ARC Commodity Factor Risk Model
Monthly Report April 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, and over 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. 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 Factor Tilted Portfolios (Low Vol, Value, Momentum)
- Popular Commodity Index (BCOM, GSCI) Risk Factor Decomposition

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 & Factors Performance Report:

Sectors/Sub-sectors	April 2021	YTD Perf	Historical Returns*	Volatility*
Agriculture	**6.0%**	**18.9%**	**9.6%**	**10.2%**
Grain And Oilseed	7.6%	25.3%	12.9%	12.6%
Lumber And Pulp	47.7%	69.5%	39.5%	43.0%
Proteins	0.5%	10.6%	6.3%	9.9%
Softs	1.8%	3.9%	1.8%	10.5%
Energy	**5.6%**	**16.3%**	**-4.2%**	**13.5%**
Biofuels	24.4%	50.5%	8.6%	22.3%
Coal	4.9%	13.2%	7.0%	14.9%
Crude Oil	7.7%	18.3%	-4.6%	16.6%
Natural Gas	-0.1%	4.4%	-8.2%	9.9%
Petrochemicals	1.7%	13.4%	-5.4%	17.4%
Refined Products	6.7%	20.5%	-3.6%	19.5%
Metals	**6.5%**	**14.4%**	**16.3%**	**15.3%**
Base	8.9%	31.2%	18.2%	18.3%
Precious	3.3%	-5.6%	14.4%	17.4%

* Annualized 2017-2021

Except for Precious Metals, all sectors are positive this year so far with quite a few with double digits returns. As the economies are reopening with the worst of the pandemic behind us, commodities are in massive rally mode. Lumber and Pulp is 70% up year to date after a 98% performance in 2020. A rise in Oil prices and a new administration seen more friendly on environmental issues have driven Biofuels up 50% YTD. Grains and Oilseed are up 25% YTD and Base Metals are up 30% so far. The commodity super cycle is meeting the post pandemic rush and things look like they are only beginning to heat up!

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.

Factors	Apr-21	YTD	Historical Returns*	Volatility*
Basis	**-0.4%**	**-3.6%**	**-5.5%**	**5.6%**
Open Interest	**1.5%**	**0.8%**	**-0.9%**	**3.4%**
Momentum	**0.6%**	**0.8%**	**0.5%**	**4.8%**
ST Momentum	**-1.7%**	**-5.3%**	**-6.3%**	**5.0%**
Trading Activity	**0.1%**	**0.6%**	**0.1%**	**1.9%**
Volatility	**-1.0%**	**10.6%**	**5.7%**	**6.1%**
ST Volatility	**-1.3%**	**-5.2%**	**-3.0%**	**5.8%**

* Annualized 2017-2021

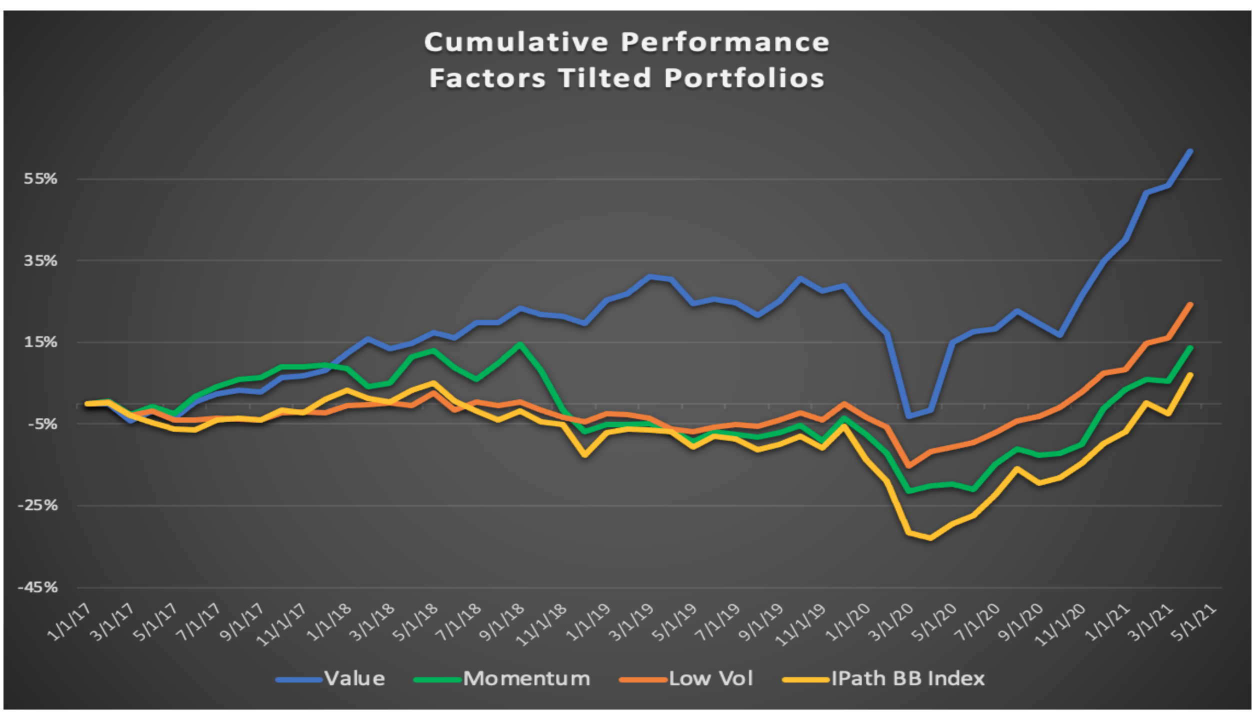
On the Styles side, we notice that the Volatility factor, on a tear since the April of last year, finally came to a stop this month. It could be significant as this factor captured risk for front months contracts and had a significant impact on the GSCI index for instance vs the BCOM index.

