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**COMMISSION STAFF WORKING DOCUMENT**

**Task force on the role of speculation in agricultural commodities price movements**

**Is there a speculative bubble in commodity markets?**

*Accompanying document to the*

**COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN  
PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL  
COMMITTEE AND THE COMMITTEE OF THE REGIONS**

**FOOD PRICES IN EUROPE**

**Including a roadmap to improve the functioning of the food supply chain**

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## COMMISSION STAFF WORKING DOCUMENT

### Task force on the role of speculation in agricultural commodities price movements

#### Is there a speculative bubble in commodity markets?

## 1 Introduction

In 2007 and the first half of 2008 the prices of many agricultural commodities (such as dairy, grains, and oilseeds) increased substantially. This sudden surge in prices stirred a worldwide political debate on how to limit the negative impact of a "food crisis".

In May 2008 the European Commission issued a communication: *Tackling the challenge of rising food prices*, in which it tried to assess the impact of rising food prices within the EU and worldwide, including a preliminary analysis of the development of agricultural and food prices. The communication stated that "the Commission will monitor closely activities by speculative investors in commodity-related financial markets and their impact on price movements". This note results from a follow-up analysis made by Commission staff and deals in particular with the hypothesis of a speculative bubble in the markets for some agricultural products.

Since speculation tends to be mistaken for market manipulation, a rather precise definition of a speculator (and speculation) is needed. For the purpose of this paper, a speculator is an investor (such as a hedge fund, investment fund, sovereign wealth fund) who purchases/sells a futures contract in order to sell/purchase it later (usually before expiry) for the purpose of profiting from the intervening price changes. By doing so the speculator frequently acts as a counterparty to hedgers (producers and buyers) and assumes risks. Hedging activity also improves price discovery in commodities markets, as commercial hedgers typically are a primary source of new market information.

This typically improves the efficiency of commodity markets and the efficiency of commodity production. In the absence of reasonable hedging opportunities, commodities producers might be forced to increase prices to compensate for unhedged risk or might cut production of particular commodities. Speculation is a feature of any efficiently functioning financial market and speculators are present in financial markets at all times. A distinction must be drawn between speculation based on macroeconomic and financial market fundamentals and on market momentum.

Speculation based on market fundamentals involves trading regularly and making profits by anticipating changes in prices and taking appropriate positions. This form of speculation is positive, facilitating price discovery and risk management. Speculation based on market momentum is characterised by herding behaviour in times of strong (usually upward) price trends, which in developed and easily accessible markets can result in the emergence of speculative bubbles, with market prices driven away from fundamental level, contributing to increases or decreases in agricultural commodities prices and higher price volatility. Nevertheless, neither of these types of financial market speculation should be confused with manipulation, i.e. illegal distortion of market functioning (such as price collusion, short-term squeezes, disseminating false information) that is typically illegal under market abuse legislation.

The note is organised as follows. Section 2 presents basic information on how commodities derivatives markets function, the instruments traded, market structure and investment strategies applied on derivatives markets. Section 3 describes in more detail the evolution of prices and provides analysis of possible price drivers, distinguishing fundamentals and factors that are more specific to financial markets. Section 4 considers the arguments for and against a speculative bubble. Section 5 provides a statistical analysis of possible causalities.

## 2 Functioning of commodities derivatives markets

### 2.1 Main types of instruments traded

All participants in a food production chain, i.e. producers, processors or merchants, seek protection against unpredictable price changes, which can be enforced through privately negotiated contracts aimed at obtaining the immediate (spot contracts) or future (forward contracts) delivery of the commodity at the agreed price.

**Futures contracts**<sup>1</sup> are agreements to buy or sell in the future a specific quantity of a commodity at a certain pre-determined price and allow the transfer of price risk from one party seeking to lay it off to another willing to take it on. The use of derivative contracts allows investors to acquire exposure to commodities without incurring the problems typically linked to physically holding them (such as dependence on their cycles, their perishability, their storage).

Futures contracts may — or may not — involve the actual delivery of the underlying commodity at the delivery date. However, even in the case of delivery-type contracts, very few of them actually result in delivery; the majority of market participants (especially non-commercial ones) prefer trading into a new futures contract before the expiry date or closing their position with an offsetting trade.

In order to enter into the contract the counterparties are not required to put up the entire value of a contract but they have to post a margin. Margin is a percentage (determined by the exchange on which the contract is traded) of the initial total value of the trade (notional value) and must be maintained throughout the time positions are open; it is designed to limit the credit risk.

**Options** are another kind of common derivative market instrument. An option is a contract which gives the buyer a right, but not an obligation, to buy (call) or sell (put) a specified quantity of a commodity or a futures contract at a set price within (or at) a specified point in time. The seller of the option (writer) is obliged to sell/buy the commodity or futures contract if the option is exercised. The premium is the price paid by the buyer of an option.

A number of alternative instruments, such as index funds, exchange traded funds and exchange traded commodities have also been developed. These instruments have been created in order to meet the needs of commercial and non-commercial investors and to allow also retail investors to obtain indirect exposure to commodity markets.

**Index funds** are passively managed investment funds, replicating the performance of a benchmark index via joined-up transactions in futures. No underlying inventory is physically held, but the proceeds are usually used to buy another position ("rolling" process).

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<sup>1</sup> In typical financial markets, futures contracts are derivatives, i.e. financial instruments whose value changes in response to changes in values of the underlying asset.

Commodity **exchange traded funds** (ETFs) offer very similar benefits but can be also traded on an exchange.

## **2.2 Commodities derivatives markets**

The biggest futures exchanges for agricultural commodities are based in the US. Several changes have occurred in recent years, especially on the Chicago Board of Trade (CBOT): in 2005 speculative position limits were increased twice so as to enhance liquidity in the market; in 2007, the CBOT merged with the Chicago Mercantile Exchange (CME) to form a for-profit organisation as opposed to a user contract exchange where profits are refunded to the users typically via discounts on trading fees.

Additionally, some derivative exchanges have changed the way they conduct trading. Old systems of face-to-face trading on trading floors have been replaced with electronic trading, and telephone and computer networks that have further evolved into e-trading. For example, the possibility of electronic trading on the CBOT was introduced only in 2006 and now accounts for most of the trading.

The OTC (over the counter) market should be mentioned as well. Although the notional value outstanding of OTC commodity derivatives represents only 1.5% of total OTC derivatives activity, it increased from \$400 bn in 1998 to \$9 trillion in 2007, with a 30% annual increase in 2007.<sup>2</sup> The Bank of International Settlements (BIS) distinguishes between gold and other commodities, so agriculture and energy products will fall into the latter category, which represent 92% of the residuum group and experienced the biggest growth in recent years. However, OTC derivative transactions are generally cash settled without a direct influence on the physical market. By default, OTC trading is less transparent than activity on exchanges, where trading is monitored by the market operator and thus any irregular activity can more easily be spotted.<sup>3</sup> Therefore, making a complete assessment of the size or potentially changing nature of OTC trading as well as its impact on spot prices is difficult.

## **2.3 Relationship between spot and forward prices**

In commodity trading two types of prices can be distinguished: the spot price and the forward price, i.e. the selling price of a commodity for immediate and for forward delivery respectively. A futures contract is a standardised forward contract traded on an exchange; its price will be closely related to the forward price.

Conventional theories on the relationship between spot and futures prices (based on market efficiency and arbitrage) suggest that spot prices, futures prices and expected spot prices should respond consistently to any new market developments. However, to the extent that commodity markets differ from other markets, the relationship between futures and spot prices could work differently than in the other markets, possibly heightening concern that the futures prices may distort the spot prices. Futures prices signal expectations of the movement in spot prices over a specified period. Therefore, when betting on the future spot price using a futures contract, an investor assumes the risk of unexpected movements in the future spot price. As the maturity date of a futures contract approaches, the futures price converges to the spot price. At maturity, the futures price should converge towards the spot price. However, such convergence may not occur due to inefficiencies in the functioning of the futures market.

