



ARC Commodity Factor Risk Model Monthly Report February 2023

The Asset Risk Company (ARC) Commodity Model is a cross-sectional commodity factor model. The model contains 50 of the most widely 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, and open interest. The model is estimated daily with 21 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
- Examples of Style Tilted Portfolios (Low Vol, Value, Momentum, Backwardation)
- Inflation prediction
- Risk Factor Decompositions 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, but 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>.



Sectors and Factors Performance Report:

Table 1. Sectors and Subsectors Performance* Annualized 5 years

| Sectors/Subsectors | Feb 23 | YTD | 5-year Return | 5-year Volatility* |
|--------------------|--------------|--------------|---------------|--------------------|
| Agriculture | -0.3% | -2.1% | 13.8% | 11.8% |
| Grain And Oilseed | -1.3% | -3.0% | 15.7% | 13.9% |
| Lumber And Pulp | -21.5% | -52.1% | 10.8% | 51.9% |
| Proteins | 3.5% | 34.6% | 12.3% | 10.5% |
| Energy | -3.2% | -5.0% | 2.1% | 15.8% |
| Biofuels | 0.6% | -5.3% | 13.1% | 21.9% |
| Coal | -1.0% | -1.4% | 25.8% | 22.5% |
| Crude Oil | -3.8% | -5.2% | -1.8% | 18.6% |
| Natural Gas | -4.1% | 27.9% | 1.9% | 15.7% |
| Petrochemicals | -3.1% | -5.9% | -2.1% | 20.0% |
| Refined Products | -4.0% | 29.6% | 3.9% | 20.8% |
| Metals | -6.5% | -1.7% | 9.8% | 15.5% |
| Base | -5.5% | 1.8% | 10.4% | 18.9% |
| Precious | -8.9% | 37.1% | 12.3% | 17.9% |

Is this the year when commodities go back to their old behavior? Too early to tell, but so far, year to date all 3 sectors are negative. For subsectors, Proteins (Lean Hogs, Live Cattles) is positive with +34.6% YTD. Natural Gas and Refined Products are still up double digits YTD (+27.9% and +29.6%). February saw a correction for both Industrials and Precious Metals (-5.5% and -8.9%). 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, Natural Gas has more



than 120 maturities in the model. The model uses all of that information to derive sector and subsector returns and one can think of our sectors as risk weighted on the entire curve.

Table 2. Styles Performance *Annualized 5 years

| Factor | Feb 23 | 2023 | 5-year Return | 5-year Volatility |
|-------------------------|---------------|--------------|----------------------|--------------------------|
| Basis | -1.1% | 0.1% | -6.6% | 5.5% |
| Open Interest | -0.1% | -0.6% | 1.4% | 4.1% |
| Momentum | -0.9% | -5.8% | -0.1% | 6.0% |
| ST Momentum | -1.6% | -3.9% | -7.4% | 5.9% |
| Trading Activity | -0.1% | 0.4% | -0.3% | 2.3% |
| Volatility | -1.6% | -5.8% | 2.6% | 8.5% |
| ST Volatility | 2.2% | 3.4% | 0.4% | 8.3% |

Our Momentum factor, continues its drop with a YTD performance of -5.8%-an outlier compared to the historical data¹. Short Term Momentum continues to perform exceptionally (from the short perspective). Except for Short Volatility, all factors are negative this month. 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 most of the instruments in the model’s universe. We provide a much more parsimonious factor tilted (long only) portfolios later in this analysis.

Style Tilted Portfolios Performance Report:

All style tilted portfolios outperformed BCOM in February. The BCOM commodity index is down 4.7% in February while GSCI is down 3.8%. As expected in this environment

¹ In a previous note on momentum we warned that the momentum train breaks down abruptly and brutally.



the Low Vol portfolio is down only 0.7% this month. Note that over the past 5 years all tilted portfolios have better Sharpe ratios than BCOM, with Low Vol and Value leading the way.

Table 3. Factor Tilted Portfolios and BCOM Performance

| Perf | Value | Momentum | Low Vol | Backwardation | BCOM |
|-------------|-------|----------|---------|---------------|-------|
| Feb 2023 | -2.9% | -2.1% | -0.7% | -1.9% | -4.7% |
| 2023 | 0.3% | -4.1% | -1.2% | -4.8% | -5.2% |
| Annualized* | 11.0% | 9.3% | 9.1% | 11.2% | 5.3% |
| Volatility* | 15.6% | 17.4% | 9.7% | 16.6% | 15.9% |

*Annualized 5 years

Inflation:

We find that the ARC Commodity Model is a good predictor of breakout moves in the headline number, both in bouts of inflation and deflation. For the upcoming February inflation number we forecast an increase of 0.4% for CPI and year on year inflation decreasing to 6.0%.

