

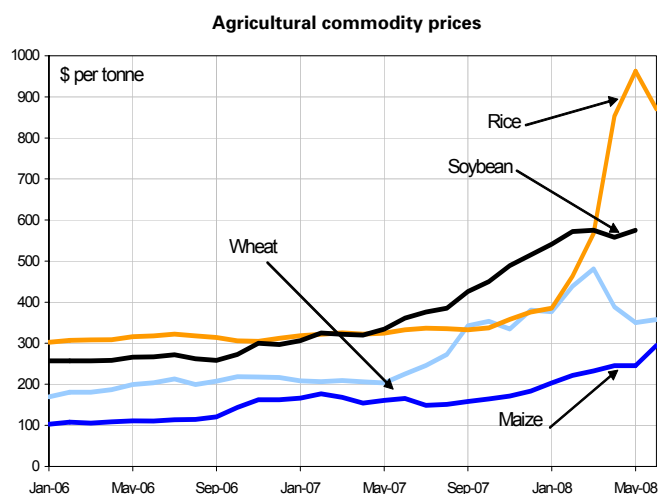
The role of financial factors in rising agricultural prices

This study was prepared under the authority of the Treasury and Economic Policy General Directorate and does not necessarily reflect the position of the Ministry for the Economy, Industry and Employment.

- There has been a sharp acceleration in the rate of increase in world prices for agricultural commodities since 2006, coming after fifteen years of rising steadily but moderately. By percolating throughout the food production chain, rising prices of agricultural commodities are contributing to global inflation. It is important to ascertain the causes of this crisis in order to determine the most appropriate way to address it.
- Demand for agricultural commodities has expanded as a result of economic growth in the emerging countries and, to some extent, the production of biofuels (in the case of certain staples such as maize). In addition, this demand for agricultural products is relatively inelastic to price.
- Supply of agricultural commodities has not immediately kept pace with demand due to climate accidents in the case of the 2006 and 2007 harvests, to rising agricultural production costs, and to lags in the response of supply to higher prices. Overall, supply and demand trends are clearly contributing to the rise in agricultural commodity prices.
- Financial investors are increasingly active in agricultural futures markets, and there are grounds for wondering whether their action may be helping to fuel the rise in agricultural prices.
- From a theoretical point of view, the existence of futures markets, even very active ones, is not sufficient to modify spot prices durably, and still less so when storage costs are high (as in the case of cereals).
- Available data suggest that the impact on spot prices of financial investment in futures markets for agricultural commodities is small compared with the impact of traditional supply and demand factors.

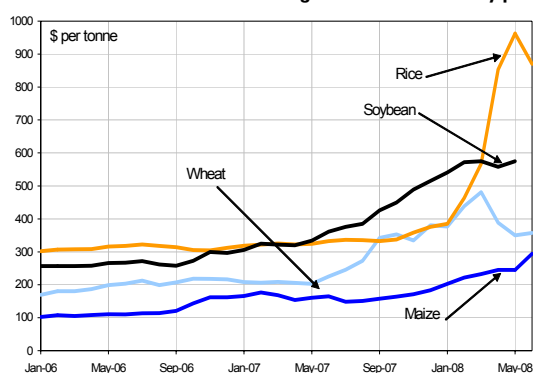
Rice: Thai white rice 100% - Grade B FOB, Bangkok
Soybean: US, No. 2 yellow, CAF Rotterdam
Wheat: US No. 2, Hard Red Winter, Ordinary protein, FOB US Gulf
Maize: US, No. 2 yellow, US Gulf.

Sources: FAO, International Grain Council (wheat),
USDA (maize), Jackson Son & Co (rice), Oil World
(soybean).



World prices for agricultural commodities have surged since 2006, after fifteen years of rising steadily but moderately. Wheat prices in particular rose by nearly a third between January 2006 and June 2007¹, then nearly doubled between July 2007 and March 2008, before starting to recede in April 2008. The price of maize also rose in the closing months of 2006, then again continuously from September 2007 onwards. It has slipped back over the most recent period, though less markedly than for the price of wheat. Soya bean prices have risen progressively since the end of 2006. The price of rice began rising more sharply and belatedly, from the end of 2007 onwards.

