grain And Oilseed	2.0%	32.6%	13.1%	12.1%
Lumber And Pulp	20.0%	-1.8%	20.8%	45.5%
Proteins	2.5%	16.7%	6.9%	9.5%
Softs	4.6%	27.5%	6.1%	10.7%
Energy	6.3%	37.5%	-0.4%	13.6%
Biofuels	2.9%	58.0%	8.9%	21.7%
Coal	12.2%	66.7%	15.4%	16.3%
Crude Oil	5.7%	30.8%	-2.1%	16.2%
Natural Gas	4.0%	27.5%	-3.5%	10.8%
Petrochemicals	10.0%	48.0%	0.5%	18.1%
Refined Products	4.3%	32.9%	-1.3%	19.0%
Metals	-2.6%	14.4%	14.8%	15.0%
Base	-2.8%	39.4%	18.0%	17.9%
Precious	-2.3%	-12.8%	11.2%	17.1%

* Annualized 2017-2021

As a reminder, ARC sectors and sub-sectors returns are not estimated using a static configuration of commodity weightings. The returns come naturally from the cross-sectional regression of the 1,200 assets in the model and therefore cover the

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entire term structure. For instance NG and CL have more than 120 maturities each in the model.

Energy had a strong month and is the best performing sector YTD. The natural gas front month contract jumped by more than 30% this month. A colder fall and lower than expected injections have driven prices up dramatically. Increased demand from European and Asian customers has caused LNG exports to increase. The travails in Europe have sent ripples across the Atlantic. Lumber and Pulp is back with vengeance-rising 20% this month. Agriculture in general is having a strong year. One will note that our sub-sector Grain & Oilseed has had a Sharpe ratio of over 1 for the last 5 years. Finally Metals on the whole had a tough month but industrial metals are still up 39.4% YTD versus -12.8% for precious metals.

Table 2. Styles Performance

Factor	Sep-21	YTD	Historical Returns*	Volatility*
Basis	-1.2%	-5.8%	-5.5%	5.4%
Open Interest	1.7%	3.5%	-0.3%	3.4%
Momentum	3.1%	6.0%	1.6%	4.8%
ST Momentum	1.7%	-2.4%	-5.2%	5.2%
Trading Activity	-0.4%	2.0%	0.3%	1.8%
Volatility	-1.6%	8.0%	4.7%	6.0%
ST Volatility	1.0%	-2.9%	-2.3%	5.7%

* Annualized 2017-2021

The Momentum factor had a very strong month (+3.1%). It is also confirmed by the tilted Momentum portfolio (see below). ST Momentum is also performing well (+1.7%) which is noticeably against the historical trend. Basis is back to the historical trend (5.8% YTD).

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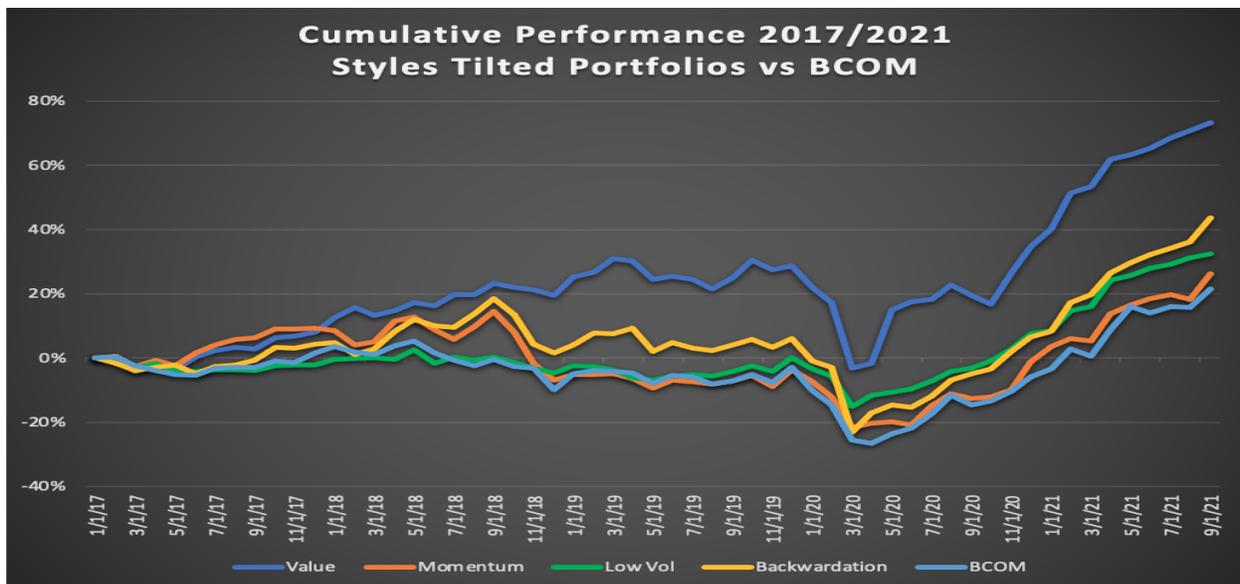
Styles Tilted Portfolios Performance Report:

Historical data going back 20 years confirms that style tilted factors out perform significantly some widely followed commodity indices. We track them on a monthly basis. The Low Vol portfolio is composed of commodities whose exposures favor low volatility. All commodity futures selected have large open interest. The other three portfolios are similarly constructed each favoring its respective factor. The portfolios are long only.