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<sup>2</sup> BIS, OTC derivatives activity second half 2007.

<sup>3</sup> Furthermore, in the US, commodity exchanges cooperate with the Commodity Futures and Trading Commission in applying position limits and establishing the beneficial owner behind each on-exchange trade. This has recently led to moves to impose similar rules on trading of the WTI contract on the London-based ICE Futures Europe, which the UK Financial Services Authority will need to scrutinise before their envisaged application.

The futures price may be either higher or lower than the spot price. When the spot price is higher than the futures price, the market is said to be in backwardation. It is often called "normal backwardation" as the futures buyer is rewarded for risk he takes off the producer. If the spot price is lower than the futures price, the market is in contango. In broad terms, backwardation reflects the majority market view that spot prices will move down, and contango that they will move up. Both situations allow speculators (non-commercial traders<sup>4</sup>) to earn a profit.

In general, a speculator's strategy in commodity futures markets is determined by the relationship between the futures price and the future spot price expected by the investor. If a speculator expects the spot price on the expiry date of the futures contract to be higher than the price of the contract he will buy the contract. If the spot price on the expiry date of the contract is lower than the contract price he loses. Similarly, if a speculator expects spot prices on the expiry date of a contract to be lower than the price of the contract he will sell the contract short (i.e. sell a contract he does not have). If the spot price at the expiry date of the contract is lower than the contract price, the investor earns a profit by buying the contract cheaper before expiry and delivering it to the counterparty.

There are a few important factors to be borne in mind when considering an investment in futures. First, the expected payoff to a futures position is the risk premium. The realised payoff is the risk premium plus any unexpected deviation of the future spot price from the expected future spot price. Second, a long position in futures is expected to earn positive (excess) returns as long as the futures price is set below the expected future spot price, because the futures prices will tend to rise over time, providing a return to investors in futures. Finally, expected trends in spot prices are not a source of return to an investor in futures, as they are priced in the futures price at the inception of the contract.

## **2.4 Hedging and arbitrage activities**

There are two basic groups of players in the commodity futures market: hedgers and arbitrageurs/speculators. Hedgers are commodity producers and commodity users, while arbitrageurs/speculators are non-commercial investors.

The rationale for commercial investors to be active in this market is to stabilise revenues and control the variability of input/output prices.

In contrast, the objective of non-commercial investors is to generate earnings through arbitrage opportunities or passive investments in commodities. In order to earn a profit they use a number of strategies, such as (i) buying a commodity in the spot market and subsequently selling it in the futures/forward market; (ii) buying/selling a near month contract when prices are low and selling/buying in the forward month contract when prices rise; (iii) reacting to price differences between two different exchanges where contract specifications are similar (i.e. buying in one market and selling in the other); (iv) investing in an index that tracks a basket of commodities to measure their performance; or (v) rolling over a futures contract that is close to expiry into a new contract at a lower price.

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<sup>4</sup> A non-commercial trader is a trader that is not commercially engaged in business activities hedged by the use of the futures or option markets (CFTC classification). The non-commercial classification does not include swap dealers and commodity index trading is generally considered as commercial.

The distinction between hedging and arbitrage is not very clear. Usually, a producer who wants to hedge against price movements faces a speculator as a counterparty that wants to earn profit from assuming the price risk. This happens if no hedging counterparty is available, i.e. if there is no counterparty that is either naturally long (physical commodity producer) or short (physical commodity buyer) of commodity.

### **3 Recent evolution of commodity prices**

#### **3.1 Evolution of food prices**

After declining for more than thirty years the real prices of many agricultural commodities started to increase in 2006. In the second half of 2007 these price increases accelerated rapidly and by early 2008 price levels had reached unprecedented levels in nominal terms for some commodities. The global commodity price surge generated a rapid increase in consumer food price levels. The resulting increase in headline inflation was mitigated to some extent by the low and declining share of agricultural raw materials in the value of food products at the consumer level. The increase in food prices peaked in July 2008 when food price inflation reached 8.3%.

Although structural factors such as the growth in global food demand and the long-term decline in productivity growth can be expected to maintain prices at relatively firm levels over the medium term, commodity prices have declined sharply in the most recent months owing to a series of factors.<sup>5</sup> Some of the short-term drivers which amplified the increase in agricultural prices in the second half of last year have started to vanish (e.g. more favourable climatic conditions). The Common Agricultural Policy has been adapted in order to stimulate supply adjustment (e.g. suspension of mandatory set-aside of land and an increase in milk quota in 2008 in the EU). The production response has been very strong in many countries with additional production factors mobilised to benefit from higher producer prices. The combined impact of these factors enabled commodity prices to come back to levels which can be considered as more in line with market fundamentals (by historical standards), although the global economic uncertainty raise concerns about renewed volatility.

#### **3.2 Comparison with other commodity markets**

Although the evolution in the price of agricultural commodities has received a lot of attention in the media, other commodities have also experienced substantial price increases. The prices of energy and crude oil have experienced a strong upward trend and have been much more volatile since 2002: see Chart 1 in the Appendix.

Interestingly, price developments for agricultural commodities have followed a similar pattern to gold prices. They both faced relatively low volatility and began to increase only in 2005. However, for all commodity types an acceleration of growth can be spotted from August 2007, when the subprime crisis started. This could be related the fact that commodities are perceived as a defensive investment and attract more inflows in times of distress or uncertainty. From Chart 1 in the Appendix it is rather difficult to identify a specific pattern or structural break in agricultural commodities prices and more analysis is necessary. In nominal terms, prices of agricultural commodities have increased while real dollar prices have followed a downward trend over the last three decades. This happened mainly as the supply kept up with increasing demand, due to technology-driven improvements in productivity and

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<sup>5</sup> European Commission, October update on recent developments in EU agricultural commodity and food prices, October 2008, Staff working paper.

yields. Most increased agricultural production has come from increased yields, rather than greater land use.

### **3.3 Possible drivers of recent developments in food prices**

#### **3.3.1 Fundamental factors**

Price fluctuation is characteristic for products exhibiting seasonality, which is a typical feature of agricultural products. Other external factors (weather, perishability of products, diseases, exceptional losses, etc.) can limit the short-term adjustment capacity of the agricultural sector. Reasons for the price hikes observed in 2007/08 have been reiterated on many occasions: a combination of steadily increasing demand and lagging supply or production shortfall, exacerbated by short-term economic and policy factors. These factors are of both a structural and a cyclical nature.

Demand from emerging economies has grown progressively. Reduction in supply, occurring more suddenly, was partly due to weather-related conditions and slow increases in yields, resulting in decreasing grain production in major exporting countries. With exports concentrated in a relatively small number of countries, small changes in production patterns can have major consequences. Competition for a relatively limited amount of arable land also restricts supplies. Without an appropriate supply response, stocks are employed, resulting in a smaller buffer should a supply failure or a slowdown occur.

Major factors driving prices can be grouped into three clusters<sup>6</sup> related to: (1) physical attributes of production; (2) macro-economic environment; (3) policies.

(1) Changes in agricultural production and trade related to physical attributes of production influence only the supply side. Among these are:

Weather-related phenomena, including droughts, floods, heat waves, early or late frosts, excessive rainfalls during harvest season, and other adverse climatic events, and in broader terms water scarcity;

Production-related phenomena that might be triggered by weather or might have developed independently. These include yield stagnation (or a slowdown of yield growth depending on the commodity), shifting production zones due to changing climatic conditions and water scarcity, or favourable conditions for faster spread of diseases, usually affecting animals.

Diseases and other exceptional losses may restrain the supply side also.

(2) Changes in the macroeconomic environment and their impacts can either directly or indirectly affect both supply and demand and include a range of factors:

Population and income growth. Demographic parameters (increasing population, urban migration and changing age distribution) impact both the supply of and demand for agricultural commodities.

