UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT
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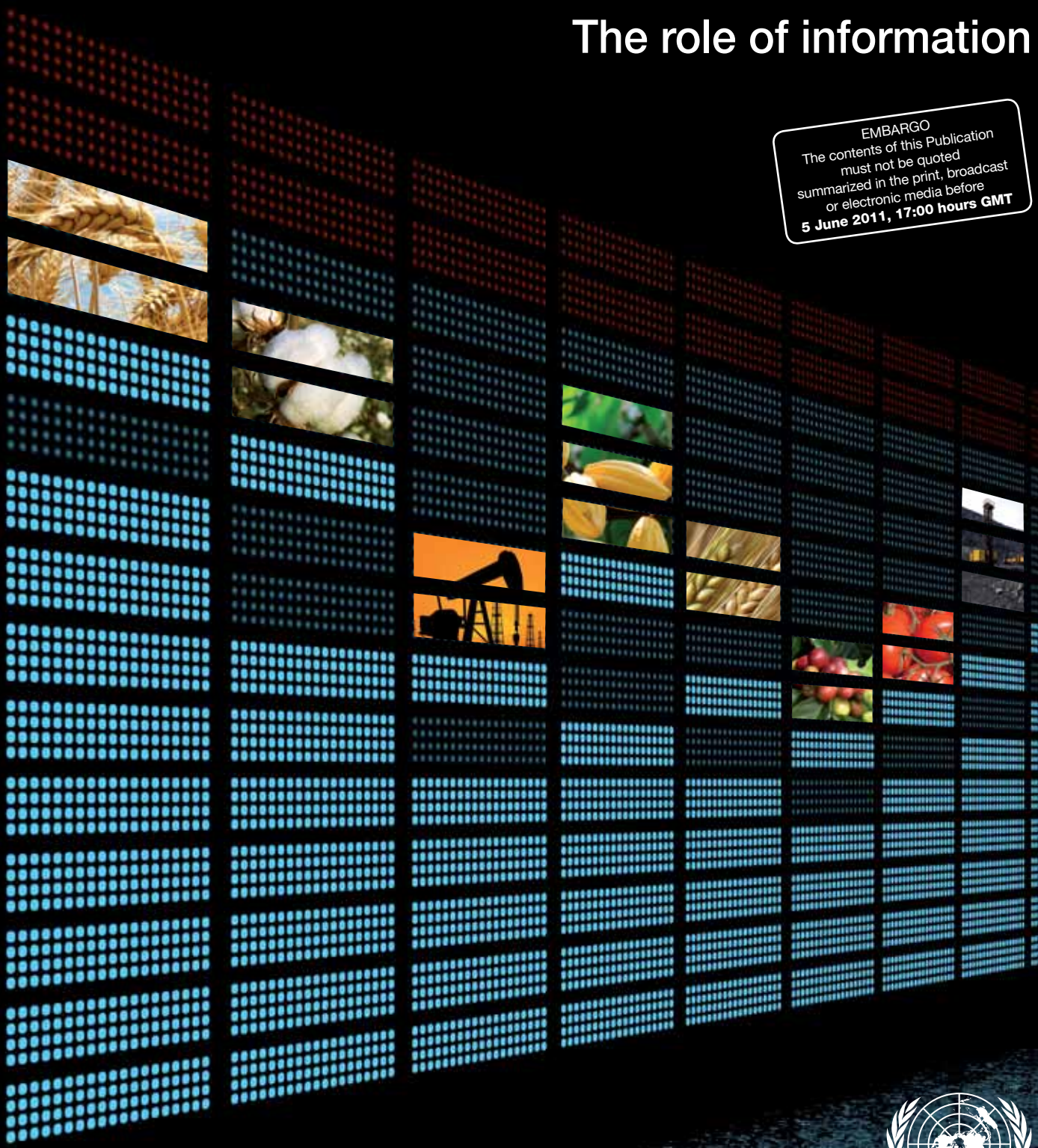
PRICE FORMATION IN FINANCIALIZED COMMODITY MARKETS

The role of information



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PRICE FORMATION IN FINANCIALIZED COMMODITY MARKETS: THE ROLE OF INFORMATION

Study prepared by the secretariat of the
United Nations Conference on Trade and Development

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Abbreviations

CBOT	Chicago Board of Trade
CFTC	Commodity Futures Trading Commission
CIT	commodity index traders
COT	commitments of traders
CPB	Central Planning Bureau Netherlands Bureau for Economic Policy Analysis
DCOT	disaggregated commitments of traders
DJ-UBSCI	Dow-Jones-Union Bank of Switzerland Commodity Index
ECB	European Central Bank
EIA	Energy Information Agency
EMH	efficient market hypothesis
ETF	exchange-traded fund
ETN	exchange-traded note
ETP	exchange-traded product
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
HFT	high-frequency trading
ICE	Intercontinental Exchange
IEA	International Energy Agency
IMF	International Monetary Fund
IOSCO	International Organization of Securities Commissions
ISO	International Sugar Organization
JODI	Joint Organisations Data Initiative
LIFFE	London International Financial Futures Exchange
NYMEX	New York Mercantile Exchange
OECD	Organisation for Economic Co-operation and Development
OPEC	Organization of the Petroleum Exporting Countries
OTC	over the counter
PMPU	producers, merchants, processors, users
S&P GSCI	Standard & Poor's Goldman Sachs Commodity Index
UNCTAD	United Nations Conference on Trade and Development
USDA	United States Department of Agriculture
WTI	West Texas Intermediate

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EXECUTIVE SUMMARY

The mid-2000s marked the start of a trend of steeply rising commodity prices, accompanied by increasing volatility. The prices of a wide range of commodities reached historic highs in nominal terms in 2008 before falling sharply in the wake of the financial and economic crisis. Since mid-2009, and especially since the summer of 2010, global commodity prices have been rising again. These developments coincide with major shifts in commodity market fundamentals, particularly in emerging economies which are experiencing fast growth, increasing urbanization and a growing middle class with changing dietary habits, including an increasing appetite for meat and dairy products. In addition, in an attempt to reduce the use of fossil fuels in energy consumption, a range of food crops are now being used in the production of biofuels, which is being promoted in a number of countries including those of the European Union (EU) as well as the United States. The related conversion of land use from crops for food to crops for biofuel production has also affected the prices of food crops. At the same time, a decline in the growth rates of production and productivity, partly due to the adverse effects of climate change, has adversely affected the supply of agricultural commodities.

However, these factors alone are not sufficient to explain recent commodity price developments; another major factor is the financialization of commodity markets. Its importance has increased significantly since about 2004, as reflected in rising volumes of financial investments in commodity derivatives markets – both at exchanges and over the counter (OTC). This phenomenon is a serious concern, because the activities of financial participants tend to drive commodity prices away from levels justified by market fundamentals, with negative effects both on producers and consumers.

The role of information flows is crucial for price developments in commodity derivatives markets. Traditionally, the so-called efficient market hypothesis (EMH) is assumed to hold in financial markets, including in commodity derivatives markets and especially in futures markets, which are the focus of this study. The EMH postulates that all publicly available information is immediately reflected in prices. In its strong form, the EMH contends that even private information – available only to individual market participants – is reflected in the price through the effects of the transactions of the persons in possession of the information. If the EMH were to apply, commodity price developments would reflect nothing but information on fundamentals.[1]

However, this study shows that the EMH does not apply to the present commodity futures markets. Market participants also make trading decisions based on factors that are totally unrelated to the respective commodity, such as portfolio considerations, or they may be following a trend. Therefore, it is difficult for other agents in the market to discern whether or not their transactions are based on information about fundamentals, which in any case is sometimes difficult to obtain and not always reliable. Trading decisions are thus taken in an environment of considerable uncertainty. In such a situation, it is rational to follow other participants' trading decisions. A wide range of motivations leads traders to engage in this so-called "intentional herding" on a perfectly rational basis, the most important one being imitation in situations where traders believe that they can glean market information by observing the behaviour of other agents.

In an environment of herd behaviour there are limits to arbitrage. Acting against the majority, even if justified by fundamentals, may result in large losses, often of borrowed money. It may therefore be rational for market participants to ignore their own information and follow the trend. This is what many financial players do by default, basing their trading decisions purely on the behaviour of price series (algorithmic trading), which can lead to a commodity price bubble.

There is considerable empirical evidence that points to financial investors' impact on commodity prices:

- A number of studies find evidence of commodity price bubbles. Analyses show that position-taking by index investors, that passively replicate the price movements of an index based on a basket of commodities, has an impact on price developments, particularly of crude oil and maize. The fact that these effects are persistent – especially in the case of crude oil – points to the presence of herd behaviour. Whereas index investors were identified as significant price drivers prior to the financial crisis, the importance of money managers (e.g. hedge funds), that follow more active trading strategies and take positions on both sides of the market, has increased since then. This is reflected in the very close correlation between price changes and position changes of money managers since 2009, which is as high as 0.8 in the oil market. Indeed, it has been estimated that speculation currently accounts for as much as 20 per cent of the oil price.
- Cross-market correlations between currency and commodity markets have increased recently, and point to factors other than fundamentals that are driving commodity prices. Information flows in other financial markets increasingly influence the dynamics of commodity futures. In addition, an analysis of the reactions of commodity prices to announcements of economic indicators shows that, within minutes of an announcement, commodity prices react in a similar manner across different commodity markets that do not have much in common.
- The behaviour of commodity prices, especially oil, over the business cycle has changed fundamentally. In earlier business cycles commodity prices and equity prices evolved differently. Increases in commodity prices did not occur until well after the trough. In the most recent business cycle, on the other hand, oil prices surged immediately after the trough, even before share prices started to rise. This surge was based simply on the expectation, not the actual occurrence, of an upswing.

To complement the theoretical and empirical findings 22 interviews were conducted with various commodity market participants, ranging from physical traders to financial investors, but also including a broker, representatives of a price reporting firm and two consultants. The interviewees agreed that the role of financial investors has become more important in recent years. Due to their financial strength, they can move prices in the short term. This leads to increased volatility, which may harm markets and drive hedgers with an interest in physical commodities away from commodity derivatives markets. The increased volatility results in more margin calls and thus higher financing requirements. Although all interviewees stressed the role of fundamentals in medium- to long-term commodity price formation, they conceded that substantial price distortions and herding effects could occur in the short term due to the participation of financial investors. This is also reflected in the responses of several interviewees, who said they paid increasing attention to financial market information. The main conclusion of the interviewed commodity market players was that market transparency needed to be increased. For the United States, this refers especially to the OTC market. In Europe, there is, in general, a greater lack of transparency than in the United States. The adoption of reporting in Europe, similar to that provided by the Commodity Futures Trading Commission (CFTC) – the institution mandated to regulate and oversee commodity futures trading in the United States – in its weekly *Commitments of Traders* reports would be a big step in the right direction, but more information should also be required about the OTC business. Concerning other regulatory issues, the level of awareness of current discussions on regulation and reform differed widely among the interviewees. Generally, they appeared to have paid more attention to United States regulations, such as the Dodd-Frank Act, whereas only a minority of those interviewed had a clear idea about the European Commission's regulatory initiatives. There was substantial scepticism about bans (e.g. on high-frequency trading) and position limits. The general belief was that regulations were rather difficult to enforce.

The analysis clearly shows that information flows play a vital role in commodity price developments. The market distortions described above are closely related to the fact that market participants make decisions under conditions of substantial uncertainty. Therefore policy responses to improve market functioning should concentrate on the following issues:

- Increased transparency with respect to fundamentals. Although a variety of sources of information currently exist, there is substantial uncertainty in terms of data quality and timeliness, particularly with respect to inventories.
- Increased transparency in the exchanges and OTC markets themselves. More information should be made available with regard to position-taking and categories of market participants in commodity derivatives markets. This applies in particular to commodity trading in Europe, where transparency lags significantly behind that in United States exchanges. Improved transparency is important not only for market participants but also for regulators, who can only intervene if they know what is happening in the market.
- Tighter regulation of financial players. Tighter rules internationally would be an optimal scenario, so that regulatory migration could be avoided. Given that the size of financial players' involvement has a substantial impact on price developments, position limits aimed at restraining the engagement of financial investors in commodity markets may be indispensable in the medium to long run. As appropriate levels are not easy to determine, a first step might consist of position points at which traders would be required to provide additional information. In addition, proprietary trading by financial institutions that are involved in hedging transactions of their clients could be prohibited because of conflicts of interest.
- Beyond this kind of "soft regulation", a number of direct commodity price stabilization measures should be considered. As governments and international institutions have access to the same kind of information as the market participants, the establishment of a government-administered virtual reserve mechanism and the possibility of allowing governments' direct intervention in the physical and the financial markets need to be considered. In financialized commodity markets, as in currency markets, intervention may even help market participants to better recognize the fundamentals.
- The introduction of a transaction tax system could generally slow down the activities of financial investors in commodity markets.

All these measures deserve serious political consideration, even if some of the more sophisticated schemes among them may prove difficult to implement quickly.

1. MOTIVATION OF THIS STUDY

Speculators may do no harm as bubbles on a steady stream of enterprise. But the position is serious when enterprise becomes the bubble on a whirlpool of speculation.

John Maynard Keynes

Recent developments in commodity prices have been exceptional in many ways. The price boom between 2002 and mid-2008 was the most pronounced in several decades – in magnitude, duration and breadth. The price decline following the eruption of the current global crisis in mid-2008 stands out both for its sharpness and for the number of commodities affected. Since mid-2009, and especially since the summer of 2010, global commodity prices have been rising again. While the recent oil price increases have been modest compared to the spike in 2007–2008, food prices reached an all-time high in February 2011. Commodity prices have also been extremely volatile, in many instances with no obvious link to changes on the supply side.

Commodity price volatility tends to have significant adverse effects. At the macroeconomic level, it can lead to a deterioration in the balance of payments and in public finances, and the associated uncertainty is likely to curtail investment and to significantly depress long-term growth. At the microeconomic level, high and volatile commodity prices have severe impacts on the most vulnerable, especially food- and energy-insecure households.

Price volatility has long been recognized as a major feature of commodity markets. Commodity-specific shocks, especially on the supply side of food commodities, have generally played a key role in this respect. Rapidly growing demand for commodities, especially in emerging economies, as well as the debate about the future use of fossil fuels in the light of global climate change, and about the link between agricultural production and climate change more generally, have clearly had an impact on recent commodity price developments beyond simple commodity-specific shocks. However, since commodity prices have moved largely in tandem across all major categories over the past decade or so, the question arises as to whether the very functioning of commodity markets has changed.

A major new element in commodity markets over the past few years is the greater presence of financial investors, who treat commodities as an asset class. The fact that these market participants do not trade on the basis of fundamental supply and demand relationships, and that they may hold, on average, very large positions in commodity markets, implies that they can exert considerable influence on the functioning of those markets. Indeed, the greater participation of financial investors may have caused commodity markets to follow the logic of financial markets more closely, than that of a purely goods market.

Goods markets may be characterized by an atomistic market structure and by price discovery based on information from a multitude of independent agents who act according to their own individual preferences. By contrast, in financial markets, especially those whose assets largely fall in the same risk category (such as equities, emerging-market currencies and, recently, commodities), price discovery is based on information related to a few commonly observable events, or even on mathematical models that mainly use past – rather than just current – information for price forecasts. These differences between goods

and financial markets, regarding both the sources of information and the way information is processed, imply behavioural differences. In goods markets, the most profitable market participants will have used individual, pioneering action based on their own private circumstantial information. In financial markets, on the other hand, the most profitable attitude frequently means following the trend for some time and disinvesting just before the rest of the crowd does do so. In other words, a successful financial market strategy is characterized by herd behaviour. A high correlation between returns on investment in commodities and that in other asset classes is indicative of such behaviour.

The aim of this study is to provide comprehensive insights into recent developments in the functioning of commodity markets. It pays particular attention to information flows that affect trading decisions. The study focuses on six commodities: one energy commodity – crude oil – and five food commodities – barley, cocoa, maize, sugar and wheat.

Section 2 of the study focuses on price formation in commodity markets and also explains the role of exchanges and over-the-counter (OTC) markets. Section 3 briefly summarizes recent price developments and trends of those factors that are commonly assumed to drive commodity prices – the so-called "fundamentals". In this respect, the study focuses on changes on the demand side, including through government intervention such as the mandated greater use of biofuels in some countries. Section 4 addresses the main focus of the study, namely the increasing importance of financial investors on commodity markets. It discusses the institutions, protagonists and instruments that characterize commodity trading, as well as the available data on recent commodity market developments.

Section 5, the other key part of the study, presents the results of the interviews with physical and financial traders, as well as other entities involved in commodity markets. It provides an assessment of the functioning of commodity markets by market participants that are involved in commodity trading on a day-to-day basis.

Based on the analysis in the preceding sections, section 6 presents policy recommendations. It first outlines how transparency on physical commodity markets, as well as on the related futures exchanges and over-the-counter markets, could be improved. It suggests that in order to improve the functioning of commodity futures exchanges in the interests of producers and consumers, and to keep pace with the participation of new trader categories such as index funds, closer and stronger supervision and regulation of these markets is indispensable. Finally, it addresses the pros and cons of recently proposed price stabilization mechanisms. Section 7 concludes with a summation of the main findings.

2. PRICE FORMATION IN COMMODITY MARKETS

2.1. Information and commodity price formation

This section addresses the main aspects of commodity price formation in spot and futures markets.[2] It explains the relationship between spot and futures prices and analyses the role of information in commodity markets.

Market participants who need a certain commodity at the future time t, can either buy it in the spot market today and store it, or buy (i.e. take a long position in) a futures contract and take delivery when the contract expires. In the former case, the participants will incur storage costs and opportunity costs because they might alternatively have invested the funds used to buy the commodity at the prevailing interest rate.

The futures price should thus be equal to the spot price plus interest and storage cost – the so-called *cost of carry.* It is expressed as:

$$F_0 = S_0 + I + W \qquad (1)$$

F_0=futures price at t=0, S_0=spot price at t=0, I=interest, W=storage cost.[3]

Thus, the price formation of commodity futures is already linked to financial markets via the interest rate.

If the futures price exceeds the sum of the spot price and the cost of carry, there is an incentive to buy the commodity in the spot market and take a short position (i.e. an obligation to sell the asset) in a futures contract. This will drive up the spot price and lower the futures price. As arbitrageurs will be able to make a risk-free profit as long as $F_0 > S_0 + I + W$, they buy the commodity in the spot market and sell a futures contract, engaging in this kind of operation until prices have adjusted and the futures price is equal to the spot price plus the cost of carry.

In the opposite case of a lower futures price, arbitrageurs can sell the commodity on the spot market, invest the proceeds at the prevailing interest rate and take a long position (an obligation to buy the asset) in a futures contract. As long as the arbitrage possibility persists, a risk-free profit can be made. Thus arbitrageurs engage in market operations until the prices have adjusted and equation (1) holds.

In markets for storable commodities, demand can be met out of current production or inventories. To the extent that inventories offer protection against sudden supply disruptions the holder of an inventory obtains a certain utility from the stock. This utility is the so-called *convenience yield.* If inventories are high, the additional utility from their further increase, the *marginal convenience yield*, is low. By the same token, when inventories are low, and the risk of a stock running out is high, the marginal convenience yield from an extra unit of inventories is fairly high. Thus the marginal convenience yield is inversely related to inventory levels.

Due to the convenience yield, the forward price may be below the price defined in equation (1). The relationship between the futures price and the spot price – taking the convenience yield into account – is thus,

$$F_0 = S_0 + I + W - C \qquad (2)$$

where C is the convenience yield.

In the case of an upward sloping futures curve (i.e. if futures prices increase with the length of the maturity of the underlying contract), the market is in *contango*. This is typical of situations when inventories are abundant, causing the sum of the storage cost and the interest rate to exceed the convenience yield. It implies that the futures price will exceed the cash price, which is probable, as storage capacity is limited and therefore storage costs tend to rise with the level of inventories. This provides an incentive to sell the commodity on the spot market, which tends to drive spot prices down.

The opposite, a situation when futures prices are progressively lower with rising maturity, is called *backwardation*. In this case, the futures price does not cover the cost of carry. Obviously, the demand for inventories is high in such a situation, because the convenience yield exceeds the cost of carry. When inventories are low and the convenience yield is high, the market is likely to be backwardated, because the high convenience yield may offset the sum of the interest and storage costs.