Chart 1: Agricultural commodity prices



Rice: Thai white rice 100% - Grade B FOB, Bangkok

Soybean: US, No. 2 yellow, CAF Rotterdam

Wheat: US No. 2, Hard Red Winter, Ordinary protein, FOB US Gulf

Maize: US, No. 2 yellow, US Gulf.

Sources: FAO, International Grain Council (wheat), USDA (maize), Jackson Son & Co (rice), Oil World (soybean).

By percolating throughout the food production chain, rising agricultural commodities prices are contributing to global inflation, accounting for roughly half of that figure in 2007, versus a quarter in 2006. The impact on consumer prices has been more pronounced in the developing countries, accounting for nearly two thirds of overall inflation in 2007 in Asia, and for one half in Africa, than in the advanced countries, where it accounted for roughly one fifth². In France, the increase in food prices accounted for only one fifth of overall inflation in 2007. However, food prices rose 5.5% over the year to June 2008, after 3.1% in December 2007, versus only 1.3% in June 2007. This acceleration is hurting low-income households especially, as food accounts for a higher proportion of their consumption spending³.

It was in this context that the G8 Ministers of Finance, meeting in Osaka on 13 and 14 June 2008, expressed concern at the consequences of the rising price of food products for the poorest sections of society. But in order to respond appropriately to this crisis, we first need to understand its causes. Does it reflect a change in the fundamental variables affecting the supply and demand for agricultural products? Or is it rather a speculative bubble reflecting a manipulation of agricultural prices by investors seeking immediate profits? Here we consider the respective influence of these different factors.

1. Demand for agricultural commodities is tending to rise while harvests are coming under pressure

Demand for agricultural commodities is tending to exceed available supply under the combined effects of:

- increasing utilisation as a result of the economic development of the emerging countries and biofuels production (for some staple products such as maize), compounded by the relative price inelasticity of demand for cereals and by substitution effects between commodities;
- constraints on production due to climate accidents, the costs of which are rising steeply.

1.1 Rising demand

The economic development of the emerging countries (especially Brazil, China and India) is leading to greater consumption of agricultural products and new

eating habits, with greater consumption of meat products, impacting the consumption of cereals. This in turn is boosting their imports of agricultural commodities and reducing their exports. China, for instance, has been a net importer of agricultural products since 2004.

Demand for certain commodities is also being driven by the **production of biofuels**. Worldwide, the production of ethanol in 2007 absorbed around 100 million tonnes of cereals (including 80 million in the United States), whereas the total cumulative cereals shortfall for 2006 and 2007 was roughly 50 million tonnes according to the International Grains Council (IGC). Consequently the huge growth in the production of bioethanol in the United States has undoubtedly helped push up the price of maize. In the European Union, biodiesel production has

(1) Prices of other products rose by between 5 and 10% over the same period.

(2) See International Monetary Fund (2008), Recent developments in commodity markets, *World Economic Outlook*, appendix 1.2., April.

(3) Based on the weightings calculated by Guedes (2006), "Indices de prix à la consommation par catégorie de ménages 1996-2006" (Consumer price indexes by household category 1996-2006), INSEE, *Document de travail F0606*, November.

absorbed two thirds of the rapeseed crop. However, the contribution of biofuels to rising agricultural prices needs to be seen in perspective, insofar as the proportion of cereals production intended for biofuels is relatively small (around 6%), or indeed marginal in the case of certain crops such as wheat (less than 1%), according to IGC figures.

The consequences of rising demand on prices are spreading from one market to another via **substitution effects in the consumption** of agricultural products. Wheat and rice in particular are fairly substitutable for consumption purposes, since both are intended mainly to feed humans. The price of wheat rose by 48% between 2006 and 2007, for example, compared with a rise of only 7% for rice, pushing wheat consumers to switch to rice; over the same period, rice consumption rose 1.1% whereas that of wheat fell by 0.2%. Similarly, maize and oilseeds intended for animal feed are fairly substitutable.

Price rises do not have a major impact on demand. For instance, demand for cereals to feed humans (which accounts for the bulk of cereals demand) is very inelastic to prices. This is less true in the case of demand for cereals for animal feed and for other uses such as biofuels, starch and sweeteners.

