



## Controlling investment risk in the commodity space

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## Abstract

Commodity futures have evolved from trading instruments to vectors of long-term investment for this new asset class. As uses and users have changed, new ways of representing the performance of commodities class and investing in it have to be devised. In this article, we outline the drawbacks of the traditional commodity indexing solutions and we expose solutions realigning commodity investing with long term investor goals. In particular, we detail risk management techniques, at the single commodity level as well as at the portfolio level, that can be used to build a balanced investment benchmark.

Formerly a market for hedging purposes - used mainly by commodity producers or users - the commodity space has gradually opened to investors. Commodity indexation has gone a long way towards popularizing this market providing standard, cost-effective access products. It simplifies the specificities of this market - its term structure, the futures contracts that previously required a high level of sophistication. While commodity indices as benchmarks have existed since 1957 (the CRB index), the first investable index (the S&P GSCI Index ) was launched in 1991. A wide array of similar indices are now available, covering the whole asset class, slicing it into various subsectors or even into single commodities. A survey conducted by consultancy firm ETFIGI, inventoried as much as 783 ETFs and ETPs totaling \$151bn AUMs in this market, as of the end of August 2013. Traditional commodity indices were designed on principles that make them useful market indicators but poor benchmarks for investors intending to hold long term exposure to the asset class. These indices overlook key features of the term structure of the commodities futures contracts, such as contango and backwardation. This results in higher than needed maintenance costs when the index rolls over the futures positions to replace the expiring contracts. Moreover, built as broad economic benchmarks, they allocate the weights in the index basket proportionally to the economic weight of each commodity. This results in an overconcentration on some market sectors that is at odds with the best practices in portfolio allocation. Recent evolutions in the financial industry regulation, emphasizing portfolio diversification, make the traditional indices even less suitable for investing purposes. We present here new approaches to commodity index design that address the issues of the traditional commodity indices and allow to invest in this market in a risk-controlled way. We show how contract

maturity management gives ways to manage efficiently each single commodity investment position. Finally, we address how portfolio allocation can be redesigned in order to make the commodity index more risk-efficient

## 1 The case for a new paradigm

The commodity asset class contains but a few different underlyings when compared to the more traditional equity or fixed income asset classes: there are less than 25 different commodities in the major broad commodity investment sets. This lack of breadth in the investment universe means that the commodity portfolios will tend to be less diversified than equity or fixed income portfolios. The classical weighting scheme within traditional broad commodity indices by production weight and liquidity - heightens the concentration problem. The S&P GSCI index for example has an exposure skewed towards one specific sector: energy. At the end of August 2013 It represented 72% of the total index weight crude oil is 30% by itself while corresponding to only  $\frac{1}{4}$  of the index constituents. This concentration issue is even more acute when we consider risk contribution of each sector in the total portfolio risk instead of the nominal exposure. The percentage of total volatility explained by the allocation to this sector is 82%. Figure 1 displays the breakdown of risk across the different sectors within the S&P GSCI .

Regulators have identified this concentration issue. The new European guidelines e.g. UCITS IV - impose stricter rules that make traditional commodity indices ineligible investment benchmarks. To respond to this change in regulation landscape, "capped" version of the traditional indices have emerged to ensure compliance. But the capped indices, using ad-hoc constraints, do not offer a really new risk-aware allocation principle. Ethi-

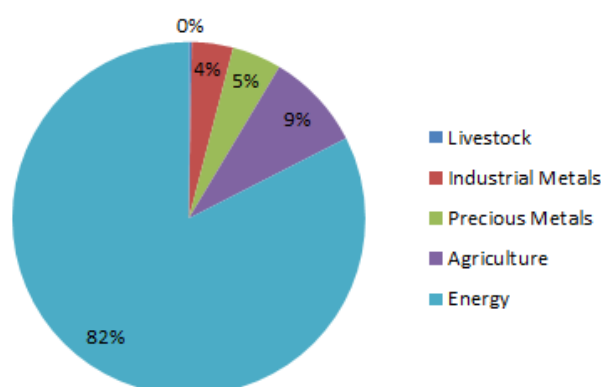


Figure 1: Risk contribution by Sector in the S&P GSCI

Source: S&P, calculation by Ossiam

cal considerations should also be added on top of the regulatory constraints. With increased controversy about investment in food related commodities, investors are shying away from investment in this sector or even fully disallocating. This shrinking of the eligible asset base will mechanically increase the concentration on other commodities even further. In this context, traditional allocation principle has to be redesigned in order to provide risk-efficient and diversified benchmarks, compatible with a long term investment.