This definition of backwardation should not be confused with the concept of "normal backwardation" introduced by Keynes (1930: 142–144). Keynes' concept refers to an insurance premium paid by hedgers who take a short futures position (e.g. commodity producers) and are more risk-averse than their counterparts. Due to this insurance premium, the futures price exceeds the expected future spot price. Even in a situation when there are ample liquid stocks of the commodity and the futures market is in contango, the expected future spot price still exceeds the futures price by the premium (i.e. the "normal backwardation"). However, "normal backwardation" is only plausible if short hedgers are more risk-averse than long hedgers, or if the former outnumber the latter. Numerous studies have tested commodity markets for "normal backwardation", with mixed results (see, for example, Kolb, 1992; and Chang, 1985).

Most commodity markets are characterized by a low short-run price elasticity of supply and demand. Consumers have limited substitution possibilities and substantial medium-term investments are needed, for example, to develop new oilfields or increase crop yields. In this market environment, even a comparatively small increase in demand leads to substantial price hikes. The same is true of short-term supply disruptions, such as those caused by armed conflict in oil-exporting countries or export bans by grain-producing countries after a drought. Minor shocks to quantities will result in significant price reactions. The situation is exacerbated if inventories are low and additional demand thus cannot be met out of inventories or, in the case of a supply shock, if releases from stocks cannot mitigate the price effect.

Due to the high liquidity and easily accessible information on futures prices, futures markets play a decisive role in commodity price discovery. The functioning of this process rests on the EMH. It is widely believed that the EMH holds in its semi-strong form, which postulates that any publicly available information about an asset is reflected in its current price (see, for example, Malkiel, 1991). Although the hypothesis initially referred to equity markets, it can just as easily be applied to prices in other financial markets as well, such as commodity futures. This means that any new information on fundamentals of supply and demand of a commodity leads to a change in expectations and is immediately incorporated into commodity futures prices. In the strong form of the EMH, even private information is reflected in prices. The reasoning is that as long as information offers market participants the possibility of a risk-free profit (arbitrage possibility), they will exploit this opportunity, causing a movement in the price that reflects the private information.

The availability of up-to-date and reliable information on commodity supply, demand and stocks is essential for the formation of accurate price expectations and an efficient functioning of commodity markets. Existing gaps regarding accurate information on market fundamentals risks causing market participants to trade on little or wrong information, which in turn will tend to accentuate price movements and may cause a sizeable divergence of actual prices from fundamental values, at least for some period of time. While information on market fundamentals is available from a range of sources (see box 1), there are doubts as to the timeliness and reliability of that information. Harmonization of data provision and a more systematic way of data presentation would greatly facilitate the accessibility of available information. Finally, stocks are often held by the private sector and the proprietary character of the information on those stocks causes publicly available stock data to be particularly incomplete. Owing to these factors, monitoring and analysing of information on commodity market fundamentals is a difficult task. Consequently, a significant proportion of trading in commodities is subject to considerable uncertainty.

Box 1

SOURCES OF INFORMATION ON COMMODITY MARKET FUNDAMENTALS[a]

Different types of commodity market information are available, including: (i) raw data from databases that cover prices, production, consumption, stocks and trade; (ii) processed data based on analyses of market trends and monitoring of the current situation; and (iii) forecasts or projections of the short- medium- and long-term evolution of market fundamentals. The frequency of commodity market information varies widely, depending on the data source, and can range from daily to annual. However, most publicly available information from official sources is based on monthly data.

There is ample information on physical commodity markets, but it is not easy to obtain in a systematic way. A number of sources provide the same information, but in different formats. It therefore takes time and expertise to find out which are the most useful, relevant and reliable sources of information required for a specific commodity. Even from a single source the multiplicity of information products can make it rather cumbersome to access the targeted information. The various sources of information include official sources, such as international organizations and study groups, organizations specializing in specific commodities or groups of commodities, and governments of countries which are key players in the commodity markets, such as Australia and the United States, as well as private sources. In many cases, even from official sources, the information is not publicly available and can be accessed only against payment.

For agricultural commodities, the Food and Agriculture Organization of the United Nations (FAO) is the main international source for data, market analysis and monitoring of market fundamentals. The FAO publishes data at different frequencies for various agricultural commodities, most of which can be accessed on the Internet from its World Food Situation portal. However, a national source, the United States Department of Agriculture (USDA), is among the most comprehensive sources of information on global agricultural markets. Its information is particularly important because the United States is a major producing country for a number of agricultural commodities such as cotton, maize, soybeans and wheat. Therefore, information about changes in estimations on crops in that country can have a strong impact on global markets. The "Comité du Commerce des céréales, aliments du bétail, oléagineux, huile d'olive, huiles et graisses et agrofournitures" (COCERAL) publishes forecasts for grain and oilseed crops for the countries of the EU.

Regarding crude oil, the most comprehensive source of data on production, demand, refinery intake and output, imports, exports, closing stock levels and stock changes is the Joint Organisations Data Initiative (JODI). This initiative comprises seven partner organizations: Asia-Pacific Economic Cooperation (APEC), EUROSTAT, the International Energy Agency (IEA), the International Energy Forum (IEF), the Latin American Energy Organization (OLADE), the Organization of the Petroleum Exporting Countries (OPEC) and the United Nations Statistics Division (UNSD). More than 90 countries, representing about 90 per cent of global oil supply and demand, participate in JODI. The JODI World Database is freely available and is updated monthly. Information on the major energy consuming countries, is available through the *Oil Market Report* online service of the IEA, which provides a monthly assessment of supply, demand, stocks, prices and refinery activity. On the supply side, OPEC's *Monthly Oil Market Report* covers major issues affecting the world oil market, the outlook for crude oil market developments for the coming year, and a detailed analysis of key developments impacting oil market trends in world oil demand, supply and the oil market balance. At the national level, the United States Energy Information Administration provides a variety of data and analyses on the situation in United States and global energy markets, at different time frequencies. In the private sector, the widely used annual *Statistical Review of World Energy* produced by British Petroleum, provides data about world energy, markets and trends, which are also publicly available. In addition, Cambridge Energy Research Associates (IHS CERA) is a leading adviser to different clients, including international energy companies, governments, financial institutions and technology providers. It delivers critical knowledge and independent analyses on energy markets, geopolitics, industry trends and strategy.

Platts is a leading global provider of energy information, and among the foremost sources of benchmark price assessments in the physical energy markets. Argus publishes a full range of business intelligence reports, market assessments and special studies on all aspects of energy, transport and emissions markets. Commodity forecasts are also offered by companies specializing in market intelligence, such as the Economist Intelligence Unit, Business Monitor International and LMC International (agricultural commodities). In addition, the Working Group on Commodity Prices of the Association of European Business Cycle Institutes (AIECE) publishes a *World Commodity Prices* report twice a year, with price forecasts for two years.

This brief review shows that there is an abundance of data sources regarding the fundamentals of physical commodity markets. Nevertheless, a number of information gaps exist, and there are many areas in which the transparency of physical commodity markets could be improved, as mentioned in the main text.

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[a] This box is based on Fajarnes (2011).

If prices are driven both by information on fundamentals and by factors unrelated to physical supply and demand in the respective market, the EMH fails. Price changes may also be due to a "weight-of-money" effect. This happens when, for example, index investors take positions that are large compared to the overall market size. They then face short-term liquidity constraints, as positions of counterparties with an interest in the physical commodity are less than perfectly price elastic. This results in a strong price impact. However, the price change is not necessarily in line with the fundamentals of the respective market. Such price movements "in the wrong direction" may be exacerbated when algorithmic traders follow the new trend and reinforce it. This is also likely to occur because many algorithmic traders use similar models, thus drawing similar conclusions from market developments.

For these reasons, changes in market prices are not easy to interpret. Market participants cannot easily distinguish between price signals that are based on fundamentals and contain new information, and distorted price signals introduced by market participants that trade on the basis of purely financial news or signals from mathematical models. As the data based on fundamentals is limited (especially for inventories) it is difficult to form price expectations. Therefore market participants may rely, instead, on futures prices to convey the right signals. This increases the risk of herd behaviour and a perpetuation of the misleading price signals. Ultimately it may result in a speculative bubble.

2.2. The role of futures exchanges and OTC markets in commodity price formation

Commodity derivatives are traded either on organized exchanges or bilaterally "over-the-counter" (OTC) usually with a financial institution, depending on the concrete requirements of a trader. However, a number of exchanges (such as the Intercontinental Exchange – ICE) also offer OTC transactions and clearing services.

As the choice of exchange-traded standardized contracts is limited, there may not be a futures contract which exactly tracks the price developments of the underlying asset. Differences may be due, for example, to the delivery point or the quality. Due to this so-called "basis risk" the standardized contracts do not always provide a perfect hedge.

This is also why traders tend to choose tailor-made, non-standardized OTC contracts to hedge their risks, usually in the form of swaps. OTC contracts are particularly widely used in energy commodities such as crude oil or kerosene. A recent report by the International Organization of Securities Commissions (IOSCO, 2010) gauges the share of OTC transactions in all crude oil derivatives at 39 per cent (18 per cent cleared and 21 per cent uncleared). This means that substantial counterparty risk is an issue.

Currently, OTC markets in all parts of the world are still rather opaque, both with respect to the concrete positions taken and the way prices are formed. Price discovery in OTC markets – particularly for energy commodities – relies heavily on the services of price reporting agencies (such as Platts or Argus), which provide thousands of cash reference prices per day. These benchmarks are commonly used to determine the floating price component for the settlement of swaps, though there may be some doubts about the reliability of these prices (IOSCO, 2010: 5).

In contrast to the OTC market, futures exchanges trade standardized products with clear definitions of the quality and quantity of the respective commodity, and predefined delivery points. Qualities deviating from these standards or different delivery points are partly accepted, but traded at a discount. Futures exchanges thus offer high liquidity, price transparency and reduced counterparty risk. Counterparty risk is limited by the requirement to deposit an initial margin and settle the account on a daily basis. If the balance on the account falls below a predefined threshold (the so-called maintenance margin), a margin call is triggered. The respective market participants then have to provide additional funds or close their position.

The initial margin is generally only a fraction of the value of the contract, which means that a trader can take a position which is several times the value of that initial margin. Due to the high degree of standardization of contracts, exchanges attract a large volume of trade (i.e. there is high liquidity).

Price developments at the exchanges are immediately reported to news agencies, such as Reuters or Bloomberg, via the exchanges' price reporting systems. There is a high degree of price transparency, but the positions of various types of traders are only reported in the United States in an aggregated way and on a weekly basis. On the whole, prices on futures exchanges are much more transparent than those in spot markets, which are comparatively opaque. This is also emphasized in an IOSCO report (2010: 6) which states: "The transparency and functioning of cash markets for commodities remains a prominent concern." It is therefore not surprising that futures markets play such a vital role in commodity price discovery.

A recent study by the International Food Policy Research Institute analyses the dynamic relationship between spot and futures prices of selected agricultural commodities (Hernandez and Torero, 2010). Using data on weekly returns and weekly volatility for maize, hard wheat, soft wheat and soybeans, the study shows that for these commodities, changes in futures prices lead changes in spot prices more often than the reverse. The study thus supports the findings of several earlier ones that reached similar conclusions. According to the findings of Hernandez and Torero (2010: 9), "the information flow from futures to spot markets has intensified in the past 15 years, probably due to the increase in the relative importance of electronic trading of futures contracts over open auction trading, which results in more transparent and widely accessible prices."

In liquid standardized markets, such as commodity exchanges, any substantial price differentials would not normally be expected to persist for an extended period, as arbitrage is expected to eliminate such differentials quickly. The extent price differentials of similar qualities of commodities can persist also depends on concrete contract specifications. The most important specification is whether the settlement is financial or physical, and in the latter case, the relevant delivery points. In the case of physical delivery, transaction costs, such as transport costs between delivery points need to be taken into account.

A recent example of a persisting differential is the wide gap between Brent crude oil prices and West Texas Intermediate (WTI) oil prices, which exceeded $15 per barrel in early February 2011. The price of New York Mercantile Exchange (NYMEX) WTI, the leading oil contract in the world, has been significantly below Brent crude futures at ICE, although the two are similar in quality. This can be explained by various factors. The NYMEX WTI contract envisages physical delivery in Cushing, Oklahoma. Inventories in Cushing are soaring, recently reaching a peak of 38.3 million barrels (Meyer, 2011) as a result of increased oil production both in North Dakota and Canada. As pipelines deliver oil to Cushing from the north and the south, but cannot transport oil *from* Cushing (see, for example, IntercontinentalExchange, undated), inventories there keep on rising, whereas demand from nearby refineries does not keep up, which depresses the price. Any market participant wishing to engage in arbitrage would have to move the oil from Cushing to the Gulf of Mexico for shipment to Europe. This is costly and takes time. There has been some arbitrage between Cushing and the Gulf of Mexico to exploit higher prices on the coast, but the price differential between WTI and Brent has persisted.

Table 1 offers an overview of relevant exchanges for the commodities analysed in this study. It is difficult to obtain a reliable quantitative ranking of exchanges by volume, as rankings are usually based on the number of contracts traded (e.g. by the Futures Industry Association, FIA). This may be misleading, because futures contracts for the same commodity at different exchanges may differ substantially in size. For instance, the white sugar contract at the London International Financial Futures Exchange (LIFFE) refers to 50 tons, whereas the respective contract at the Zhengzhou commodity exchange refers to 10 tons. The FIA rankings can provide a very rough idea as to the relative importance of different exchanges and contracts in the global trade of commodity derivatives, but not enough to allow any reliable quantification.

Table 1

LEADING EXCHANGES FOR OIL AND AGRICULTURAL COMMODITY DERIVATIVES[a]

Exchange	*Relevant derivatives*	*Relative importance*
Chicago Board of Trade (CBOT) - part of CME Group	Maize, soft red winter wheat - futures, options wheat-maize inter-commodity spread options	Leading exchange for soft red winter wheat and maize
Dalian Commodity Exchange (DCE, China)	Maize - futures	Most important exchange for maize in Asia
Intercontinental Exchange (ICE)	United States: cocoa, raw sugar (no. 11) - futures and options Europe: Brent, WTI - futures and options Canada: barley - futures and options OTC: crude oil (various) - swaps	Leading exchange for raw sugar and cocoa futures (ICE Futures United States) and Brent crude oil futures (ICE Futures Europe)
Kansas City Board of Trade (KCBT)	Hard red winter wheat - futures and options	Specialized exchange for wheat
Minneapolis Grain Exchange (MGEX)	Hard Red Spring Wheat Index (HRSI), Hard Red Winter Wheat Index (HRWI), Soft Red Winter Wheat Index (SRWI), National Corn Index (NCI) - futures and options	Leading exchange for hard red spring wheat
Multi Commodity Exchange of India (MCX)	Brent crude oil, crude oil, barley, wheat, feed maize, white sugar	Among leading exchanges for crude oil
New York Mercantile Exchange (NYMEX) - part of CME Group	Cocoa, raw sugar (No.11) - futures (settlement: financial) WTI, Brent, others - futures and options	Leading exchange for light, sweet crude oil futures; Among leading exchanges for other commodities
NYSE LIFFE	London: white sugar, cocoa, feed wheat - futures and options Paris: milling wheat, malting barley, maize - futures and options	European exchange for agricultural commodities
Zhengzhou Commodity Exchange (ZCE, China)	Hard white wheat, strong gluten wheat, white sugar - futures	Largest number of contracts for white sugar, but contract size is 20 per cent of that at NYSE LIFFE

Source: Websites of the respective exchanges and Futures Industry Association.
a Concerning the six commodities analysed in this study: barley, cocoa, crude oil, maize, sugar and wheat.

3. RECENT EVOLUTION OF PRICES AND FUNDAMENTALS

3.1. Crude oil

In recent years, crude oil prices have climbed to unprecedented levels, reaching an all-time high of nearly $150 per barrel in July 2008. In the wake of the financial crisis of 2008–2009, oil prices fell below $40 per barrel at the end of 2008 (figure 1).

It is often argued that the fast-growing Asian emerging economies are a major source of rising demand for crude oil. The higher energy intensity of their production compared to that of developed economies has contributed decisively to the growing demand (e.g. ECB, 2010). This demand slowed down only temporarily as a result of the recent crisis.

As Kaufmann (2011) argues, the strong surge in oil prices in recent years cannot be explained without taking into account the role of the supply side. There are two groups of producers in the oil market that differ significantly in their behaviour. Whereas the non-OPEC countries can be assumed to be price takers, with their production positively related to price and negatively related to cost, the OPEC countries form a cartel whose operations are based on strategic considerations. A shift in the supply relations between the two groups can thus be assumed to have a significant impact on the evolution of oil prices. The sudden slowdown in the growth rate of non-OPEC crude oil supply after 2004 is therefore seen as a major factor driving oil price developments (Kaufmann, 2011; ECB, 2010). It caused an unexpected increase in OPEC's capacity utilization, lowering OPEC's excess capacity and thus strengthening the role of the cartel as a marginal supplier.

Figure 1

EVOLUTION OF CRUDE OIL PRICES, 1980–2010

($ per barrel)

Source: UNCTADstat.
Note: The prices shown refer to an equally weighted average of Brent, Dubai and WTI crude oils.

Recent oil price increases are likely to have been accelerated by political tensions and armed conflicts in oil-producing countries, among other factors, although the effect may have been dampened to some extent by declining inventories. According to the IEA (2011), current inventories and spare capacity are still sufficiently high to constrain price increases in the near future.

3.2. Selected food commodities

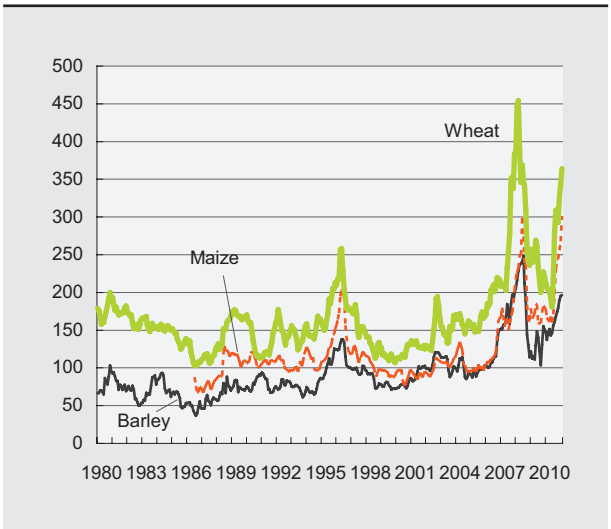
Grain prices have been very volatile[4] in the most recent years. Having peaked in 2008, they declined sharply, but started rising again in 2010. In February 2011 maize prices exceeded the level of June 2008. Due to substitution effects, price movements of the three crops analysed in this study are highly correlated (figure 2). A number of supply and demand factors contribute to rising food commodity prices. Supply growth is slowing, because agricultural land is limited and productivity growth has slowed (OECD-FAO, 2009). Supply constraints are exacerbated by the effects of climate change (such as extreme weather events), which are already felt in many regions of the world, but are expected to grow dramatically over the next decades.

On the demand side, the rising world population and changes in emerging economies towards more protein-rich diets are major long-term factors. As incomes in emerging economies have risen sharply with accelerated economic growth, consumption patterns of the population have also changed. Between 1995 and 2005, world meat consumption rose by 15 per cent, East and Southeast Asia being the region with the highest increase at almost 50 per cent (FAO, 2009). Taking into account that the production of 1 kg of meat requires about 7 kg of grains, the impact on grain demand is substantial.

Figure 2

EVOLUTION OF GRAIN PRICES, 1980–2010

($ per ton)



Source: UNCTADstat; and IMF, primary commodity price tables.

Biofuel production is another decisive demand factor. The decision by some governments to introduce blending requirements and subsidies for biofuel production is considered to play a significant role in the recent price hikes of grains (box 2). Biofuel production also affects price movements of agricultural products which are not used in the production of biofuels, because agricultural land is diverted to producing crops needed for biofuel production. As biofuels partly replace petroleum products, they strengthen the link between the oil market and markets of agricultural products used in the production of biofuels (i.e. maize, sugar, oilseeds and palm oil). High oil prices also affect agricultural commodity prices via higher production costs, especially for energy and fertilizers. This may also explain the co-movement of oil prices and some agricultural commodity prices.