1.2 Insufficient supply, dearer supply

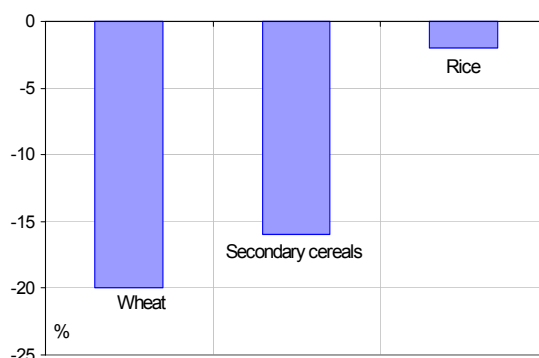
At the same time, supply has failed to keep pace fully with the growth in demand. **Drought** in Australia and Ukraine (exporting countries), as well as in India and Morocco (which are net importers) sharply depressed wheat harvests for two consecutive years (2006 and 2007) in the regions concerned. Other crops such as maize and soybeans have been more or less unaffected by weather conditions.

Shocks can spread from one crop to another where these are relatively **substitutable in terms of which crops farmers choose to sow**. This applies to wheat, maize and oilseed crops in many parts of the world. In France, for example, because margins for wheat crops in 2008 are expected to be distinctly higher than for rapeseed, the acreage sown with wheat will probably rise by nearly 5%, partly at the expense of acreage sown with rapeseed, which is expected to be down by more than 8%⁴. As a result, increased wheat acreage should curb the rise in the price of wheat, but it could help push up the price of other cereals.

Moreover, **global stocks of cereals are down 55% since the late 1990s and are now at historical lows**

(see chart 2), according to figures published by the Food and Agriculture Organization of the United Nations (FAO). The recent fall in wheat production has accentuated this trend, with stocks down 52% in two years. The fall in world stocks of maize has been less pronounced (down 15% in two years). Altogether, world stocks are at a very low level, below the FAO's recommended 17-18% safety threshold. Stocks are therefore no longer sufficient to act as a buffer, in the sense of preventing markets from over-reacting to information on harvests or surpluses available for export.

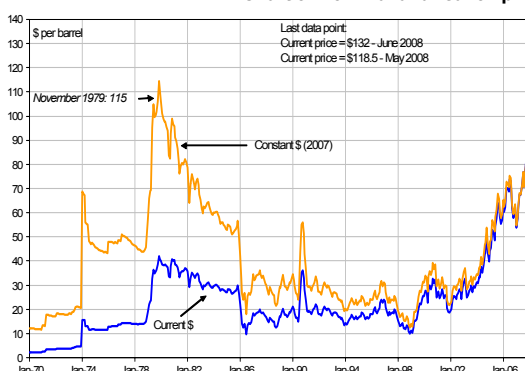
Chart 2: Change in stocks between the 2005/06 and 2007/08 harvests



Source: FAO.

Moreover, dearer **non-agricultural commodities** such as potash, nitrogen and phosphates are pushing up the price of fertilizers and farm production costs. According to the International Centre for Fertilizer Development, fertilizer prices leapt 200% in 2007. Higher energy prices are also driving up agricultural produce transport and shipment costs (see chart 3). In the short run, these cost increases are limiting growth in the supply of agricultural produce.

Chart 3: Nominal and real oil prices



Source: IMF, Datastream, US Bureau of Labor Statistics (the real price is deflated by the US consumer price index, base 100 = 2007).

(4) See French Ministry of Agriculture and Fisheries (2008), Agreste Conjoncture - "Grandes cultures et fourrages" (Major crops and animal feed crops), *Info rapides* no. 3/10, May.

Finally, the response of some governments to rising agricultural prices, **by limiting or even totally banning exports**, has further fuelled this increase in most cases. These restrictions penalise food-importing countries. What is more, they have a negative impact on production since producers no longer have any incentive to invest. Thus the very steep rise in the price of rice in early-2008 coincided with the export limitations imposed by several exporting countries, especially Vietnam and India, respec-

tively the world's no. 2 and 3 exporters, in a very tight global market⁵.

Altogether, shifts in supply and demand are clearly helping to push up the price of agricultural commodities. **However, the scale of current trends in the different markets cannot be entirely accounted in simple terms of supply and demand.** This is suggested, for example, by a comparison between rates of change in global prices and those in wheat stocks over the long period.

2. Are financial investors' transactions on the futures markets partly responsible for rising agricultural prices?

Financial investors have been increasingly active in the futures markets for agricultural commodities. A growing proportion of their transactions are betting on a rise in futures prices⁶, leading some observers to fear they could push up both futures and spot prices.

