# ARC Commodity Factor Risk Model
# Monthly Report August 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 some 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.

ARC
Asset Risk Company

## Sectors and Factors Performance Report:

**Table 1. Sectors and Subsectors Performance**

| Factor | Aug 2021 | YTD Perf | Historical Returns* | Volatility* |
|---|---|---|---|---|
| **Agriculture** | **2.4%** | **23.6%** | **9.8%** | **9.9%** |
| Grain And Oilseed | 2.9% | 30.0% | 12.8% | 12.2% |
| Lumber And Pulp | -9.6% | -18.2% | 16.5% | 45.2% |
| Proteins | -0.4% | 13.9% | 6.5% | 9.5% |
| Softs | 5.3% | 21.8% | 5.2% | 10.7% |
| **Energy** | **0.1%** | **29.4%** | **-1.7%** | **13.4%** |
| Biofuels | -1.1% | 53.5% | 8.4% | 21.8% |
| Coal | 10.4% | 48.6% | 12.8% | 15.6% |
| Crude Oil | -2.2% | 23.7% | -3.3% | 16.1% |
| Natural Gas | 4.1% | 22.6% | -4.4% | 10.7% |
| Petrochemicals | -0.6% | 34.5% | -1.5% | 17.7% |
| Refined Products | -2.5% | 27.4% | -2.2% | 19.1% |
| **Metals** | **-2.4%** | **17.4%** | **15.7%** | **15.1%** |
| Base | -1.5% | 43.4% | 19.0% | 18.0% |
| Precious | -3.4% | -10.7% | 12.0% | 17.2% |

* Annualized 2017-2021

Agriculture is having a strong year except Lumber and Pulp which suffered a correction this year after an outstanding 2020. Grains and Softs are up 30% & 22% year to date, respectively. Energy is up 29% year to day, with a strong month again for Natural Gas

and Coal (4.1% and 10.4% respectively). Precious Metals have had a tough year so far, while Base Metals are up 43.4% YTD with an average loss of 1.5% for August. Overall, though we do not see a massive performance for August, we do not see a slowdown in commodity prices in either Ags or Energy directly affecting consumers. 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.

**Table 2. Styles Performance**

| Factor | Aug-21 | YTD | Historical Returns* | Volatility* |
|---|---|---|---|---|
| **Basis** | **-0.93%** | **-4.7%** | **-5.4%** | **5.4%** |
| **Open Interest** | **0.18%** | **1.8%** | **-0.6%** | **3.4%** |
| **Momentum** | **0.46%** | **2.8%** | **0.9%** | **4.7%** |
| **ST Momentum** | **-0.52%** | **-4.1%** | **-5.6%** | **5.2%** |
| **Trading Activity** | **0.70%** | **2.4%** | **0.4%** | **1.8%** |
| **Volatility** | **-0.84%** | **9.8%** | **5.1%** | **6.0%** |
| **ST Volatility** | **-1.42%** | **-3.9%** | **-2.5%** | **5.7%** |

* Annualized 2017-2021

Noticeably the Volatility factor is still up 10%, quite above its historical performance. It is important to track this factor as the more volatile Futures tend to be in the front month and the most traded. As we have seen repeatedly, Short Momentum and Basis provide a steady return (through a short position).

## Styles Tilted Portfolios Performance Report:

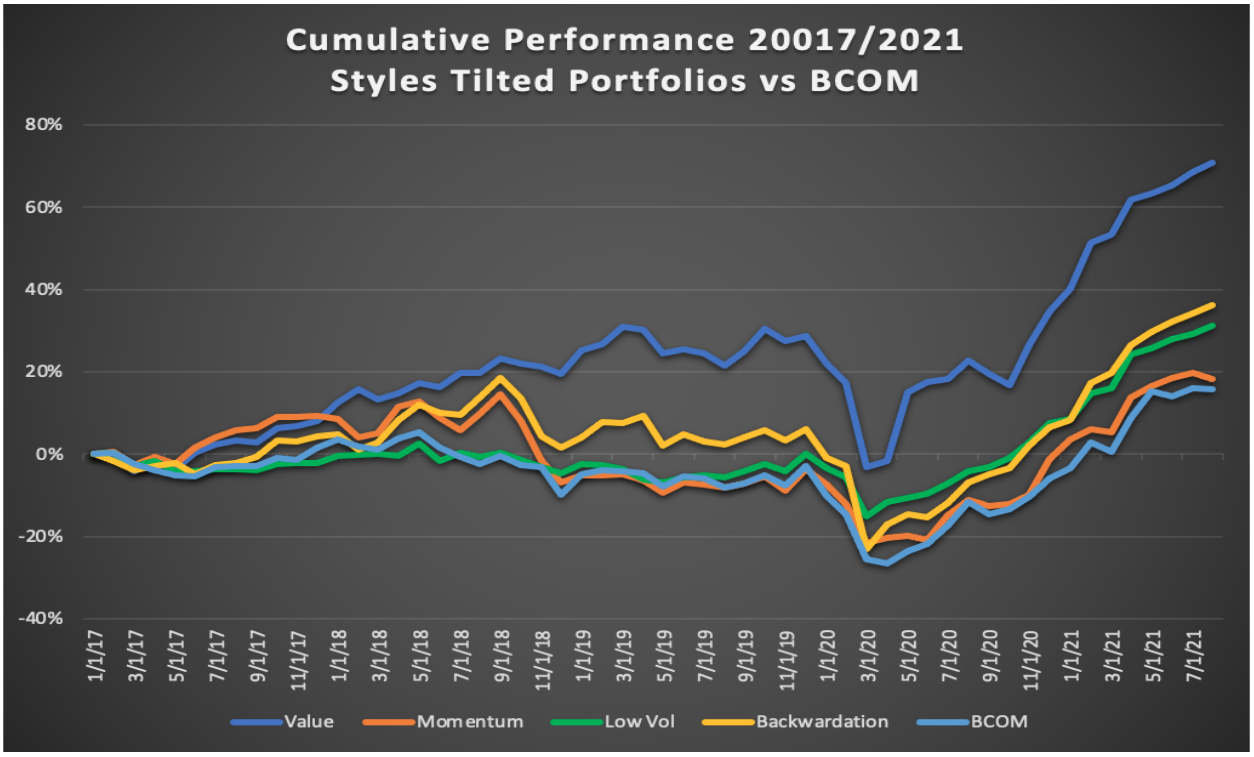
Historical data going back 20 years confirms that style tilted factors out perform significantly the commodity indices. We track them on a monthly basis. The Low Vol portfolio is composed of commodities whose exposures favor low volatility. All