Both population and GDP growth in developing economies exceed the rates of growth in developed countries. Income-driven changes in dietary patterns (mostly demand for meat and dairy) are most notable in Asia and Latin America. These changes tend to be structural in nature;

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<sup>6</sup> The note is simplified in terms of linkages among agricultural production, economic developments, and policy announcements.



Price of crude oil. On the input side, a close relationship exists between the price of crude oil and the price of raw fertilisers. Even in the absence of trade, high oil prices result in higher costs of processing, transportation and distribution. Freight rates in January 2008 were more than double those in January 2007 but have eased since then. Freight rates, although related to fuel prices, are also a result of increased trade volumes, infrastructure congestion (such as ports), overall stretched shipping capacity, and longer trade routes. Transport of bulk agricultural commodities directly competes for shipping capacity with iron ore and similar products, demand for which is driven by economic expansion and the associated building boom in emerging economies. These factors are likely to be structural;

Currency movements. Undervalued or overvalued currencies influence the competitiveness of a particular country's imports and exports. The progressive decline of the USD makes US exports cheaper and increases the demand for US products. Exchange rate adjustments can act as a buffer, absorbing increases in commodity prices quoted in USD.

#### Activities on the commodity exchange markets

- (3) Various policies influence mostly supply, but also have an impact on the demand side. Some are put in place to mitigate the effects of high prices while at the same time some measures further increase prices. Among the most important ones are:

Stocks and related policies. The size of reserves held decreased due to the high costs of storing perishable products, the high opportunity cost of storage in the environment of previously low global prices, the development of other less costly risk management instruments and as a result of agricultural policy reforms. Nevertheless, the amount of stocks in some countries remains unknown due to limited record keeping and ambiguities about private inventories;

Agricultural policy and its reforms. Agricultural policy reforms such as the reduction of price support and the introduction of direct payments require some time for the markets to adjust. In some countries reforms might lead to abandonment of agriculture, increased urbanisation, etc.;

Research and development. The global lack of investment in research and development might hinder the capacity to keep pace with demand growth. Expenditure on farming as a share of total public spending fell by half between 1980 and 2004. Despite its importance, increasing private research has not sufficiently replaced the role of public research;

Trade-restrictive policy announcements. Responding to the price increases, many countries introduced measures to protect their population from price hikes, either at domestic level (such as price controls or subsidies), or in terms of trade policies (such as export taxes or other forms of export stops) that carry a "beggar your neighbour" element and further disturb markets by reducing supply. In the medium term such restrictions send the wrong signal, reducing incentives for farmers to invest to increase production;

Energy policies (biofuels). Biofuels emerged as an alternative market for agricultural commodities, creating new demand for some grains and oilseeds.

Cross-cutting elements influencing all three themes and affecting both supply and demand are uncertainty, expectations (related to macroeconomic development and policies) and unsettled markets resulting from new markets for agricultural commodities, announcements in the policy sector, expected restrictive trade policies responding to high price situations, and developments on the futures markets (the subject of this report).

However, the contribution and combination of these factors varies between sectors. Moreover, while a certain degree of substitution for agricultural commodities exists, in general the demand for staples is not price-sensitive and the degree of substitution is low.

Crop production shortages in major producing countries have greater effects on markets in the short term, while changes in the macroeconomic conditions are more important in the longer term. With several factors being triggered simultaneously, it is difficult to determine whether the changes are temporary or structural. The evidence suggests that some market fundamentals might be changing owing to new demands but uncertainty prevails regarding the extent of the adjustment.

### **3.3.2 Contribution of financial investors and reallocation from other markets (recent evidence)**

Over the past five years, the presence of financial investors in commodity markets has increased considerably. Nevertheless, it is rather difficult to assess the amount or composition of inflows from financial investors to commodities markets. Furthermore, it is not clear to what extent these changes reflect structural shifts in investor behaviour or a temporary boom supported by a "search for yield". In any event, a full reversal of the trend towards a greater role of financial investors appears unlikely against the backdrop of greater investor sophistication and a broadening range of commodity-related financial instruments. Currently, there are observed reverse developments in liquidation..

A factor that may have attracted financial investors to this market is the fact that commodities have traditionally been a comparatively attractive investment during periods of economic uncertainty and diversification yields benefits as commodity futures earn above-average returns when stocks earn below average returns. Commodity futures can also be a better inflation hedge than stocks or bonds, as they are directly linked to expectations of commodity prices development, taking into account information about foreseeable trends.

Furthermore, many new products related to commodity investment have been created, and these have attracted a wide range of investors. The new products do not require specialist commodity knowledge and most of them, combined with electronic trading, are customised products tailored to meet precise investment objectives of institutional and individual investors.

One rapidly growing area is passively managed investment and portfolio products, which is consistent with investors now viewing commodities as an attractive separate asset class. By mid-2006, around \$85bn of funds were tracking the Goldman Sachs Commodity Index (GSCI) and the Dow Jones/AIG index, two important commodity indices.<sup>7</sup>

The presence of investors with a short-term focus (such as hedge funds) has grown considerably during the past three years. The number of hedge funds active in energy markets has reportedly tripled to more than 500 since the end of 2004, with an estimated \$60 billion in assets under management.<sup>8</sup>

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<sup>7</sup> D. Holmes, *A financial Feast: A-la-Carte Commodity Investing*, 2006.

<sup>8</sup> The \$6bn loss on natural gas derivatives that the hedge fund Amaranth reportedly incurred in September 2006 is a further indication of the size of positions that hedge funds take in commodity markets.

According to an IFSL estimate, global pension funds, insurance funds and mutual funds had \$74 900bn under management at the end of 2007; however, an actual estimation of how much of those funds had been invested in agricultural commodities is impossible.

As far as **pension funds** are concerned, many of them clearly still do not invest in commodities or consider commodities only as a peripheral diversifying investment to their portfolio. Pension funds investment in commodities was estimated at circa \$80bn. Most of this money was invested in indexed products.

Looking at **insurance funds**, in 2005 commodity investments were included in the category "others", accounting for a fairly marginal 5.6% of total assets. In 2006 and 2007, increasing interest rates and the Solvency II rules encouraged insurers to expand fixed income products at the expense of more risky investments. Overall it seems that although some commodities may appear to be natural hedges against natural disasters, insurance companies have not heavily invested in commodities.

**Undertakings for Collective Investment in Transferable Securities (UCITS)**<sup>9</sup> are prohibited from investing in financial derivative instruments based on a commodity or on another commodity derivative instrument.

The emergence of innovative investment products that allow all kinds of investors to gain exposure to commodities (instead of only experienced investors) appears to be the major driving force behind the increase in commodity trading. This development signals the move away from passive, long-only commodities exposure via commodity indices to more active strategies. Investing via exchange-traded products (ETPs) such as exchange traded funds (ETFs), exchange traded notes (ETNs) or exchange traded commodities (ETCs) was the mainstream development during last year for retail as well as institutional investors, which helped to increase diversification of non-correlated assets. These new products are mainly transacted through swap dealers, who serve as a bridge between the OCT and futures markets. The participation of swap dealers and commodity index traders in futures markets has increased. **Sovereign Wealth Funds (SWFs)** also account among the clients of swap dealers for investment into commodities (both oil and agricultural commodities).

**Hedge funds** may allocate a portion of their assets to commodity markets. However, most hedge funds' investment policies are negotiated with general partners, so they can invest only a tiny portion of their assets in commodities with a view to seeking diversification. In 2008 Q1 hedge funds had a global \$2 759bn worth of assets under management, shared between an estimated 10 000 hedge funds and hedge funds of funds. Between September 2005 and May 2007, the number of hedge funds trading commodities grew by 63%. This comes to as many as 300-370 hedge funds specialising in commodities, of which it is estimated only 2% are trading in agriculture.