## 2 New building blocks

One specificity of commodity market is the need to use futures contract to implement commodity investments. Each underlying commodity is represented by a number of futures contracts of different maturity. The traditional indices were based on the nearest-month contracts that are rolled to the next available maturity before they expire. One can refer to these sequences of futures positions as mono-commodity indices. They provide investable underlyings that can be used as building blocks in the design a broad commodity portfolio.

The choice of the nearest-term futures contracts inside the traditional mono-indices was determined with the objective of reproducing as close as possible the spot commodity prices movements. This is suitable if one has to use a single-commodity benchmark for short-term hedging or tactical purposes. Still, over the long run the traditional mono-indices suffer from high roll costs. Investment in natural gas is a blatant example of the inefficiency of the traditional roll technique: the mono-commodity index lost 99% over the period 2003-2013 whereas the spot price was down only 32% over the same period. It is possible to reduce the roll cost by taking into account the shape of the futures price curve. The most common curve shape is "contango" with prices increasing with contract maturity at a decaying rate. Such a situation prompts that the less costly roll occurs between contracts that are at the far end of the forward curve (the ones with the longer maturities). The use of such a technique when indexing natural gas yields a performance of -67% on the period 2003-2013, more aligned with the spot price own performance. This rolling technique was used to build the so-called second generation mono-commodity indices, that are called dynamic or enhanced. Performance enhancement in the second generation mono indices is also accompanied by a decrease in risk making them truly more efficient investment underlyings. The longer term contracts often used inside the enhanced contract selection process are also those that exhibit the lower volatilities. Figure 2 shows this decreasing pattern.

A simple economic reasoning can explain this behavior. Commodity prices are directly affected by supply and demand e.g. a supply shortage will trigger soaring prices. Demand can vary greatly in a short amount of time while producers need time to adjust their production output to the new level of demand. This creates tensions in short term prices and

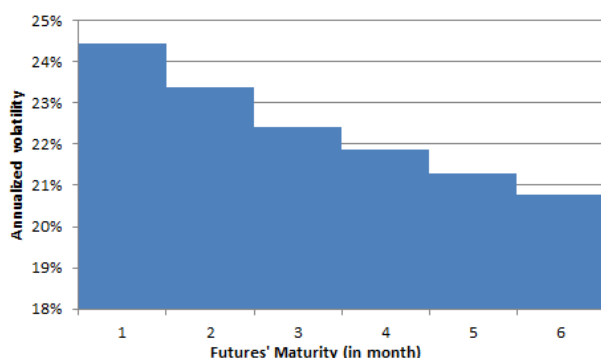


Figure 2: Volatility of S&P GSCI for different futures maturities for the period 2000-2013

Source: Bloomberg, calculation by Ossiam

overreaction to new economic data or restatements of production estimates. These tensions are smoothed out when the contract term is longer than the time needed to adjust the supply: the future price only accounts for the economic equilibrium price. Natural gas is one such commodity whose volatility is highly dependent on the maturity: stocking gas is a lengthy and complicated process. The volatility of the 1 month contract is 48% over the last ten years while for the 3 month contract it is down by one forth, with 36% volatility. As they improve on both performance and risk, second generation mono indices are suitable building blocks to use in redesigning broad commodity indexing.

### 3 Portfolio allocation

The solutions combining the classic production weight allocation with the new generation of mono indices are more efficient than the traditional indices, yet they fail to address the core problem: the lack of diversification. This issue should be addressed explicitly at the portfolio construction level. In an asset class with such a low number of assets, apply-

ing a "Risk Parity"<sup>1</sup> allocation will provide a balanced portfolio which contains all the commodities within the investment universe. Risk Parity allocates the same risk budget to each portfolio constituent. The weight of each commodity in such a portfolio is inversely proportional to its volatility. Such a construction evens out the risk contributions of the assets within the portfolio and aligns the weight of different sectors to the number of constituents they contain. Figure 3 shows the risk contribution breakdown that results from applying risk-parity approach to S&P GSCI investment set.

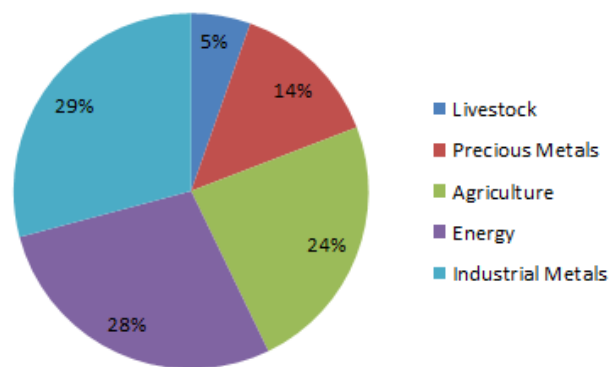


Figure 3: Risk contribution by Sector for a Risk Parity Portfolio

Source: Bloomberg, calculation by Ossiam

This allocation can be described in an intuitive manner when compared to the most straightforward portfolio construction the Equal Weighting: all assets have the same weight. The risk parity goes one step further than Equal Weighting in the diversification process. While Equal Weighting would have sector weights proportional to the numbers of assets that compose each sector, Risk Parity will also factor in the relative riskiness of each sector. For instance, energies are generally more volatile than the other com-

