Commodities: an asset class in their own right?

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Investor interest in commodities has risen in recent years in line with the spectacular surge in most commodity prices. Some institutional investors, for instance Dutch[1] or Californian[2] pension funds, have confirmed that they have gained or intend to gain moderate exposure (less than 5% of their assets) to commodities. In parallel, the development of new investment vehicles has enabled individual investors also to gain commodity exposure.

Expectations of continued strong economic growth in Asia, which should result in Asian countries' sustained demand for commodities, may be the driver of the increased appetite for these assets. Interest also seems to be spurred by studies by academics and market analysts that highlight commodities as an effective way of diversifying portfolio risk.

This assessment and interpretation suggest that investors are slowly but sustainably including commodities in their portfolios. Can we however assert that commodities constitute an asset class in their own right? This study suggests they do, given that over the long term, returns on commodity-related investments appear to outperform risk-free returns, seem to have a low or negative correlation with other asset classes and can apparently not be replicated with a simple linear combination of assets.

1 *See Global Investor Magazine (2006).*
2 *See Business Week (2006).*

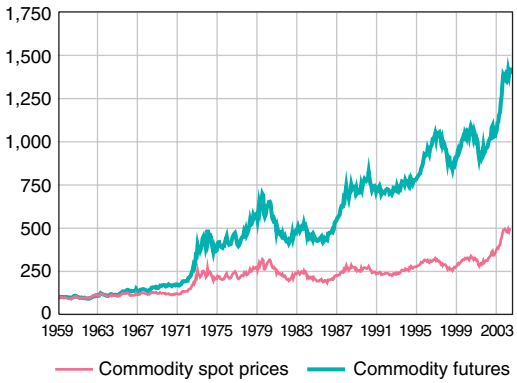
The sharp rise in commodity –especially oil– prices since 2001 has led many investors to place a growing share of their assets in commodities. Several articles[3] have underlined the diversification benefits derived from including this new asset class in institutional investors' portfolios.

This study is divided into two parts:

• it first presents the main investment vehicles used to obtain exposure to commodities;

• it then defines the criteria that a vehicle must fulfil in order to constitute an asset class in its own right and attempts to ascertain whether commodities fulfil these criteria.

Chart 1
Real performance of spot prices compared with indices of commodity futures
(July 1957 = 100)



Source: Gorton et Rouwenhorst (2005).

1| COMMODITY INVESTMENT VEHICLES

The vehicles used by investors to gain exposure to commodities are commodity futures contracts and funds benchmarked to commodity indices[4] based on various underlying commodity futures.

Beyond the storage difficulties they entail, the purchase and holding of physical commodities do not yield attractive returns: historically, since the late 1950s, real returns on a basket of physical commodities have been much lower than those on a portfolio of commodity futures.

To buy commodity futures, investors have to post collateral to protect the seller against the risk of investor default should futures prices evolve unfavourably. The collateral is often made up of US Treasury bills.

Investing in commodity futures means rolling positions forward as futures contracts come up to expiry so as to avoid delivery of the underlying commodity. Depending on whether the forward price curve is in contango (futures prices are higher than spot prices) or conversely, in backwardation (the usual slope of the oil curve), the roll yield –*i.e.* the return from rolling the futures positions forward– is either positive or negative.

Overall, the spread between returns on futures contracts and returns on spot transactions, which is largely to the advantage of futures, corresponds to the sum of the roll yield and the collateral yield as shown by the following equation:

Total return on a futures investment = yield on the underlying asset + roll yield + collateral yield

In practice, roll yields have tended to be the largest contributor to the spread: between 1989 and 2004, the rate of return on a crude oil futures contract stood at an average of 20.1% per year, broken down into 6.0% for the appreciation of the underlying assets, 9.1% for the roll yield[5] and 4.9% for the collateral yield. For gold however, the contango of the futures curve explains why the roll yield stood at a negative 5.7% per year on average between 1989 and 2004.