commodity futures selected have large open interest. The other three portfolios are similarly constructed each favoring its respective factor. The portfolios are long only. August was a strong month for all portfolios except Momentum. On a risk adjusted basis, all of the Styles tilted portfolios dominate the industry benchmark.

**Table 3. Factor Tilted Portfolios and BCOM Performance**

| Returns | Value | Momentum | Low Vol | Backwardation | BCOM |
|---|---|---|---|---|---|
| 2021 | 26.8% | 19.7% | 22.0% | 27.8% | 23.0% |
| Aug. 2021 | 1.4% | -1.2% | 1.5% | 1.5% | -0.3% |
| Annualized* | 11.9% | 3.6% | 5.9% | 6.7% | 3.1% |
| Volatility* | 15.4% | 13.6% | 9.3% | 15.4% | 13.2% |

*2017/2021




Graph 1: Cumulative performance 2017/2021 for styles tilted portfolio vs BCOM

## Factor Correlations:

**Table 4. Factor Correlations**

| Correlations | Agriculture | Energy | Metals | Basis | Open Interest | Momentum | ST Momentum | Trading Activity | Volatility | ST Volatility |
|---|---|---|---|---|---|---|---|---|---|---|
| Agriculture | 1.00 | 0.39 | 0.35 | (0.21) | 0.22 | 0.05 | 0.06 | (0.01) | 0.11 | 0.15 |
| Energy | 0.43 | 1.00 | 0.29 | (0.08) | 0.52 | 0.15 | (0.10) | (0.18) | 0.08 | 0.03 |
| Metals | 0.41 | 0.55 | 1.00 | (0.10) | 0.26 | 0.18 | 0.02 | (0.07) | (0.11) | (0.02) |
| Basis | (0.36) | 0.13 | 0.33 | 1.00 | (0.05) | (0.10) | (0.21) | (0.04) | (0.11) | (0.18) |
| Open Interest | 0.44 | 0.71 | 0.65 | 0.26 | 1.00 | 0.23 | 0.01 | (0.49) | (0.24) | (0.33) |
| Momentum | 0.40 | 0.42 | 0.44 | 0.15 | 0.65 | 1.00 | 0.08 | (0.10) | (0.29) | (0.23) |
| ST Momentum | (0.29) | (0.57) | (0.42) | (0.20) | (0.56) | (0.40) | 1.00 | (0.12) | (0.22) | 0.07 |
| Trading Activity | (0.16) | (0.45) | (0.49) | (0.26) | (0.56) | (0.39) | 0.34 | 1.00 | 0.10 | 0.23 |
| Volatility | (0.25) | (0.44) | (0.44) | (0.37) | (0.68) | (0.65) | 0.39 | 0.57 | 1.00 | (0.17) |
| ST Volatility | 0.02 | 0.20 | 0.14 | (0.16) | (0.25) | (0.34) | 0.11 | (0.25) | 0.12 | 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. The proportion of risk coming from sectors vs styles is an approximate even split. 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 | 0.33 | 0.26 |
| Energy | 0.37 | 0.56 |
| Metals | 0.30 | 0.18 |
| Basis | 0.79 | 0.77 |
| Open Interest | 2.41 | 2.46 |
| Momentum | 0.19 | 0.50 |
| ST Momentum | 0.14 | -0.22 |
| Trading Activity | 0.81 | 0.54 |
| Volatility | 0.51 | 0.63 |
| ST Volatility | 0.39 | 0.63 |

Exposures, z-scores for BCOM and GSCI as of 8/31/2021

For the first time in a while the ex-ante risk of the GSCI index is higher than BCOM's. 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**

| Index | BCOM | GSCI |
|---|---|---|
| **Total Risk** | **16.1%** | **14.9%** |
| Agriculture | 2.2% | 1.7% |
| Energy | 3.7% | 5.4% |
| Metals | 3.0% | 1.5% |
| Basis | -0.1% | -0.3% |
| Open Interest | 7.2% | 5.8% |
| Momentum | 0.2% | 0.3% |
| ST Momentum | 0.0% | 0.1% |
| Trading Activity | -0.4% | 0.3% |
| Volatility | -0.5% | 0.0% |
| ST Volatility | 0.1% | -0.2% |
| Specific Risk | 4.0% | 3.4% |

Ex-Ante Annual Volatility Decomposition for BCOM and GSCI as of 8/31/2021

## 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.