



## **ARC Commodity Factor Risk Model Monthly Report February 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)
- Unexpected Returns from High Volatility Commodities
- Popular Commodity Index (BCOM, GSCI) Risk Factor Decomposition
- Macro correlations of SPX, 10 Yr rate, DXY with our factors.

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>.



## Factor Performance Report:

Factor	Feb 2021 Perf	YTD Perf	Historical Returns*	Volatility*
<b>Agriculture</b>	7.4%	9.2%	7.8%	10.0%
Grain And Oilseed	9.7%	12.7%	10.6%	12.4%
Lumber And Pulp	-1.4%	9.2%	27.2%	37.9%
Proteins	4.3%	5.2%	5.3%	9.8%
Softs	5.2%	3.5%	1.8%	10.6%
<b>Energy</b>	5.1%	9.8%	-5.7%	13.5%
Biofuels	0.6%	17.5%	2.6%	19.4%
Coal	3.1%	2.1%	4.7%	14.8%
Crude Oil	7.2%	11.0%	-6.2%	16.4%
Natural Gas	0.7%	3.9%	-8.6%	10.0%
Petrochemicals	5.6%	12.0%	-5.9%	17.6%
Refined Products	7.7%	12.5%	-5.3%	19.7%
<b>Metals</b>	10.0%	4.4%	14.5%	15.4%
Base	18.4%	12.3%	14.6%	18.1%
Precious	-0.9%	-5.9%	15.0%	17.5%

\* Annualized 2017-2021



Factor	Feb 2021 Perf	YTD	Historical Returns*	Volatility*
<b>Basis</b>	-1.8%	-2.4%	-5.5%	5.7%
<b>Open Interest</b>	0.3%	1.5%	-0.8%	3.3%
<b>Momentum</b>	-0.6%	1.3%	0.7%	4.8%
<b>ST Momentum</b>	-0.9%	-3.0%	-6.0%	5.0%
<b>Trading Activity</b>	-0.3%	-0.8%	-0.3%	1.8%
<b>Volatility</b>	4.5%	8.0%	5.4%	6.0%
<b>ST Volatility</b>	-2.0%	-4.1%	-2.9%	5.9%

\* Annualized 2017-2021

Agriculture and Energy were up significantly this month. We will note a very strong month for Grain & Oilseed (+9.7%). Lumber is down for the first time in a while after a fantastic run. Crude Oil (+7.2%) is back with the barrel of WTI above \$60. The end of the pandemic could drive up a lot of these commodities. Base Metals (+18.4%) which includes copper is clearly another example. After a very strong 2020, Precious Metals are down so far this year.

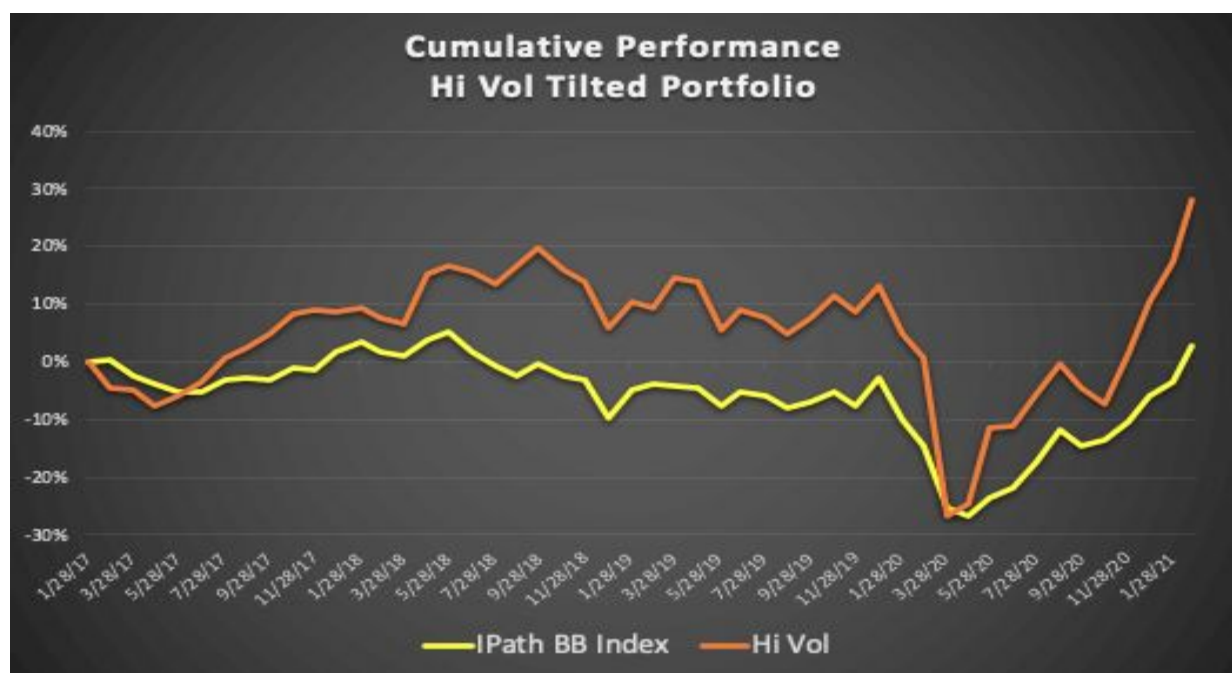
As a reminder, ARC sectors and sub-sectors returns are not estimated using a static configuration of commodity weightings. The returns come naturally from the cross-sectional regression of the 1,200 assets in the model and therefore cover the entire term structure.