3 *Several studies, including those by Gorton and Rouwenhorst (2005) and JP Morgan (2006), suggest that using commodities to create diversified portfolios improves the portfolio's risk/return ratio. Ibbotson Associates (2006) in fact place the optimal share of commodities in a diversified portfolio within a range of 22% to 29%.*
4 *The major commodity indices are the Dow Jones-AIG composite index, the Goldman Sachs commodity index (GSCI), the Deutsche Bank liquid commodity index (DBCI) and the RJ/CRB index. The main differences between these indices lie in the different means of weighting certain types of commodities, especially energy.*
5 *These results were obtained under the assumption that the collateral backing futures contracts consists of US Treasury bills with an annualised yield of 4.8% over the period considered.*

Commodity market participants also invest in exchange traded funds (ETFs), which are instruments traded on an organised market where, *via* the purchase of ETF shares, participants may invest in commodities in the same way as in stocks. Many observers consider that investor interest in commodities –particularly from individual investors– has been boosted by the introduction of gold and silver ETFs.

While the main ETFs track gold prices, others are linked to oil prices and to composite indices of commodity prices. Gold ETFs are quoted on US, European, South African and Australian stock exchanges. An ETF share generally represents 1/10 of an ounce of gold. This recent product –the first contract was launched in November 2004– gathers individual investors' appetite for commodity-related investments. The gold held by individual ETF investors amounted to 548 tonnes in September 2006, which, according to the Word Gold Council, places this investor category just behind the tenth largest institutional holder of gold.

2| COMMODITIES AS A SEPARATE ASSET CLASS

2|1 Definition of an asset class

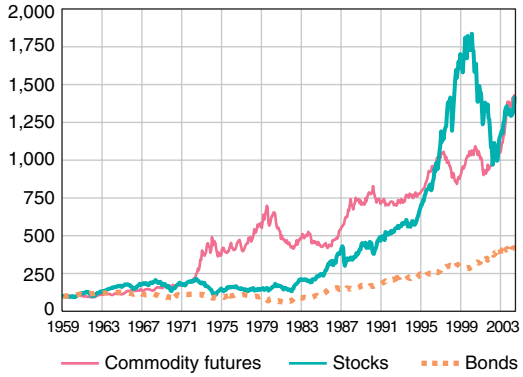
A commonly used approach is to consider as an asset class any instrument:

• that generates returns that are higher than risk-free returns,

• whose returns demonstrate little or no correlation with other asset classes,

• whose returns may not be replicated with a simple linear combination of other assets.

Chart 2
Real returns on stocks, US bonds and commodity futures
(July 1957 = 100)



Source: Gorton et Rouwenhorst (2005).

2|2 Fulfilling the criteria

OVER THE LONG TERM, RETURNS ON COMMODITY-RELATED INVESTMENTS OUTPERFORM RETURNS ON RISK-FREE INVESTMENTS

Over the long term, returns on commodity futures are close to stock returns and largely exceed bond returns.

The high annualised return on commodity indices over the long run is largely a result of the contribution made by the energy sector, as shown by the table below.

Total annualised return
(underlying + roll yield + collateral yield)
1989-2004 (in annualised terms)
(%)

Crude oil	20.1
Heating oil	13.9
Aluminium	-1
Gold	1
Flour	1.2
Corn	-3.7

Source: Deutsche Bank (2005).

Annualised returns on different asset classes in business cycles between 1959 and 2004
(%)

	Stocks	Bonds	Commodity futures
Expansion	13.3	6.7	11.8
Early	16.3	10.0	6.7
Late	10.4	3.6	16.7
Recession	0.5	12.6	1.1
Early	-18.6	-3.9	3.7
Late	19.7	29.1	-1.6

Source: Gorton et Rouwenhorst (2005).