2.1 The growth in futures transactions on agricultural commodities

Like most organised markets, markets for agricultural commodities comprise a spot compartment where the product is traded immediately at the prevailing price, and a futures compartment in which standardised or futures contracts are traded, providing for the purchase or sale of a fixed quantity of the product (or underlying asset) at a previously agreed price and date.

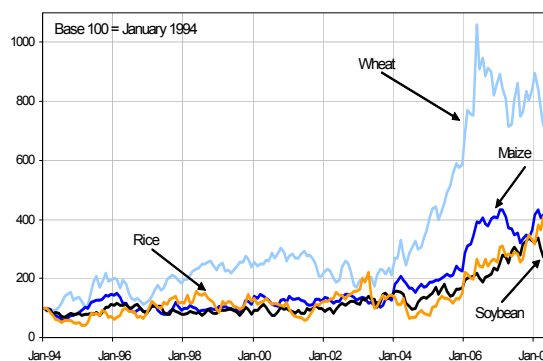
The purpose of the futures compartment is to enable participants to buy or sell in the expectation of a rise or fall in the spot price, either in order to hedge against a change in the price (the seller wants to protect against a possible fall in the price and the buyer against a possible rise) or, alternatively, in the hope of making a profit if their price expectations materialise, while taking the risk of a loss if the reverse occurs. Consequently there are two kinds of futures markets operators:

- *hedgers*, who seek to hedge their price risks by taking the reverse position to the one they have taken on the spot market, in the case of producers, traders or users, or on the swaps market in the case of banks;
- financial investors, who buy futures contracts on agricultural commodities in order to diversify their portfolio with a view to reducing risk, to protect against the risk

of inflation, or to make a profit by speculating on futures prices.

Investor interest in futures markets for commodities, including energy, agricultural products and metals, has increased significantly in recent years, as witnessed by the spectacular growth in transactions on these markets. For instance, the number of agricultural futures contracts traded daily on the Chicago Board of Trade (CBoT) has more than tripled since 2000. On the cereals futures markets, aggregate long and short positions for all operators combined have increased significantly (see chart 4), and especially since 2004.

Chart 4: Change in total positions on agricultural products compartments on the CBoT



Source: Bloomberg.

There are several reasons for this vogue.

The inclusion of commodity futures contracts in portfolios serves to diversify risks⁷. Certain pension funds and other long-term investors, i.e. ones following a buy and hold

(5) See in particular the article "As demand for rice climbs, international trade falls", in the *International Herald Tribune*, 28 April 2008.

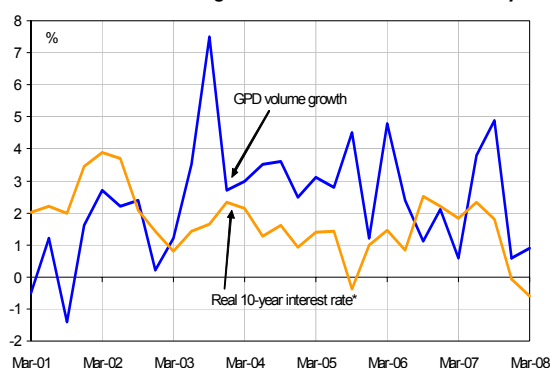
(6) This need not necessarily be destabilising, since it increases market liquidity and moves prices closer to equilibrium. A considerable body of academic work further suggests that as a general rule futures markets transactions do not lead to greater spot market volatility.

(7) The inclusion in a portfolio of financial instruments linked to commodities not correlated with the assets already held is supposed to reduce the portfolio's risk. For example, see Gorton and Rouwenhorst (2005), "Facts and fantasies about commodity futures", *NBER Working Paper*, No. 10595, February.

strategy, as in the equity markets, are gradually and durably introducing commodity futures contracts into their portfolios, rolling over their positions before contracts mature to avoid having to deliver the underlying asset.

Other investors more concerned with earning high returns are speculating on expected price trends, buying when they expect prices to rise, and selling when they expect the reverse. Relatively low interest rates (see chart 5) and the spectacular surge in commodity prices in recent years have no doubt encouraged this kind of behaviour.