On the Styles side, Volatility and Short Term Momentum Factors continue their historical and recent trend. Volatility is defined as the 252 day (one business year) historical volatility for each future in the model. Starting in April 2020, the factor return has been on an upward trajectory and posted a +29% return over the last year. Volatility is not considered a “Premia” factor, if anything it is something risk managers and traders avoid. Given its sustained performance, we think it makes sense to look a bit more in

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detail at the factor. We highlighted the volatility factor in our previous month's analysis<sup>1</sup>. It is possible to replicate a factor coming from a cross-sectional model. These portfolios are called Factor Mimicking Portfolios. The drawback of these portfolios is the large number of constituents (in our case, in the thousand). In order to test the "Volatility" factor we decided on a simpler approach. Every month we created an equi-weighted portfolio made up of 10 futures that have the highest z-scores in our model (with a small constraint to satisfy liquidity concerns). Below, we plot the cumulative returns over the last 5 years.



It is quite surprising to see how well the Volatility tilted portfolio performed. It would be interesting to extend the historical period of the model to investigate the stability of this factor's performance. Specifically, it would be interesting to note its performance around the time of the Great Financial Crisis.

<sup>1</sup> See [https://www.assetriskcompany.com/docs/ARC\\_CommodityModel\\_Monthly\\_202102.pdf](https://www.assetriskcompany.com/docs/ARC_CommodityModel_Monthly_202102.pdf)

