ARC Commodity Factor Risk Model
Monthly Report January 2022

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
- Inflation prediction
- 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* Annualized 2017-2021

Sectors/Subsectors	Jan 2022	2021 Perf	Historical Returns*	Volatility*
Agriculture	**6.1%**	**36.9%**	**12.5%**	**10.5%**
GrainAnd Oilseed	7.0%	42.3%	15.3%	12.2%
Lumber And Pulp	-16.2%	71.0%	28.5%	48.4%
Proteins	6.8%	19.7%	8.4%	10.0%
Energy	**8.4%**	**40.1%**	**1.6%**	**14.0%**
Biofuels	1.2%	77.8%	11.1%	21.2%
Coal	16.2%	41.8%	14.0%	18.4%
Crude Oil	10.2%	37.6%	0.9%	16.7%
Natural Gas	2.8%	27.5%	-2.8%	10.7%
Petrochemicals	9.9%	40.5%	1.3%	19.0%
Refined Products	10.1%	39.9%	1.7%	19.6%
Metals	**3.7%**	**16.9%**	**15.1%**	**14.9%**
Base	3.3%	50.7%	19.3%	17.9%
Precious	4.3%	-17.7%	10.1%	16.9%

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 NG and CL have more than 120 maturities each in the model.

Commodities started the year with a bang, after a fantastic 2021. All 3 sectors are up this month and except for the wild, Lumber & Pulp (which was up 70% last year), all subsectors are up this month. Energy subsectors, are all up double digits this year with the exception of Natural Gas which is up more modestly. Grains, Oil and Seeds in Ags are still in rally mode. Overall if one thought that commodities had reached their acme, January certainly corrected this assumption. Both Energy and Ags performance in the last two months will have a significant impact on customers and inflation as we will show below.

Table 2. Styles Performance

Factor	Jan-22	2022	Historical Returns*	Volatility*
Basis	**-1.0%**	**-6.4%**	**-5.5%**	**5.3%**
Open Interest	**2.2%**	**-0.1%**	**-0.5%**	**3.7%**
Momentum	**1.5%**	**0.6%**	**0.7%**	**4.9%**
ST Momentum	**-0.1%**	**-9.7%**	**-6.3%**	**5.3%**
Trading Activity	**-1.7%**	**4.0%**	**0.4%**	**2.2%**
Volatility	**1.1%**	**9.7%**	**4.9%**	**6.3%**
ST Volatility	**2.0%**	**-2.2%**	**-1.6%**	**6.5%**

* Annualized 2017-2021

Momentum and Volatility started the year very strongly. 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 practical to trade and consist of positions (both long and short) in many of the instruments in the model’s universe. We provide 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. With inflation at 7.0% in December, the highest in 40 years, expectations are high for next month's print. Commodities contribute a large part to the CPI. 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. All indicators are flashing red for the sectors/factors influencing our estimate of CPI. For January we see an increase of 0.6% for CPI. Commodities alone could drive the year to year change of consumer inflation to 7.5%.

Styles Tilted Portfolios Performance Report:

Commodity indices started the year zooming, with BCOM up +8.8% and GSCI up +11.6%. The ARC Momentum tilted portfolio outperformed both indices with +13.3% return. Backwardation and Value were up +7.7% and +5%. Low Vol had a very poor start this year with a +2.7% return. These portfolios are long only. 20 years of data show they all outperform both indices. We are probably in for a very volatile year.

Table 3. Factor Tilted Portfolios and BCOM Performance

Year	Value	Momentum	Low Vol	Backwardation	BCOM
2022	5.0%	13.3%	2.7%	7.7%	8.8%
2021	33.4%	24.8%	27.9%	32.4%	27.1%
2020	8.2%	4.1%	8.0%	2.4%	-3.1%
2019	8.7%	3.8%	5.0%	5.0%	7.7%
2018	11.2%	-13.9%	-2.2%	-1.8%	-11.2%
2017	8.4%	9.8%	-2.0%	4.6%	1.6%
Annualized	14.4%	7.5%	7.3%	9.4%	5.3%
Volatility	14.9%	15.4%	9.1%	15.7%	13.9%

*2017/2021

Factor Correlations:

Table 4. Factor Correlations

Correlations	Agriculture	Energy	Metals	Basis	Open Interest	Momentum	ST Momentum	Trading Activity	Volatility	ST Volatility
Agriculture	1.00	0.33	0.42	(0.28)	0.20	0.31	0.16	0.01	(0.11)	0.24
Energy	0.24	1.00	0.30	0.08	0.49	0.21	(0.07)	(0.25)	(0.24)	0.33
Metals	0.47	0.25	1.00	(0.05)	0.21	0.30	0.06	(0.04)	(0.04)	0.00
Basis	(0.21)	(0.21)	(0.24)	1.00	0.05	(0.06)	(0.17)	(0.12)	(0.18)	0.04
Open Interest	0.17	0.50	0.02	0.07	1.00	0.42	0.09	(0.59)	(0.41)	(0.07)
Momentum	0.42	(0.06)	0.08	(0.05)	0.23	1.00	0.21	(0.16)	(0.26)	(0.14)
ST Momentum	0.19	(0.24)	(0.10)	(0.14)	0.14	0.61	1.00	(0.14)	(0.01)	(0.02)
Trading Activity	(0.07)	(0.22)	0.09	(0.05)	(0.61)	0.00	(0.02)	1.00	0.24	(0.03)
Volatility	(0.13)	0.11	(0.08)	0.01	(0.38)	(0.04)	(0.04)	0.26	1.00	(0.36)
ST Volatility	0.44	0.04	0.05	(0.18)	0.21	0.23	0.18	(0.28)	(0.54)	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 the 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. We also note the large positive exposure to Trading activity for GSCI.

Table 5. Factor Exposures

Factors	BCOM	GSCI
Agriculture	0.35	0.24
Energy	0.32	0.60
Metals	0.33	0.16
Basis	0.80	0.88
Open Interest	2.55	2.30
Momentum	-0.46	-0.06
ST Momentum	0.49	0.82
Trading Activity	0.56	1.49
Volatility	0.29	0.34
ST Volatility	0.27	0.12

Exposures, z-scores for BCOM and GSCI as of 1/31/2022

The model allows users to track exposures to Styles factors at the contract level. Open Interest is the largest contributing factor for both indices followed by Energy. Note that styles' risk contribution to the total risk is larger than sectors' contributions, for both BCOM and GSCI. It really highlights the fact that looking at sectors or sub-sectors allocation for a commodity portfolio is not enough. 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.

Table 6. Risk Attribution of BCOM and GSCI

Total Risk	**18.2%**	**17.9%**
Agriculture	1.9%	1.1%
Energy	**3.3%**	**6.8%**
Metals	3.4%	1.3%
Basis	1.0%	1.3%
Open Interest	**8.7%**	**7.5%**
Momentum	-0.6%	-0.1%
ST Momentum	0.4%	1.0%
Trading Activity	-0.6%	-1.2%
Volatility	-0.7%	-0.7%
ST Volatility	0.6%	0.2%
Specific Risk	**5.4%**	**4.7%**

Ex-Ante Annual Volatility Decomposition for BCOM and GSCI as of1/31/2022

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.