Factor Correlations:

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.

Table 6. Factor Correlations

| Correlations | Agriculture | Energy | Metals | Basis | Open Interest | Momentum | ST Momentum | Trading Activity | Volatility | ST Volatility |
|------------------|-------------|--------|--------|--------|---------------|----------|-------------|------------------|------------|---------------|
| Agriculture | 1.00 | 0.44 | 0.37 | (0.04) | 0.06 | (0.03) | (0.18) | (0.07) | 0.10 | 0.18 |
| Energy | (0.36) | 1.00 | 0.38 | 0.15 | 0.50 | (0.27) | (0.14) | (0.23) | (0.12) | 0.36 |
| Metals | (0.09) | 0.22 | 1.00 | (0.11) | 0.23 | 0.03 | (0.02) | (0.13) | (0.09) | 0.26 |
| Basis | 0.13 | 0.09 | (0.13) | 1.00 | (0.22) | (0.21) | 0.06 | 0.28 | 0.01 | 0.11 |
| Open Interest | (0.40) | 0.53 | 0.27 | (0.14) | 1.00 | (0.27) | (0.11) | (0.71) | (0.34) | 0.21 |
| Momentum | 0.11 | 0.16 | 0.07 | (0.52) | (0.20) | 1.00 | 0.20 | 0.10 | 0.38 | (0.29) |
| ST Momentum | 0.23 | 0.03 | (0.12) | (0.43) | (0.14) | 0.56 | 1.00 | 0.13 | 0.05 | 0.06 |
| Trading Activity | 0.19 | (0.40) | (0.30) | 0.08 | (0.71) | 0.09 | 0.08 | 1.00 | 0.20 | (0.13) |
| Volatility | 0.22 | 0.17 | (0.20) | (0.22) | (0.40) | 0.78 | 0.39 | 0.28 | 1.00 | (0.71) |
| ST Volatility | 0.04 | (0.28) | (0.03) | 0.18 | 0.09 | (0.61) | (0.39) | (0.21) | (0.75) | 1.00 |

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1 yr correlations on the right (above the diagonal), 30 days on left (below the diagonal).

Commodity Indices Risk Decomposition

GSCI is overweight in Energy and BCOM is roughly equally weighted between sectors. 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. Both indices exposure to Momentum is negative vs the overall universe of futures in the model.

Table7. Factor Exposures

| Factors Exposures | BCOM | GSCI |
|--------------------------|-------------|-------------|
| Agriculture | 0.33 | 0.26 |
| Energy | 0.30 | 0.58 |
| Metals | 0.36 | 0.16 |
| Basis | 0.11 | 0.09 |
| Open Interest | 2.39 | 2.00 |
| Momentum | -0.31 | -0.44 |
| ST Momentum | -0.21 | 0.01 |
| Trading Activity | -0.52 | -0.49 |
| Volatility | 0.20 | 0.42 |
| ST Volatility | 0.01 | 0.11 |

Exposures, z-scores for BCOM and GSCI as of 2/28/2023



Table 8. Risk Attribution of BCOM and GSCI

| Index | BCOM | GSCI |
|-------------------------|--------------|--------------|
| Total Risk | 21.7% | 22.2% |
| Agriculture | 2.2% | 1.6% |
| Energy | 4.0% | 9.0% |
| Metals | 4.2% | 1.5% |
| Basis | -0.2% | -0.1% |
| Open Interest | 11.1% | 8.2% |
| Momentum | 0.2% | 0.5% |
| ST Momentum | 0.2% | 0.9% |
| Trading Activity | -0.4% | -0.8% |
| Volatility | -0.2% | 0.1% |
| ST Volatility | 0.2% | 0.6% |
| Specific Risk | 4.9% | 5.6% |

Ex-Ante Annual Volatility Decomposition for BCOM and GSCI as of 2/28//2023

We use a 6 month half life for this risk decomposition so the model is fairly reactive to market conditions. Despite different sector allocations, both indices have similar risk and exposures to styles. If your portfolio is long/short you want to see if you have systematic exposures or whether idiosyncratic risk predominates. For long only managers, you want to find your exposures versus your benchmark. 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.