Commodity Investment Insight

Sector characteristics

November 6, 2019
Examining sector characteristics and asset allocation

Introduction

Commodities have long been a staple investment of multi-asset investors. Traditionally, its main benefits to portfolios was seen to be as a diversifier to equity and fixed income exposures and as a hedge against inflation. It has also been popular with trend-following CTA funds. More recently, commodities have been included as a source of alternative risk premia. When included in portfolios as a diversifying asset class or an inflation hedge, commodities investments have typically been accessed via the use of benchmark indices. Broad equity and fixed income benchmark indices generally include hundreds, or even thousands, of securities and since these securities are usually market value-weighted in the benchmark index, the risk and return characteristics of various broad market benchmark indices are quite similar. On the other hand, broad commodity benchmark indices include a much smaller number of instruments and allocate differently across their constituent commodities. As a result, even broad commodity benchmark indices can have different risk exposures and return characteristics.

Thus, for passive investors, the choice of a benchmark index determines the properties of the investment and the decision should be made thoughtfully. For example, the Bloomberg Commodity Index (BCOM), the S&P GSCI index and the Rogers International Commodity index have different eligible commodities and weight allocations. Over a one year period ending October 2019, their total returns were -2.6%, -10.0% and -3.4% respectively. For the purposes of this paper, given its widespread usage, we focus on the BCOM index.

The BCOM index includes 23 commodities that are weighted according to liquidity and production measures, subject to certain limits to facilitate diversification. Individual commodity weights in the BCOM index can differ significantly, from just over 1% for wheat to over 12% for gold. Index rules limit the notional weight allocated to individual commodities, groups of commodities and their derivatives, as well as larger groups of commodities (e.g. Grains, Precious Metals, Energy etc.). Sub-indices are published for five sectors: energy, industrial metals, precious metals, agriculture and livestock.

While all commodities share the characteristics of being physical goods requiring extraction and/or cultivation, their price dynamics and risk profiles vary considerably. Individual commodity returns are affected by a number of distinct factors, which include industrial production and growth (energy and industrial metals), harvest cycles and weather (agriculture and livestock) and their usefulness as a store of value.
(precious metals). Not surprisingly then, long term correlations between sectors are low—ranging from 0.15 to 0.3 over the past 30-40 years. In comparison, the average correlation between four segments in the US fixed income market (Treasuries, investment grade corporates, high yield corporates and securitized products) is 0.5—with pairwise correlations ranging from 0 to 0.7. The average sector correlation in US equities is approximately 0.6.
The literature covering optimal portfolio construction is extensive. Focused primarily on equities and fixed income, it covers topics such as balancing risk contributions and combining traditional asset class risk premia (beta) with alternative risk premia. Commodities have been less well-covered. In prior publications we have focused on the inflation-hedging capabilities of commodity sectors (Inflation and Commodities: Examining the Link, April 2019) and commodity-based risk premia strategies (Structural Sources of Excess Return, December 2011). In this publication, we focus on commodity sectors as investment building blocks. Traditional commodity benchmark indices introduce diversification via the use of notional weight limits. However, due to the wide range of individual commodity and sector volatilities these indices can have concentrated risk exposures. We analyze sector risk and return characteristics and outline a transparent, rules-based approach to constructing alternative-weight, risk-balanced benchmark indices.

**Data**

The BCOM index was launched in 1998. Historical information for certain sectors goes back to 1960. In this paper, we use the index data from the BCOM family of indices starting in 1991, when all five sectors have data available. Total return indices are constructed by adding the 3-month US Treasury return to the return of the relevant commodity futures return (excess return). Figure 1 contains the Bloomberg Terminal tickers for the sector indices we reference.