It is impossible to assess the amount of money allocated to agricultural derivatives by financial investors. Most of the available evidence is anecdotal; however, it seems that for most of them commodity derivatives in general are rather a marginal investment and used as a diversification tool.

If investment in commodity derivatives appears limited in relation to the overall activity of all these investors, when compared with the size of agricultural markets it becomes significant

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<sup>9</sup> The UCITS Directives are a set of European Union rules that aim to allow collective investment schemes to operate freely throughout the EU on the basis of a single authorisation by one Member State.

and has increased sharply since 2006. For instance, the US Commodity Futures Trading Commission estimated that index investment activity in commodities reached 25 billion US dollars (notional value) for wheat, maize and cotton (combined) by June 2008. In the case of wheat, the activity of index investment represented 47% of the total notional value of opened contracts (futures and options for wheat estimated at 19 billion US dollars). This assessment was based on a survey and covers both over the counter and on-exchange index investment activity. Non-commercial<sup>10</sup> players gained importance on agricultural futures markets. For instance, on the CME wheat futures, since mid-2007 non-commercial agents (that do not include index and swap traders) have had a higher number of open contracts than commercial players.

The emergence of trading among financial investors in commodity markets on a bigger scale suggests that commodity derivatives markets may become more similar to traditional financial markets. This might raise some concerns considering the linkage with food.

## **4 Analysing the hypothesis of a speculative bubble**

### ***4.1 The case for a speculative bubble in agricultural commodities markets***

Over the last decade all commodities derivatives markets have experienced unprecedented growth, combined with increased liquidity, which has attracted further market participants. A greater number of market players might suggest higher volatility and price increases.

As the interest in derivatives kept growing and the investor base widened, the range of instruments and strategies employed in commodity trading broadened substantially. Together with development of technology, banks and derivatives dealers were able to create a wider range of derivative products. New products could not only cover more risks but also offered different types of protection. When other, more traditional markets (such as equity and bonds) ceased to offer attractive returns, the attention of financial investors turned to derivatives, agricultural derivatives included.

Since the beginning of 2006, there has been a substantial increase in investment flows into the agricultural commodities futures markets, fostering suspicion of a speculative bubble. The investment flows into futures markets are reflected in the total number of outstanding futures contracts held by market participants, referred to as open interest. While the increase in investment flows predates the ongoing credit crisis, the acceleration in 2007 is regarded by some as evidence that the market for agricultural commodities futures and commodity futures in general may be the latest to be affected by a "rolling bubble of speculation". Similarly, the recent decrease in investment flows in conjunction with falling prices observed during the summer and the deepening of the financial crisis is argued by some to be an indication of the speculative bubble bursting.

Proponents of the speculative bubble hypothesis point to a period of low inflation and accommodating global monetary policies since the late 1990s as having created conditions of ample monetary liquidity — leveraged many times by financial markets — and a rampant investor search for yield. In consequence, massive flows of highly speculative investment

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<sup>10</sup> According to the US Commodity Futures Trading Commission (CFTC), "all of a trader's reported futures positions in a commodity are classified as commercial if the trader uses futures contracts in that particular commodity for hedging, as defined by the CFTC".

have moved through the dot-com equities markets, the government bond markets, housing markets and the markets for securitised products before the eruption of the current credit crisis. As the credit crisis has been characterised by sharp corrections in house prices and dislocated securitisation markets, it is suggested that the speculative investment flows have now migrated to markets for financial derivatives related to commodities.

The charts in the Appendix show the relationship between open interest and spot and futures prices. From the charts the correlation seems to be stronger for soybeans, while for sugar it seems to be the weakest. In the case of wheat, peak prices were reached in spring 2008. Since then, both open interests and prices have been declining. However, futures prices remain higher than spot prices, showing a lack of convergence. This variation indicates that it is rather difficult to find a straightforward relationship between the open interest and price developments. It varies across the commodities and time-spans considered.

It has been further argued that the effects of a speculative bubble on agricultural commodities futures prices have been transmitted to the spot market, driving further up the price of commodities, and in turn, that of food and threatening to provoke a resurgence of global inflation. The rationale for the transmission of higher prices from the futures market to the spot market is that the upward momentum in futures prices is creating a pervasive expectation of higher spot prices in the future.

The correlation between spot and futures prices seems to be higher for most agriculture commodities, likely indicating that markets are efficient, irrespective of the existence of a speculative bubble. If markets are efficient, spot prices, futures prices and expected spot prices should be determined by the best available information on the fundamentals and any new information available should be quickly incorporated into prices. However, for some commodities there is a lack of convergence between future and spot prices at maturity. This has been observed for contracts based in the United States and mainly for wheat, soybeans and, to a lesser extent, maize (see 5.2).

Finally, the hypothesis of a speculative bubble postulates that rising futures prices are somehow acting as a benchmark for the prices of agricultural commodities, whereby the effect of speculators in driving futures prices higher would be reflected rapidly in the spot prices. Obviously, the existence of such a mechanical link would allow speculating effects in the futures market to be transmitted directly to the spot price. The link would be even stronger if the price of the closest-to-expire futures serves as a spot price.

#### **4.2 The case against a speculative bubble in agricultural commodities markets**

In considering the existence of a speculative bubble on the futures market, it is necessary to examine the extent to which the increased investment flows to the market may reflect speculation based on fundamentals (presented in section 3.3.1). Such speculation would be simply an element of normal market functioning and higher futures prices would reflect a beneficial process of price discovery. In other words, they would signal the need for immediate adjustments in supply and demand to avoid critical shortages later. Moreover, the inflow of investment would most likely be the counterpart of increased demand for hedging from larger consumers, such as food processing factories. In this interpretation of events, the

rise in agricultural commodities prices would be the response to investors' assessment of market fundamentals, and this assessment would be embodied in both spot and futures prices.

The case for fundamentals as the main driver of agricultural commodities prices is reinforced by weakness in the *prima facie* evidence linking higher investment flows directly to higher futures prices. However, there seems to be also a relationship between open interest and spot and futures prices: see Chart 2 in the Appendix.

While increased investment inflows into the agricultural commodities futures market would intuitively suggest that futures prices should move higher, this is not necessarily the case. As futures are contracts, their price is determined by the expectations of the respective counterparties about the future price of the underlying asset and not by the demand for these contracts (which would not exist unless there is an agreement between the counterparties).

Chart 3 in the Appendix compares developments in spot commodity prices and the share of non-commercial traders<sup>11</sup>. It is difficult to say if there is a correlation between the price and activity of non-commercial investors. For wheat no correlation between long positions of non-commercial traders and the price can be spotted. During recent (from the beginning of 2007) price increases the non-commercial positions were rather evenly distributed on the long and short sides. Before 2007 there were spikes of non-commercial investors' activities on either side; however, they do not seem to have influenced either price or its volatility. It should however be noted that most of commodity index traders are not counted among non-commercial players in Chart 3, as their activity is reported separately. Index players have held a significant share in long positions on the CBOT wheat contracts. According to the CFTC, the index fund long position in CBOT wheat still represented nearly 45% of all open contracts as of September 2008. In the case of maize, soybean and sugar, the recent price increases coincided with the long positions predominant among non-commercial traders. In addition the latter often roll-over their positions. Depending on the size of the market it could be an indication of lower liquidity of those markets. In this case enhanced activity on the market is very likely to have contributed to price volatility.

However, Speculation Pressure (SPI) and Hedge Pressure (HPI) Indices<sup>12</sup> (see Chart 4) appear to have a strong correlation, which indicates that sellers/buyers of contracts to/from speculators are the hedgers. Furthermore, both indices have stabilised in the last two years for all observed commodities, so there were no shifts in positions that could possibly justify price changes.