In addition, unlike stock and bond returns, commodity returns tend to increase in periods of inflation. Moreover, commodities provide diversification benefits, especially in times of financial market volatility: between 1959 and December 2004, annualised commodity futures returns rose by 1% for the quintile corresponding to the months in which stocks posted the sharpest falls. Commodity futures therefore appear to provide an effective hedge against stock market declines.

Lastly, commodity futures and funds tracking composite commodity indices enable diversification depending on the phase of the business cycle: their returns tend to be historically higher in late expansion phases, and then remain positive in early recession or economic slowdown phases; conversely, stock returns tend to be strongly negative in early recession phases.

Low or negative correlation of commodity returns with other asset classes

The following table shows a slightly negative correlation between commodity futures returns and stock and bond returns. Conversely, commodity futures returns are positively correlated with inflation.

Coefficients of correlation of annualised commodity returns with those of other asset classes between 1970 and 2004

US Treasury Bills	-0.1
US Treasury bonds	-0.32
US TIPS	0.41
International bonds	0.15
American stocks	-0.24
International stocks	-0.07

Source: Ibbotson Associates (2006).

Correlation between commodity futures, stocks and bonds from July 1959 to December 2004

Correlation coefficients	Stocks	Bonds	Inflation
One month	0.05	-0.14	0.01
One quarter	-0.06	-0.27	0.14
One year	-0.10	-0.30	0.29
Five years	-0.42	-0.25	0.45

Source: Gorton et Rouwenhorst (2005).

These results appear to be valid irrespective of the time frame considered, with the exception of the one-month correlation between commodity futures returns and stock returns, which is positive.

It appears difficult to replicate the returns generated by commodity-related investments with a simple linear combination of other assets

We examine in further detail below whether it is possible to replicate the returns on the major commodity indices with a linear combination of other types of assets.

The prices of four asset categories are considered:

- commodities, based on the Goldman Sachs commodity index (GSCI),
- stocks, based on the S&P500,
- bonds, based on the price of a 10-year US Treasury bond,
- US house prices, as reflected by the House price index produced by the Office of federal housing enterprise oversight (OFHEO) since 1975.

Weekly returns

Excluding US house prices, which are only available on a quarterly basis, we carry out a multiple linear regression of weekly changes in commodity prices on changes in the S&P500 and 10-year US bonds, using the ordinary least squares method for the March 1975-September 2006 period. We then examine the determination coefficient R^2 resulting from the linear regression, which is between 0% and 100% and reflects the quality of the adjustment:

the closer R^2 is to 100%, the larger the share of changes in commodity prices resulting from those of prices in other asset categories.

The linear regression results in a determination coefficient of almost zero (0.02%). It determines the coefficients *a* and *b*, which minimise the sum of the squared differences between the weekly returns observed for the GSCI and the estimated returns in the following equation.

GSCI returns = a * *S&P500 returns* + b * *returns on 10-year US T-bonds* + c *(constant)*

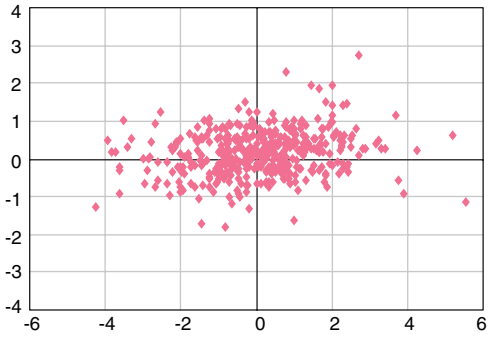
However, the coefficients *a* and *b* obtained do not necessarily fulfil the constraint $a + b = 1$, which reflects the fact that an investor could replicate GSCI returns with a combination of stocks and bonds making up a total investment amount equal to that which it would have invested in the GSCI. In order to take this additional constraint into account, we calculate weekly returns on ten composite portfolios made up of an increasing share of stocks (in this case the S&P500), from 0% to 100%, in increments of 10%, with the rest of the portfolio being invested in US Treasury bonds.

