

# ARP strategies: With or without Commodities?

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### Introduction

The goal of our paper is to assess how commodities fare within a multi asset style risk premia portfolio.

We view a style factor premium as a characteristic shared by a group of assets (stocks, bonds, or commodities) that has persistently explained a significant share of the relative returns within the given group. We believe an alternative risk premia ("ARP") strategy should mainly take exposures in style factors premia that meet the criteria of being 1) strongly backed by academic research, 2) investable with liquid instruments, 3) decorrelated from asset classes, and 4) persistent and pervasive among all selected asset classes.

Carry, Momentum and Value are probably the most documented long-short style factors. They meet the four criteria listed above and they can be found in most asset classes including commodities.

The existing literature supports the use of commodities, within both long only and long/short frameworks, as a reasonable source of diversification. As such, we should expect commodities to improve the risk-return profile of a multi-asset multi-premia portfolio. However, commodities should only be considered in an ARP investment universe if the long/short exposures to Carry, Momentum and Value are able to capture systematic risks and limit the unwanted idiosyncratic risks inherent to the individual constituents of this asset class. In other words, Carry, Momentum and Value, which are systematic factors, should be able to explain a significant share of the relative returns within commodities. The empirical results are, nonetheless, more complex.

Therefore, while there is a general consensus for the compelling case of adding commodities within a multi-asset style premia portfolio, our research encourages a more careful consideration given the unique structure of the asset class. Our analysis will take a closer look at this asset class considering the Carry, Value and Momentum factors and how a commodities factor strategy performs within a broader multi asset ARP solution.

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# I. Commodities: A distinct asset class with significant sector clusterization and more idiosyncratic risks

The Bloomberg Commodities Index has 22 constituents<sup>1</sup> over 4 distinct sectors: Metals, Agriculture, Energy, Livestock. Exhibit 1 displays the intra- and inter-sector correlations.

Overall, inter-sector correlations are significantly lower than intra-sector correlations. For any given sector, intra-sector correlations are at least twice higher than inter-sector correlations. Correlation levels are marginally different for Livestock as this sector has only 2 constituents, compared to 5 for the Energy sector, 6 for the Metals sector and 9 for the Agriculture sector. Clustered returns correlations can translate into clustered risk premia signals where signals are driven by the returns.

The sector correlation structure and the vastly different natures of the sectors within the space increases the possibility of undesired sector risk concentration and can lead to taking strong bets on any given sector (e.g. Short energy/Long soybean) which can lead to significant drawdowns if the market moves unfavorably.

Exhibit 1: Intra- and inter sector correlations\*

	Intra-sector	Inter-sector
Energy	58%	23%
Metals	46%	22%
Agriculture	40%	20%
Livestock	27%	7%
Whole Universe	45%	20%

\* The figures in this table are the averages of pairwise correlations.

**The figures refer to simulated past performance. Simulated past performance is not a reliable indicator of future performance.**

Sources: Bloomberg, HSBC Global Asset Management. Weekly data from 01/01/1999 to 31/12/2018. Correlations are calculated based on the futures contracts' returns.

A portfolio construction that is sector neutral is a reasonable approach to mitigate sector concentration risk. However this implies considering commodity sectors as standalone asset classes. To overcome this issue, we have opted to focus, for the remainder of the paper, on a limited number of assets (2-4) per sector, representing 11 out of the 22 constituents<sup>2</sup> representing over 60% of the index. We should note that **most practitioners' allocations to commodities within their ARP solutions are limited to a subset of the asset class.**

Our main goal is to define the risk driving the relative performance of the asset class i.e. are commodities displaying more or less specific risk than what can be seen in other asset classes, like equities (DM and EM), bonds, FX (DM and EM)? Can common factors (Carry, Momentum and Value) explain a significant share of the variance of commodities?

On average and over a long term horizon, the share of returns explained by roll returns<sup>3</sup> (i.e. carry) is higher for commodities than for other asset classes. We will explore how Carry behaves for commodities later on, which supports the intuition of our analysis.