The rather inconclusive theoretical and empirical evidence in support of the hypothesis that higher agricultural commodities futures prices are translating into higher spot prices further reinforces the case for fundamentals as the main driver of commodities prices. Again, several factors are relevant:

As mentioned above, conventional theories on the relationship between spot and futures prices<sup>13</sup> (based on market efficiency and arbitrage) suggest that spot prices, futures prices and expected spot prices should be determined by the best available information on the fundamentals and any new information available should be quickly discounted. Futures markets signal the *expectations* about the future direction of prices rather than determine future spot prices. In determining the fair futures price, market participants compare the

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<sup>11</sup> Swap dealers and most of Commodity Index trading are not part of the non-commercials.

<sup>12</sup> SPI measures the net long position of non-commercials per unit of non-commercial's share of open interest, and the Hedge Pressure Index is defined as the net long position of commercials divided by the sum of both long and short positions of the commercials.

<sup>13</sup> As opposed to theories assuming imperfect market functioning, imperfect information or "rational exuberance" leading to herd behaviour as proposed in behavioural finance.

current futures price to the expected spot price, that is, a higher (lower) expected spot price in the future will be reflected in a high (low) current futures price that can be expected to prevail at the maturity of the futures contract. Therefore, since foreseeable trends in spot markets are taken into account (priced in) when the futures prices are set, expected movements in the spot price are not a source of return to an investor in futures. The return for an investor comes from unexpected movements in the spot price.

Analysis of spreads between the spot and 12-month futures prices shows mixed results, as illustrated in Chart 5 in the Appendix. In the case of wheat and maize the steep price increases since the beginning of 2007 coincided with a period when futures prices were higher than spot prices, therefore the argument of futures prices creating expectations of higher future spot prices would hold. Nevertheless, for sugar and soybean the situation was quite opposite and if futures prices had been determining spot prices over this period, spot prices should have moved lower.

## **5 Further analysis of the relationship between spot and futures prices**

### **5.1 Quantitative analysis**

To analyse whether futures prices influence spot prices or vice versa, causality relationship between spot and futures prices as well as the direction of such a relationship (using a common Granger causality test) is tested. The same test is also applied on daily volatilities of spot and futures commodity prices.

The results obtained show that for most of the commodities spot and futures prices do not granger-cause the other. However, Granger causality does not always imply true causality. If both spot and futures prices are driven by a common third process, but with a different lag, there would be Granger causality. Yet, manipulation of one process would not change the other. Common factors driving both spot and futures prices seem indeed to be a driving force behind our results.

Looking closer at the relationships, in medium-term relationships between spot and futures prices, using the lag of 20 working days, in most cases no causality relationship is observed between spot and futures prices. Most probably this implies a common exogenous factor, including financial market developments, standing behind such a two-sided relationship. This simple analysis implies that spot prices neither help to forecast futures prices nor vice versa. Surprisingly, exactly the same conclusions are applicable to Granger causalities between volatilities of spot and futures prices (calculating the volatilities as one-day differences). Pair-wise causality tests run for a short-term horizon are far less robust and misleading, both in the case of spot and futures prices as well as their volatilities relationship. Therefore, no conclusion can be obtained for the very short-term perspective.

The IMF (2006)<sup>14</sup> also made an econometric assessment of the direction of Granger causality between movements in spot and futures prices, and changes in speculative positions (as measured by net long non-commercial positions) in a sample of major commodities, comprising oil, copper, sugar, coffee, and cotton. It finds little support for the hypothesis that

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<sup>14</sup> IMF (2006), Global Economic Outlook, September.

speculative activity affects either price levels over the long run or price swings in the short run. In contrast, the IMF (2006) presents evidence (both across commodities and over time) that speculative positions mostly follow price movements. These findings are consistent with the hypothesis that speculators play a role in providing liquidity to the markets and may benefit from price movements, but do not have a systematic causal influence on prices. More recently the IMF (2008)<sup>15</sup> argued that purely financial factors, including shifts in market sentiment, may have short-term price effects, but that a lasting impact on recent price trends indeed remains difficult to establish.

## **5.2 Cases of lack of convergence between futures and spot prices**

Since 2006, a lack of convergence between futures and spot prices has been observed for contracts based in the United States. This mainly concerns wheat, as well as soybeans and, to a lesser extent, maize.

In-house analysis considered the changes in the differentials between spot and futures prices for wheat over time. That differential usually closes at the end of the contract, as futures and spot prices should converge. However, since 2006, a lack of convergence is observed. This phenomenon has been more marked since early 2008, as spot prices declined sharply amid good crop prospects. Futures prices remain much higher than spot prices, while the forecasts are for increased production and stocks.

The lack of convergence was discussed in several forums in the US, including in the hearings that took place in Congress on "excessive commodity price speculation". Several factors are mentioned among possible causes for the divergence. To summarise, the factors relate to contract specifications and/or to the behaviour of agents. In September 2008, the CME group proposed changes in contract definitions to address the issue of convergence. These changes need to be approved by the US Commodity Futures Trading Commission. Several comments were made according to which the proposed changes would not be sufficient to restore convergence.

The lack of convergence may well have made it more difficult for commercial operators to use future markets for traditional hedging activities, raising questions about the efficiency of the markets in achieving price discovery and hedging opportunities.

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<sup>15</sup> Thomas Helbling (2008), Oil and Food Prices Expected to Ease only Moderately, IMF Survey Magazine: IMF Research.



## 6 Conclusions

Identifying a speculative bubble, either *ex ante* or *ex post*, is very difficult. Speculative bubbles are observationally equivalent to changes in market fundamentals that are discounted by market participants but cannot be seen by policy analysts. As a consequence, policymakers cannot draw definite conclusions on the extent to which prices reflect changes in fundamentals or speculative activity. In such circumstances, policy action to address a perceived speculative bubble risks ignoring important market signals and reducing efficiency in the normal functioning of markets. Accordingly, any conclusion on the existence of a speculative bubble in agricultural commodities markets today must be very soundly based.

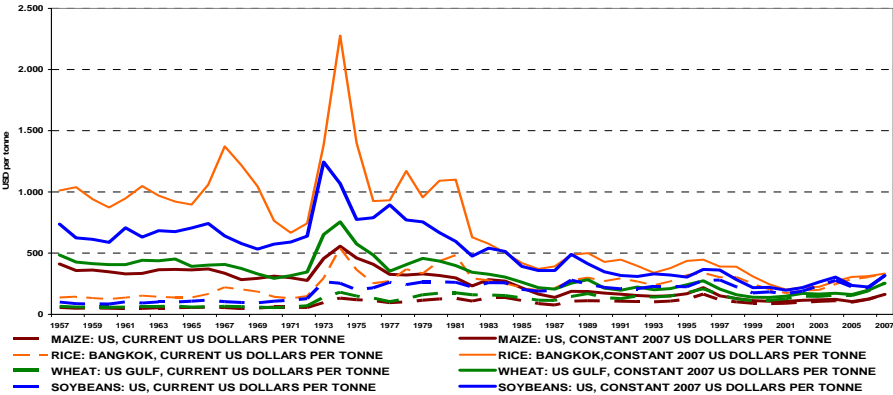
The crux of the argument in favour of a speculative bubble as a driver of current prices in the agricultural commodities futures market — and by extension in the spot market — is that the futures price is indeed misaligned with agricultural market fundamentals. This implies that investors' assessment of those fundamentals is incorrect and that market behaviour reflects some form of "euphoria", which will dissipate rapidly at a point in the future and result in a sharp price correction. Despite a sharp correction in prices, it is difficult to prove that the correction is the result of a bursting speculative bubble and not a sudden reassessment of market fundamentals by investors based for example on good harvest or declining consumption of the commodity. However, recent developments in financial and futures markets would suggest that there could be feedback from futures prices onto spot prices, so that a bubble in the futures market could be transmitted to the spot market also.

