ARC Commodity Factor Risk Model
Monthly Report March 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 decision making.

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.

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Sectors and Factors Performance Report:

Table 1. Sectors and Subsectors Performance* Annualized 5 years

Sectors/Subsectors	March 22	YTD Perf	5-year Return	5-year Volatility*
Agriculture	**2.3%**	**14.4%**	**15.1%**	**10.6%**
GrainAnd Oilseed	3.1%	15.0%	18.2%	12.2%
Lumber And Pulp	-3.1%	-8.1%	27.9%	48.9%
Proteins	0.4%	12.8%	9.6%	10.2%
Energy	**8.0%**	**22.7%**	**5.9%**	**14.4%**
Biofuels	-3.1%	3.7%	10.2%	21.5%
Coal	17.6%	60.6%	21.5%	21.2%
Crude Oil	7.2%	21.2%	4.6%	16.9%
Natural Gas	17.7%	27.4%	3.3%	13.3%
Petrochemicals	1.5%	15.3%	4.8%	18.7%
Refined Products	12.2%	30.6%	7.9%	20.3%
Metals	**3.5%**	**13.4%**	**14.0%**	**14.5%**
Base	4.6%	12.2%	17.9%	17.5%
Precious	2.0%	15.1%	9.5%	17.0%

Commodities are still on fire. All three sectors are up double digits already this year. Crude Oil, Refined Products and Natural Gas are up more than 20% year to date. Coal is up 17% this past month and 60% on year to date. Both Base and Precious Metals are up. High inflation, the chase for yield, and geopolitical instability has helped precious metals. 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. At the end of this quarter, commodities are the only asset class performing for investors. If Inflation is not transitory, appetite for commodity exposures should increase.

Table 2. Styles Performance *Annualized 5 years

Factor	March-22	YTD Perf	5-year Return	5-year Volatility
Basis	**1.8%**	**0.0%**	**-5.6%**	**5.3%**
Open Interest	**1.8%**	**3.7%**	**-0.1%**	**3.8%**
Momentum	**3.1%**	**5.9%**	**1.7%**	**5.2%**
ST Momentum	**-5.8%**	**-5.8%**	**-6.6%**	**5.7%**
Trading Activity	**0.5%**	**-0.7%**	**0.5%**	**2.2%**
Volatility	**-5.4%**	**-3.7%**	**3.6%**	**6.7%**
ST Volatility	**0.6%**	**2.6%**	**0.2%**	**7.0%**

When it comes to Styles, the first quarter is all about Momentum. 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 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. 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. We predicted an inflation of 7.5% in January and 7.9% in February. For March we see again an increase with the threshold of 8% passed above. Reach out to us if you wish to get more information.

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Styles Tilted Portfolios Performance Report:

Commodity indices are on fire YTD, with BCOM up +25.5% and GSCI up +29.0%, providing a source of diversification for investors in Q1. With inflation heating up, commodity allocations should be a larger portion of investor allocation. Unfortunately the performance of the two indices over a longer period (10+ years) has been poor. Most funds or ETFs offered to investors track these two indices or play on curves and roll strategies with limited upside. Our research indicates that real premia exists with Style factors such as Low Volatility and Low Momentum (Value).

As mentioned above Q1 was all about Momentum, the tilted portfolio is up +34.3% YTD. We are still wary of this factor, as it can mean revert quickly and brutally.

Table 3. Factor Tilted Portfolios and BCOM Performance

Year	Value	Momentum	Low Vol	Backwardation	BCOM
March	1.7%	9.3%	5.0%	7.2%	8.6%
YTD	12.0%	34.3%	12.2%	20.0%	25.5%
5-yr Perf	17.2%	12.0%	9.9%	12.8%	7.2%
5-yr Volatility	14.8%	16.1%	9.3%	15.9%	14.4%

Factor Correlations:

Table 4. Factor Correlations

Correlations	Agriculture	Energy	Metals	Basis	Open Interest	Momentum	ST Momentum	Trading Activity	Volatility	ST Volatility
Agriculture	1.00	0.41	0.48	(0.30)	0.15	0.31	0.26	0.03	(0.11)	0.31
Energy	0.54	1.00	0.45	(0.05)	0.38	0.20	0.24	(0.13)	(0.26)	0.52
Metals	0.59	0.84	1.00	(0.26)	0.24	0.24	0.30	(0.05)	(0.05)	0.25
Basis	(0.38)	(0.38)	(0.63)	1.00	(0.12)	(0.09)	(0.37)	0.01	(0.07)	(0.05)
Open Interest	0.10	0.24	0.39	(0.45)	1.00	0.17	0.01	(0.68)	(0.44)	(0.02)
Momentum	0.32	0.24	0.23	(0.15)	(0.36)	1.00	0.36	(0.04)	(0.14)	0.02
ST Momentum	0.45	0.61	0.61	(0.52)	(0.09)	0.64	1.00	0.07	0.05	0.15
Trading Activity	0.13	0.13	(0.01)	0.11	(0.73)	0.30	0.24	1.00	0.26	0.14
Volatility	(0.12)	(0.23)	(0.13)	0.11	(0.47)	0.24	0.18	0.36	1.00	(0.41)
ST Volatility	0.40	0.72	0.56	(0.18)	(0.06)	0.18	0.29	0.36	(0.48)	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. 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 a large negative exposure to Trading activity (Volume change over one day) for both indices, happening in the last few days of the month. It could be the sign of a maturity related rebalancing or a change of allocation and profits taking.

Table 5. Factor Exposures

Factors	BCOM	GSCI
Agriculture	0.34	0.24
Energy	0.33	0.61
Metals	0.33	0.15
Basis	1.02	1.00
Open Interest	2.50	2.27
Momentum	0.22	0.72
ST Momentum	0.44	0.53
Trading Activity	**-2.21**	**-1.93**
Volatility	0.34	0.42
ST Volatility	0.26	0.59

Exposures, z-scores for BCOM and GSCI as of 3/31/2022

The model pick-ups a significant increase in level of risk for both indices. Annualized Ex-Ante Volatility jumped from around 19% last month for both indices to 26% for BCOM and 29% for GSCI, this month.

Table 6. Risk Attribution of BCOM and GSCI

Index	BCOM	GSCI
Total Risk	**26.3%**	**28.9%**
Agriculture	1.9%	1.4%
Energy	4.2%	9.0%
Metals	4.0%	1.7%
Basis	-0.3%	-0.2%
Open Interest	**10.6%**	**8.1%**
Momentum	0.2%	1.1%
ST Momentum	1.3%	1.9%
Trading Activity	**3.6%**	**2.3%**
Volatility	-1.0%	-1.3%
ST Volatility	1.1%	4.3%
Specific Risk	6.2%	7.1%

Ex-Ante Annual Volatility Decomposition for BCOM and GSCI as of 3/31/2022

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. We note an unusually high level of risk contribution from Trading Activity as noted above for their exposures. ST Momentum and ST Volatility are contributing significantly to GSCI risk. Note that styles' risk contribution to the total risk is larger than sectors' contributions, for both BCOM and GSCI. 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.