In the short run, weather effects have a strong impact on price developments. Often, these are exacerbated by policy measures such as export bans or taxes. Thus, wheat prices were driven up last August by the drought in the Russian Federation and an export ban.

In contrast to grains markets, high and rising prices are not a new phenomenon in the sugar and cocoa markets, judged by historical standards (figure 3). These two soft commodities already experienced extreme price spikes in the 1970s and 1980s. Recently, the cocoa price has come under pressure due to political tensions in Côte d'Ivoire, the world's largest cocoa producer. The sugar price has risen sharply despite production increases. Expected higher demand may be a factor (FAO, 2010).

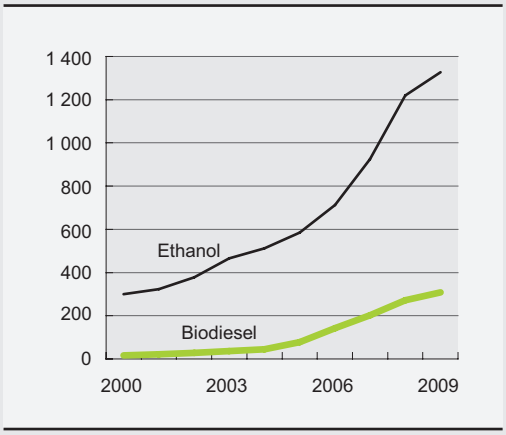
Box 2

BIOFUELS[a] AND THEIR ROLE IN DRIVING UP COMMODITY PRICES

In recent years, a number of countries have introduced or expanded mandates for the blending of fossil fuels with biofuels.[b] These requirements have been driven largely by political rather than economic motives, based on the need to reduce greenhouse gas emissions, increase energy independence and support rural incomes.[c] In addition to blending requirements, biofuel production is supported by high subsidies, the highest being in the United States, where almost $6 billion were spent in support of biofuels in 2006 (Steenblik, 2007). Biofuels are heavily subsidized also in the EU. Brazil has the highest ethanol blending requirement, at between 20 and 25 per cent, but its ethanol is produced from sugar cane which is competitive without subsidies (FAO, 2008).

WORLD BIOFUEL PRODUCTION

(Thousand barrels per day)



Source: Energy Information Agency (EIA), *International Energy Statistics* database.

Spurred by subsidies and blending requirements in a number of countries, as well as rising crude oil prices, biofuel production has increased more than fivefold since 2000 (see figure). However, biofuels still account for only about 2 per cent of world oil supply and therefore do not yet affect crude oil prices. Biodiesel, the production of which started from a much lower level, increased its share in world biofuel production from 5 per cent in 2000 to 18.8 per cent, but the share of ethanol continues to be higher. There are substantial regional differences. Production of biofuels is heavily concentrated in the United States and Brazil, which accounted for 45.6 per cent and 29.2 per cent, respectively, of total biofuel production in 2009, while the combined share of Europe and Asia was just 20 per cent (see also annex table A.1).

The world's largest ethanol producer, the United States, almost exclusively uses maize for ethanol production. According to data from the USDA, the share of the total maize production which is used for ethanol production has almost doubled since 2006 and is now close to 40 per cent. The period of the most rapid expansion of United States ethanol production coincides with strong increases in grain prices. In contrast, Brazil bases its ethanol production on sugar cane, of which it is the world's leading producer, using 55–60 per cent of its sugar cane production to produce fuel (McConnell, Dohlmann and Haley, 2010). Owing to the strong increase in ethanol production, Brazil's output of sugar cane has risen fast, albeit more slowly than its ethanol production. There are substantial differences in the so-called fossil energy balance of biofuels (i.e. the ratio of energy contained in biofuel to fossil energy used in its production). Whereas the fossil energy balance of ethanol produced from maize is less than two, that of ethanol produced from sugar cane ranges between 2 and 8 (FAO, 2008: 17).

A recent study by UNCTAD (2009a: 1) estimates that, due to blending requirements in many countries, demand for biofuels will rise much faster than production capacity. In addition, subsidization of biofuels implies that biofuel production has zero elasticity with respect to changes in feed prices. For these reasons it seems plausible that enhanced biofuel production has had some effect on maize prices and – via substitution effects – also on prices of other grains such as barley, rice and wheat. In addition to the direct price effects of higher demand for those crops which serve as feedstock for biofuel production, there are also indirect price effects on other crops which result from changes in land use in favour of crops for biofuel.

A number of studies find significant effects of biofuel production on agricultural commodity prices. For example, growing biodiesel production in Europe has indirectly exacerbated price rises in the wheat market, because land which would otherwise have been used for growing wheat has been diverted to oilseed production (Mitchell, 2008). It has also had an effect on other food products (such as meat and dairy products), which require the same agricultural commodities as a production input (Helbling, Mercer-Blackman and Cheng, 2008). Estimates of the effects of biofuels on maize prices range from 39 per cent

/...

Box 2 (concluded)

(Rosegrant, 2008 for the period 2000–2007) to between 70 and 75 per cent (Mitchell, 2008 for the period 2002–2008). Roberts and Schlenker (2010) estimate the impact of United States biofuel production alone on world prices of maize, rice, soybeans and wheat to be about 30 per cent. If a third of the calories used were recycled to feed animals, the price effect would still be 20 per cent. For rice and wheat, the price effects may be slightly lower than for maize, according to Rosegrant (2008) who estimates the impact at 21 per cent and 22 per cent, respectively, of price increases between 2000 and 2007.

Several other studies find no significant effects, or argue that biofuels cannot have serious effects on agricultural commodity prices. Baffes and Haniotis (2010) contend that it is highly unlikely that biofuel production triggered recent agricultural commodity price spikes, given the small share of land used for biofuels in global land used for grain and oilseed production. Based on an analysis of data on food commodity prices, production, inventories and trade, Pfuderer and del Castillo (2008) conclude that biofuel production has not been the main driver of recent commodity price hikes. However, their analysis leaves some open questions. For example, in their analysis of the wheat price, little account is taken of substitution effects between various grains. Trostle (2008) acknowledges that United States ethanol production, which accounts for 30 per cent of the global growth in wheat and feed grain consumption, had some effect on world markets. On the other hand, he stresses that the effect was mitigated by the availability of by-products of ethanol production (so-called "distillers' grains") for feed purposes and by an increase in land use.

On balance, the evidence supports the view that biofuels have contributed to the recent increase in food prices but estimates as to the extent of this effect diverge widely.

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[a] As this study focuses on grains (barley, maize, wheat), cocoa, crude oil and sugar, the use of oilseeds for biodiesel is not highlighted here.

[b] Pfuderer and del Castillo (2008) provide an overview (see also FAO, 2008: 29).

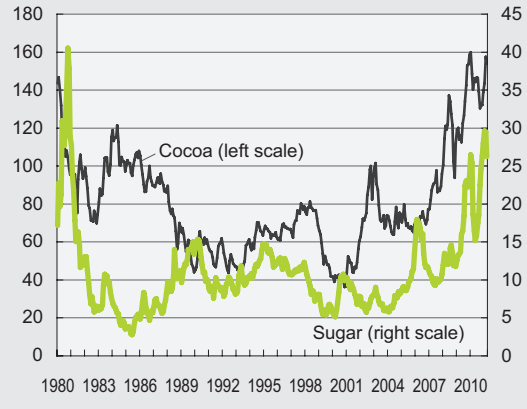
[c] More recently, however, doubts have emerged about the environmental benefits of biofuels. Taking the change of land use into account the net benefit of biofuels for the reduction of greenhouse gases might actually be negative (see e.g. Searchinger, 2008).

Unlike in earlier periods, the recent price hikes have occurred in an environment of general price increases across a wide range of commodities, from energy to agricultural commodities. Most of the factors which are often cited as price drivers, such as population growth or changing consumption patterns have been at work for an extended period often coinciding with low commodity prices. Their role in explaining recent price hikes is therefore doubtful. Experiences with the weak forecasting performance of econometric models for oil prices based on fundamentals (e.g. Kaufmann, 2011) also suggest that physical supply and demand are not the only factors that drive oil prices. The European Commission (2008) has also expressed doubts that market fundamentals are the main drivers of commodity prices. As the following sections show, there is strong evidence that the increasing presence of financial investors in commodity markets plays an important role in price dynamics.

Figure 3

EVOLUTION OF PRICES OF SELECTED SOFT COMMODITIES, 1980–2010

(US cents per pound)



Source: UNCTADstat.

4. FINANCIALIZATION OF COMMODITY PRICE FORMATION

4.1. Financialization: definition, motivation, size and instruments

The term "financialization of commodity trading" indicates the increasing role of financial motives, financial markets and financial actors in the operation of commodity markets.

Investors have been engaging in commodities trading for the purpose of portfolio diversification ever since it became evident that commodity futures contracts exhibited the same average returns as investments in equities, while over the business cycle their returns were negatively correlated with those on equities and bonds. The empirical evidence for this finding emerged from an analysis of data stretching over a long period, from 1959 to 2004 (Gorton and Rouwenhorst, 2006). That analysis also shows that the returns on commodities were less volatile than those on equities or bonds, because the pair-wise correlations between returns on futures contracts for various commodities (e.g. oil and copper, or oil and maize) were relatively low (Gorton and Rouwenhorst, 2006).

Commodity futures contracts were also found to have good hedging properties against inflation (i.e. their return was positively correlated with inflation). This is because they represented a bet on commodity prices, such as prices of energy and food products, which have a strong weight in the goods baskets used for measuring current price levels. Also, futures prices reflect information about expected changes in commodity prices, so that they rise and fall in line with deviations from expected inflation.

Furthermore, investing in commodity futures contracts may provide a hedge against changes in the exchange rate of the dollar. Most commodities are traded in dollars and commodity prices in dollar terms tend to increase as the dollar depreciates. Measured in a currency basket, commodity prices are generally less correlated with the dollar; indeed, the sign of the correlation is reversed (IMF, 2008: 63). This suggests that changes in the value of the dollar against other currencies may partly explain the negative correlation between the prices of dollar-denominated commodities and the dollar.

Financial investors have long been active on commodity markets.[5] But the above mentioned empirical findings of their investments in commodities for purposes of portfolio diversification gained considerable attention following the bursting of the equity market bubble in 2000, which spurred financial investment in commodities.[6] Moreover, there was growing acceptance of the notion that commodities as an asset class are a quasi-natural hedge against positions in equity markets (Gorton and Rouwenhorst, 2006), as already mentioned.

Such portfolio diversification considerations gained further impetus in the early 2000s with the increasing recognition in both academic circles (e.g. Radetzki, 2006) and among potential investors (e.g. Heap, 2005) that commodities were entering a new super cycle. It was believed that rapidly growing demand associated with urbanization and industrialization, as well as changes in dietary habits towards more protein-rich diets in major emerging economies, particularly China and India, had triggered a new, prolonged increase in real commodity prices (see also UNCTAD, 2005).

Financial investors use a range of instruments.[7] However, investment in commodity indexes has probably attracted the most attention over the past few years. Index investment tracks returns on weighted commodity baskets (e.g. the Standard & Poor's Goldman Sachs Commodity Index (S&P GSCI) and the Dow Jones-Union Bank of Switzerland Commodity Index (DJ-UBSCI)).[8] These indexes are composites of futures contracts on a broad range of commodities (including energy products, agricultural products and metals) traded on commodity exchanges. Investing in a predetermined basket of commodities, as is done in index investment, rests on the assumption that commodities have a unique risk premium which is not replicable by combining other asset classes, and that they form a fairly homogeneous class which can be represented by a few positions (Scherer and He, 2008). These characteristics are likely to be accentuated in periods of commodity super cycles. During those periods, commodity-specific market intelligence, as generally gathered by investors that focus on specific commodities, may be considered unnecessary. As a result, the fees associated with investing in commodity indexes are fairly low.

Financial investors gain exposure in commodity indexes by entering into a bilateral financial agreement, usually a swap, with a bank or another large financial institution. The investor purchases parts in a commodity index from the bank, and the bank in turn hedges its exposure resulting from the swap agreement through futures contracts on a commodity exchange. Financial investment in commodity indexes involves only "long" positions (i.e. pledges to buy commodities) and relates to forward positions (i.e. no physical ownership of commodities is involved at any time).[9] This process – known as "rolling" – gives rise to a roll yield which is positive in a "backwardated" market and negative in a "contango" market.[10] This specific characteristic of index trading implies that roll yields are of particular importance to position-taking by index traders.

Financial investors that follow a more active trading strategy, such as money managers (see below), are unlikely to rely on long-term oriented index investment; rather, they tend to operate on the basis of more short-term investment horizons and take positions on both sides of the market through futures and options contracts. This enables them to earn positive returns in both rising and declining markets.

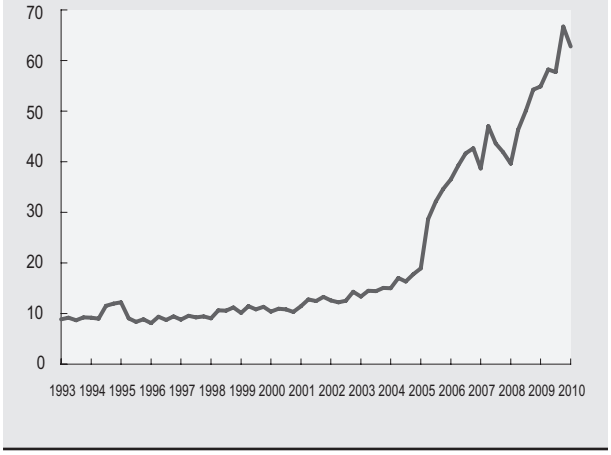
Since about 2009, a third basic instrument has gained considerable importance, namely so-called "exchange-traded products" (ETPs). Most ETPs, which comprise exchange-traded notes (ETNs) and exchange-traded funds (ETFs), replicate the return on a single commodity, while a few track commodity groups. The shares of ETPs are traded on equity markets. Some of them are easily accessible by small-scale investors, while others offer large single coupons and are therefore more attractive to institutional investors such as pension funds. Apart from ETFs for precious metals, such funds have traditionally used futures contracts as collateral. But an important recent development is that some ETPs, such as those in copper and aluminium, are backed by physical commodities. Futures-backed ETPs expose investors to counterparty risk, as transactions involving buying or selling of ETPs do not go through a clearing house on commodity exchanges. The rising importance of physically-backed ETPs indicates that risk aversion and growing concern with counterparty risk have made it more acceptable for financial investors to bear the storage cost of the physical commodities as they can be used as collateral. The currently very low interest rates, which reduces the cost of credit used to finance storage costs, has most likely also contributed to the increased importance of physically-backed ETPs. Returns on such products are determined by spot price movements, while the returns on futures-backed ETFs are largely influenced by the roll yield, and thus share the characteristics of traditional index investments.

The further expansion of physically backed ETPs may well cause a tightening of physical commodity supply, because part of the physical commodities available in the warehouses of commodity exchanges will be earmarked as collateral, and therefore will not be available for delivery. This could give rise to a cash premium (or increase existing premiums) and move commodity markets into backwardation, which in turn would increase the return on commodity index investments and make such investments more attractive. To the extent that this would cause an increase in commodity prices, it would increase the need for physically backed ETPs in order to hold more physical commodities. In other words, the conjunction of these two instruments may well ignite a speculative bubble. Moreover, due to the close link of returns to spot price movements, an increasing popularity of physically backed commodity investments would most likely exacerbate price

Figure 4

FUTURES AND OPTIONS CONTRACTS OUTSTANDING ON COMMODITY EXCHANGES, DECEMBER 1993–DECEMBER 2010

(Number of contracts, millions)

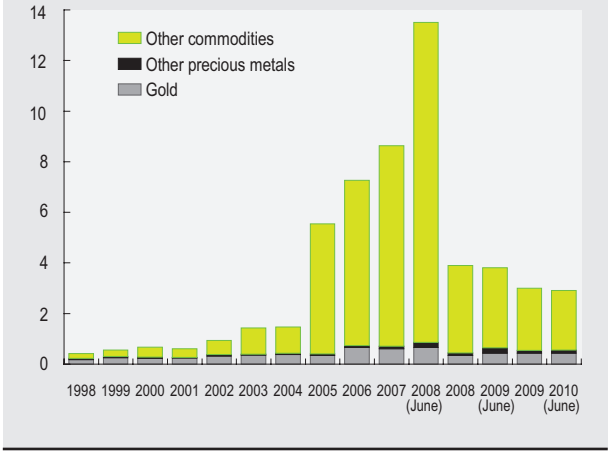


Source: Bank for International Settlements (BIS), *Quarterly Review*, March 2011, table 23B.

Figure 5

NOTIONAL AMOUNT OF OUTSTANDING OVER-THE-COUNTER COMMODITY DERIVATIVES, DECEMBER 1998–JUNE 2010

(Trillions of dollars)



Source: BIS, *Quarterly Review*, March 2011, table 22A.

volatility, as investors would buy such instruments in times of rising prices, but sell in times of declining prices.

Financial investors are also increasingly using structured products. These products can take different forms, but typically combine an underlying asset with a derivative (such as an option). The addition of a derivative is often aimed at protecting the capital invested in the underlying asset, and thereby reducing risk while maintaining the possibility of benefiting from the current price trend. This option gives the right (but not the obligation) to buy (or sell) an asset at a specified price within a given time frame. Given the generally non-standardized character of structured products, they are typically traded OTC between an investment bank and a financial investor. Structured products on commodity indexes first appeared on the market in 2006. They compete with the traditional, broad-based commodity indexes but make the rolling process more flexible, thereby reducing roll losses.

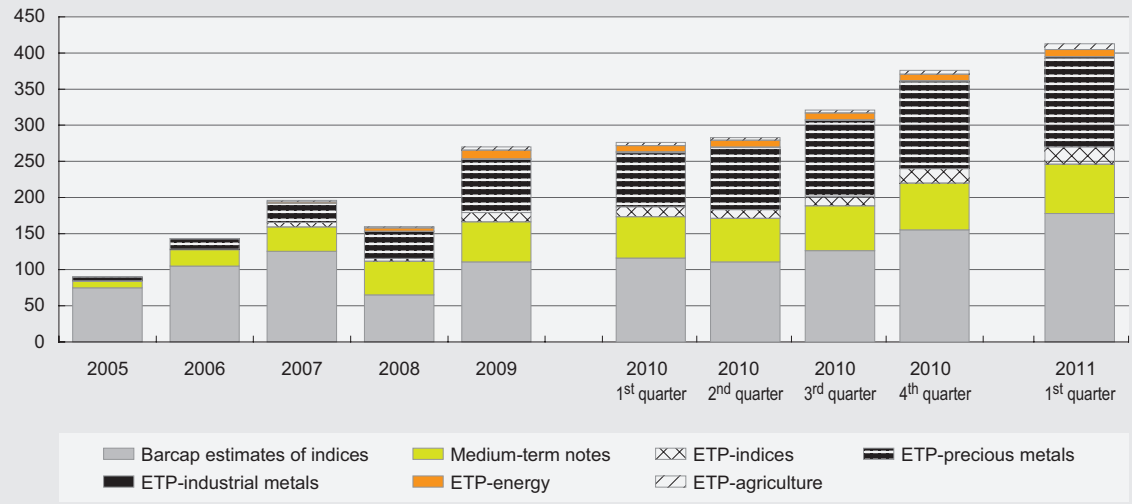
It is difficult to assess the size of the financialization of commodity trading due to the lack of comprehensive data. But it is reflected, for example, by the strong increase, starting around 2004, in the number of futures and options contracts outstanding on commodity exchanges and in the amount of outstanding OTC commodity derivatives. The number of contracts outstanding on commodity exchanges has continued to increase since the collapse of commodity prices in mid-2008, and is now about 50 per cent higher than in the first half of 2008, when commodity prices peaked (figure 4). In contrast, the notional amount of outstanding OTC-derivatives has dropped to about one third, which corresponds to roughly half of its level in 2005–2006, but also to about five times its level in 1999 (figure 5).[11]

A number of reasons could explain the sharp decline in the notional value of outstanding OTC commodity derivatives. The collapse of commodity prices between mid-2008 and early-2009 to about half their previous level clearly accounts for part of this decline.[12] Another reason could be that the financial crisis led to greater awareness of counterparty risk, making financial investors wary of exposure in bilateral OTC deals. Thirdly, the recent fall in recorded OTC activity probably reflects a decline in the relative importance of broad-based passive index investments by financial investors in commodities, which includes the use of swaps on OTC markets, and an increasing relative importance of more sophisticated active trading strategies, which emphasize the use of futures contracts traded on organized exchanges. A survey conducted in early

Figure 6

FINANCIAL INVESTMENTS IN COMMODITIES: ASSETS UNDER MANAGEMENT, BY PRODUCT, 2005–2011

($ billion)



Source: Barclays Capital, *The Commodity Investor*, various issues.