On the one hand, the coincidence of the most recent movements in commodities prices and the ongoing credit crisis is striking and supports the theory of a rolling speculative bubble moving into agricultural commodities futures markets. On the other hand, the balance of other available evidence does not support the speculative bubble theory. The most likely explanation of price increases since the beginning of 2007 to mid-2008 seems to be a combination of economic fundamentals in particular and factors specific to the financial markets, which might have amplified price changes.

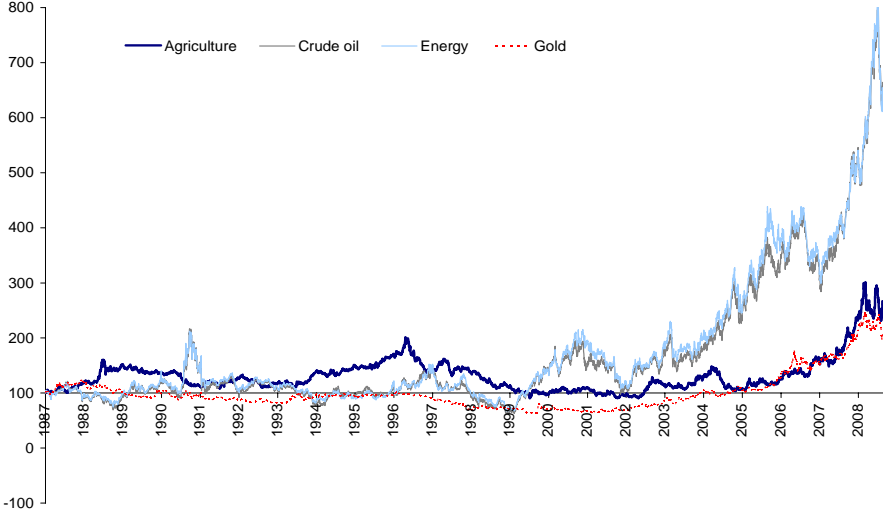
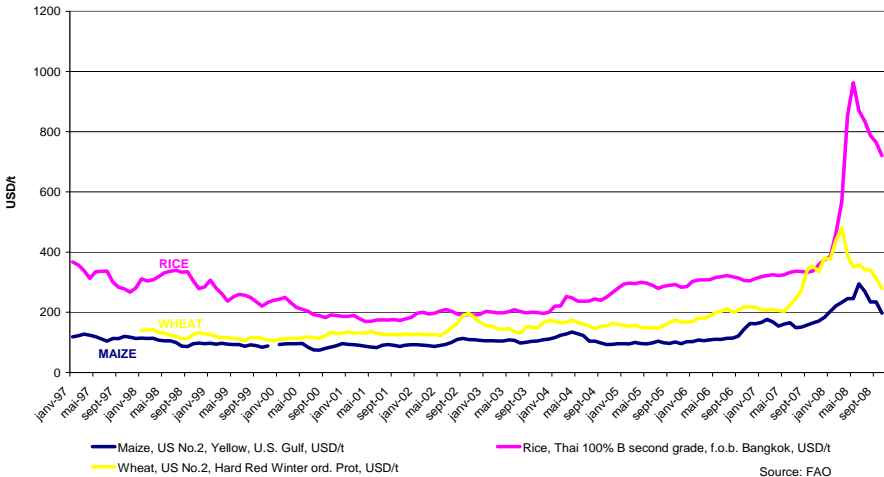
APPENDIX

Chart 1

Maize, Rice, Wheat and Soybeans  
in Current and Constant USD(2007) per tonne

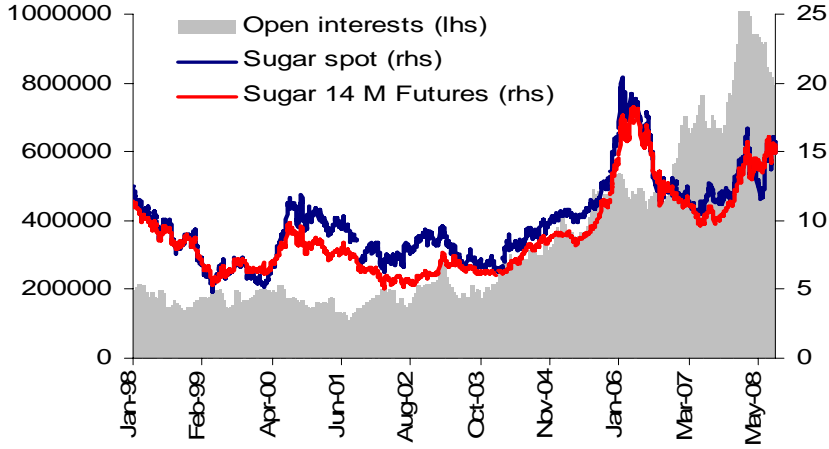
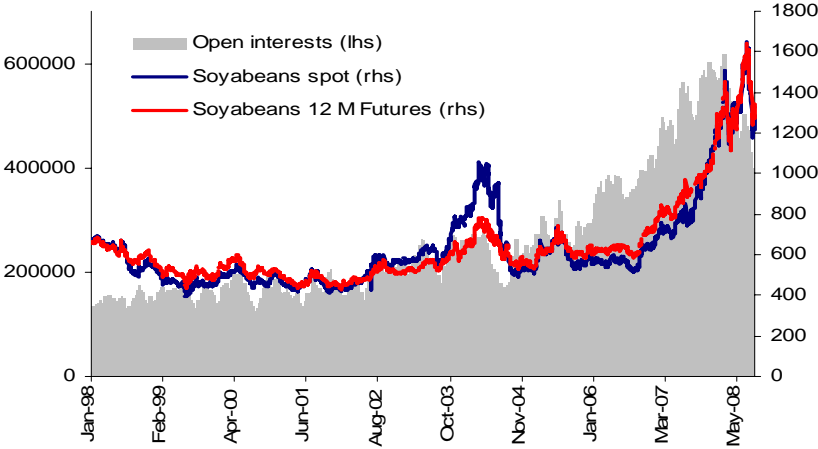
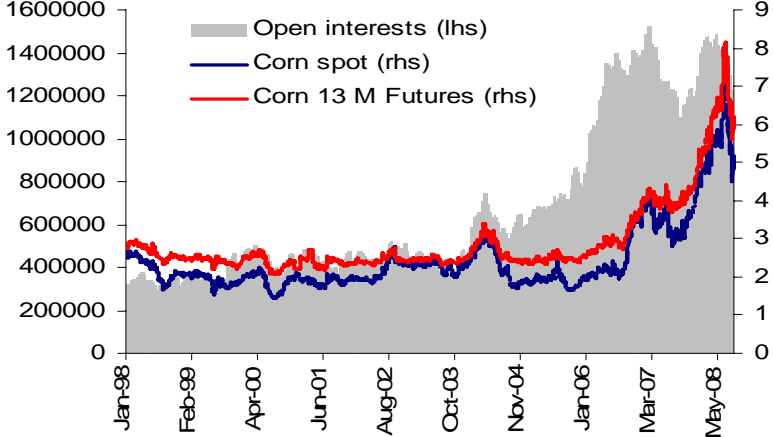
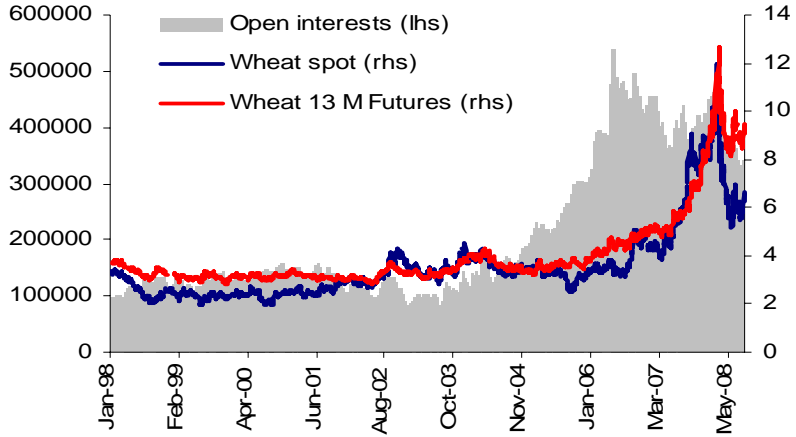