Chart 5: US long-term interest rates are relatively low

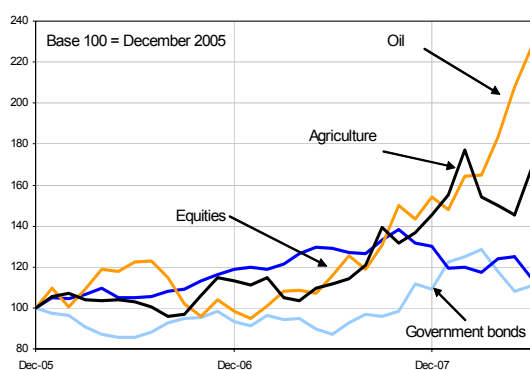


*: 10-year Government bond rate deflated by annualised consumer price index.

Source: Bloomberg

Thus \$100 invested in agricultural futures contracts (S&P GSCI agriculture index) at the end of 2005 would have earned \$167 in June 2008 (see chart 6). This is less than the gain on oil futures contracts (\$227 for the S&P GSCI oil index), but more than what could have been earned on US Government 10-year bonds or international equities (MSCI AC World index), where the investment would have grown to \$111 and \$115 respectively.

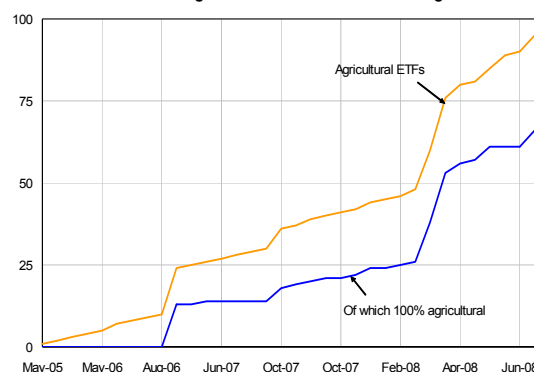
Chart 6: Comparative returns on different financial investments



Source: Bloomberg.

At the same time, the **emergence of new types of investment instrument** has enabled a larger number of investors, including individual investors, to buy this type of exposure to the futures markets. Foremost among these are Exchange Traded Funds (ETF), which replicate the performance of a commodities index (see chart 7) and can be bought and sold on the stock exchange. According to the U.S. commodity futures markets regulator, the Commodity Futures Trading Commission (CFTC), issuers of commodities ETFs currently account for between 20 and 50% of volumes of agricultural commodities futures traded on the Chicago, Kansas City and New York exchanges.

Chart 7: Number of agricultural commodities Exchange Traded Funds



Source: Bloomberg.

2.2 What impact on agricultural prices?

Futures prices and spot prices are closely linked⁸.

A futures contract initiated at date t provides for delivery at date T of a quantity of commodities (the underlying) worth $S(t)$ at date t . In theory, to be in a position to deliver the underlying at maturity, the futures seller borrows the amount needed to buy that underlying asset and repays the amount at maturity at interest rate $r(t, T)$. Physically holding the underlying entails a storage cost $w(t, T)$ but also a (non-observable) return $c(t, T)$ which measures a gain resulting from the opportunity of storing it when the supply-demand balance is uncertain. If the market expects a sufficiently abundant supply at maturity, this return tends towards zero. In the absence of any arbitrage opportunity, the value of the contract, which corresponds to the sum $F(t, T)$ that he receives for the sale of the underlying, is such that it covers the repayment of the principal and interest on the loans plus the cost of storage, less the return on holding the asset. I.e., adopting simple compound interest, we obtain:

$$F(t, T) = S(t) + S(t) * [r(t, T) + w(t, T) - c(t, T)]$$

Thus, insofar as this relationship is verified, the factors influencing futures prices also affect the spot price of the

(8) See Gorton, Hayashi and Rouwenhorst (2007), "The fundamentals of Commodity Futures Returns" *Yale ICF Working Paper No. 07-08*, June.

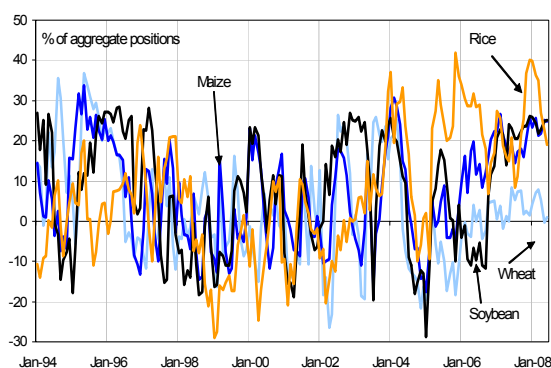
underlying asset, although one cannot deduce from this that it is futures prices that influence spot prices.