1. Bloomberg announced in October 2018 that it would change the Bloomberg Commodity Index in 2019, with the inclusion of Low Sulphur Gas Oil. See <https://www.bloomberg.com/company/announcements/bloomberg-commodity-index-bcom-2019-target-weights-announced/>

2. The retained commodities are Aluminium, Coffee, Copper, Corn, Gold, Lean Hogs, Live Cattle, Natural Gas, Soybeans, Sugar and WTI.

3. A roll return depends on the shape of the futures term structure, and is the return an investor gets when a future expires provided he/she remains invested in the asset.

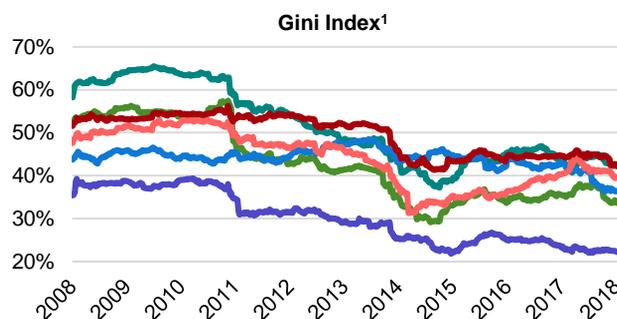
Source: HSBC Global Asset Management. The commentary and analysis presented in this document reflect the opinion of HSBC Global Asset Management on the markets, according to the information available to date. They do not constitute any kind of commitment from HSBC Global Asset Management.

Since we are interested in the common factor structure of commodities, we will consider returns in excess of an equally-weighted basket of commodities for all the following analyses which we simply refer to as returns for the remainder of the paper.

We perform a Principal Component Analysis (PCA) on the returns of the 11 selected commodities. Exhibit 2 shows that the first common factor explains only 25% of the variance. This number averages 43% for all other asset classes with a range between 39% and 50%. **The lower number for commodities indicates that they exhibit more idiosyncratic risk.**

**Exhibit 2: Rolling 3 years PCA results**

1 <sup>st</sup> Factor 3Yr rolling	Min	Mean	Max
DM Equities	35%	50%	67%
EM Equities	25%	39%	55%
Bonds	37%	44%	50%
DM FX	30%	42%	51%
EM FX	27%	39%	49%
Commodities	17%	25%	36%



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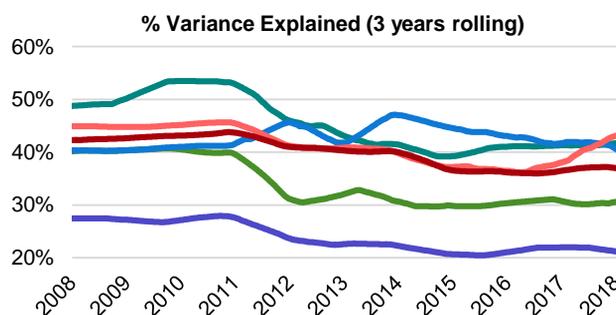
Source: HSBC Global Asset Management. Weekly data from 01/01/1999 to 31/12/2018.

If we illustrate this phenomenon with the Gini index<sup>4</sup>, a measure of statistical dispersion, we notice figures are once again lowest for commodities. It means **the share of variance explained by each factor is more homogeneous for commodities**: there are less common drivers, hence more specific behaviors within commodities.

We observe a similar pattern with a Factor Analysis (FA) in Exhibit 3. Compared to PCA, the number of factors modeled needs to be specified. We set it to 3.

**Exhibit 3: Share of variance explained by Factor Analysis**

% Variance explained	Min	Mean	Max
DM Equities	38%	45%	54%
EM Equities	27%	34%	41%
Bonds	36%	43%	48%
DM FX	34%	41%	46%
EM FX	35%	40%	44%
Commodities	20%	23%	28%



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Source: HSBC Global Asset Management. Weekly data from 01/01/1999 to 31/12/2018.