Grains



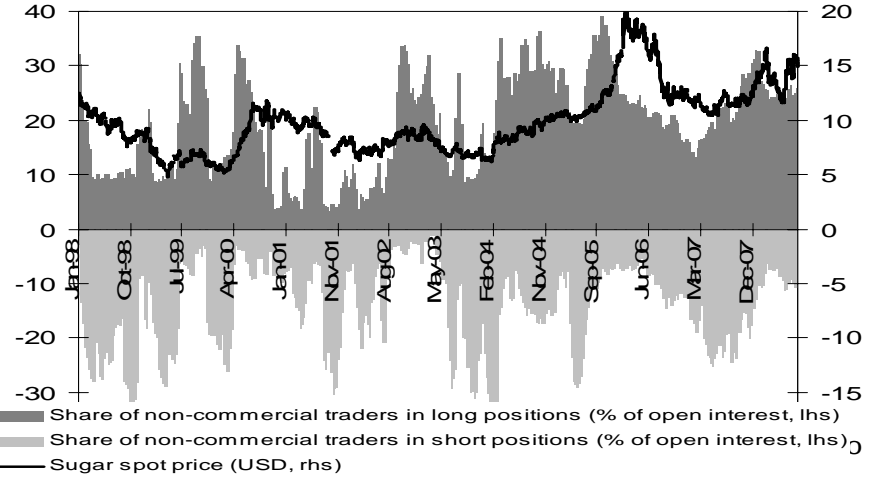
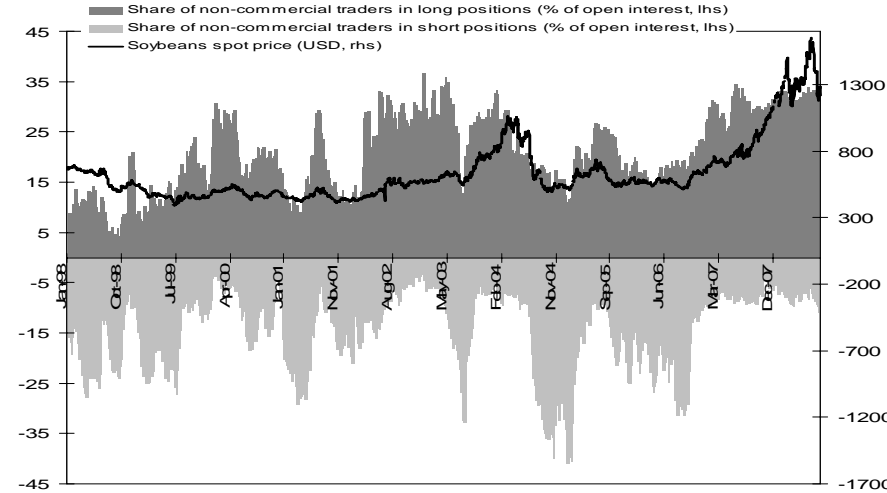
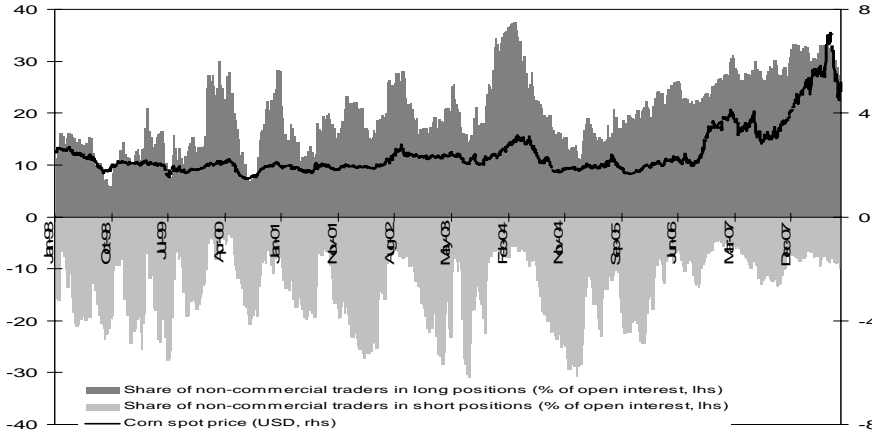
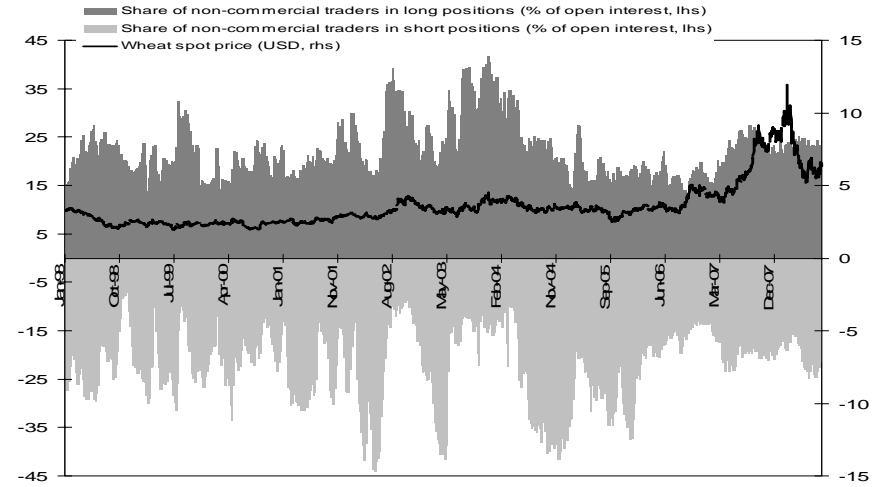
Source: Ecwin. All indices are Goldman Sachs world indices.

**Chart 2: Open interest and the evolution in agricultural commodities futures and spot prices**



Source: Ecwin.

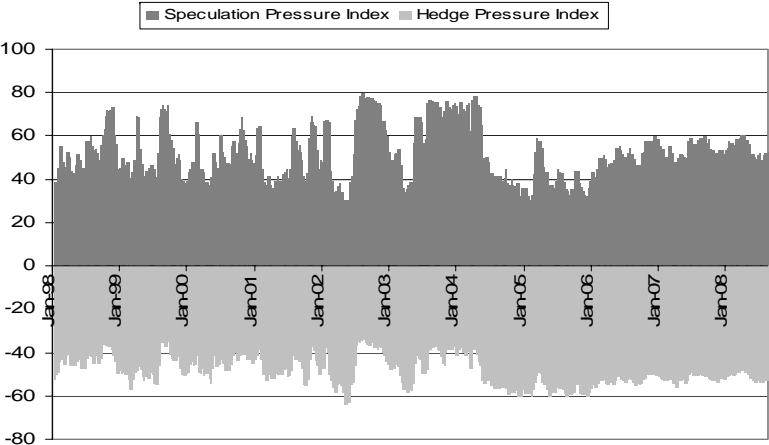
**Chart 3: Trading positions and the evolution of agricultural commodities prices**



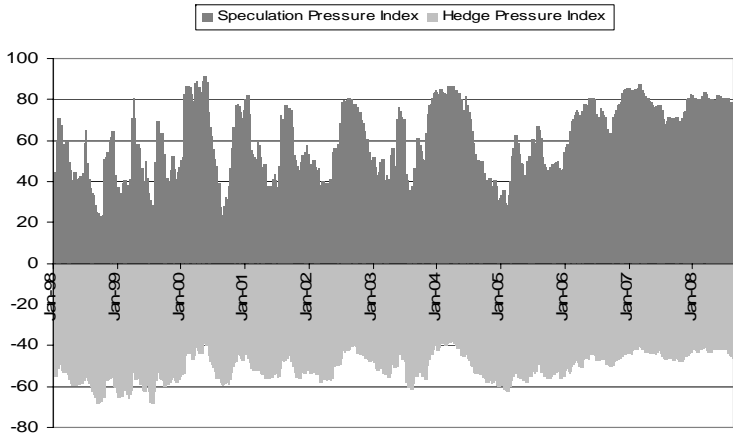
Source: Ecwin. NB: Swap dealers and index funds are not included among the non-commercial traders.