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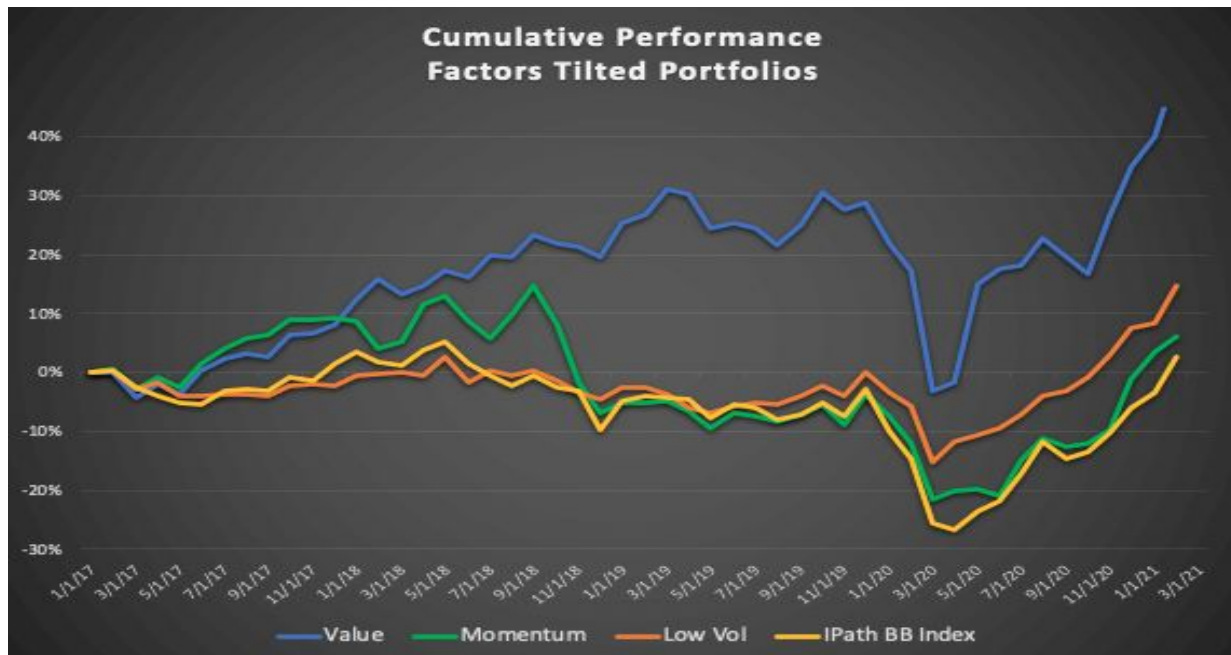


## Factor Tilted Portfolios Performance Report:

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. The other two portfolios are similarly constructed. Value continues its historical trend with a strong month and year to date (+12.4%)

Returns	Value	Momentum	Low Vol	IPath BB Index
2021	12.4%	7.2%	6.7%	9.3%
February 2021	8.1%	2.3%	5.8%	6.5%
Annualized*	10.5%	1.4%	3.3%	15.5%
Volatility*	15.8%	13.8%	8.8%	12.6%

\*2017/2021



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## Factor Correlations:

Correlations	Agriculture	Energy	Metals	Basis	Open Interest	Momentum	ST Momentum	Trading Activity	Volatility	ST Volatility
<b>Agriculture</b>	1.00	0.53	0.47	0.22	0.15	(0.26)	(0.25)	(0.23)	0.34	0.24
<b>Energy</b>	0.69	1.00	0.42	(0.18)	0.33	(0.27)	(0.31)	(0.29)	0.17	0.22
<b>Metals</b>	0.43	0.23	1.00	0.07	0.12	(0.15)	(0.20)	(0.15)	0.07	0.21
<b>Basis</b>	(0.49)	(0.18)	(0.08)	1.00	0.13	(0.00)	(0.05)	0.02	0.09	(0.12)
<b>Open Interest</b>	0.12	0.26	0.31	0.10	1.00	(0.19)	(0.18)	(0.37)	(0.02)	(0.05)
<b>Momentum</b>	0.14	0.39	0.09	0.16	(0.08)	1.00	0.32	0.09	(0.11)	(0.15)
<b>ST Momentum</b>	0.13	(0.01)	0.39	0.19	(0.15)	0.36	1.00	0.10	(0.24)	0.04
<b>Trading Activity</b>	(0.39)	(0.21)	(0.44)	0.31	(0.57)	(0.01)	(0.07)	1.00	0.00	(0.04)
<b>Volatility</b>	0.40	0.23	0.06	(0.58)	0.00	(0.28)	(0.54)	(0.36)	1.00	(0.55)
<b>ST Volatility</b>	0.05	(0.10)	(0.45)	(0.32)	(0.60)	(0.27)	(0.14)	0.48	0.04	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 Metals/Energy correlation changing dramatically. In the Style camp, the Momentum exposure's correlation to the other style factors has changed drastically. This might be something to monitor.

## Commodity Indices Risk Decomposition

Next, we turn to the ex-ante annual volatility of the two indices BCOM and GSCI as of 2/26/2021. We compute and present the factor attribution of the total volatility of each index, respectively. Sectors contribution in terms of risk are even between Agriculture, Energy and Metals for BCOM, while, as expected, Energy contributes significantly more than the other sectors for GSCI. Styles factors contribute to 49% and 57% of the total volatility for BCOM and GSCI. Both have significant exposure to Open Interest, reflecting a bias towards the front of the curve (short maturity contracts are more volatile). The Volatility factor contribution is significant for GSCI due to an overweight in volatile futures, most likely in the energy sector.