Once again, **commodities appear more diverse than other asset classes: common factors fail to explain as much variance**. The segmented nature of the universe, with weakly correlated sectors and the idiosyncratic features unique to individual commodities, such as seasonality, explain these results.

Hence, building common factors that fit our framework, though not unfeasible, appears more intricate in the commodities space.

We should highlight that an ARP portfolio is designed to harvest the common factors (not the idiosyncratic risks) that explain the excess return any given asset class.

Identifying the relevant common factors in order to include commodities into an ARP portfolio is difficult

4. The Gini index measures the inequality among values of a distribution. A Gini index of 0 expresses perfect equality: all values are the same. In our case, it would mean all principal components explain the same share of variance. A Gini coefficient of 1 expresses maximal inequality among values. In our case, it would mean the first principal component explains 100% of the variance while all other principal components explain 0% of the variance.

References

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## II. A Closer look at Carry, Momentum and Value in the Commodities space

### Momentum

This factor is based on relative trend continuation wherein securities that have outperformed – relative to the asset class average return - are expected to continue outperforming and vice versa. Momentum has strong academic support across most asset classes including commodities. For this analysis, we use the standard 1 year – 1 month performance where we are long outperformers and short underperformers.

### Carry

Carry is typically the return based on the difference between spot and futures prices. Unlike other markets, the arbitrage conditions that hold the relationship between the spot and future prices for other financial assets are not as straightforward for commodities. Carry in commodities can be linked to the curvature of the futures term structure. The slope of this curve is used to go long the commodities that are in backwardation (i.e. positive carry when demand exceed supply) and short the ones that are in contango (i.e. negative carry when there is supply exceeds demand).

Given the unique aspects of commodities which include storage costs and supply and demand imbalances, the relationship between the spot and future prices becomes more complex. It is beyond the scope of this paper to dissect all the components that affect the carry factor for commodities but the slope of the curve used to determine the carry factor can and typically will change for reasons (e.g. seasonality aspects and storage costs) not related to the carry premium which financial investors aim to harvest. Although strong (see Exhibit 4 below), the carry factor for commodities encompasses non risk premium drivers pointing to a potential overestimation of the size of the premium.

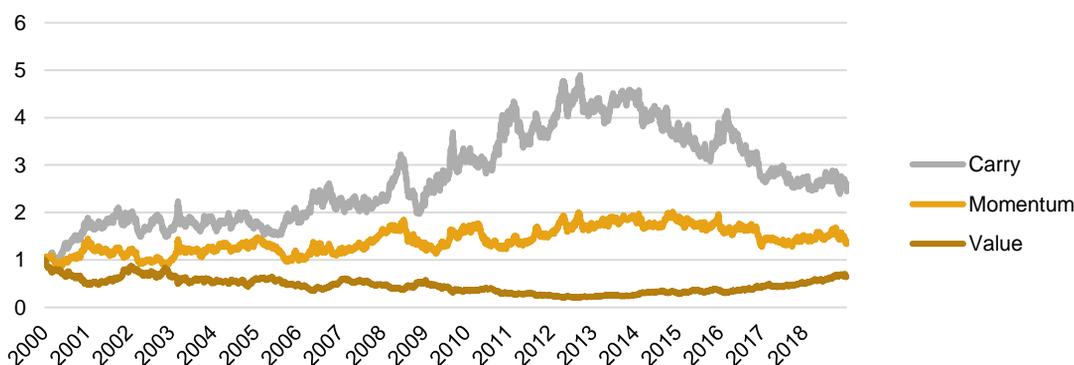
### Value

Value is often justly used as the natural diversifier to momentum, given its contrarian nature. This is why our ARP framework insists on a balanced exposure to all three factors across all asset classes to get the most diversification when things go awry for any given factor.

The most basic intuition entails purchasing undervalued commodities, with the expectation that their prices will rise and selling overvalued commodities with the anticipation of a price correction downward.