We then regress weekly GSCI returns on those of each of the ten portfolios. The results obtained once again indicate a very low correlation between GSCI returns and those of the ten portfolios, with coefficients of determination R^2 still below 1%. These results are illustrated in the charts above.

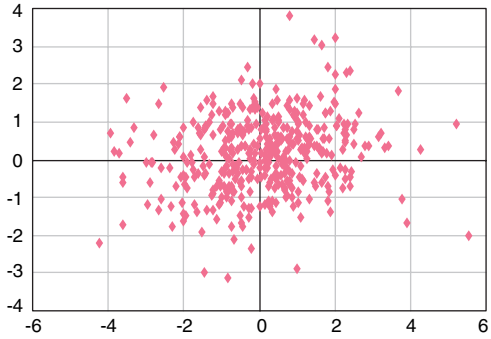
For the different combinations of stocks and bonds used, the charts do not clearly indicate the existence of a linear relationship between weekly returns on the GSCI and on the various mixed portfolios.

Chart 3
Weekly returns on the GSCI (X-axis) and on a portfolio (Y-axis) consisting of:
(%)

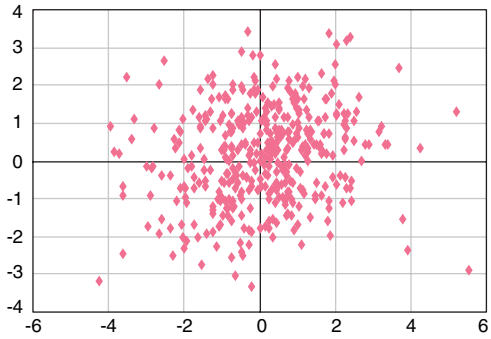
30% of S&P500 and 70% of 10-year T-bonds



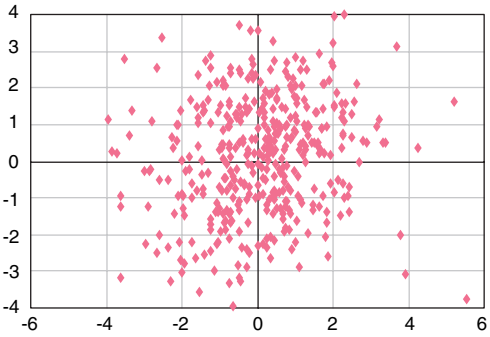
50% of S&P500 and 50% of 10-year T-bonds



70% of S&P500 and 30% of 10-year T-bonds



90% of S&P500 and 10% of 10-year T-bonds



Source: Bloomberg.

Quarterly returns

Using quarterly returns in our econometric calculations allows us to take house prices into account. We thus carry out a linear regression of quarterly changes in commodity prices; this time on changes in the prices of the other three asset categories (stocks, bonds and housing) and also for the March 1975 to September 2006 period.

The coefficient of determination comes to 8.7%. This value, which is again very low, suggests that a linear combination of returns on the S&P500, 10-year US T-bonds and the OFHEO index would not make it possible to properly replicate returns on the GSCI composite index either.

Robustness of the results

Replacing the GSCI with other composite commodity indices does not modify the conclusion. In particular, the calculations carried out with the GSCI total return[6] index result in a determination coefficient of 5.9% when quarterly returns are used.

If the CRB index is used over a period spanning from March 1975 to September 2006, the coefficient R^2 obtained is still much lower than 1% for weekly returns and stands at just 3.8% for quarterly returns.