December 2010 on how commodity investors plan to invest in the coming 12 months indicated that only 7 per cent expected to use index swaps compared with 43 per cent that would choose active management (Barclays Capital, 2010). Such active management includes the use of ETPs, such as ETFs, which may be backed by futures contracts.

Evidence on the value of assets under management by financial investors in commodities reveals two salient features (figure 6). First, these investors have rapidly increased their involvement in commodities even more since mid-2010 than before the financial crisis when it was already growing fast. Judging from currently available data, the commodity-related assets under their management recorded a historic high in March 2011, when it reached about $410 billion – about double the pre-crisis level of 2007. Second, while index investment accounted for 65–85 per cent of the total between 2005 and 2007 prior to the financial crisis, its relative importance has fallen to only about 45 per cent since 2008. This decline occurred despite a roughly 50 per cent increase in the value of index investments between 2009 and the end of 2010.

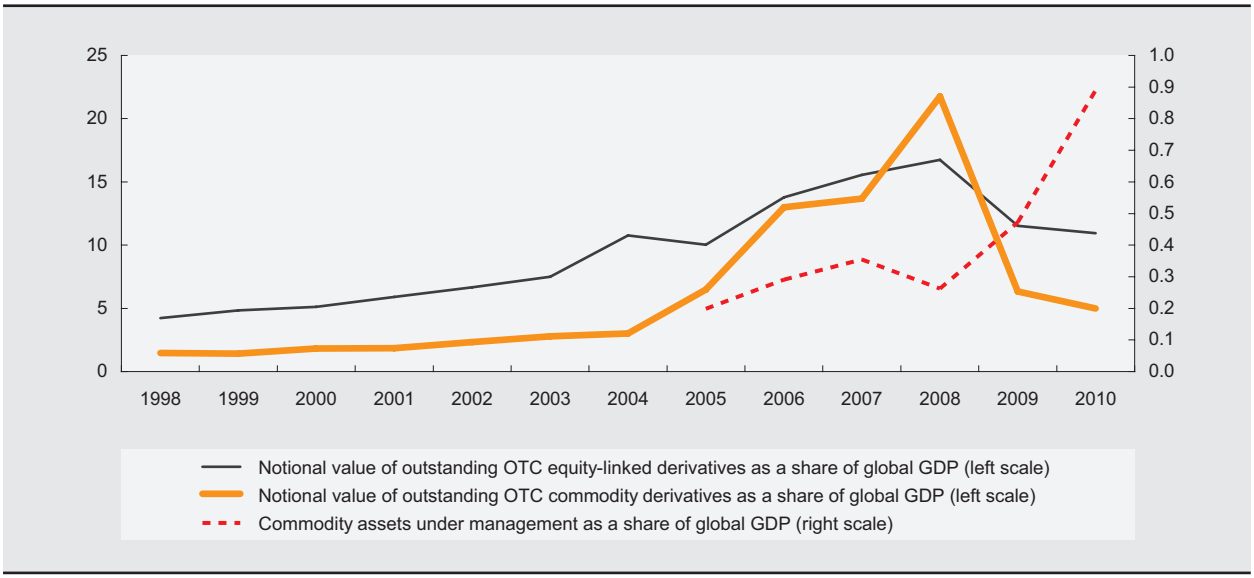
To put the size of financial investments in commodities in perspective, it is useful to consider how these have evolved relative to investments in equity markets, and relative to developments in the real economy. Between about 2002 and the outbreak of the financial crisis, the notional amount of outstanding OTC commodity derivatives increased considerably faster than comparable investments in equity-linked contracts. However, in 2008–2009 the value of commodity investments also declined considerably faster than that of equity-linked investments (figure 7). Perhaps more importantly, the share of the notional amount of outstanding OTC commodity derivatives in global gross domestic product (GDP) increased from 2–3 per cent in the early 2000s to more than 20 per cent in 2008, and, in spite of its subsequent rapid decline, this share has remained at about 5–6 per cent (i.e. roughly double its share about a decade ago). The evidence in figure 7 also reflects the differences in the evolution of commodity investments on exchanges and on OTC markets, noted above; it shows that the share of the value of commodity assets under management in global GDP increased more than fourfold in the period 2008–2010.

A comparison of the development of physical commodity production and financial investment in commodities sheds some further light on the size of the financialization of commodity markets. Concentrating on oil, which constitutes the largest share of total commodity production, reveals that the share of the notional value of total (i.e. not just oil

Figure 7

FINANCIAL INVESTMENTS IN COMMODITIES AND GLOBAL GDP, 1998–2010

(Per cent)

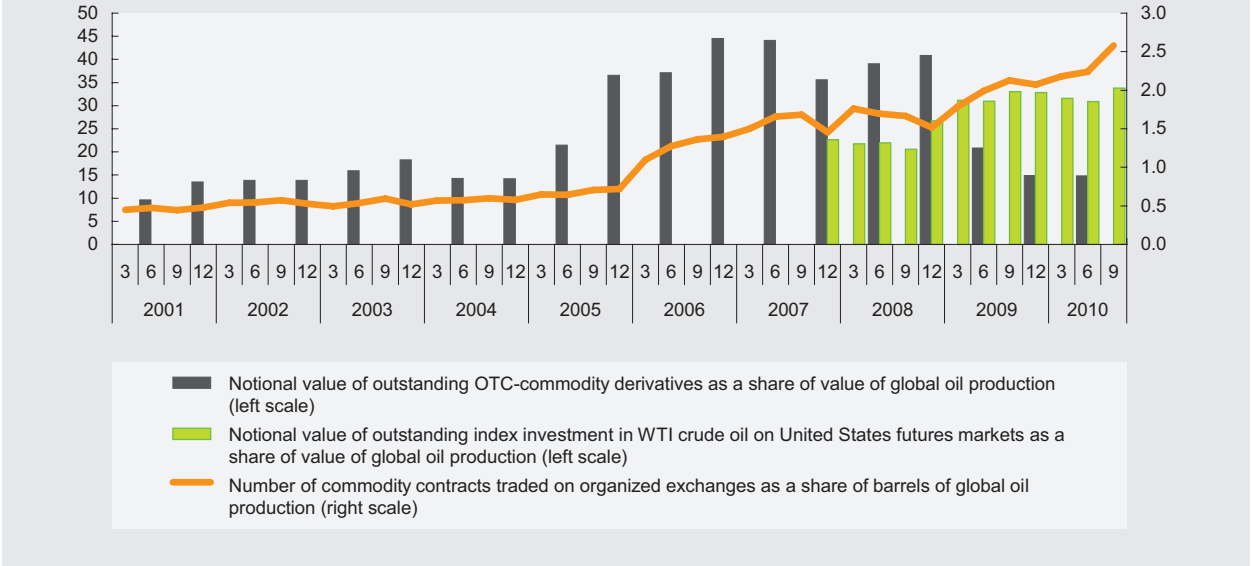


Source: UNCTAD secretariat calculations, based on BIS; Barclays Capital; and UNCTADstat.

Figure 8

FINANCIAL INVESTMENTS IN COMMODITIES AND GLOBAL OIL PRODUCTION, 2001–2010

(Per cent)



Source: UNCTAD secretariat calculations, based on BIS; CFTC; IEA; and UNCTADstat.

for which no separate data are available) outstanding OTC commodity derivatives in the value of global oil production increased about fourfold between the early 2000s and 2007–2008 when it reached 40–45 per cent (shown by the dark columns in figure 8). A similar value-based measure relating to financial investments in commodity futures exchanges shows that the share of the notional value of the outstanding index investments in WTI crude oil on United States futures exchanges in the value of global oil

production in 2010 was about 50 per cent higher than in 2007–2008 (shown by the light columns in figure 8). Given that WTI appears to have ceded part of its function as a benchmark for global crude oil prices to Brent, this increase may well be an underestimation. Indeed, comparing the number of commodity contracts traded on organized exchanges and the volume of global oil production (indicated by the line in figure 8), indicates an unabated increase in the financialization of commodity markets.

4.2. Categories of market participants

Several categories of market participants are active in commodity markets.[13] These categories are usually distinguished on the basis of the reports on traders' positions that are published in anonymous and summary form by the CFTC – in its weekly *Commitment of Traders* (COT) reports. The main purpose of these reports is to improve transparency about activity in futures markets.

The CFTC used to distinguish only between two categories of market participants: those that hedge an existing exposure, which it categorized as "commercial", and those that do not hedge which it categorized as "non-commercial".[14] However, it became widely perceived that, as a consequence of the growing diversity of market participants in futures exchanges and the greater complexity of their activities, the traditional COT data may fail to fully reflect such activity (CFTC, 2006). This is because those hedging, and therefore defined as commercial market participants, have normally been considered as entities that use transactions in futures contracts to reduce risk in the conduct of a commercial enterprise. However, many market participants who report positions as hedges, and who therefore fall under the "commercial" category, are in fact commodity swap dealers, who hedge to offset financial positions. If their underlying positions were held directly as commodity futures contracts (rather than being intermediated through OTC swap agreements), they would be categorized as "non-commercial".

Responding to these concerns, in 2007 the CFTC introduced a new and better categorization in its *Supplementary Commodity Index Trader*s (CIT) reports with data on positions of index traders for 12 agricultural commodities.[15] The index trader positions include those taken by both pension funds, previously classified as non-commercial traders, and swap dealers that had been classified as commercial traders. According to the CFTC (2009), CITs generally replicate a commodity index, but may belong to either the commercial or non-commercial category.

In September 2009, the CFTC went even further and started to publish *Disaggregated Commitment of Traders* (DCOT) reports. These reports have been providing weekly data beginning in June 2006 for the 12 agricultural commodities covered by the CIT reports plus a range of energy commodities and metals, such as crude oil, natural gas, copper and gold. The DCOT reports distinguish five trader categories (see table 2).

The DCOT reports consider the first two trader categories (i.e. PMPU and swap dealers) as "commercial" traders, and the other two reporting trader categories as "non-commercial" traders. By contrast, the index trader category of the CIT reports does not coincide with the swap dealer category in the DCOT reports. This is because the swap dealer category of the DCOT reports includes swap dealers who do not have commodity index-related positions, and therefore are not included in the index trader category of the CIT reports. Also, the index trader category of the CIT reports includes pension and other investment funds that place index investments directly into the futures markets rather than going through a swap dealer; these traders are classified as managed money or other reportables in the DCOT reports (see also Irwin and Sanders, 2010).

Money managers generally have a short-term perspective and adopt an active investment strategy. This strategy goes beyond the consideration of commodities as a fairly homogenous asset class with a unique risk premium, which is characteristic of

Table 2

TRADER CATEGORIES IN THE CFTC'S DISAGGREGATED COMMITMENT OF TRADERS REPORTS

1. Producers, merchants, processors, users (PMPU)	Entities that predominantly engage in the physical commodity markets and use the futures markets to manage or hedge risks associated with those activities.
2. Swap dealers	Entities that deal primarily in swaps for a commodity and use the futures markets to manage or hedge the risks associated with those swap transactions. The bulk of these traders' clients are index investors who invest in commodity indexes such as the S&P GSCI and the DJ-UBSCI.
3. Money managers	Entities that manage and conduct organized futures trading on behalf of their clients. This category includes registered commodity trading advisers (CTAs), registered commodity pool advisers (CPOs), and unregistered funds identified by the CFTC. Hedge funds and large ETFs are part of this category.
4. Other reporting traders	Every other reportable trader that is not included in one of the other three categories.
5. Non-reporting traders	Smaller traders who are not obliged to report their positions.

broad-based passive index investment; it also takes into account factors such as different short-term supply-and-demand dynamics, as between industrial metals and energy. Perhaps more importantly, active trading strategies try to take advantage of profitable investment opportunities arising: (i) in declining markets (by taking "short" in addition to "long" positions); (ii) from taking longer dated futures positions than those usually included in readily available indexes; (iii) from trading commodities that are barely, if at all, included in the popular commodity indexes (e.g. soybean oil is not included in the S&P GSCI, while cocoa is not included in the DJ-UBSCI); and (iv) from employing a "relative value" approach, such as by exploiting differences in quality (e.g. WTI versus Brent crude oil), regional dynamics (e.g. North America and Western Europe versus Asia), intra-commodity dynamics (e.g. soybeans versus soybean oil), and cross-commodity dynamics (e.g. trading oil and feedstock used for biofuel production against other food commodities).

The money manager category includes a range of investors, such as hedge funds and institutional investors, which follow different trading strategies based on macroeconomic fundamentals, detailed commodity research, algorithmic trading or trend following, and general financial portfolio-diversification considerations. Thus they are able to adjust their exposure in commodity markets according to changes in asset prices with a view to stabilizing the structure of their portfolio.

4.3. What is problematic about financialization?

The financialization of commodity trading has made the functioning of commodity exchanges controversial. Their traditional functions have been to facilitate price discovery and allow the transfer of price risk from producers and consumers to other agents that are prepared to assume the price risk. These functions are impaired to the extent that trading by financial investors increases price volatility and drives prices away from levels that would be determined by physical commodity supply and demand relationships. As a result, commodity price developments no longer merely reflect changes in fundamentals; they also become subject to influences from financial markets. Consequently, market participants with a commercial interest in physical commodities (i.e. producers, merchants and consumers) face greater uncertainty about the reliability of signals emanating from commodity exchanges. Thus, managing the risk of market positions and making storage, investment and trading decisions become more complex. This may discourage long-term hedging by commercial users. Moreover, with greater price volatility, hedging becomes more expensive, and perhaps unaffordable for developing-country users, as well as riskier.[16]

4.4. Herd behaviour and the limits of arbitrage

The availability and processing of information plays a key role in the determination of asset prices. This role has traditionally been examined on the basis of the EMH, whereby prices perfectly and instantaneously respond to all available information relevant to a freely operating market. Market participants continuously update their expectations from inflowing public and private information. This means that prices will move either when new information becomes publicly available (in the case of commodities, for example following announcements of harvest forecasts or changes in oil production), or when private information leads to transactions that affect prices.

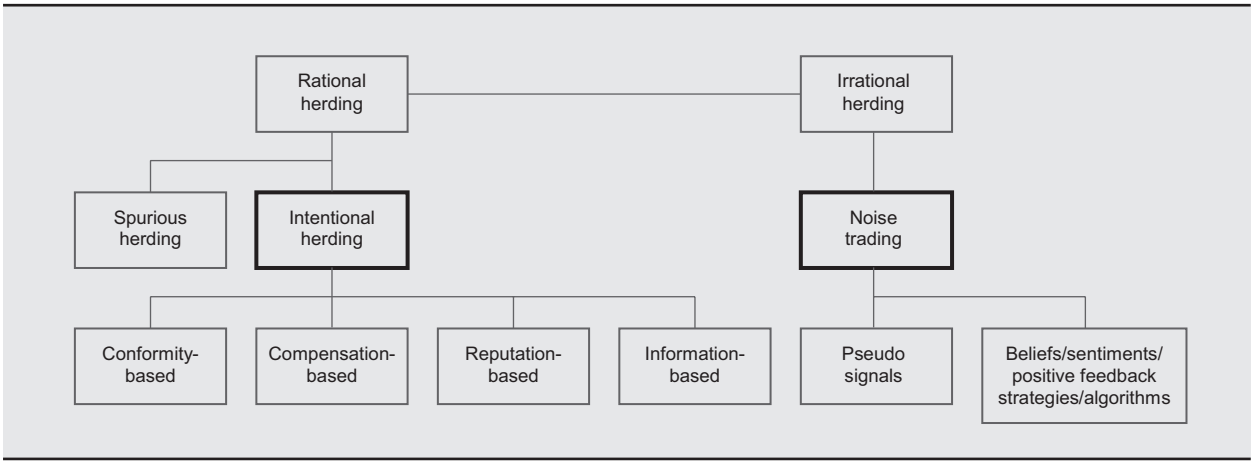
Crucial assumptions of the EMH are that market participants evaluate assets on the basis of fundamentals, act fully rationally, base their actions on publicly available or their own private information, and do so independently of each other. However, some circumstances can cause individuals to deviate from this assumed behavioural pattern and to engage in herd behaviour. Herd behaviour frequently occurs when decisions need to be taken in situations of uncertainty.[17] It may be defined as the tendency of individuals to mimic the actions of a larger group, rather than acting independently and on the basis of their own information.

Herd behaviour can take various forms and may be rooted in irrational behaviour, but it may also be fully rational. Figure 9 provides a taxonomy of different types of herd behaviour. Early models of herd behaviour were based on assumed deviations from perfect rationality, or so-called "noise trading" (Shleifer and Summers, 1990). Investment by noise traders is affected by pseudo-signals, which convey no information about future returns in a specific asset market, or by changes in traders' beliefs and sentiments that are not justified by news on fundamentals. An example of pseudo signals for positions in commodity markets is information related to other asset markets that triggers portfolio rebalancing, and, hence, changes in investors' exposures to commodities.

Changes in beliefs and sentiments may reflect investors' judgemental biases, such as overreacting to news or overoptimism.[18] It may also reflect use of inflexible trading strategies, such as momentum

Figure 9

DIFFERENT TYPES OF HERD BEHAVIOUR



Source: UNCTAD secretariat, derived from Bikhchandani and Sharma (2001); and Shleifer and Summers (1990).

investment or positive feedback strategies. Such strategies assume that past price developments carry information on future price movements giving rise, for example, to trend chasing. This will result in buying after prices rise and selling after prices fall, independently of any changes in fundamentals. Simple types of positive feedback strategies are closely related to technical analysis that utilizes past price and position data to assess patterns of activity that might be helpful in making predictions. More sophisticated trading rules use computer-based algorithms that strictly adhere to a predetermined set of rules. Algorithms analyse market activity and produce signals for trading strategies established either on the basis of past trading and price developments or on the basis of the anticipated reaction by other algorithmic traders to current market developments.[19] Given that several positive-feedback and algorithmic traders may use similar rules, they run the risk of collectively generating market movements that they then individually identify and follow. Moreover, to the extent that algorithms follow statistical strategies and monitor market developments across different asset markets, such rules will cause price signals to spill over from, for example, equity or currency markets to commodity markets, even when there is no change in the fundamentals on commodity markets.

Herd behaviour can also be fully rational. In this context, "spurious herding" should be distinguished from "intentional herding" (Bikhchandani and Sharma, 2001). Spurious herding describes situations where agents facing similar decision-making problems and information sets take similar decisions. Given that spurious herding reflects agents' common reaction to public information, it is entirely compatible with the EMH, provided that the information refers to the fundamentals of the specific market. Fundamentals-driven spurious herding in commodity investment can arise if, for example, a significant share of international supply is suddenly cut off, as occurred with oil during the Gulf war in 1990–1991 and with rice following the imposition of export bans by various large exporting countries in 2008.

Intentional herding may be based on four motives (Devenow and Welch, 1996; Bikhchandani and Sharma, 2001). First, conformity-based herding relates to an alleged intrinsic preference of individuals for conformity. Second, reputation-based herding relates to imitation which arises when traders and their employers are uncertain about the traders' abilities (Scharfstein and Stein, 1990). Traders who doubt their own abilities will not take positions contrary to those taken first by other traders, even if their own information would lead them to do otherwise. Doubtful traders, by imitating others, will avoid being considered low-skilled if taking positions contrary to those taken by others turned out to be loss-making. If the common decision turns out to be loss-making, it will be attributed to a change in general market sentiment, rather than to poor individual judgement or performance.[20] Third, closely related to reputation-based herding is compensation-based herding. This refers to agents who invest on behalf of others and whose compensation schemes and terms of employment provide incentives

that reward imitation. For example, risk-averse investors will align their positions with benchmark portfolios if their compensation increases when they do better than the benchmark but decreases when they underperform the benchmark. Compensation rules based on such relative performance measures can lead not only to herding but also to risk-loving investors taking excessively high risk.