**Chart 4: Speculation Pressure Index and Hedge Pressure Index**

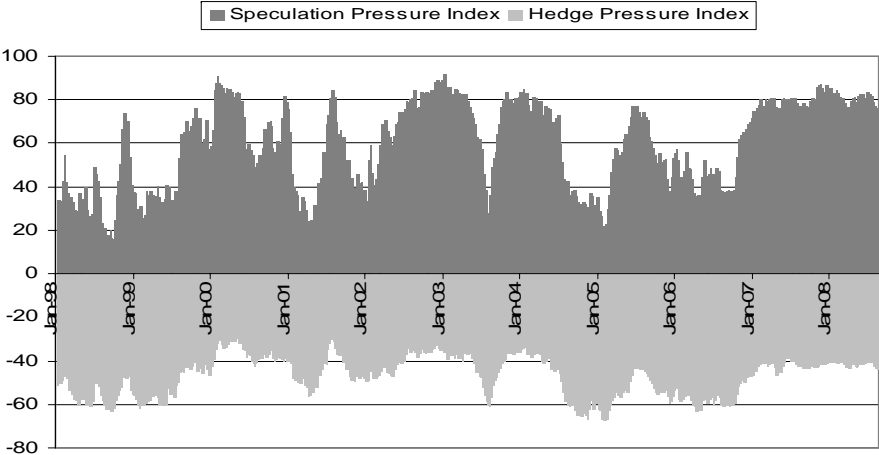
*Wheat*



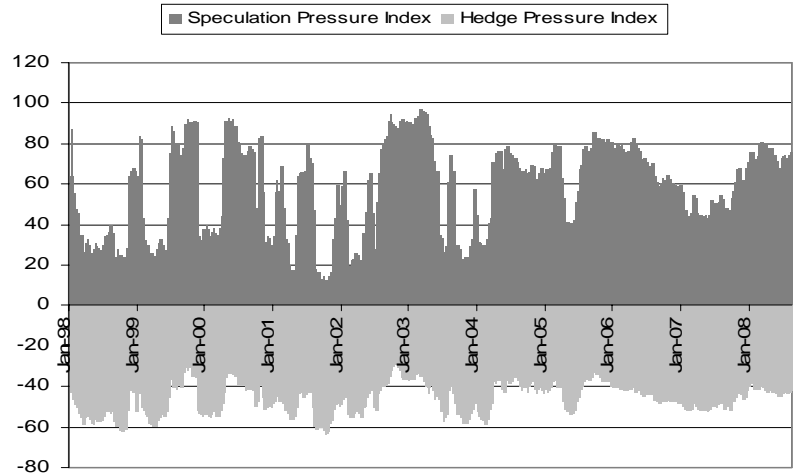
*Maize*



*Soybean*



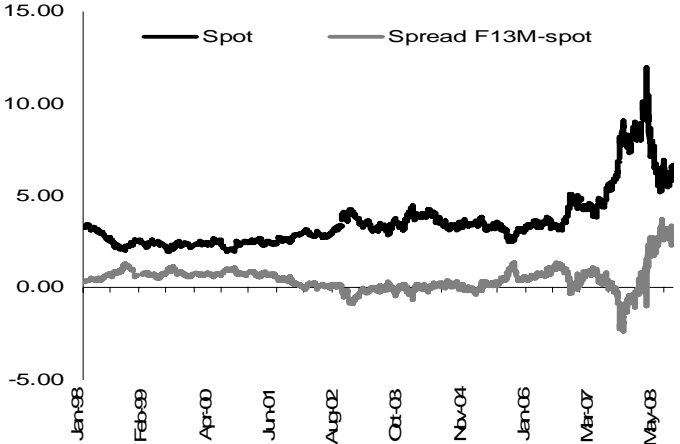
*Sugar*



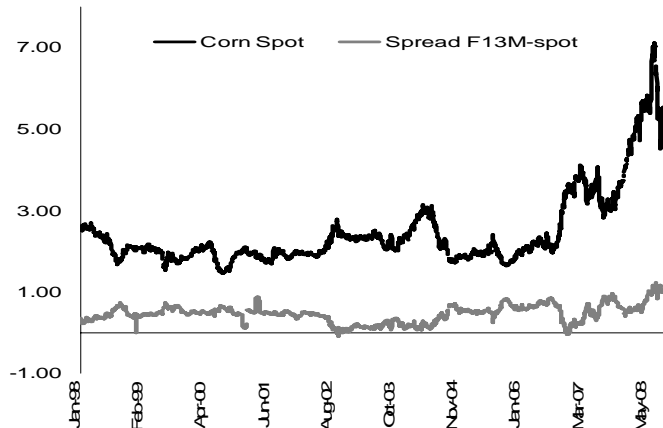
Source: CBOT (Ecowin), own calculations. NB: Swap dealers and index funds are not included among the speculators.

**Chart 5: 12-month future vs. spot spread and the evolution in spot prices**

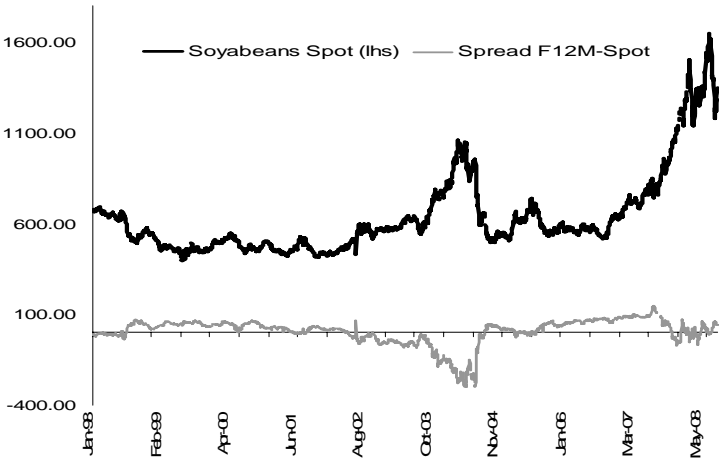
*Wheat*



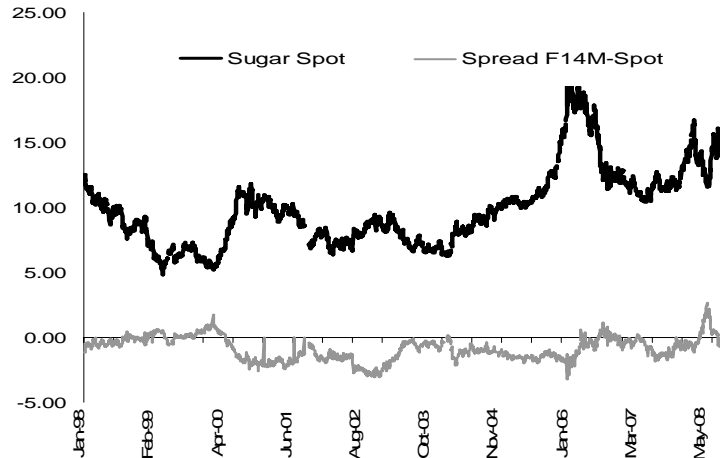
*Maize*



*Soybean*



*Sugar*



Source: CBOT (Ecowin), own calculations.