Factor Tilted Portfolios Performance Report:

In order to illustrate the power of the model, ARC calculates three factor tilted portfolios. They are the Low Vol, Momentum and Value portfolios. The Low Vol is composed of commodities whose exposures favor low volatility. All commodity futures selected have large open interest. The other two portfolios are similarly constructed. It was a very strong month for the main indices (BB COM up 8.3% and GSCI 8.2%). The factor tilted portfolios underperformed this month compared to the indices. But Value is still outperforming BB COM YTD and the Low Vol portfolio is in line with the Index for a realized volatility 70% lower.

Returns	Value	Momentum	Low Vol	IPath BB Index
2021	20.0%	15.0%	15.4%	15.8%
April 2021	5.5%	7.9%	7.0%	8.3%
Annualized*	11.5%	3.0%	5.0%	1.9%
Volatility*	15.9%	14.0%	9.5%	13.3%

*2017/2021



Factor Correlations:

Correlations	Agriculture	Energy	Metals	Basis	Open Interest	Momentum	ST Momentum	Trading Activity	Volatility	ST Volatility
Agriculture	1.00	0.39	0.25	(0.05)	0.07	(0.15)	0.02	0.04	0.39	0.09
Energy	(0.04)	1.00	0.23	(0.17)	0.42	0.01	0.03	(0.12)	0.30	(0.06)
Metals	0.34	0.28	1.00	(0.11)	0.08	(0.02)	(0.03)	0.01	0.07	0.01
Basis	(0.21)	(0.69)	(0.34)	1.00	(0.07)	(0.14)	(0.18)	(0.07)	(0.04)	(0.19)
Open Interest	(0.15)	0.46	0.33	(0.29)	1.00	(0.01)	0.00	(0.42)	(0.08)	(0.26)
Momentum	(0.22)	0.08	0.31	(0.06)	0.68	1.00	0.16	0.02	(0.12)	(0.20)
ST Momentum	0.03	(0.01)	(0.34)	(0.13)	(0.11)	(0.25)	1.00	(0.15)	(0.28)	0.14
Trading Activity	0.56	0.11	0.32	(0.21)	(0.13)	(0.19)	(0.31)	1.00	0.01	0.15
Volatility	0.17	(0.08)	(0.17)	0.14	(0.48)	(0.69)	0.07	0.28	1.00	(0.42)
ST Volatility	0.44	0.37	(0.11)	(0.36)	(0.40)	(0.66)	0.28	0.27	0.35	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, with only the Agriculture/Energy correlation changing dramatically. Long term correlations between sectors and style factors are also relatively low with the highest being Energy/Open Interest with 0.42. As we will point out below for the risk indices analysis, the model is able to separate sector allocation risk from styles risk, providing key insights in the real key drivers of risk and performance of a portfolio.

Commodity Indices Risk Decomposition

Next, we turn to the exposure and ex-ante annual volatility of the two indices BCOM and GSCI as of 4/30/2021. In terms of sector exposures, BCOM is currently fairly equi-weighted while, as expected, GSCI is overweight in Energy. For the style factors both indices have similar exposures except with respect to the volatility factors. The higher exposures come from the more volatile energy commodities. 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 and, in most cases, is the most traded contract. It is worth noting that despite very different sector allocations the current risk estimates for both indices is similar, around 15% annualized. Also the proportion of risk coming from sectors vs styles is around 50% for both. As shown above in the correlation tables, sectors correlations with styles factors are relatively small. The model is able to separate risk due to sectors allocation and styles risk.

Index	BB COM	GSCI
Agriculture	0.37	0.29
Energy	0.32	0.53
Metals	0.31	0.18
Basis	0.57	0.58
Open Interest	2.41	2.40
Momentum	0.50	0.80
ST Momentum	0.22	-0.02
Trading Activity	0.10	0.03
Volatility	0.38	0.56
ST Volatility	0.22	0.56

Exposures, z-scores for BCOM and GSCI as of 4/30/2021

All risk is not equal. Systematic risk can display non normal behavior when compared to specific or idiosyncratic risk. We can make an analogy to bad cholesterol and good cholesterol, where both are cholesterol but one is believed to increase cardiac risk and the other ameliorates it. Both types of risks are driven by fluctuation, but systematic risk is driven by the “crowd”. Because these are common factors, the systematic risk is market risk. A factor model is key as it divines not only the risk numbers but their nature. As expected most of the risk for long only indices is systematic. The make of the risk systematic/specific is as important as the raw risk number.

Index	BCOM	GSCI
Total Risk	**14.8%**	**15.4%**
Agriculture	1.9%	1.5%
Energy	2.9%	5.3%
Metals	2.6%	1.1%
Basis	-0.2%	-0.3%
Open Interest	6.8%	6.5%
Momentum	0.2%	0.4%
ST Momentum	0.1%	0.0%
Trading Activity	0.0%	0.0%
Volatility	0.4%	0.8%
ST Volatility	-0.3%	-0.2%
Specific Risk	3.7%	3.6%

Ex-Ante Annual Volatility Decomposition for BCOM and GSCI as of 4/30/2021

Conclusion:

In this report, we have shown the factor performance driving the commodity markets. The strong performance of the commodity markets this month was mostly uniform. Using the ARC model, we have built factor tilted portfolios that 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.