ARC Commodity Factor Risk Model
Monthly Report October 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 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. You can access our latest research at https://www.assetriskcompany.com/library.html.

ARC
Asset Risk Company

Sectors and Factors Performance Report:

Table 1. Sectors and Subsectors Performance

Factor	Oct 2021	YTD Perf	Historical Returns*	Volatility*
Agriculture	**-0.4%**	**27.0%**	**10.1%**	**9.8%**
Grain And Oilseed	2.3%	35.6%	13.4%	12.0%
Lumber And Pulp	0.8%	-1.0%	20.6%	45.1%
Proteins	-3.6%	12.5%	6.0%	9.6%
Softs	-4.8%	21.4%	4.9%	10.9%
Energy	**3.5%**	**42.3%**	**0.3%**	**13.6%**
Biofuels	-0.5%	57.1%	8.6%	21.5%
Coal	-12.3%	46.2%	12.0%	17.3%
Crude Oil	4.8%	37.1%	-1.1%	16.2%
Natural Gas	3.9%	32.5%	-2.7%	10.9%
Petrochemicals	5.1%	55.5%	1.5%	18.1%
Refined Products	3.9%	38.0%	-0.5%	18.9%
Metals	**0.4%**	**14.8%**	**14.6%**	**14.9%**
Base	0.4%	39.9%	17.7%	17.8%
Precious	0.5%	-12.3%	11.1%	17.0%

* 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

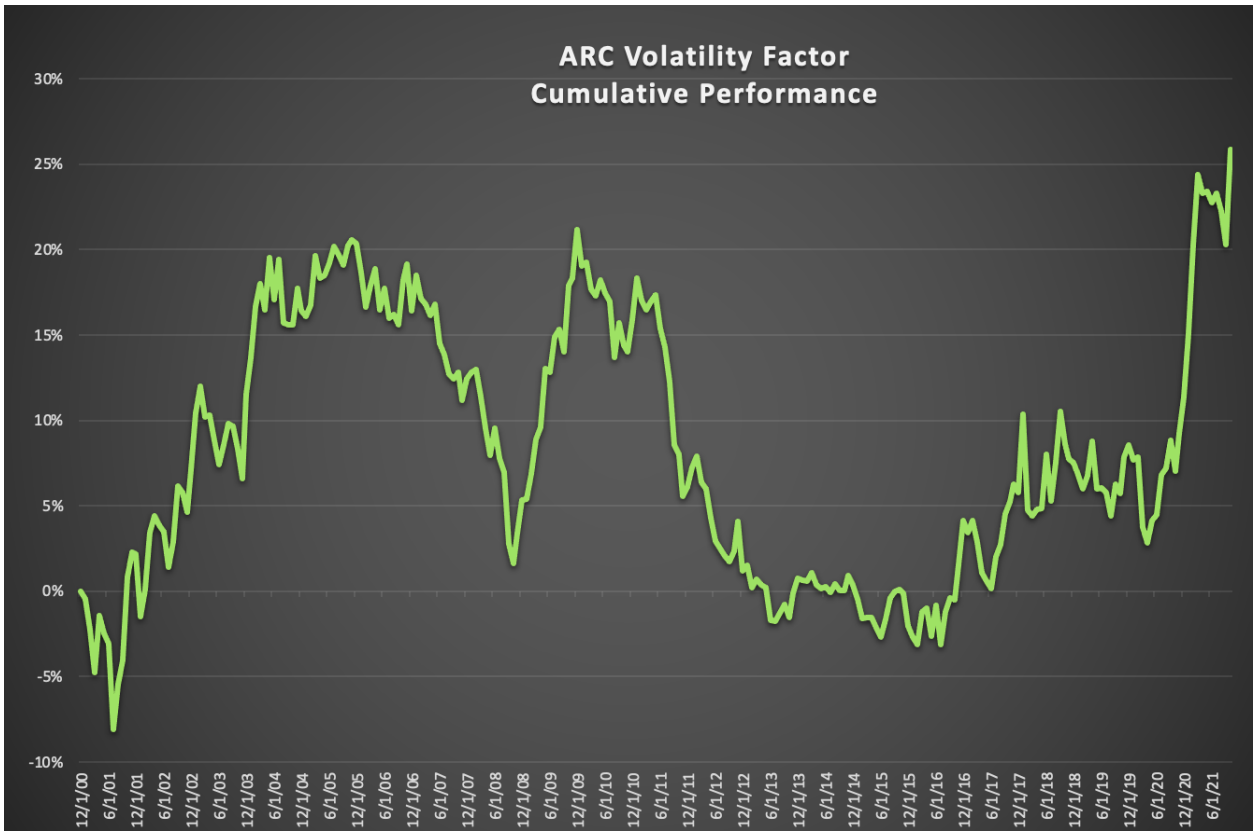
entire term structure. For instance NG and CL have more than 120 maturities each in the model. Energy had a strong month again and is the best performing sector YTD, driven by Crude Oil, Refined Products and Natural Gas. Agriculture is flat this month but we note that Grains & Oilseed had a strong month (+2.3%). Industrial metals are still performing very well this year up 39.9% year to date versus -12.3% for precious metals.