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.

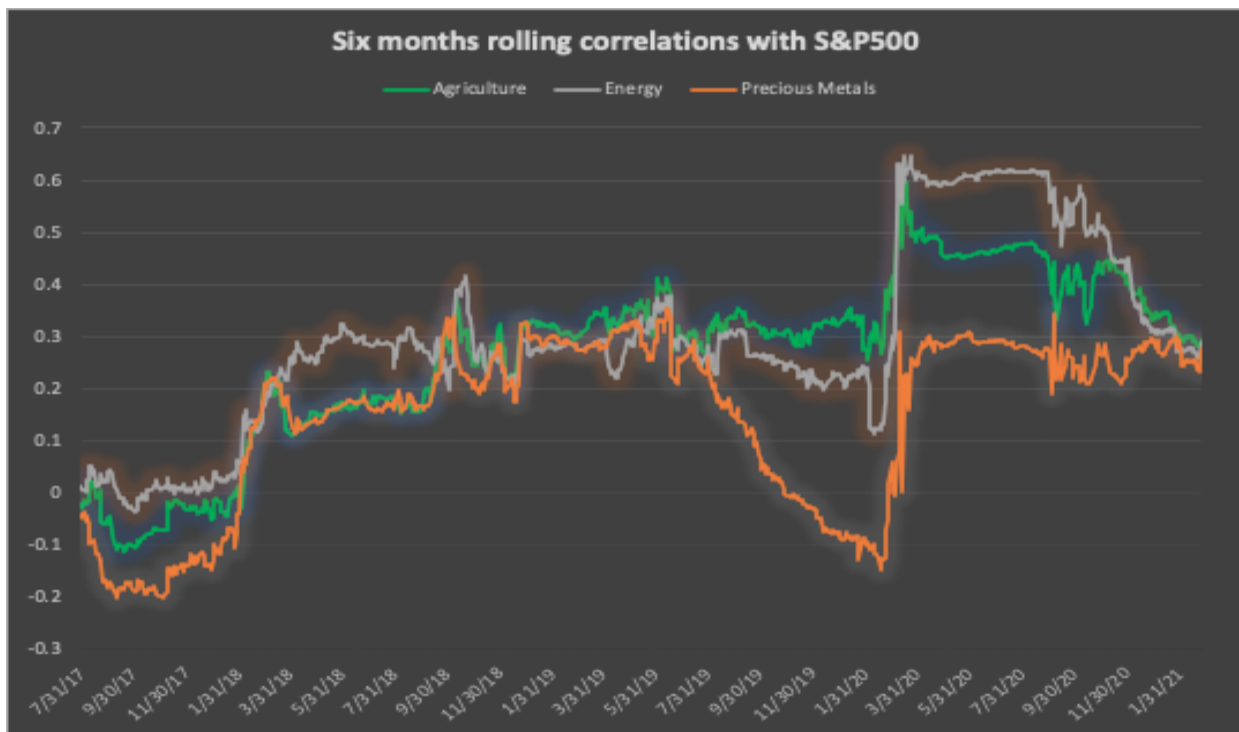
Index	BCOM	GSCI
<b>Total Risk</b>	<b>18.4%</b>	<b>21.7%</b>
Agriculture	2.7%	1.7%
Energy	3.3%	6.1%
Metals	3.0%	1.1%
Basis	0.5%	0.4%
Open Interest	6.8%	5.9%
Momentum	-0.4%	-0.3%
ST Momentum	-0.2%	-0.6%
Trading Activity	0.6%	0.5%
Volatility	1.9%	6.7%
ST Volatility	0.0%	-0.3%
<b>Specific Risk</b>	<b>3.8%</b>	<b>4.1%</b>