**Figure 1: Sector indices: Bloomberg tickers**

<table>
<thead>
<tr>
<th>Commodity sector</th>
<th>Inception date</th>
<th>Excess return ticker</th>
<th>Total return ticker</th>
<th>3-Month Total return ticker</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>Mar 1960</td>
<td>BCOMAG Index</td>
<td>BCOMAGTR Index</td>
<td>BCOMAG3T</td>
</tr>
<tr>
<td>Livestock</td>
<td>Jan 1987</td>
<td>BCOMLI Index</td>
<td>BCOMLITR Index</td>
<td>BCOMLI3T</td>
</tr>
<tr>
<td>Precious metals</td>
<td>Jan 1975</td>
<td>BCOMPR Index</td>
<td>BCOMPRTR Index</td>
<td>BCOMPR3T</td>
</tr>
<tr>
<td>Industrial metals</td>
<td>Jan 1991</td>
<td>BCOMIN Index</td>
<td>BCOMINTR Index</td>
<td>BCOMIN3T</td>
</tr>
<tr>
<td>Energy</td>
<td>Jan 1984</td>
<td>BCOMEN Index</td>
<td>BCOMENTR Index</td>
<td>BCOMEN3T</td>
</tr>
</tbody>
</table>

Source: Bloomberg

**Analyzing sector performance**

For a comparison of sector performance, we examine a period over which we have data for all sectors. Starting in January 1991, we have a 29-year history of returns.
Correlations

We examine correlations in several different ways: the full sample correlation, shorter sub-period correlations (to examine whether there is significant time-variation in the correlation structure) and correlations conditional on negative returns (to check whether sector returns are correlated during drawdowns).

Full sample correlations (using monthly returns) between sectors are low—ranging from 0-0.3 (Figure 3). The correlations within non-overlapping three year intervals deliver a similar result (Figure 4), indicating that sector returns correlations are low and fairly stable through time.

Figure 3: Correlation of monthly excess returns (full sample period: 1991-2019)

<table>
<thead>
<tr>
<th></th>
<th>Agriculture</th>
<th>Livestock</th>
<th>Precious</th>
<th>Industrial</th>
<th>Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregate</td>
<td>0.62</td>
<td>0.15</td>
<td>0.44</td>
<td>0.61</td>
<td>0.82</td>
</tr>
<tr>
<td>Agriculture</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Livestock</td>
<td></td>
<td></td>
<td>-0.05</td>
<td>0.31</td>
<td>0.20</td>
</tr>
<tr>
<td>Precious</td>
<td></td>
<td></td>
<td>0.34</td>
<td>0.10</td>
<td>0.16</td>
</tr>
<tr>
<td>Industrial</td>
<td></td>
<td></td>
<td></td>
<td>0.29</td>
<td></td>
</tr>
</tbody>
</table>

Source: Bloomberg
Next, for each sector, we calculate its correlation to all other sectors conditional on it having experienced a negative return. This is done by identifying the months when a particular sector index experienced a negative return and then calculating the correlation of returns between that sector and the other sectors using data from only those months. Individual sectors are listed in the first column in Figure 5. The conditional correlations to the other sectors are the values in the corresponding row. While slightly higher than the unconditional correlations, the correlations in months of negatives returns remains moderate (below 50%).

Figure 5: Conditional sector correlations (1991-2019)

<table>
<thead>
<tr>
<th>Conditioning sector</th>
<th>Agriculture</th>
<th>Livestock</th>
<th>Precious</th>
<th>Industrial</th>
<th>Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td></td>
<td>0.15</td>
<td>0.25</td>
<td>0.32</td>
<td>0.23</td>
</tr>
<tr>
<td>Livestock</td>
<td>0.10</td>
<td></td>
<td>-0.05</td>
<td>0.03</td>
<td>0.05</td>
</tr>
<tr>
<td>Precious</td>
<td>0.29</td>
<td>0.14</td>
<td></td>
<td>0.47</td>
<td>0.25</td>
</tr>
<tr>
<td>Industrial</td>
<td>0.36</td>
<td>0.17</td>
<td>0.36</td>
<td></td>
<td>0.37</td>
</tr>
<tr>
<td>Energy</td>
<td>0.22</td>
<td>0.36</td>
<td>0.07</td>
<td>0.34</td>
<td></td>
</tr>
</tbody>
</table>