Fourth, information-based herding is perhaps the most important motive of intentional herding. It refers to imitation in situations where traders believe that they can glean information by observing the behaviour of other agents. In other words, investors converge in their behaviour because they ignore their private information signals (Hirshleifer and Teoh, 2003). As explained by Banerjee (1992), who calls this effect "herd externality", information-based herding exerts an external influence on decision-making processes and causes position-taking that is not in line with an agent's own information. Position-taking based only on other peoples' previous actions will cause price changes without infusing any new information into the market. A sequence of such actions causes a so-called "informational cascade" (Bikhchandani, Hirshleifer and Welch, 1992) – a snowballing effect which will eventually lead to self-sustaining asset price bubbles.

Informational cascades are most likely to occur where market participants are unequally informed and ignore the accuracy of other peoples' information. Market participants who judge their own information to be incomplete and approximate will tend to delay their decision-making, preferring to act only once they can make inferences on the basis of other – supposedly better informed and more experienced – people's action. This implies that position-taking by investors that make early decisions is likely to determine which way followers will decide to move, and it therefore has a disproportionate impact on price changes. This will be the case even if the assessments of the early movers are incorrect, based on overconfidence or on idiosyncratic motives (such as readjusting portfolio composition following price changes in other asset markets). It also implies that an increase in the number of market participants and in liquidity does not necessarily indicate that market transactions are based on more information.

Informational cascades are not limited to one market. They can spread across different asset markets if prices in those markets are correlated. Herding across markets can lead to excess correlation (i.e. a level of correlation between asset prices that exceeds the correlation between their fundamentals) (Cipriani and Guarino, 2008).

Informational cascades and information-based herding can be altered or even reversed by a publicly observable shock or by the release of public information (Hirshleifer and Teoh, 2003). Both events infuse new information into the market. They also allow followers to assess the accuracy of the information on which they assumed precursors were acting, as they know that the newly released public information is more accurate than what they inferred from the actions of the early position-takers. Such new public information may consist of easily observable events (such as extreme weather events that impact harvests) or well-researched findings from specialized agencies.[21] However, it may also consist of newsletter recommendations from investment banks or other analysts who base these recommendations on models that are proprietary knowledge. This means that the methodologies that produce these findings are impossible to verify, and therefore their objectivity is open to question.[22] Unless investment banks keep research and trading departments completely independent, such predictions may well be an attempt to ignite a new informational cascade and be combined with the analysts' prior position-taking, the returns on which will increase through imitation by others.

If herd behaviour has an impact on price movements, early movers will benefit the most. Imitation by followers will gradually become less profitable the longer it is delayed, and the greater becomes the probability that newly arriving public information will alter the informational cascade. The speed at which opportunities for high returns and incentives to engage in herding behaviour decline, and the extent to which herding affects prices, depend on the degree of uncertainty. When it is difficult to differentiate between uninformed traders, who are herding, and informed traders, market participants may believe, mistakenly, that most traders possess accurate information. The ensuing confusion allows uninformative herd behaviour to have dramatic effects on prices and can lead to bubbles and excessive volatility (Avery and Zemsky, 1998). Such situations occur when the prevalence of uninformative noise trading is underestimated, either because of a lack of data on the relative importance of different trader categories, or because of the mistaken belief that trading from rational arbitrageurs will instantaneously balance

any price effect from trading that is not based on fundamentals, as discussed below.

The persistence of price deviations from fundamental values caused by herding depends on the speed and efficiency of arbitrage. An arbitrage opportunity presents the possibility of earning a positive return at no risk. Such a possibility will arise if prices diverge from fundamental values or across markets on which identical assets are traded. According to the EMH, an arbitrageur will detect such an opportunity immediately, act upon it and thereby make such price divergences disappear. Given that all these actions are assumed to happen instantaneously, the notion of unlimited arbitrage implies the absence of any arbitrage opportunities. It also implies that irrational position-taking that would drive prices away from fundamental values will not make profits, and hence be driven out of the market. Thus, from an EMH perspective, speculation must be stabilizing (Friedman, 1953).

However, there is widespread agreement that there are limits to arbitrage (for a recent survey, see Gromb and Vayanos, 2010). For example, rational arbitrageurs may not be able to correct mispricing either because of risk aversion (de Long et al., 1990a) or because of capital constraints. Shleifer and Vishny (1997) argue that arbitrageurs may need to use other people's capital. If the market initially moves against the arbitrageurs, they will need to report intermediate losses. This will cause the arbitrageurs' client investors to withdraw part of their money, so that the arbitrageurs would need to liquidate their positions at a loss. Given that arbitrageurs are aware of this possibility, they will exploit arbitrage possibilities only partially.

What is more, it may not even be optimal for rational arbitrageurs to counter the position-taking of irrational investors that follow positive feedback strategies. Instead, they may want to buy and push up the price following some initial good news, thereby providing an incentive for feedback traders to aggressively buy the asset. This reaction by feedback traders will allow the rational arbitrageurs to sell their positions at a profit. But in so doing, profitable arbitrage also contributes to the movement of prices away from fundamentals and feeds short-term price bubbles (de Long et al., 1990b).

Bubbles may persist even over a substantial period of time. This can occur when a bubble bursts only once a sufficient mass of arbitrageurs have sold out and rational arbitrageurs know that there will always remain some agents who are overconfident or pursue momentum-trading strategies. Rational arbitrageurs who know perfectly well that the bubble will eventually burst then need to weigh the risk of overestimating the remaining number of irrational traders, which would imply losing all capital gains by getting out too late, against maximizing profits by riding the bubble as it continues to grow and exiting from the market just prior to the crash. New public information about market fundamentals would allow rational arbitrageurs to synchronize their exit strategies, and thus make the bubble burst earlier (Abreu and Brunnermeier, 2003). The same may be true for disclosure of data that indicate the true number of remaining irrational traders.[23]

Taken together, the above discussion shows that financial investors have a variety of motives, either rational or irrational, for engaging in trend-following and momentum trading, as well as for engaging in arbitrage only to a limited extent. As a result, asset prices deviate from fundamental values for periods of time long enough to disturb the normal decision-making process of consumers and of investors in fixed capital. This is less visible for commodities than for currencies. For currencies, where the fundamentals are obviously the price differentials, due to currency speculation exchange rates are driven away from fundamentals – even in the opposite direction of fundamentals – for extended periods of time, in some cases for three to five years.

The discussion also shows that herding can have sizeable detrimental effects since it reduces the information content of prices, and because, being based on only a little information, existing price levels become very sensitive to seemingly small shocks. Consequently, commodity prices risk being subject to speculative bubbles, move far away from fundamental values and display high volatility.

An empirical assessment of herd behaviour is notoriously difficult. It is particularly difficult to test models of informational herding where intentional herding must be distinguished from spurious herding (which reflects a common and simultaneous reaction to public announcements). Observing market transactions and prices cannot reveal the factors that ultimately determine the decisions of market participants. This is because actions do not reveal the kind of private information or signals that agents receive and that motivate their position-taking. For commodity markets, this problem is exacerbated by

the fact that data on market transactions are available only in aggregated form and at relatively long intervals,[24] and it is often difficult to pinpoint what constitutes fundamentals and how they should be measured and quantified. This is the case especially in the presence of a variety of big events that may change fundamentals gradually but permanently, such as climate change-related events, peak oil concerns or increasing demand in emerging markets.

Nonetheless, despite these difficulties, a small number of studies have attempted to test for herd behaviour in commodity markets. In principle, trend-following and momentum trading in commodity markets can be examined by regressing speculative position-taking over price changes on previous days. In addition to unresolved questions as to what trader categories should appropriately be considered as "speculators", daily data on speculative position-taking are not publicly available. Therefore, using confidential position data from the CFTC, Irwin and Yoshimaru (1999), based on data for 1988–1989, and Irwin and Holt (2005), based on data for 1994, found evidence for the existence of trend-following or momentum strategies, but they also found that these had relatively low price effects. However, the data used in these studies are dated, and thus cannot reveal the effects of herding behaviour over the past few years.

A recent study by Gilbert (2010a) uses data for seven commodities (aluminium, copper, crude oil, maize, nickel, soybeans and wheat) and looks for evidence of trend-following behaviour in the pricing process itself. Using monthly data for the period 2000–2009, the study finds a single eight-month bubble for copper (February to October 2006), as well as one-month bubbles for aluminium (May 2006) and nickel (April 2007). Using daily data for the period 2006–2008 for crude oil and the three grains, and for the period 2000–2008 for the non-ferrous metals, the study finds clear evidence of price bubbles in copper trading (2004, 2006 and 2008), weak evidence for crude oil (first half of 2008), nickel (January–March 2007) and soybeans (early 2008), and clear evidence of the absence of any bubble for aluminium, maize and wheat. However, Gilbert emphasizes that the results must be interpreted with caution because the identification of bubbles may be sensitive to the selection of the initial date for the sample,[25] and also because explosive price developments may indicate buoyant fundamentals (i.e. spurious herding) rather than speculative bubbles.

While the study by Gilbert (2010a), as well as that by Phillips and Yu (2010), indicate that price bubbles have developed across commodity markets over the past 10 years, their results are subject to the difficulty of separating spurious and intentional herding, and in particular they do not identify the market participants that may be responsible for creating and perpetuating the price bubble.[26] The latter issue is addressed in the next section.

4.5. The price effects of the financialization of commodity markets

The impact of financial traders on commodity prices is difficult to quantify. Part of this difficulty is due to the fact that the financialization of commodity trading became a major factor roughly at the same time as demand for physical commodities from emerging economies started to increase rapidly. These roughly simultaneous developments make it difficult to disentangle their relative price impacts.

Accordingly, most empirical assessments of the impact of financialization on commodity prices have emphasized either fundamental supply-and-demand factors or variables that reflect the financialization of commodity trading. Given that commodity prices have been influenced by both factors, both these groups of studies have found a significant impact on commodity prices of the variables they selected. Hence, those that attribute most of the development of commodity prices over the past few years to fundamental factors (e.g. Sanders and Irwin, 2010), as well as those that point to an additional impact from increased financial investment (e.g. Gilbert, 2010b), have been able to provide empirical support for their point of view. A prominent recent empirical

study has included both fundamental and financial variables (Tang and Xiong, 2010). The results of this analysis refute the contention that growing demand from emerging economies was the only driver of the commodity price hike in 2006–2008. They show that variables reflecting financialization remain significant even after controlling for fundamental factors. This finding suggests that the process of financialization has caused commodity prices to be determined no longer simply by supply and demand, but also by a wide range of financial factors and financial investors. The resulting change in commodity price dynamics is likely to persist and seriously affect commodity producers' hedging strategies, as well as many countries' food and energy policies.

A further analysis by Gilbert (2010a) conducts Granger-causality tests that relate returns on futures contracts to changes in the positions of index investors for the period January 2006–March 2009. For the seven commodities in the sample, the study finds that changes in index trader positions Granger-cause price changes for aluminium, copper, crude oil and maize, while no such impact is detected for soybeans and wheat. To the extent that changes in index trader positions are perceived by other traders as conveying information – similar to the informational cascades discussed above – these price effects should persist. In an additional step, Gilbert (2010a) employs a regression analysis to examine whether the uncovered price impacts following position changes of index traders are persistent effects. The results suggest such persistent effects to be present for copper, crude oil and wheat.

In a final step, Gilbert estimates the price impact of index-based investments by comparing the actual price developments with those that would have prevailed had there been no index investments. This hypothetical price development is estimated based on the econometric exercises just mentioned. The evidence indicates that for crude oil prices, index investors accounted for 3–10 per cent of the price increases in 2006–2007, but that their impact rose to 20–25 per cent in the first half of 2008 (figure 10). Their impact on grain prices is estimated to have been about half that for oil. Gilbert (2010a: 26, 28) concludes that during the first half of 2008 "index-based investment generated a bubble in commodity futures prices" and that overall "it would be incorrect to argue that high oil, metals and grains prices were driven by index-based investment but index investors do appear to have amplified fundamentally-driven price movements."

Structural econometric models that incorporate both the role of current fundamental supply and demand factors and expectations about the future development of those factors also indicate the presence of price bubbles in commodity markets in 2007–2008. Kaufmann et al. (2008) have attempted to explain oil price developments on the basis of supply and demand levels, refinery capacity and expectations which provide an incentive for inventory storage that bolsters demand.[27] Crude oil prices predicted by the model were fairly close to actual prices until about mid-2007, when the predicted prices began to grow rapidly but the actual prices increased even more rapidly and started to exceed the predicted prices by a substantial margin, which in the second quarter of 2008 amounted to about 20 per cent (figure 11).[28] This result suggests that fundamental supply and demand factors pushed stocks downwards and prices upwards starting from 2003, but in 2007–2008 prices rose above their fundamental levels.

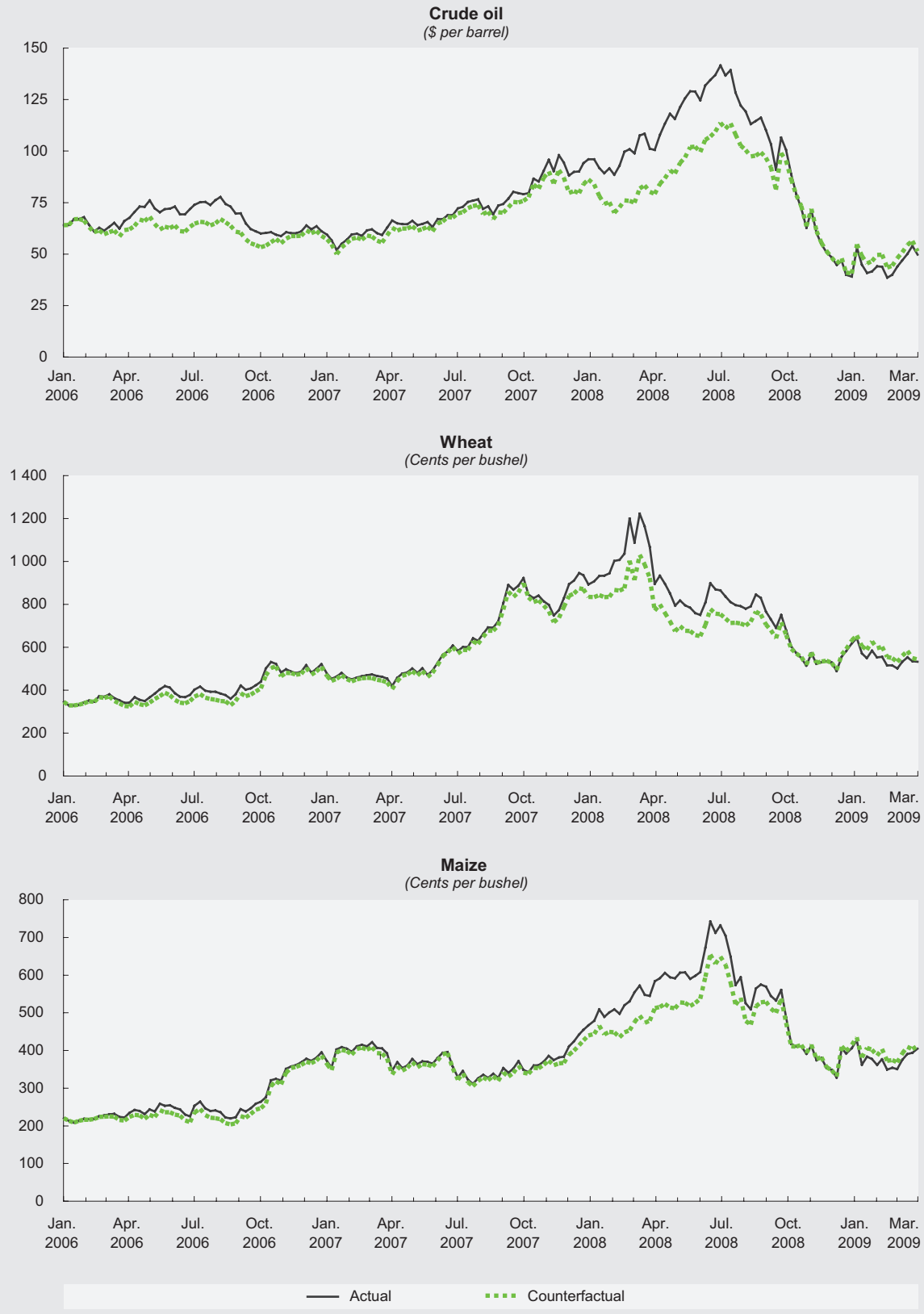
Prometeia (2008) adopts a similar approach in examining whether the strong increase in oil prices between mid-2007 and mid-2008 can be explained by rational pricing behaviour of market participants or whether it reflects a bubble. The tests cannot reject the presence of a bubble. Prometeia (2008) interprets the evidence as pointing to the role of financial investor activities on commodity futures markets in accelerating and amplifying price movements that in the medium and long run are driven by fundamentals.[29]

It has sometimes been argued that the price impact of index investments detected prior to the collapse of commodity prices in 2008 is spurious because similar hikes could be observed for the prices of commodities that are not included in the main indexes – the S&P GSCI and the DJ-UBSCI (ECB, 2008: 18–20). The commodities which experienced such a price hike but are not part of these indexes include iron ore, rice and a number of metals, such as cadmium and molybdenum. However, a recent study by Tang and Xiong (2010) shows that the co-movement between the prices of different commodities increased after 2003–2004 (i.e. the beginning of significant position-taking by index investors on commodity markets), and that for the commodities included in the major indexes this increase was significantly more pronounced than for those not included.

All of the empirical evidence discussed so far relates to the impact of index investments on the

Figure 10

ACTUAL PRICE DEVELOPMENTS AND ESTIMATED PRICE DEVELOPMENTS WITHOUT INDEX INVESTORS, SELECTED COMMODITIES, 2006–2009

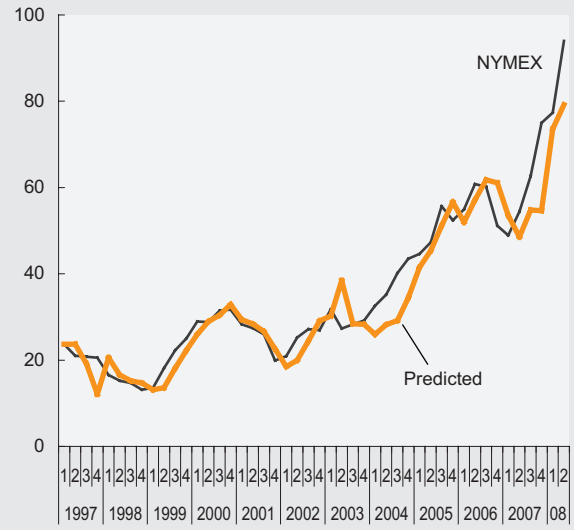


Source: Gilbert (2010a).

Figure 11

ACTUAL AND PREDICTED CRUDE OIL PRICES, 1997–2008

(Dollars per barrel)



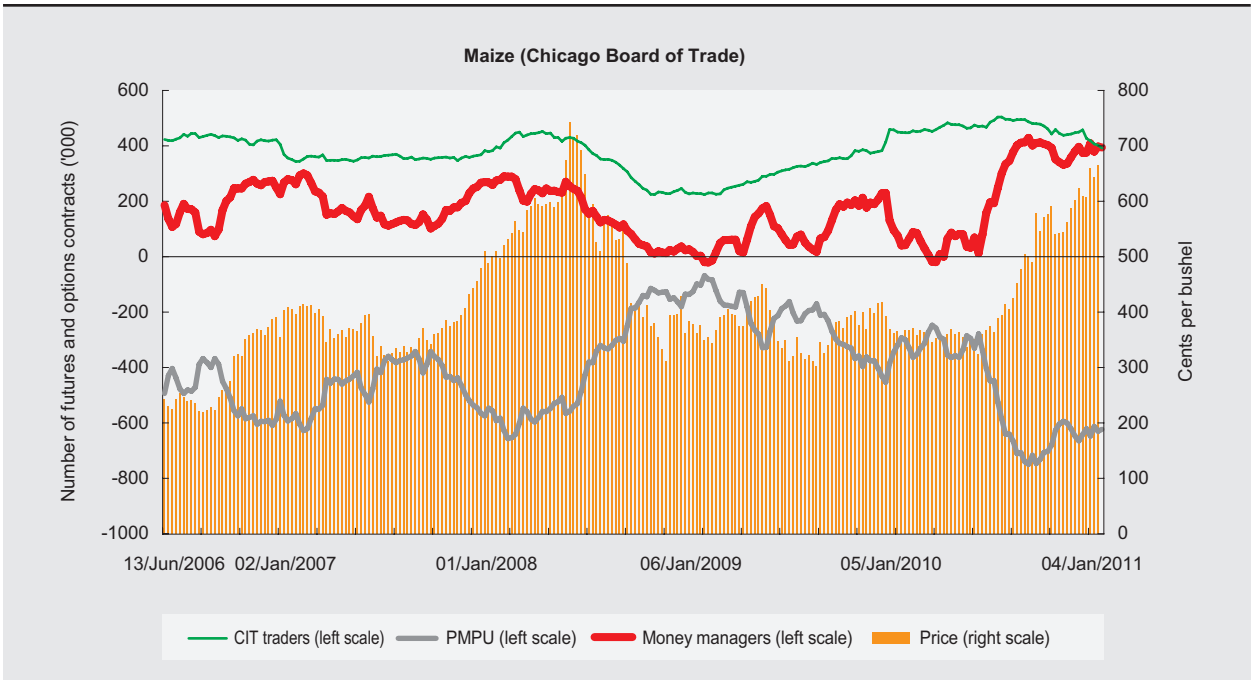
Source: Kaufmann et al. (2008); and private communication from RK Kaufmann.