Table 2. Styles Performance

Factor	Oct-21	YTD	Historical Returns*	Volatility*
Basis	**0.9%**	**-5.0%**	**-5.3%**	**5.4%**
Open Interest	**0.6%**	**4.1%**	**-0.1%**	**3.4%**
Momentum	**-1.0%**	**5.0%**	**1.3%**	**4.8%**
ST Momentum	**-2.1%**	**-4.4%**	**-5.5%**	**5.2%**
Trading Activity	**-0.6%**	**1.4%**	**0.2%**	**1.8%**
Volatility	**4.6%**	**13.0%**	**5.6%**	**6.0%**
ST Volatility	**-5.6%**	**-8.4%**	**-3.4%**	**5.7%**

* Annualized 2017-2021

Both short term and long term Momentum had some pull back in October after a very strong September. The story this month is the significant uptick in the Volatility factor (252d historical). We plot below the cumulative returns of the Volatility factor over the last 20 years. We are at historical high, so it is worth keeping an eye on this factor. After the Covid crisis, the factor was on a tear and we believe managers who had moved away from the most volatile Futures, in particular front months contracts, were penalized.



Graph 1: Cumulative performance ARC Volatility Factor 2001/2021

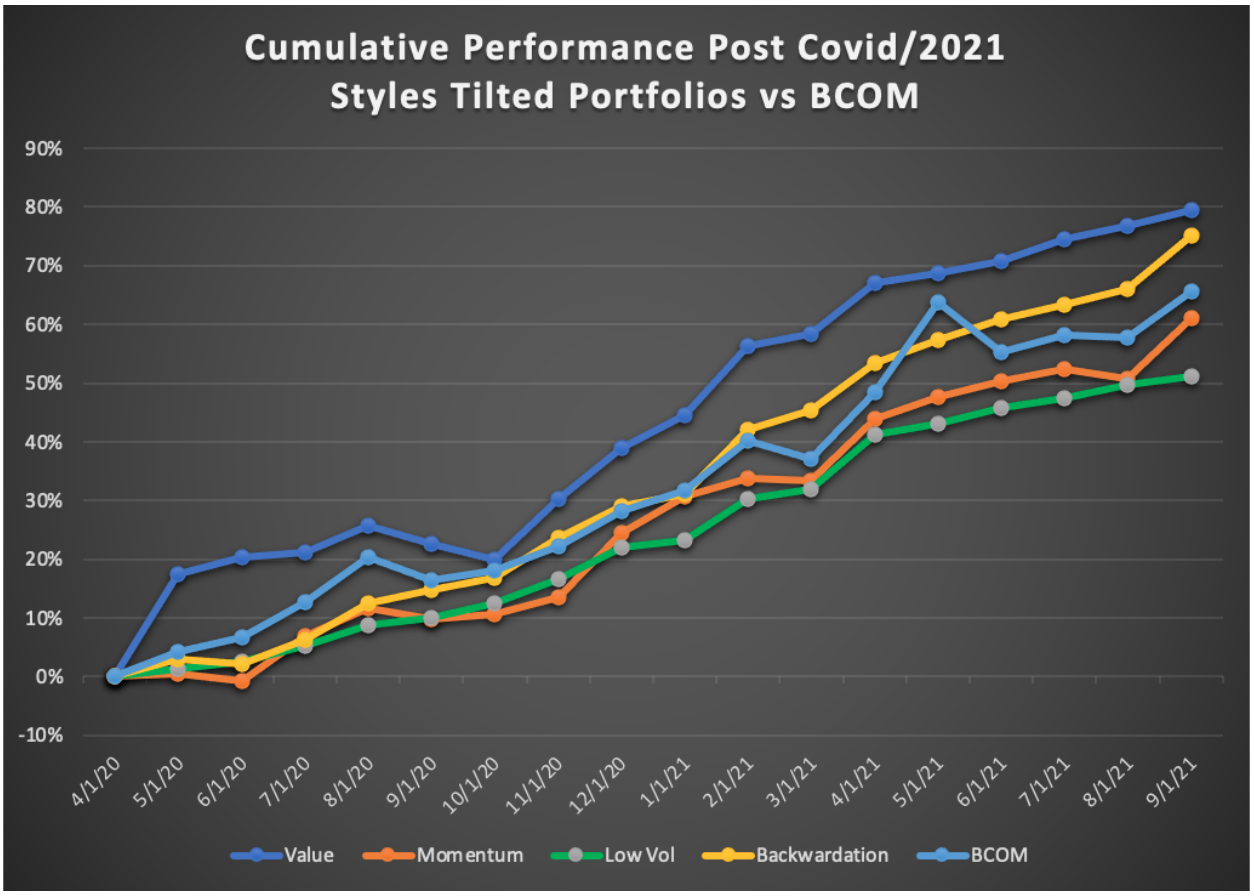
Styles Tilted Portfolios Performance Report:

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
YTD	32.1%	35.0%	26.3%	38.4%	32.5%
Oct. 2021	2.3%	4.4%	2.0%	2.0%	2.6%
Annualized*	13.9%	6.9%	6.8%	9.2%	4.1%
Volatility*	15.1%	13.6%	9.1%	15.1%	13.8%

*2017/2021



Graph 2: Cumulative performance Post Covid 2021 for styles tilted portfolio vs BCOM

The Momentum tilted portfolio (10 assets only) had another strong month (+4.4%), despite a slow month for the factor that reflects all assets in the model. Value, Momentum, Backwardation Portfolios are on par with the index for YTD performance, but with a realized volatility almost half of the index.

Factor Correlations:

Table 4. Factor Correlations

Correlations	Agriculture	Energy	Metals	Basis	Open Interest	Momentum	ST Momentum	Trading Activity	Volatility	ST Volatility
Agriculture	1.00	0.35	0.40	(0.32)	0.18	0.20	0.18	0.01	0.05	0.17
Energy	0.40	1.00	0.32	(0.04)	0.43	0.28	0.01	(0.21)	(0.10)	0.19
Metals	0.51	0.45	1.00	(0.12)	0.22	0.23	0.07	(0.06)	(0.05)	0.00
Basis	(0.27)	0.48	(0.11)	1.00	(0.06)	(0.04)	(0.18)	(0.04)	(0.25)	(0.03)
Open Interest	0.18	0.15	(0.12)	0.20	1.00	0.35	0.07	(0.53)	(0.38)	(0.23)
Momentum	0.51	0.26	0.24	(0.05)	0.16	1.00	0.11	(0.16)	(0.35)	(0.17)
ST Momentum	0.46	0.33	0.24	(0.03)	0.16	0.32	1.00	(0.14)	(0.16)	0.09
Trading Activity	(0.05)	(0.33)	0.11	(0.34)	(0.49)	(0.07)	(0.18)	1.00	0.21	0.15
Volatility	0.18	(0.40)	0.21	(0.54)	(0.48)	(0.10)	(0.17)	0.42	1.00	(0.26)
ST Volatility	0.07	0.69	0.09	0.59	0.33	0.12	0.31	(0.44)	(0.80)	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. 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	0.24
Energy	0.39	0.60
Metals	0.28	0.16
Basis	0.80	0.79
Open Interest	2.36	2.52
Momentum	0.08	0.24
ST Momentum	0.22	0.53
Trading Activity	0.85	0.63
Volatility	0.37	0.34
ST Volatility	0.31	0.07

Exposures, z-scores for BCOM and GSCI as of 10/29/2021

The model allows users to track exposures to Styles factors at the contract level. Key contributors to Momentum are driven by energy futures in both BCOM and GSCI.

Energy is the largest contribution to both indices. To note sectors risk represents around 50% of the total risk for BCOM and GSCI, the rest coming from Styles factors and idiosyncratic 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. 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	**15.9%**	**16.9%**
Agriculture	1.9%	1.3%
Energy	3.8%	6.0%
Metals	2.9%	1.3%
Basis	0.3%	0.3%
Open Interest	6.6%	7.7%
Momentum	0.1%	0.4%
ST Momentum	0.1%	0.6%
Trading Activity	-0.4%	-0.4%
Volatility	-0.7%	-0.8%
ST Volatility	0.5%	0.1%
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.