Source: Bloomberg

Finally, another way to view returns dispersion across sectors is to bucket a particular sector’s monthly returns into quintiles and then plot the other sectors’ corresponding returns. In order to account for differences in volatility between sectors, returns are standardized by volatility. Figures 6 and 7 illustrate the sector returns when conditioning on agriculture and energy. Here we see that although there is some dispersion in sectors’ returns in Quintiles 2-5, there is significant tail correlation evident from the returns in Quintile 1. The corresponding figures for the other sectors are given in the appendix.

Figure 6: Conditioning on agricultural returns

Figure 7: Conditioning on energy returns

Source: Bloomberg
**Balancing risk**

While it may not be possible to diversify away the high correlation we see in the tails of the sector returns, the significant differences in volatility and generally low correlations suggest a risk-balanced approach to allocation between sectors could harness the differences in sector characteristics to yield slightly improved long-term risk-adjusted returns. There are several ways to construct such a portfolio—ranging from a fairly simple equal-volatility contribution approach to incorporating correlations, such as in the risk parity portfolio. (For a primer in portfolio construction, please see *Return sources, portfolio construction and tail risk management*, July 2012)

The two cases we examine are equal volatility contributions and equal risk contributions. For the purposes of tradability, we assume monthly rebalancing. In the first case, sector weights are assigned inversely proportional to trailing historical volatility (using weekly returns and a one-year lookback window). A more sophisticated approach is risk parity, which accounts for correlations and assigns weights in a manner that targets equal risk contributions from each sector. The equal volatility approach is equivalent to risk parity in the case where pairwise sector correlations are equal.

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**Figure 8: Sector exposures: Risk parity portfolio**

Source: Bloomberg

**Figure 9: Comparing index performance**

Source: Bloomberg

**Figure 10: Performance statistics (Total return portfolios, 1992-Oct 2019)**
Both the risk-based portfolios show a small improvement in performance over the BCOM index. Over the full sample, annualized returns were approximately 1% higher per annum (Figure 10) while annualized portfolio volatility was 1%-1.5% lower.

Importantly for asset allocators, the correlation between the risk-balanced portfolios and the BCOM index exceeds 0.9—thus continuing to provide exposure to the traditional properties of the commodity asset class.

Figure 11 displays the deviations in sector weights for the risk parity portfolio relative to the BCOM index. In general, weight is reassigned from energy to industrial and precious metals.

- In the BCOM index the average exposure to energy, precious metals, industrial metals and the agriculture and livestock sectors was 32%, 13%, 17% and 38% respectively.
- In the risk parity portfolio, the corresponding average exposures were 17%, 27%, 23% and 34%.
The sector deviations are time varying weights relative to liquidity, production weights (BCOM) is shown in Figure 12.

Figure 11: Performance statistics (Total return portfolios, 1992 – Oct 2019)

![Graph showing deviation from BCOM weights (%)]

Source: Bloomberg

**Conclusion**

Low correlations between commodity sectors along with differing return profiles suggest allocating exposures based on risk could enhance portfolio performance. We compare the results of two risk-based portfolios with the BCOM index. The risk balanced portfolios consistently aim to maintain equal risk exposure to the sectors; this results in less variability in their returns over time. However, this also entails some added complexity over investing in the BCOM index.
Appendix

Figure 12: Conditioning on livestock returns

Source: Bloomberg

Figure 13: Conditioning on precious returns

Source: Bloomberg

Figure 14: Conditioning on industrial returns

Source: Bloomberg
Bibliography

4. “Refining Commodity Beta to Protect Against Inflation Shocks”, (2014), Bloomberg LP
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