2007–2008 commodity price spikes. However, as discussed in sections 4.1 and 4.2, the relative importance of index investors has declined while that of money managers has increased. The question therefore arises as to what price impact these two trader categories have had over the more recent period. This question is the focus of the remainder of this section.

Comparing price developments and net financial positions of different trader categories reveals a number of salient features (see figure 12 for maize and figure 13 for crude oil, as well as figure A.1 in the annex for cocoa, sugar and wheat).[30, 31] First, market participants that have an interest in physical commodities (i.e. the category PPMU) almost always take net short positions (i.e. they are net sellers of futures and options contracts). Second, financial investors almost always take net long positions (i.e. they are net buyers of futures and options contracts). Third, overall, the comparison provides only scant evidence of a long-running correlation between index positions and price changes. While there are clearly periods and commodities where positions and prices have moved together, especially during the price collapse

Figure 12

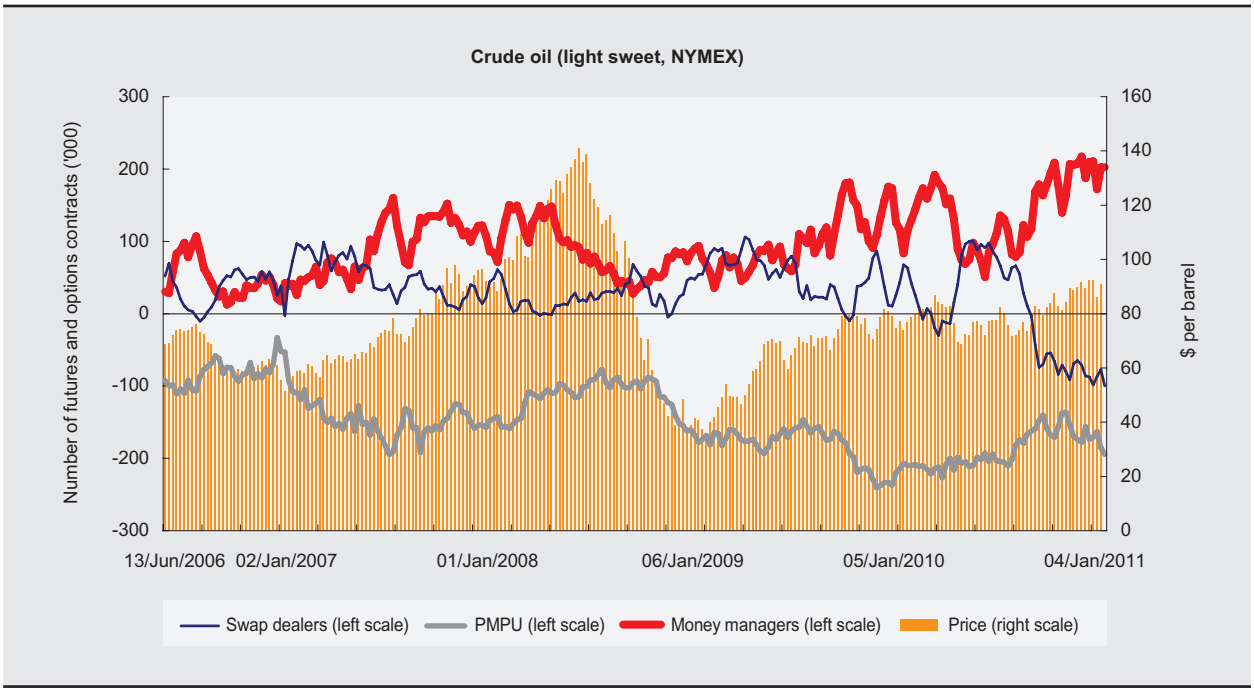
MAIZE: PRICES AND NET LONG FINANCIAL POSITIONS, BY TRADER CATEGORY, JUNE 2006–FEBRUARY 2011



Source: UNCTAD secretariat calculations, based on weekly data from Bloomberg; and CFTC.
Note: CIT traders = commodity index traders; PMPU = producers, merchants, processors, users.

Figure 13

CRUDE OIL: PRICES AND NET LONG FINANCIAL POSITIONS, BY TRADER CATEGORY, JUNE 2006–FEBRUARY 2011



Source: UNCTAD secretariat calculations, based on weekly data from Bloomberg; and CFTC.
Note: CIT traders = commodity index traders; PMPU = producers, merchants, processors, users.

in 2008 and occasionally during the previous price upturn, there are other times when positions have not risen during periods of rapid price appreciation. For example, in the wheat market there was no increase in either money-manager or index-trader positions during the steep price increase from mid-2007 to the end of the first quarter of 2008. By contrast there appears to have been a positive correlation between market positions and maize prices during the same period. For oil, money-manager positions exhibited strong volatility, even as oil prices rose almost continuously from the beginning of 2007 through the second quarter of 2008. Nevertheless, in all the graphs some correlation between position and price changes is present over subperiods, as peaks and turning points seem to occur around the same time.

Fourth, and perhaps most importantly, since about mid-2009, when commodity prices appear to have terminated their downward overshooting and started a relatively stable sideward movement, which for most commodities ended with the onset of the price surge in mid-2010, there has been a fairly close correlation between price changes and changes in money managers' positions. This close correlation is further highlighted by the evidence given in table 3, where the especially high correlation coefficient for crude oil is noteworthy.

Table 3

SIMULTANEOUS CORRELATION BETWEEN PRICE AND POSITION CHANGES, SELECTED COMMODITIES AND TRADER CATEGORIES, JULY 2009–FEBRUARY 2011

(Correlation coefficient)

Oil	Index positions	0.18
	Money manager positions	0.81
Cocoa	Index positions	0.35
	Money manager positions	0.45
Maize	Index positions	-0.08
	Money manager positions	0.52
Sugar	Index positions	-0.12
	Money manager positions	0.54
Wheat	Index positions	0.09
	Money manager positions	0.56

Source: UNCTAD secretariat calculations, based on data from Bloomberg; and CFTC.

Overall, the above evidence indicates that active investment strategies are increasingly gaining importance at the expense of the more passive, broad-based index-investment strategies. It also indicates a close correlation between commodity prices and the positions of financial investors that pursue an active trading strategy.

4.6. Herding and its effects in different markets

For decades, investments in commodities were seen as a good opportunity for portfolio diversification, because their returns were largely uncorrelated with those in other markets (see section 4.1). As explained in the preceding sections, the activities of financial investors have profoundly affected the relationship between commodity markets and other markets over the past decade. Portfolio restructuring, algorithmic trading and herding of market participants have spilled over from one market to the other and increased correlations between previously uncorrelated markets.

With the enhanced financialization of commodity markets since the mid-2000s, those markets have increasingly moved in parallel with financial markets. During the crisis of 2008, in particular, a sudden exit of financial players from markets they considered risky was clearly observable across a wide range of financialized markets. The first quarter of 2009 marked a turning point, when financial flows returned once again to risky investments.

Financial investors are usually active in several financial markets at the same time. Information collected in one market or for the economy as a whole tends to be used to form expectations about the significant price swings in other markets, regardless of the specifics of supply and demand in the latter. This mechanism creates new or reinforces existing cross-market linkages, and it increases or alters correlations between two asset classes. An increasing correlation between two markets over time indicates that the markets have been moving more and more in tandem.

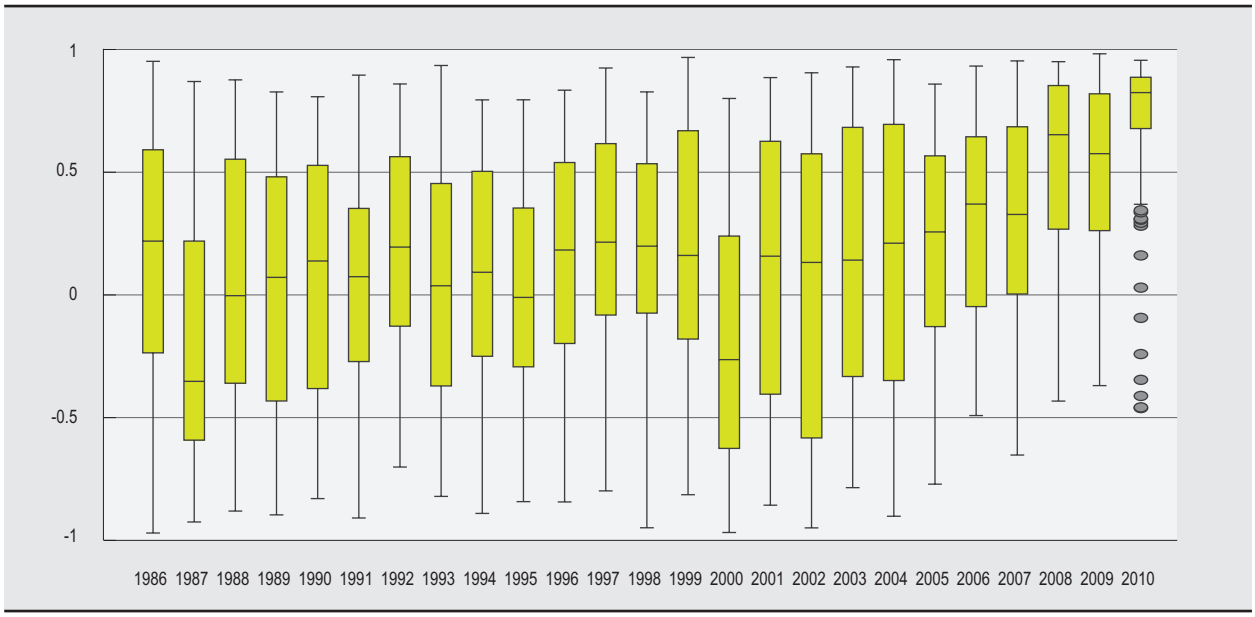
The evidence from a 30-day rolling correlation of prices in various asset classes from 1986 to 2010 proves this point. Using box plots[32] to capture the changes in the trend, it was found that the mean correlation fluctuated around zero for most of the period covered (i.e. from the mid-1980s to the early 1990s). Significant positive or negative correlations occurred only in individual years, but not over longer periods. However, recently this has changed in a number of markets.

One example is the 30-day rolling correlation between the WTI front month futures contract and the Australian dollar–United States dollar exchange rate shown in the first box plot (figure 14). There is an upward trend of the median, starting in 2004, that coincides with an increasingly concentrated distribution of correlations. Prior to 2005, the median fluctuated slightly around a positive value close to zero, but more recently it has moved regularly beyond 0.5. It is difficult to construct a substantive relationship between these variables outside the financial markets that could explain why the Australian dollar rises whenever the price of oil increases. With carry trade for currencies (and the Australian dollar considered a riskier asset than the United States dollar) and speculation with oil futures (since commodities are considered as an alternative investment), the explanation is clear and straightforward.

The same is true for the positive cross-market correlation between a stock market index like the S&P 500 and WTI futures (figure 15). Again, the middle of the last decade marks the beginning of an upward trend and an increasing correlation. The years 2009 and 2010 show a very compressed box plot, with a median approaching 1 in 2010. It may be argued that oil and stocks face rising demand when the global economy recovers, but the extreme coincidence of oil and stocks recovering at exactly the same time in the first quarter of 2009 raises grave doubts about such a simple argument (see section 4.7 below).

Figure 14

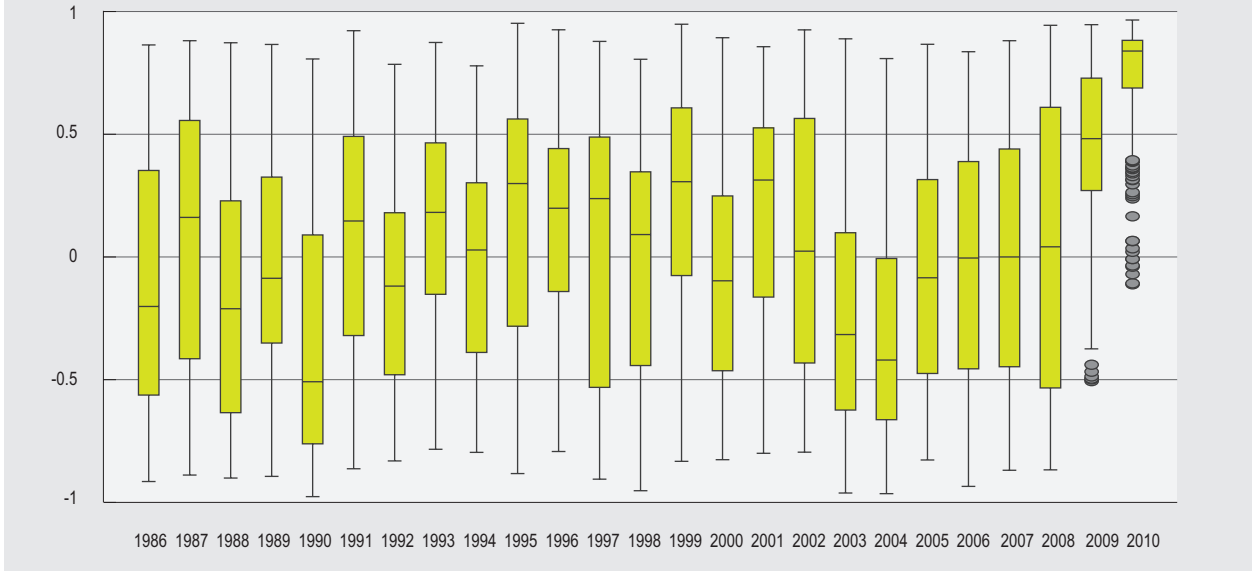
THIRTY-DAY ROLLING CORRELATION BETWEEN THE WTI FRONT MONTH FUTURES CONTRACT AND THE AUSTRALIAN DOLLAR–UNITED STATES DOLLAR EXCHANGE RATE, 1986–2010



Source: UNCTAD secretariat calculations, based on Bloomberg.
Note: For an explanation of the structure of box plots, such as figure 14, see note 32.

Figure 15

THIRTY-DAY ROLLING CORRELATION BETWEEN THE WTI FRONT MONTH FUTURES CONTRACT AND THE S&P 500, 1986–2010

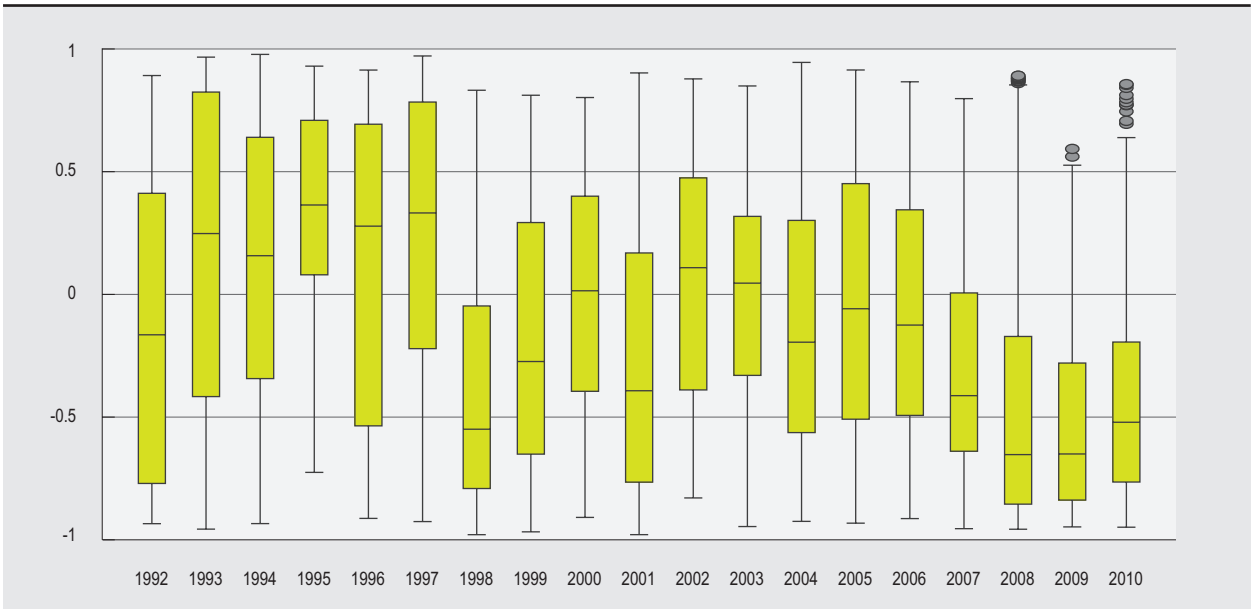


Source: See figure 14.
Note: See figure 14.

Figure 16 shows the 30-day rolling correlation between the DJ-UBS Agriculture Total Return Index and the United States dollar–Brazilian real exchange rate. There is a persistently high and negative correlation starting in 2007. This means that an appreciation of the Brazilian real coincides with rising returns on the DJ-UBS Agriculture Total Return Index. As the United States dollar–Brazilian real is a preferred currency pair for carry trade strategies this result suggests that the same investors are present at the

Figure 16

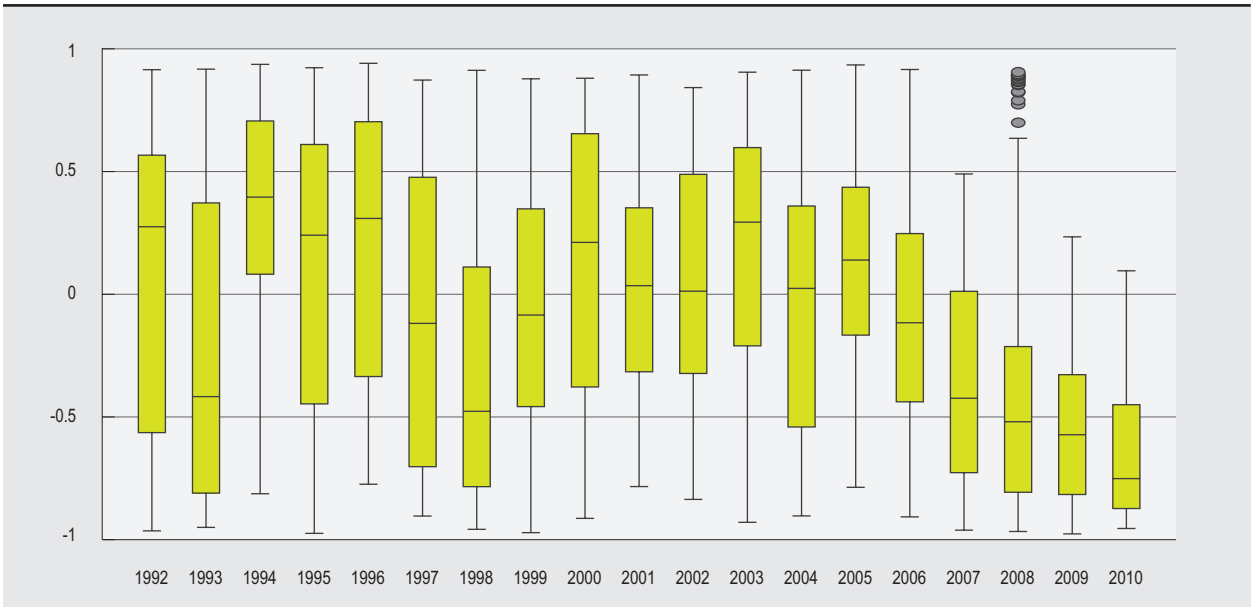
THIRTY-DAY ROLLING CORRELATION BETWEEN THE DJ-UBS AGRICULTURE TOTAL RETURN INDEX AND THE UNITED STATES DOLLAR–BRAZILIAN REAL EXCHANGE RATE, 1992–2010



Source: See figure 14.
Note: See figure 14.