However, **Value is the most challenging of the three factors to define for commodities**. First, commodities are hard assets that do not have a fundamental value that is defined in the same way as financial assets. Second, the fundamental value of each commodity is different from the other. Thus using Value metrics that are both intuitive to each constituent and implementable across the board is not straightforward. The most popular metric for Value in commodities is based on the 5-year mean reversion - Asness, Moskowitz and Pedersen (2013). Despite its ease of use, this metric is far from being perfect. The 5 year window of reversal is often not consistent across all commodities as it fails to capture valuation insights into all of the individual commodities and make the results highly dependent on the time frame selected. The Value factor in commodities has significantly lagged Carry and Momentum.

Exhibit 4: Cumulative returns of Carry, Momentum and Value factors in commodities



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Source: HSBC Global Asset Management. Weekly data from 01/01/1999 to 31/12/2018.

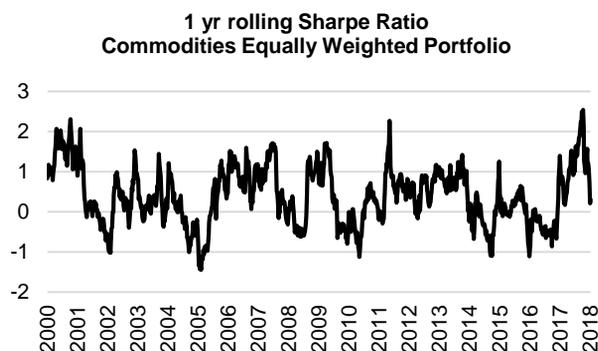
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We should note that the volatility of the three factors returns for commodities, which averages 22-23%, is significantly higher than that of factor returns for the other asset classes. As an illustration, the volatility of the factor returns for EM equities, which comes in second place, is almost half that level at an average of 12-14%.

One of the strengths of a multi risk premia solution is to combine these various factors instead of optimizing each individually. Exhibit 5 looks at the Sharpe ratio of the Momentum, Carry and Value factors for commodities between 1999 and 2018, along with the Sharpe ratio of an equally-weighted portfolio using the three factors. The overall Sharpe ratio is marginally positive at 0.3.

**Exhibit 5: Sharpe ratio of style factors across commodities and other asset classes**

Sharpe Ratio	Momentum	Carry	Value	Equal Weight
DM Equities	-0.2	0.2	0.3	0.2
EM Equities	0.3	0.5	0.2	0.6
Bonds	0.2	0.5	0.1	0.6
DM FX	0.2	0.3	0.1	0.7
EM FX	0.1	0.9	0.6	1.2
Commodities	0.1	0.2	-0.1	0.3



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Source: HSBC Global Asset Management. Weekly data from 01/01/1999 to 31/12/2018.

On average, and except for developed equities, **Carry, Momentum and Value factors have delivered lower Sharpe ratios in the commodities space than in other asset classes.** The results are unique to the period considered (1999-2018) and thus have their limitations. However, they provide an intuitive indication as the evidence supporting factors premia within commodities remain highly dependent on the history used. The different style factors are more consistent in some sectors than others which potentially requires a more subjective lens in the execution of the strategy. Furthermore, **the higher idiosyncratic risk for commodities would on average result in lower expected Sharpe ratios for systematic factor-based strategies.**

- Defining the right metrics for Carry and Value factors is challenging owing to the very nature of Commodities
- Carry, Momentum and Value factors have posted lower Sharpe ratios in the commodities space than in other asset classes

### III. Looking into the benefit of adding commodities within a broader ARP portfolio

Within the commodities space, Carry, Momentum and Value factors do correlate, as shown in the left table of Exhibit 6. However, they diversify very well with factors from other asset classes, as the average correlations are close to 0 .