Ex-Ante Annual Volatility Decomposition for BCOM and GSCI as of 2/26/2021

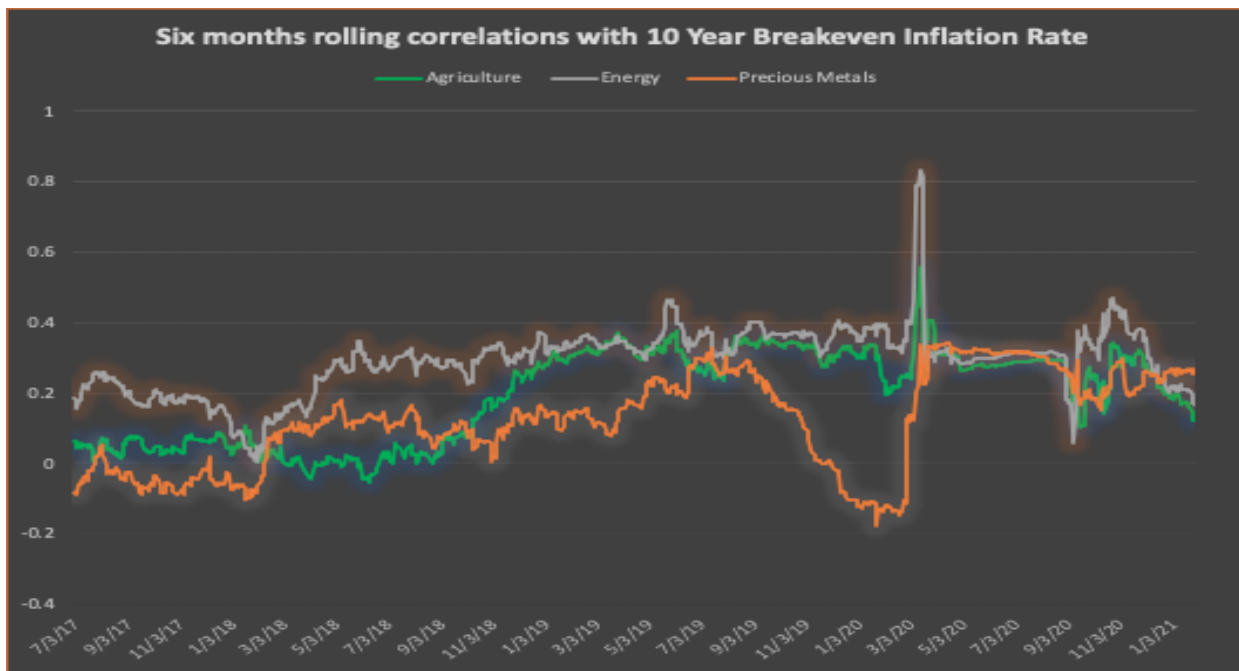


## Macro Correlations

Commodities as an asset class are often seen as a diversifier. They also can be used as a hedge against inflation. To this effect, we track the 6 month rolling correlations between our Agriculture, Energy sectors, and the Precious Metals sub-sectors versus the S&P 500, the 10-year breakeven inflation rates and the Dollar Index (DXY). After a spike due to the Covid-10 pandemic, correlations between the equity market and commodities are back to low values (see Graphs below). We see similar features with the 10-year breakeven inflation rates.







We then looked at the rolling correlation with the DXY index. We can clearly see that the correlations between the Dollar Index and Precious Metals are on a downward trend currently at  $-0.7^2$ . The Dollar Index has weakened while Precious Metals has had a very good year. Expectations are for the Dollar to continue to weaken as the recovery of the pandemic will trigger a rotation away from US assets. It will be interesting to see how the correlations continue to evolve versus Precious Metals.

<sup>2</sup> Recall that using the Fisher transformation, we can calculate the standard error of the correlation coefficient as approximately  $\text{SQRT}(1/(N-3))$  where N is the sample size. Using the sample size  $N = 125$  gives us the result that  $\pm 0.09$  is the standard error. Implying anything beyond  $\pm 0.2$  is significant.



## Conclusion:

In this report, we have shown the factor performance driving the commodity markets. The performance of the markets was centered on Agriculture and Energy sub sectors like Crude Oil. 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. Finally, we show the correlations between the factors and major economic indicators. 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.