Figure 17

THIRTY-DAY ROLLING CORRELATION BETWEEN THE WTI FRONT MONTH FUTURES CONTRACT AND THE UNITED STATES DOLLAR–BRAZILIAN REAL EXCHANGE RATE, 1992–2010

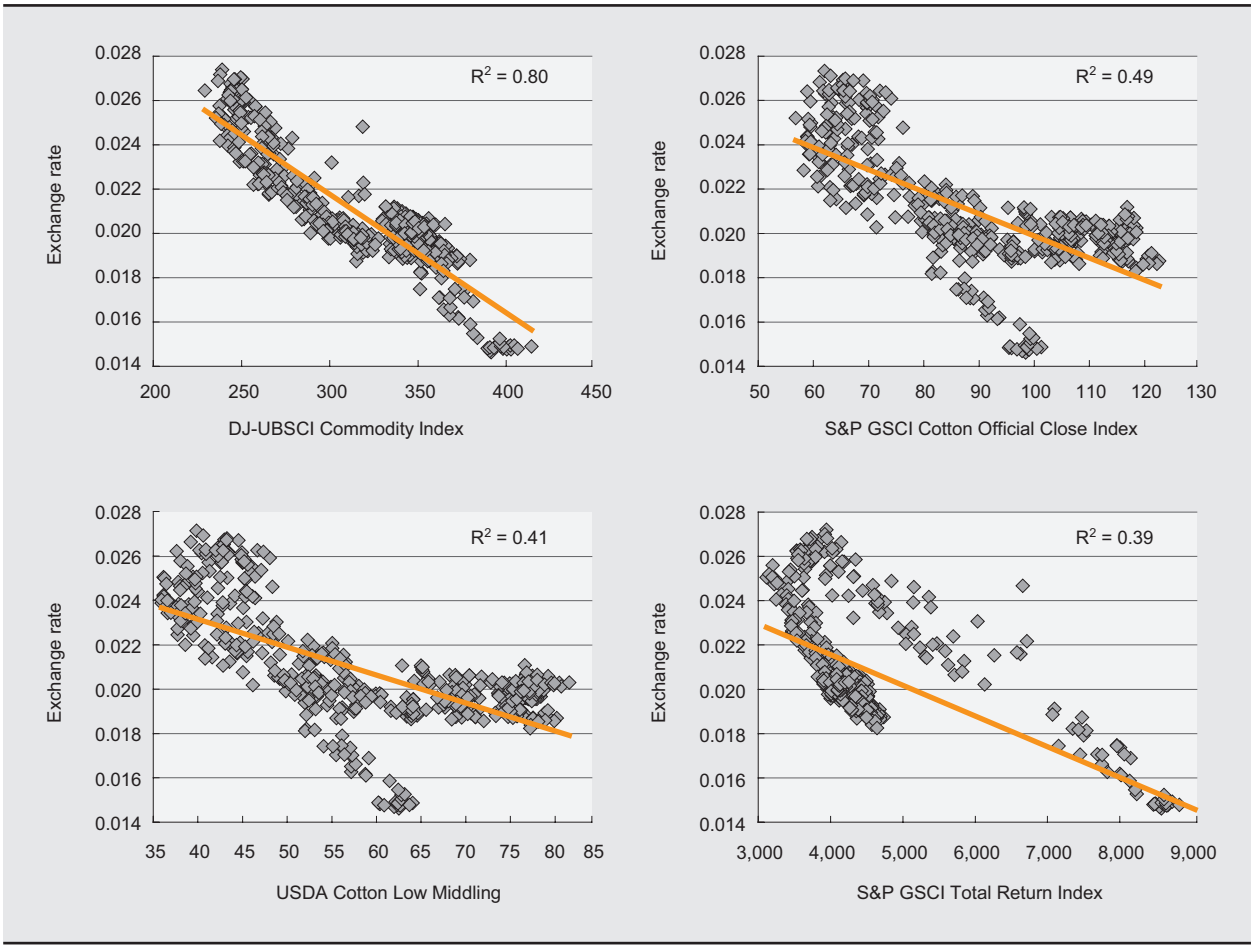


Source: See figure 14.
Note: See figure 14.

same time on both markets, interpreting economic news in the same fashion irrespectively from individual market dynamics (in this case, positively for risky assets). The relationship between WTI futures and the United States dollar–Brazilian real exchange rate is similar. However, the trend towards stronger correlations begins already in 2005 (figure 17). Since then, the relationship has become increasingly negative and persistent.

Figure 18

RELATIONSHIP BETWEEN THE BRAZILIAN REAL–JAPANESE YEN EXCHANGE RATE AND SELECTED COMMODITY MARKETS, AUGUST 2008–JULY 2010



Source: UNCTAD secretariat calculations, based on Bloomberg.
Note: The vertical axis shows the Brazilian real–Japanese yen exchange rate. Thus, a decrease indicates an appreciation of the Brazilian real.

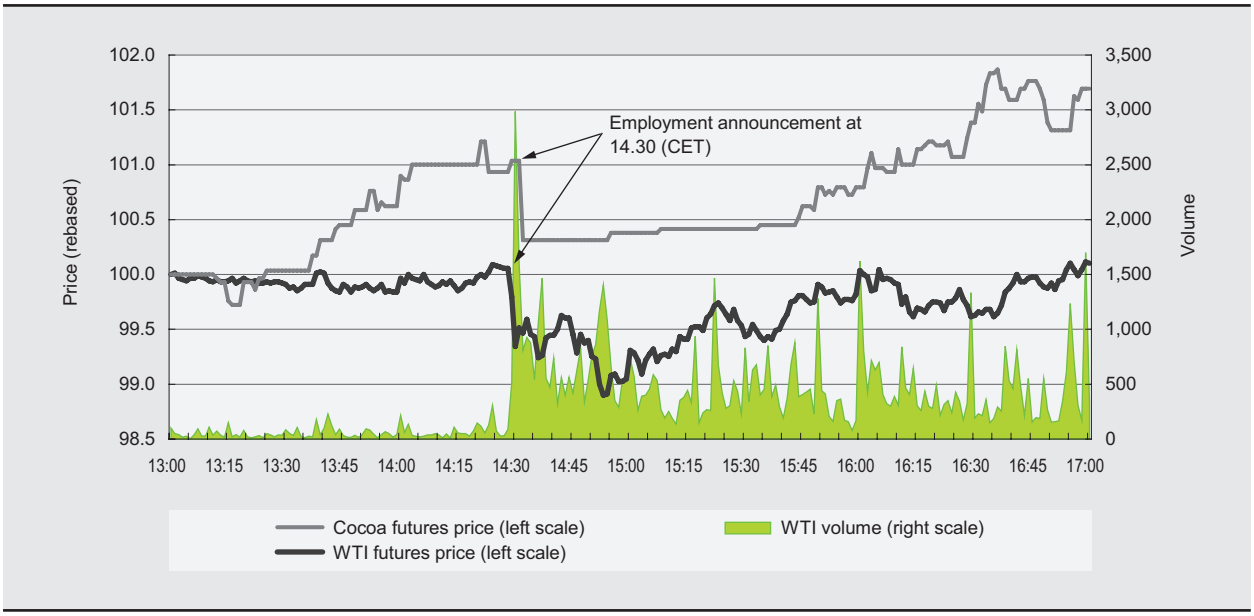
The results presented above are in line with the findings of Büyükşahin and Robe (2010: 2, 4; emphasis in original): using data not publicly available, they conclude that "co-movements are positively related to greater commodity participation by financial speculators as a whole and by hedge funds especially – notably by hedge funds that trade in *both* equity and commodity futures markets" but that "in contrast ... the positions of other kinds of commodity-futures market participants (traditional commercial traders, swap dealers and index traders, floor brokers and traders, etc.) hold little explanatory power for cross-market dynamic conditional correlations."

More recently, cross-market linkages have appeared with a large variety of currencies, stocks and commodity derivatives, thus reinforcing the evidence of investor herding in multiple assets. Hedge funds are widely believed to contribute significantly to cross-market correlation through the sharing of investment ideas and by using the same macroeconomic indicators to formulate their trades.[33]

Figure 18 illustrates the same relationship in a different way by using daily prices. It shows the Brazilian real–Japanese yen exchange rate and selected commodity market indicators for the period of August 2008 to July 2010 (i.e. which included a period of sharp swings in all asset prices in 2008 and 2009). Thus a depreciation of the real coincides with falling commodity prices. The logic is simple: as commodity futures and emerging-market currencies are considered risky assets, any flight to security, or the expectation that the world economy is entering a period of calm, will move both downwards. More recently, the relationship has been less strong. Since the

Figure 19

EFFECTS OF ANNOUNCEMENT OF EMPLOYMENT DATA IN THE UNITED STATES (REBASED SERIES), 3 DECEMBER 2010



Source: UNCTAD secretariat calculations, based on Bloomberg.

summer of 2009, the exchange rate has fluctuated at around 0.02, whereas commodity prices have continued to rise. This weakening of the correlation may be due to the fact that the Brazilian Government became more and more vocal in criticizing the "unjustified" appreciation of the real and started to take measures against carry trades, for example by imposing a tax on any form of short-term inflows.

To further illustrate the effects of incoming data on markets where information is processed at a frequency of one minute or less, we take a much closer look than the daily observations of the preceding exercise. The current analysis focuses on the announcement of United States employment data on 3 December 2010 as an example (employment data is considered by Bloomberg as one of "market moving indicators"). Figure 19 shows the effect of the publication of the United States labour market data on the prices of cocoa and WTI futures as well as the volume of the latter. To obtain a common scale, prices are rebased to 100 at 13:00 Central European Time (CET).

On 3 December 2010, the United States employment data were disappointing. Expectations were for a stable job market, but instead unemployment approached the critical level of 10 per cent (9.8 per cent compared with an expected 9.6 per cent). Within minutes of the announcement the prices of cocoa and WTI, among others, dropped sharply, while trade volumes of WTI futures surged. This is not what would be expected to happen in a market where decisions are based purely on fundamentals. It is true that the oil price should have a strong link with economic activity, and that such activity is reflected in labour market data. However, employment and unemployment are lagging indicators, which react rather late in the cycle. Relevant information on activity should therefore already be known from new orders (as an early indicator) or production expectations. For cocoa, the price reaction cannot at all be explained by fundamentals: there can hardly be any link between United States employment and world chocolate consumption.

These price reactions, therefore, must be due to the spillover of the financial market logic to commodity markets. Financial markets focus strongly on the release of any economically relevant new information. A large number of media keep market participants aware of publication dates, and financial institutions provide forecasts of economic indicators shortly before their publication. Thus knowing that "the community" is looking at this information, market participants form expectations about potential reactions in the markets, and accordingly, about price

movements. This explains the increased volume of trading after announcements and the big price effects. As reactions tend to be similar across a wide range of markets, the strong cross-market correlations described above can be explained easily.

Overall, the evident financialization of commodity markets implies that, over significant periods of time, price changes in the markets do not properly reflect new information regarding supply and demand of a specific commodity. The result is an immense misallocation of resources. Information emanating from financial markets contaminates the normal price discovery mechanism in the commodity markets, thereby generating wrong signals for consumers and producers, and threatening to make premature adjustment of both extremely costly once the bubbles on the financial markets burst.

4.7. Commodity prices and world business cycles

The most recent decline in world industrial output is known to have been by far the strongest of all downward cycles in the past 35 years. The sharp drop of 12 per cent from the peak makes other recessions seem like mild slowdowns in comparison (figure 20). However, in spite of the very low utilization of global industrial capacities at the beginning of 2009, the upward pressure on prices in commodity markets was much stronger than with similar positions of earlier business cycles – a development often overlooked by observers. Anticipation of recovery by the financial markets seems likely to have played a disproportionately significant role in this current bout of commodity price inflation.

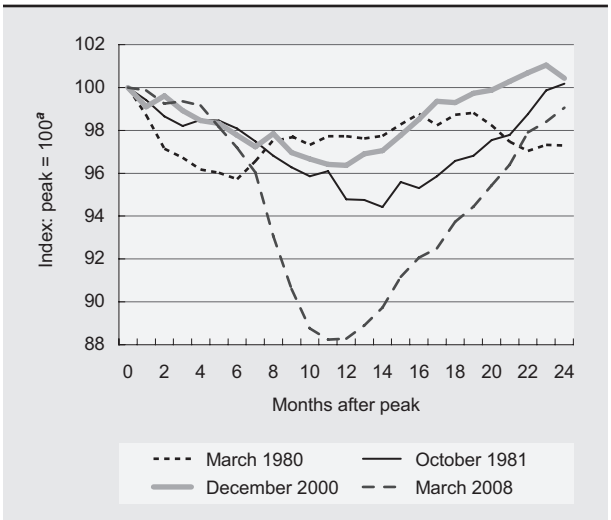
The strong impact of financial investors on prices, which may be considered "the new normal of commodity price determination", affects the global business cycle in a very profound way. Commodity price inflation endangers a smooth recovery to the extent that it provokes a premature tightening of monetary policy. It has already played an important role in the tightening of Chinese and Indian monetary policy since early 2010, and in the first interest rate hike since the beginning of the crisis by the European Central Bank (ECB) in April 2011.

To illustrate this new normal, it is useful to compare four global business cycles that have occurred since the mid-1970s.[34] Global economic activity may be assumed to be reflected in the monthly time series of world industrial production published by the Netherlands Bureau for Economic Policy Analysis (CPB).[35] The periods of recession troughs can be identified by applying the method proposed by Bry and Boschan (1971) in BUSY, the European Commission's software package. It shows four recessions for the period 1975–2010, with peaks in March 1980, October 1981, December 2000 and March 2008, and respective troughs in September 1980, December 1982, December 2001 and February 2009. To illustrate the cyclical response of financial markets, the series for industrial production were normalized by their respective troughs.

A comparison of the business cycles shows that commodity prices and share prices moved in

Figure 20

DYNAMICS OF WORLD INDUSTRIAL PRODUCTION AFTER THE PEAKS OF FOUR BUSINESS CYCLES

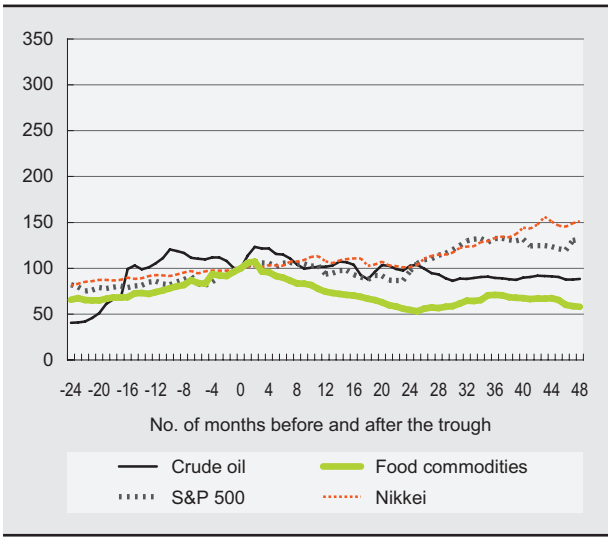


Source: UNCTAD secretariat calculations, based on data from CPB; and OECD.

a Dating as shown in legend.

Figure 21

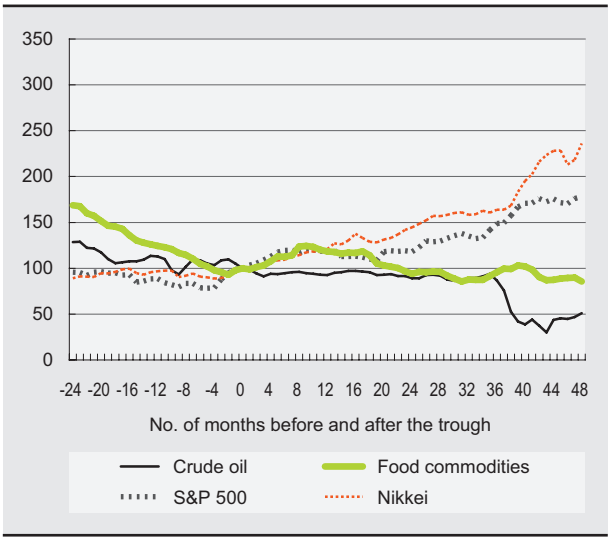
COMMODITY PRICES AND MARKET INDEXES BEFORE AND AFTER THE TROUGH OF SEPTEMBER 1980



Source: UNCTAD secretariat calculations, based on data from ECB; OECD; and UNCTAD.

Figure 22

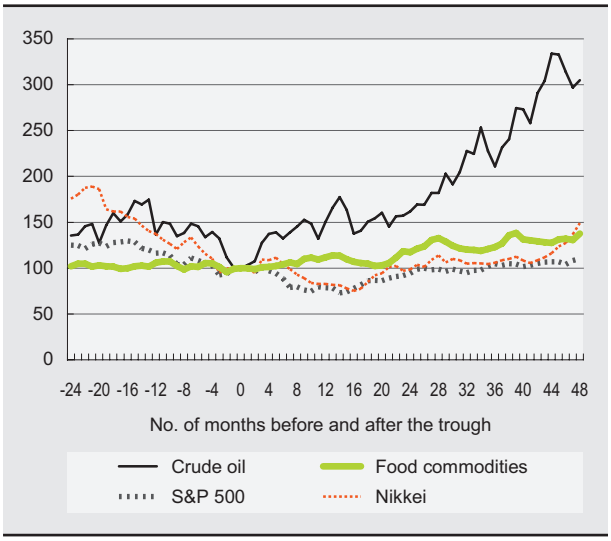
COMMODITY PRICES AND MARKET INDEXES BEFORE AND AFTER THE TROUGH OF DECEMBER 1982



Source: See figure 21.

Figure 23

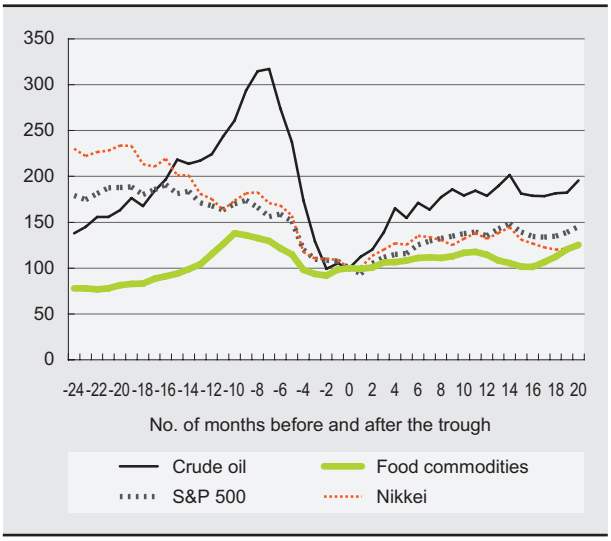
COMMODITY PRICES AND MARKET INDEXES BEFORE AND AFTER THE TROUGH OF DECEMBER 2001



Source: See figure 21.

Figure 24

COMMODITY PRICES AND MARKET INDEXES BEFORE AND AFTER THE TROUGH OF FEBRUARY 2009



Source: See figure 21.

opposite directions during the previous identified business cycles (figures 21–23). By contrast, there has been a remarkable synchronization of share price and commodity price movements in the most recent cycle (figure 24).

This finding supports the results obtained by the IMF (2010: 31–33) in a similar exercise for developed economies. In interpreting the results, the IMF warns against considering the increased synchronization of commodity and share prices as evidence in

favour of the financialization of commodity markets, and affirms that "increased co-movement, however, likely reflects the sensitivity of both markets to broader economic developments" (IMF, 2010: 33). However, such an interpretation neglects to take into account the low level of capacity utilization in the wake of the "Great Recession" of 2008 and 2009. Low capacity utilization, in principle, implies a low level of industrial use of commodities, and thus a low level of demand for commodities by their largest consumers. Under such circumstances, steadily rising prices of commodities, even ahead of the rebound of stock market indices, appear to be related more to an anticipation of a future revival of demand than to a response to actually rising demand. The most plausible explanation for such price behaviour is financialization, which in 2008 eventually led to an overshooting of commodity prices in both directions over their "fundamental" levels.