6 *Returns on the GSCI total return index comprise the yield on the underlying assets, the roll yield, the collateral yield (3-month T-Bills) and presuppose in addition that the interest on collateral is reinvested in futures and that gains/losses on futures are invested/disinvested in T-Bills posted as collateral.*

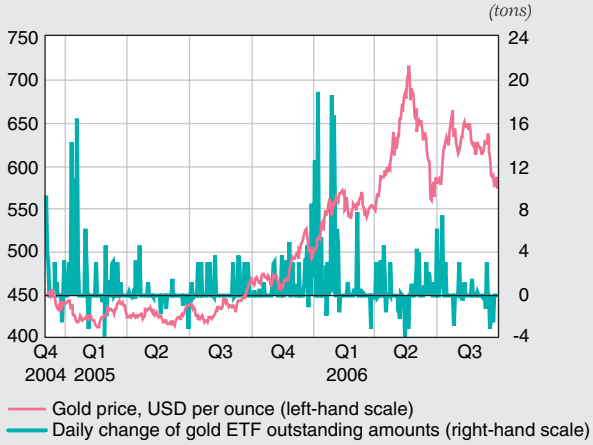
Commodity returns can apparently not be replicated simply with a linear combination of stocks, bonds and house price indices. Commodities therefore appear to adequately fulfil the three criteria set out above, which make it possible to define an asset class: returns that outperform risk-free rates, have no significant correlation with other asset classes and cannot be replicated with a combination of other asset classes.

We may therefore assume that returns on commodity-related investments are also subject to the same excesses as those on other asset classes and that it is possible to have price changes that are unrelated to economic fundamentals. Investor reaction to these undue changes will depend, of course, on their investment horizons as well as the level of diversification of their portfolios.

It is worth noting that ETF investors (who are mainly individual investors) continued to acquire ETFs during the sharp drop in gold prices in May 2006, whereas, conversely, they had tended rather to reduce their exposure during the boom in April. This suggests that their investments are not purely speculative.

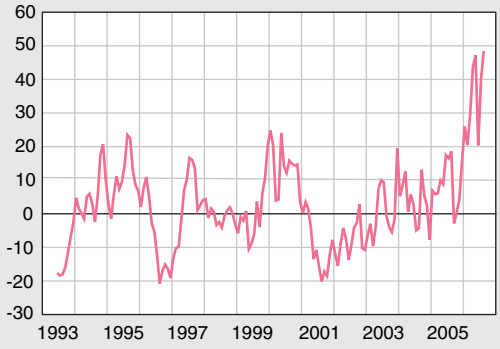
Commodities are nonetheless subject to speculative movements, even though it is difficult to evaluate the degree of speculation. Some observers believe it may be assessed by comparing changes in the spot prices of the underlying commodities on which futures contracts are based to changes in the spot prices of physical commodities. For example, Merrill Lynch estimates that speculators are more likely to trade on futures markets than on physical spot markets. Consequently, the difference between the price of a basket of commodities underlying futures contracts and that of a basket of physical commodities[7] allows to calculate the speculation premium. At the end of August 2006, the speculation premium derived from this calculation amounted to 50%, the highest level recorded since Merrill Lynch began these calculations.

Chart 4
Gold prices in US dollars and changes in outstanding amounts of gold ETFs



Sources: www.exchangetradedgold.com, *Bloomberg.*

Chart 5
Difference between the annualised returns on a basket of commodities underlying futures contracts and those on a basket of physical commodities
(%)



Source: Merrill Lynch.

7 *The return calculated for each basket is an arithmetic mean of the annualised returns on all the commodities. The first basket (commodities underlying futures contracts) is made up of cotton, copper, aluminium, zinc, lead, crude oil, nickel and tin. The second basket consists of burlap, polyester, steel, plywood, rubber, tallow, benzene, red oak flooring, ethylene and hides.*

BIBLIOGRAPHY

Business Week (2006)
"CalPERS' new crusade", 5 June

Deutsche Bank (2005)
"An investor guide to commodities", April

Global Investor Magazine (2006)
"Investing for the long term", *Global Alternatives Magazine*, June

Gorton (G.) and Rouwenhorst (G.) (2005)
"Facts and fantasies about commodity futures", *NBER Working Paper* No. 10595, February

Ibbotson Associates (2006)
"Strategic asset allocation and commodities", 27 March

Merrill Lynch (2006)
"US strategy update", 18 May

JP Morgan Securities Ltd (2006)
"Are alternatives the next bubble?", September