**Exhibit 6: Commodities factors correlations**

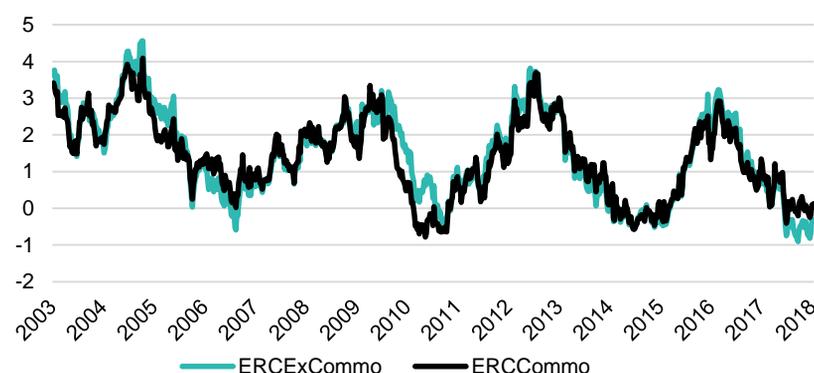
	Commodities			Other asset classes		
	Momentum	Carry	Value	Momentum	Carry	Value
Commodities Momentum	-	0.6	-0.4	0.1	0.0	0.0
Commodities Carry	-	-	-0.5	0.0	0.0	0.0
Commodities Value	-	-	-	0.1	0.1	0.1

**The figures refer to simulated past performance. Simulated past performance is not a reliable indicator of future performance.**

Source: HSBC Global Asset Management. Weekly data from 01/01/1999 to 31/12/2018.

We, thus, look at how the portfolio behaves with and without commodities. For this analysis, we use a risk budgeting framework that balances risk through factor and asset dimensions. In practice, we calculate nominal exposures to the long/ short factor portfolios so that each factor has the same risk contribution to the factor portfolio. In Exhibit 7 below we can see how a multi-asset multi-premia portfolio including Commodities fares compared to a similar portfolio without Commodities. The benchmark ("ExCommo") is based on factors from bonds, equities (DM and EM) and FX (DM and EM).

**Exhibit 7: Equal Risk Contribution portfolio 1 year rolling Sharpe ratio**



The results shown in Exhibit 7 illustrate a trivial difference between the two portfolios wherein **the benefits of adding commodities remain unclear.**

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## IV. Conclusion

Commodities can be seen as a natural complement to a portfolio given their diversification properties. Their addition within an ARP solution that uses a factor-based approach is, however, not yet clear cut.

A factor-based approach involves enhancing returns by earning risk premia linked to systematic factors. Commodities as an asset class exhibit a much less monolithic risk structure than equities, bonds and currencies, making it more challenging to extract these systematic factors. Given the heterogeneous features of its inherent sectors, commodities exhibit less consistency and cohesiveness in its underlying style risk factors.

**While there is some evidence supporting the existence of Carry, Value and Momentum in the asset class, the strength and persistence of these factors vary across the sectors, the constituents within these sectors as well as the time periods considered.** Typically Carry and Momentum are stronger indicators in the commodities spaces, although they are overestimated at times and are more persistent in some sectors than others. The highly idiosyncratic nature of some sectors with their own unique supply and demand characteristics makes it more difficult to dissect the pure systematic style risk premia that investors should harvest and can make for unpleasant (and sometime long) drawdowns episodes during prolonged bear markets. In November of 2018, natural gas was up 48% within two weeks amid fears of low supply ahead of a colder than expected winter in the U.S. Any strategy that was short natural gas (and they were many) suffered tremendously.

While the case of adding commodities to an ARP solution has merits when one looks at the lower correlations to other asset classes, rarely do managers add it with an equivalent risk allocation. In many cases, commodities have a smaller allocation than the other asset classes in light of some of the challenges we highlighted. The implementation typically focuses on a subset of sectors and the Value factor is usually underweighted relative to the other style factors. We support a more balanced approach across asset classes and factors in our solution: investing in commodities through a different implementation methodology, possibly based on tactical moves that are driven by fundamental, macro data and trends, has the potential to address some of the challenges we raised and could help generate more returns and navigate difficult troughs.

**Within an ARP solution that follows a balanced allocation across asset classes and factors, the benefits of adding commodities, are not for the present time fully warranted.**

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