In practice, the underlying asset is rarely delivered, deliveries representing less than 1% of transaction volumes on most markets⁹. Indeed the economic purpose of futures markets is not to acquire the physical asset, which would ultimately be rather costly. These transactions are generally unwound by means of a cash payment.

Investors are increasingly active in the futures markets, betting on rising prices. The CFTC publishes data allowing us to track open long positions (number of futures contracts purchased but not yet resold) and short positions (sold but not yet repurchased) by category of trader in the markets for agricultural commodities futures¹⁰. These figures show that, since 2006, non-commercial traders have practically continuously maintained net long positions on the markets for wheat, maize, soybean and rice, and that these positions have expanded significantly (see chart 8), reflecting increasing speculation on rising futures prices.

It further emerges that the share of these net long positions in aggregate positions (long and short) for all categories of traders combined is no higher than in the past, except for rice. This finding suggests that while there is a fair amount of speculation on rising prices for rice, this is less the case for maize and soybean, and is less clearly in evidence for wheat.

Chart 8: Investors' net long positions on CBoT agricultural futures markets



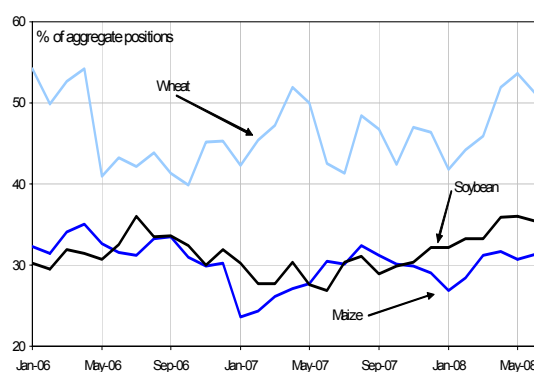
Source: Bloomberg, authors' calculations.

However, the frontier between commercial traders and non-commercial traders is a narrow one: the commercial traders identified by the CFTC do not consist solely of

participants in the physical markets for agricultural products. For example, when a bank agrees to pay a cash stream to a pension fund based on a rise in a commodities index and hedges the resulting risk by taking a long position on the futures markets, the transaction is reported to the CFTC as a hedge transaction, whereas in fact it is a bet by a pension fund on the direction of the index, which could fuel expectations of a rise in the price of commodities. If the index rises, the bank will pay the pension fund an amount equivalent to the increase in the index¹¹. Thus since 2006, the CFTC has specifically sought to chart transactions by index traders, who trade in agricultural futures via ETFs (see below).

The figures show that index traders hold net long positions, significantly so in certain markets (see chart 9). The relative share of their commitments appears to be fairly stable since 2006, but it is likely that in a bull market index traders need to buy smaller quantities of products for a given index value¹².

Chart 9: ETF's net long positions on CBoT agricultural futures markets



Source: Bloomberg, authors' calculations.

In this context, the existence of a stable link between futures prices and spot prices would be evidence of a possible impact on prices of investors' long positions on the futures markets.

The data plotted on chart 10 show that the relationship between futures prices and spot prices is stable for neither soybeans, nor wheat, nor maize. Since 2006 the spot price has diverged increasingly from futures contract prices. The relationship indeed appears particularly unstable in the case of wheat.

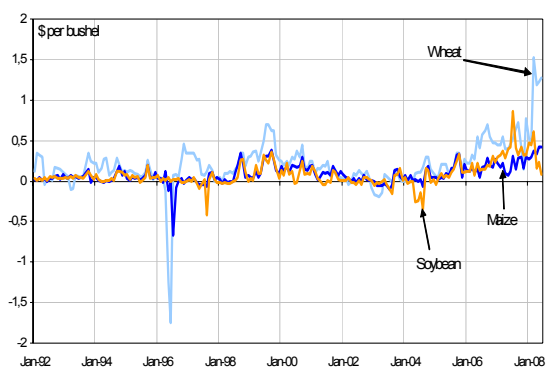
(9) See OECD (2008), "The Relative Impact On World Commodity Prices Of Temporal And Longer Term Structural Changes In Agricultural Markets", Committee for Agriculture, March.