Table 3. Factor Tilted Portfolios and BCOM Performance

Returns	Value	Momentum	Low Vol	Backwardation	BCOM
2021	28.6%	27.7%	23.2%	34.8%	29.1%
Sept. 2021	1.4%	6.7%	1.0%	5.4%	5.0%
Annualized*	12.1%	4.9%	6.0%	7.8%	3.1%
Volatility*	15.3%	13.5%	9.2%	15.4%	13.2%

*2017/2021



Graph 1: Cumulative performance 2017/2021 for styles tilted portfolio vs BCOM

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As with our Momentum factor, the Momentum tilted portfolio had a very strong month (+6.7%). Backwardation is the best performing so far with an annualized volatility this year of 8.4% (versus 13.4% for BCOM). On a risk adjusted basis, all of the Styles tilted portfolios do very well against the industry benchmark YTD and over the last 5 years.

Factor Correlations:

Table 4. Factor Correlations

Correlations	Agriculture	Energy	Metals	Basis	Open Interest	Momentum	ST Momentum	Trading Activity	Volatility	ST Volatility
Agriculture	1.00	0.37	0.35	(0.23)	0.21	0.07	0.10	0.01	0.05	0.20
Energy	0.53	1.00	0.29	(0.05)	0.49	0.16	(0.08)	(0.16)	(0.01)	0.10
Metals	0.38	0.38	1.00	(0.11)	0.28	0.20	0.02	(0.05)	(0.12)	(0.03)
Basis	(0.21)	0.37	(0.00)	1.00	(0.04)	(0.09)	(0.22)	(0.02)	(0.12)	(0.15)
Open Interest	0.26	0.47	0.25	0.13	1.00	0.30	0.05	(0.50)	(0.38)	(0.27)
Momentum	0.16	0.06	0.01	(0.14)	0.64	1.00	0.11	(0.14)	(0.41)	(0.21)
ST Momentum	(0.14)	(0.37)	0.01	(0.29)	0.06	0.10	1.00	(0.13)	(0.17)	0.05
Trading Activity	(0.15)	(0.37)	(0.10)	0.06	(0.71)	(0.51)	(0.00)	1.00	0.19	0.19
Volatility	(0.15)	(0.34)	(0.27)	0.03	(0.72)	(0.67)	0.10	0.67	1.00	(0.08)
ST Volatility	0.51	0.48	0.32	(0.03)	0.14	(0.02)	0.05	(0.29)	(0.14)	1.00

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

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.

Commodity Indices Risk Decomposition

In terms of sector exposures, BCOM is approximately equal weighted, though Energy allocation is increasing. As expected, GSCI is overweight in Energy. 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, which in most cases is the most traded contract. The proportion of risk coming from sectors vs styles is an approximate even split. 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.



Table 5. Factor Exposures

Factors	BCOM	GSCI
Agriculture	0.32	0.25
Energy	0.40	0.58
Metals	0.28	0.17
Basis	0.81	0.79
Open Interest	2.65	2.71
Momentum	0.06	0.31
ST Momentum	0.22	0.36
Trading Activity	0.54	1.30
Volatility	0.58	0.59
ST Volatility	0.53	0.48

Exposures, z-scores for BCOM and GSCI as of 9/30/2021

The model allows users to track exposures to Styles factors at the contract level. For BCOM the top 2 contributors to Momentum are Crude Oil and Soybean Oil, while Brent and Gold have the lowest contributions to BCOM Momentum.

The ex-ante risk of the GSCI index continues to increase due to the spike in energy prices. Energy risk contribution to BCOM is now almost as much as Agriculture and Metals contributions combined. 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. A factor model is key as it divines not only the risk numbers but their nature. There are managers whose finger is on the pulse of the market. These people should have systematic components (and hopefully be successful). Most managers, however, avoid the market risk and base their



strategies around relative risk/performance. The risk should then be driven primarily by idiosyncratic risk, with no discernable pattern to the factor exposure.

Table 6. Risk Attribution of BCOM and GSCI

Total Risk	16.9%	17.2%
Agriculture	2.0%	1.4%
Energy	4.0%	6.2%
Metals	2.6%	1.3%
Basis	0.1%	0.1%
Open Interest	7.9%	8.1%
Momentum	0.1%	0.4%
ST Momentum	0.0%	0.0%
Trading Activity	-0.3%	-0.6%
Volatility	-0.8%	-0.8%
ST Volatility	0.7%	0.6%
Specific Risk	4.8%	3.7%

Ex-Ante Annual Volatility Decomposition for BCOM and GSCI as of 9/30/2021

Conclusion:

In this report, we have shown the factor performance driving the commodity markets. Using the ARC model, Styles 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.