<sup>1</sup>Performance simulated by Ossiam on the period 2003-2013



modities, their risk parity weight will thus be slightly lower than what equal weighting would prompt. Livestocks on the contrary will be overweighted because of their relatively lower risk. The two innovations, enhanced maturity management within mono-commodity indices and risk-aware portfolio allocation, lead to a large reduction in the volatility of commodity indices. When applied on the S&P GSCI universe, it gives a commodity portfolio, the "Risk Parity Portfolio", with volatility reduced by around 45% with respect to the traditional S&P GSCI Index (over the period 2003-2013). The majority of the reduction (83%) results from the change in the weighting scheme while the remainder comes from the enhancement in maturity management. Portfolios that are designed around risk management are also better aligned with the new regulations that target diversification. Additional capping mechanism may be embedded in the portfolio construction process as safeguard to prevent any breach of the regulatory constraints. Below we give an example of a new generation commodity index: Risk Weighted Enhanced Commodity Index (ex Grains), that implements the portfolio construction principles described above and represents a risk-efficient investment benchmark.

## 4 Proof of concept

The RiskWeighted Enhanced Commodity ex Grains Index an index of new generation created by Societ Generale, combines the enhanced construction of mono indices with risk parity portfolio construction. In addition, the index methodology forbids investments in grains and ensures that the weight of each commodity sector does not exceed regulatory limits<sup>2</sup>. This provides us with an example of a readily available investment solution

<sup>2</sup>UCITS IV impose a maximum of 20% on the exposure of each group of highly correlated commodities

on commodities that embodies the concepts we described throughout this article. Fig 4, that plots the rolling volatilities of the S&P GSCI, the Risk Parity portfolio and the Risk-Weighted Enhanced index, shows that the risk reduction achieved using the allocation management techniques is present and consistent over time.

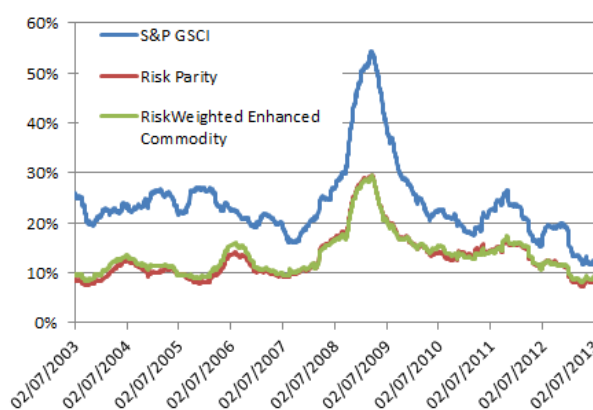


Figure 4: Comparison of historical 1 year rolling volatility

Source: Bloomberg, calculation by Ossiam

It can also be noted also that removing grains from the portfolio and introducing sector weight limits does not alter significantly the risk reduction potential: the Risk Parity portfolio has roughly the same volatility as the Risk-Weighted Enhanced ex Grains index. As is shown in Table 1, the volatility reduction is not the only benefit of the new index design. Over the period 2003-2013 the alternative commodity portfolios generated consistent overperformance with respect to the traditional S&P GSCI Index. This extra performance came from contract selection for 80% of it, the rest resulted from the allocation.

## 5 Conclusion

Traditional commodity indices are valid economic indicators but inefficient investment

	Risk Parity	Risk Weighted Enhanced Commodity
Perf. over S&P GSCI (Annualized)	1.62%	1.61%
Risk Reduction	45.27%	43.98%

Table 1: Simulated Statistics on the period 2003-2013

Source: Bloomberg, calculation by Ossiam

benchmarks for long term investors. The imbalance of production-based weights leads to severe concentration of the related index products on specific commodity sectors. This goes against sound allocation rules, such as the ones embodied by the asset management regulations. A new generation of broad commodity indices has emerged. They offer investors simple and efficient ways to access the asset class while controlling the investment risk and optimize futures rolling cost. This evolution is similar to what was witnessed in equities over the past years under the name of "Smart Beta" Indexing. In the commodities market as well, systematically applying risk management techniques adds value to the investment process, both on an absolute and on a risk adjusted basis.

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