(10) In CFTC terminology, hedge traders are called *commercial traders*, and investors are called *non-commercial traders*.

(11) See article "NYSE Chief Suggests Funds' Role in Prices", published in the *Wall Street Journal*, 18 June 2008.

(12) See Goldman Sachs (2008), "Speculators, Index Investors, and Commodity Prices", *Global Investment Research*.

Chart 10: Difference between the price of the 1st month contract and the spot price of wheat, maize and soybeans



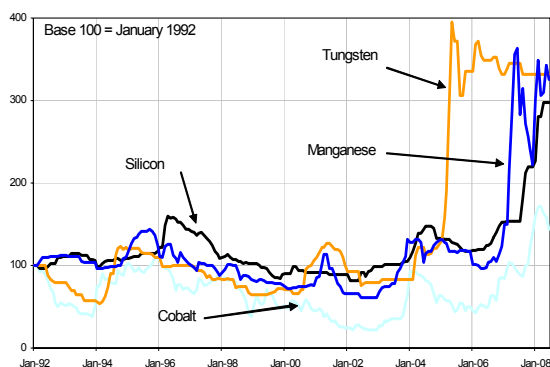
Source: Bloomberg.

While hard to quantify, the impact of financial investors' behaviour on the rise in agricultural prices appears to be less pronounced than that of supply and demand factors.

Preliminary studies by the CFTC further suggest that financial investors' transactions tend rather to follow than precede price rises, and they reveal no clear link between changes in positions on the futures markets and agricultural price variations¹³.

Finally, rising commodity prices is a widespread phenomenon affecting all products, from agriculture and energy to metals. This also applies to products for which there is no financial investment vehicle and which are therefore inaccessible to futures markets traders, cannot be substituted for other products traded on futures markets, and for which one cannot therefore suspect any possible speculative impact. This is the case, for example, with certain rare industrial metals (see chart 11) not traded on any organised market, future or spot¹⁴.

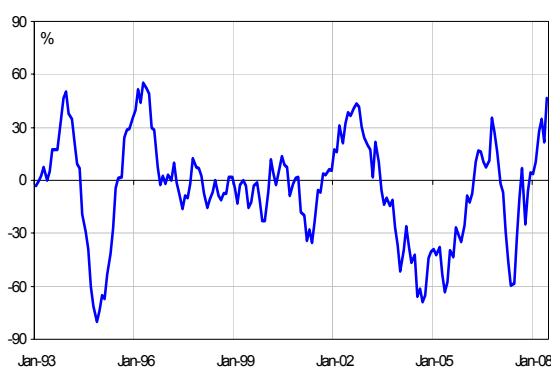
Chart 11: Trends in prices of industrial metals not traded on the futures markets



Source: Bloomberg.

One can obtain some indication as to the degree of financial speculation that would affect trends in prices of commodities traded on futures markets by comparing variations in spot prices for products constituting the underlying for futures contracts with commodities for which there is no futures contract¹⁵. By way of illustration, the difference between the annual return on a basket made up in equal quantities of wheat, maize, soybeans and rice, and that of a basket comprised of cobalt, silicon, tungsten and manganese fluctuates sharply and is fairly small on average (see chart 12). In this example, the recent period (since 2007) indeed corresponds to a phase of acceleration, but this movement does not appear to reflect an unaccustomed shift.

Chart 12: Difference in annual return between agricultural commodities linked to futures contracts and metals not traded on futures markets



Source: Bloomberg, authors' calculations.

In conclusion, the impact of financial speculation on commodities prices does not seem to prevail over the impact of supply and demand factors. **The pronounced rise in the price of agricultural commodities since summer 2007 appears to be driven primarily by excess demand over supply.** This is due to one-off factors such as climate accidents, as well as to structural factors, notably reflecting the emerging countries' economic catch-up with attendant changes in consumption patterns, together with the limited amount of land available to be brought into food production.

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(13) See CFTC (2008), Written Testimony of Jeffrey Harris, Chief Economist Before the Senate Committee on Homeland Security and Governmental Affairs, May.

(14) See also Bond (2008), "Suffering in the Seventies", *Global Speculations*, Barclays Capital Research, May.

(15) See Mongars and Marchal-Dombrat (2006), "Commodities: an asset class in their own right?", Banque de France, Financial Stability Review, no. 9, December.

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