The fact that monetary policy reacts to price pressure stemming from rising commodity prices, rather than to bottlenecks in industrial production, points to a worrisome aspect of the impact of financialization that has so far been underestimated, namely its capacity to inflict damage on the real economy as a result of sending the wrong signals for macroeconomic management. This is an important reason why more effective regulation of commodity markets is necessary so as to restore an environment of sound price signals and efficient allocation of resources in today's modern market economies.

5. FIELD SURVEY

5.1. Objectives

In addition to the theoretical and empirical analysis of the way commodity markets function and how they are affected by the activities of financial players and a review of the available literature, interviews were conducted with commodity traders, financial institutions and other entities which are closely involved in commodity markets. The interviews provide detailed insights into actual market developments, the process of price formation and trading strategies as reported by the market participants themselves. Discussions of regulatory issues with market participants help gain an understanding of potential compliance problems or negative side-effects of regulations. They constitute valuable input for discussions on current regulations and potential amendments to them.

5.2. Choice of participants

Interviews were held with various market participants in the grain, cocoa, sugar and oil markets. The emphasis was on physical commodity traders and financial players such as bank and asset managers located mainly in Geneva, brokers and consultants operating in the commodity business were also interviewed (table 4).

The selection of participants followed a multi-step approach. A list of commodity trading companies was obtained through Internet research. The Geneva Trading and Shipping Association (GTSA), a body representing the interests of Geneva-based companies engaged in international trade and shipping, also provided some support in establishing contacts with traders. The majority of companies did not respond automatically and had to be contacted several times. The main reasons for their reluctance to participate in the study were time constraints, concerns about providing sensitive information and lack of interest.

From the beginning, the field survey had been designed as a more qualitative enquiry into current market practices, and is not intended to be representative. As all interviews were on a voluntary basis, and the researchers had no access to a full list of all

Table 4

CLASSIFICATION OF INTERVIEWEES

Physical traders	Grains: 4, crude oil: 3, cocoa: 2, sugar: 2
Financial players	Banks: 5, asset management: 1, independent financial trader: 1
Others	Consulting: 2, brokerage: 1, price reporting: 1

Note: The numbers refer to the interviews. In some cases several persons participated in the interview.

relevant entities, a random selection process was considered unfeasible from the outset. The interview partners who finally participated represent physical traders of all the commodities mentioned above. They work in both small and large companies. Financial players included bank and asset managers. In addition one broker, two consultants and representatives of a price reporting agency were interviewed. As the main questions concerned the impact of financial investors on physical markets, the focus was on physical traders, and they therefore constituted the largest group interviewed.

5.3. Approach

Two separate questionnaires were developed, one for physical and the other for financial traders. For crude oil traders one question in the questionnaire for physical traders was modified (see box 3). The interviewees received the questionnaire in advance, which helped them decide whether to participate at all as well as to prepare for the interview.

The interviews had originally been planned as personal conversations to take place on the premises of the participants. However, time constraints and the preferences of some interviewees made a more flexible approach necessary. The information was therefore gathered in three different ways: personal interviews, telephone interviews and (exceptionally) written replies to (parts of) the questionnaire(s).

As most of those interviewed asked for strict confidentiality, it was decided not to record the personal and telephone interviews. The presence of two interviewers ensured a better understanding and full coverage of the interviews. A summary protocol of each interview was written by one of the interviewers immediately after the interview and proofread by the other interviewer. A summary of the findings from the interviews is reported in this study without disclosing the identities of the participants or the companies they work for, as agreed with the participants.

While physical traders and financial traders were asked to respond to all the questions of the specific questionnaires, others only needed to reply to selected questions that were relevant to them. As all the interviews were voluntary, not all questions were answered by all the respondents. Some questions were not answered because the respondent believed they touched on sensitive business information or they simply did not wish to answer. Some traders did not reply to all the questions owing to time constraints.

The interviews were conducted between mid-December 2010 and mid-February 2011 and took about one hour each on average.

Box 3

QUESTIONNAIRE FOR PHYSICAL COMMODITY TRADERS

Introductory and general questions:

1. Where do you conduct your transactions – OTC or on central exchanges? Why do you choose this way of trading?

   For oil traders: Where do you conduct your transactions – OTC or on central exchanges? Why do you choose this way of trading? What do you trade (WTI or Brent)? Do you prefer one over the other? If so, why? Do you engage in any arbitrage?
2. Have you felt a growing influence of financial investors in commodity markets and how? Which are the channels and instruments?
3. Do you consider the influence in "your" commodity market to be particularly strong and, if yes, why?
4. What are the specificities of "your" commodity compared to others?
5. Do you broadly agree with the view that commodity prices in general are more and more determined by financial investors, instead of by supply and demand? Please explain.
6. What is the impact of physical stocks of commodities on price expectations? How do you assess the data availability with respect to physical stocks? Do you think that higher international stock holdings could avoid price spikes?
7. Do you consider current regulations of commodity markets sufficient?
8. Would position limits help to restrict speculation?
9. What other measures would you consider helpful?
10. What is your assessment of the Dodd-Frank Act in this respect?
11. What is your assessment of the European Commission's regulatory initiative?
12. What problems do you think could be solved by giving a greater role to central counterparties, what problems would it leave untouched, and what problems could it cause?
13. What else would you consider to be important for a study focusing on the functioning of commodity markets?
14. What is your personal opinion about the "financialization" and its influence on commodity prices?

Company-specific questions:

1. What kind of information do you rely on for your trading decisions in the short term?
2. Please explain the information flow that you use and the price discovery mechanism on "your" market.
3. Which instruments do you use and why? To what extent do you engage in commodity exchanges, in OTC-trading, and in instruments like ETFs and ETNs?
4. How do you assess if a commodity is under-valued or over-valued?
5. Does your company try to anticipate position taking by financial investors and how?
6. Have you tried to protect your company's performance from undue influence of financial investors and, if so, how?
7. Have you taken purely financial positions or are you thinking of doing so?
8. How have your clients been affected by the increased presence of financial investors in commodity trading?
9. Has the increased presence of financial investors affected the relationship that your company has with its clients?
10. Does your company use any sort of algorithm to trade (automatic trading, either High Frequency Trading (HFT) or simple computer based models)? If yes, what are the main inputs of the model (past prices, volumes, etc.)?

/...

Box 3 (concluded)

QUESTIONNAIRE FOR FINANCIAL TRADERS

Introductory and general questions:

1. In your view, has the influence of financial investors on commodity prices in general increased and how has it evolved and in which commodity markets has their impact been strongest?
2. What distinguishes trading in "your" commodity from that in others?
3. What is your personal opinion about the financialization of commodities and its influence on prices and price discovery?
4. Do you agree with the opinion that commodity prices no longer reflect market fundamentals? If yes, please explain the role of financialization in this.
5. What is the impact of physical stocks of commodities on price expectations? How do you assess the data availability with respect to physical stocks? Do you think that higher international stock holdings could avoid price spikes?
6. Could a virtual intervention mechanism as suggested by von Braun and Torero cap speculators' price expectations? Or would you consider it easy prey for speculative attacks?
7. Would position-limits help to restrict speculation?
8. What other measures would you consider helpful?
9. What is your assessment of the Dodd-Frank Act in this perspective?
10. What is your assessment of the European Commission's regulatory initiative?
11. What else do you consider to be important for a study focusing on the functioning of commodity markets?

Company-specific questions:

1. What kind of information do you rely on for your trading decisions in the short term?
2. Please explain the information flow that you use and the price discovery mechanism on "your" market.
3. How do you assess if a commodity is under- or over-valued?
4. Which instruments do you use? To what extent do you engage in commodity exchanges, in OTC-trading, and in instruments like ETFs and ETNs?
5. How has your business been affected by other and new financial investors?
6. How does your company try to anticipate position taking by other financial investors?
7. Has your company bought physical commodities or is it considering doing so?
8. Does your company trade mainly for clients or does it have a proprietary trading desk? If yes, is the trading strategy similar with the one recommended to clients?
9. Does your company use any sort of algorithm to trade (automatic trading, either High Frequency Trading (HFT) or simple computer based)? If yes, what are the main inputs of the model (past prices, volumes, etc.)?

5.4. Results

5.4.1. Physical traders

General features of trading activity

The physical traders reported being subject to strict risk parameters and take only a marginal flat price exposure if any. Their focus was therefore on spreads. Only a small minority of traders reported occasionally speculating on the flat price for a small share of their overall business.

All grain traders reported trading mainly on exchanges, CBOT (CME Group) being the most important, followed by Marché à Terme International de France (MATIF) (now part of LIFFE). Kansas City Board of Trade (KCBT) and Minneapolis Grain Exchange (MGE) were also mentioned, but not by all traders. Futures appeared to be the most widely used instrument in grain trade, followed by options, with swaps being used only to a minor extent. OTC contracts appeared to be the exception in grain trade. They help to hedge very specific requirements or biofuel transactions. The respondents reported choosing exchanges for trading because they are more liquid, and also because, according to one trader, they are subject to regulation.

Sugar and cocoa traders also expressed a strong preference for exchanges, particularly NYMEX, ICE and LIFFE. The main instrument used is futures, but also options. OTC contracts seem to be important where the periods of exchange-traded products do not match the exposure (e.g. if the delivery month differs or a longer maturity is required). OTC contracts are also chosen for longer term hedging.

Trading patterns for crude oil seem to differ considerably from those for grains and soft commodities. Exchanges offer only a limited range of products, which are not sufficient to cover the usual hedging requirements. Oil traders, in particular, who trade not only in Brent and WTI, but also in a variety of other crudes, therefore combine exchange-traded contracts (WTI, Brent) with more specific OTC contracts to hedge their exposures. The OTC contracts then serve to hedge the basis risk. Usually these are swaps (e.g. WTI-Dubai) which rely on the quotations of a price reporting agency (e.g. Platts or Argus) that gathers information on actual prices of different qualities in different locations on a daily basis.

The use of both European and United States exchanges is also related to the time difference between the two continents.

Sources of information used

Commodity traders reported using a wide range of information from different sources, the following being the three major categories of sources:

- Official statistics and publicly available reports (both on "fundamentals" and financial markets);
- Private information obtained from internal company sources; and
- Communication with other market participants.

For agricultural commodities, the focus of their analysis is an assessment of crops and inventories based on information obtained from a combination of official statistics, media reports, special reports, satellite imagery and local or private information. All grain traders cited monthly data of the USDA as a vital source of information. In soft commodities, such as sugar and cocoa, important sources for statistics are organizations such as the International Sugar Organization (ISO) or the International Cocoa Organization (ICCO). In addition, respondents said they used export and import data by commodity to assess supply and demand. Larger companies have their own research departments.

Oil traders mentioned different markets for different kinds of crude, such as light sweet crude oil, sour crude and heavy crude. For price discovery, oil

firms reportedly rely heavily on the services of price reporting agencies, though traders of one major oil company voiced concerns about the reliability of the reported data.

In addition to generally available information, traders, especially from large international companies that cover the whole supply chain, reported using internal company data (such as inventories at their own silos, and information on local production in regions where they are represented). For cocoa, in particular, local information is needed to assess the crop. Crop counters move from farm to farm and gather relevant information. The objective is to have "reliable inside information well ahead of the markets."

In addition, most commodity traders mentioned conversations with other traders – in particular, former colleagues at other trading companies – and brokers as an important source of information. Speaking with peers is considered helpful to obtain a general idea about the market and for assessing whether a commodity is over- or undervalued.

For a short-term analysis, real-time market data provided by Bloomberg or Reuters online are considered vital. Traders look at open positions and quantities traded. A number of traders mentioned technical analysis and other markets, particularly foreign exchange markets, as being relevant.

The role of fundamentals

There was general agreement among those surveyed that medium- to long-term price trends are driven by fundamentals (i.e. supply and demand), which is why these are the focus of their market analysis.

Grain traders cited rising demand for feed grains due to increased meat consumption in emerging economies as one major demand factor. However, respondents differed in their assessment of the role of biofuels: some grain traders believed biofuels to be a major driver of maize and oilseed prices. Biofuel production, which requires 40 per cent of United States maize production and 15 per cent of world oilseeds production, was mentioned as the reason why there exists "a tight balance sheet", which creates tremendous additional demand for grain. One grain trader disagreed, arguing that biofuel production is only one of several factors affecting prices, but not "a big issue", as biofuels still account for a limited share of overall demand.

On the supply side of grain markets, weather effects and export bans or taxes were mentioned as uncoupling the local markets from world markets. It was emphasized that some of the most important factors are therefore political decisions. Adverse weather effects (in Australia, Brazil and the Russian Federation) were also cited as one reason for the current spike in sugar prices; another factor is the greater scarcity of land. Therefore several crops compete for land and the supply of individual agricultural commodities is limited. A respondent cited the example of cocoa in Malaysia, which has largely been replaced by palm oil, and some farmers are switching from cocoa to rubber in Côte d'Ivoire as rubber provides a steadier income. It was pointed out that the cocoa supply has grown more slowly than demand over the past 10 years. Cocoa yields in West Africa are still relatively low and could be increased substantially by educating farmers and improving infrastructure. The then unresolved political crisis in Côte d'Ivoire was mentioned as the main reason for a "premium" in the cocoa price in early 2011.

The role of inventories in commodity price developments was widely acknowledged for all commodities. It was stressed that data availability on grain inventories is still limited, especially for countries like China, whereas sufficiently reliable data is available for the United States. For cocoa the stocks-to-usage ratio was considered relatively high, but so-called "terminal stocks" at the exchanges were reported to have decreased significantly in Europe.

Speaking in early 2011, oil traders stated that there is no shortage of oil, and that the oil price is disconnected from supply and demand.

The role of financial investors

All those interviewed pointed to the impact of the increasing activities of financial players in commodity markets, as evidenced by both rising trading volumes and increased open interest. It was also noted that financial players increasingly enter the physical markets by opening their own trading desks or devising physically backed ETF or ETN. Banks were also reported to engage in commodity production. A bank engaged in sugar production for the ethanol market was cited as an example. Traders differed in

their perception of time horizons: the majority said that the strongest impact has been felt over the past five years or after 2004, while two traders referred to the past 10 years.

There was a consensus that financial traders cannot move prices in the long run, but can cause substantial volatility and price distortions in the short run. Reasons for their strong short-term price effects are the enormous volumes of their trades, as well as the timing of their investments and withdrawals of funds. Especially in grains and soft commodities, their relative size is huge in relation to the overall market. Funds may invest less than 5 per cent of their money in commodities, but for these relatively small markets the impact can be enormous. Several traders said they had the impression that current commodity prices were higher than they would have been in the absence of financial traders. Funds, in particular, were believed to drive up commodity prices.

According to all interviewed traders, financial investors exacerbate short-run price movements caused by changes in fundamentals such as supply disruptions. Further, most financial traders did not know the specifics of the respective commodity markets, but based their trade decisions on other considerations, algorithms or their desired portfolio structure. Exchange rate developments also spill over to commodity markets. One grain trader cited the example of the wheat price on 14 December 2010, which in his view was not backed by fundamentals but was due to financial traders aiming to make a profit at the end of the financial year. Or financial traders may base their transactions on historical spreads between wheat and maize, even though these may no longer be justified by fundamentals.

Volatility makes price discovery more difficult in all commodity markets. It also makes hedging more difficult and expensive, as large price movements may trigger margin calls. To meet the margin calls, traders need sufficient funds of their own or credit lines from their banks. Several traders mentioned difficulties in obtaining such credit lines, which deter smaller market participants (e.g. farmers) from hedging at all. According to one cocoa trader, one important effect of the increased presence of financial traders is that small trading houses disappear from the market resulting in an increased market concentration. Respondents noted that "financial investors have deeper pockets" than physical commodity traders. In this context the increasing money supply due to expansionary policies, particularly in the United States, was also mentioned. One cocoa trader mentioned that the functioning of commodity derivatives markets in providing hedging for physical commodity traders has become impaired due to financial investors' activities.

A grain trader complained that the physical and the futures markets had moved in different directions in 2007 and 2008, and that the Chicago exchange has turned into "a casino" with a number of physical traders moving away from it because "hedging does not make sense, when it is riskier to hedge than not to hedge". Another grain trader complained that the "outside money" of financial investors has introduced a "Wall Street [...] mentality" into the futures markets. In some cases, divergences between the futures and the cash markets are also explained by the specifics of contracts. An example is the cocoa futures contract at LIFFE, which is in jute bags (bulk trades at a discount), whereas the cash market is in bulk.

High-frequency trading was largely perceived as problematic; some traders were sceptical about it because they do not fully understand its impact, while others criticized the additional volatility caused by such trading. It was also pointed out that HFT is not helpful for hedging, because positions are not held over long time periods. Further, the volatility caused by HFT discourages hedgers from using the exchanges. Traders also voiced concerns about computerized or algorithm trading. Herding – "They all behave like lemmings" – was also seen as a problem.

Nevertheless, the overall assessment of financial players' presence in commodity markets was ambiguous. Most traders also saw benefits. They emphasized that speculators or financial investors[36] provide liquidity which is indispensable for hedging. An oil trader emphasized that one advantage of the presence of financial players in commodity markets is the availability of more sophisticated derivatives.

Reaction to financial players' activities

The majority of the interviewed traders said they base their trading decisions mainly on fundamentals. When asked whether they try to anticipate position-taking by financial traders, however, several replied that it would make sense to devote more resources to an analysis of financial players' activities in commodity markets.

Traders of one larger company stressed the importance of understanding and anticipating financial traders' moves. A large number of analysts are employed not only to look at fundamentals but also to anticipate the factors that determine financial players' decisions. This approach includes running a number of models similar to those commonly used by financial institutions. As one trader put it, "[t]he banks are trying to understand our markets and we try to understand their markets." Consequently, those traders are increasingly analysing not just the fundamentals of the commodity markets, but also financial markets. However, most traders reported not taking any purely financial positions, while some stated that they had considered doing so.

Regulations and policy responses

Not all traders were equally well-informed about derivative market regulations and current reform efforts. Traders' interests and views concerning regulatory issues varied widely, but most of them agreed that further regulation is needed, especially in Europe. Only one oil trader believed that "over-regulation is a greater danger than under-regulation."

There was general agreement that more transparency is necessary in commodity markets, and according to the traders, particularly in Europe, where hardly any information is available. Most traders felt that reporting, as by the CFTC, would be a big step forward. Nevertheless, some of the traders considered reporting by the CFTC insufficient, with some flaws in its classification of traders. A number of investment banks are also physical traders. One grain trader suggested the creation of a "liquidity data bank" to show who is moving the market on an hourly basis. The two cocoa traders agreed that United States markets are sufficiently regulated and transparent, whereas European markets lack sufficient regulation and transparency, which encourages market manipulations.[37] An oil trader suggested that the CFTC should ask ICE to provide the same information as NYMEX. Generally, regulators should know who trades what both at exchanges and OTC. Data should be made available after trading. One oil trader believed that data on positions taken by different groups of traders should be published daily. The same trader was sceptical of moving the OTC business to exchanges, believing that it may actually increase the financialization of that market segment.

Opinions on position limits were mixed. Many traders believed that although these are necessary they are ineffective because they can easily be circumvented. For example, positions can be split between trading platforms or between different subsidiaries of the same group, and transactions can be carried out in the OTC market. This is why one trader suggested there should be limits on OTC transactions as well. Traders also mentioned the increasing activities of financial institutions in physical trade. They pointed out that banks own more and more physical trading companies, which helps them to obtain hedge exemptions. Concerns were voiced that position limits might harm hedgers. It was stressed that sometimes a multiple of the physical value is required "in paper" to hedge, in which case position limits might hamper the proper functioning of the market. Position limits might lead to a situation where particularly physical traders, for whom the derivatives markets were established in the first place, would require exemptions all the time. At the same time, investment banks obtain hedge exemptions because they are involved in physical trading. Although some traders said that they would favour stricter position limits, most believed that their enforcement also has to be improved. Some traders did not express any opinion on position limits, one reason being that no information on the concentration of positions is available.

Generally, most respondents welcomed the regulatory reforms of the Dodd-Frank Act. However, one grain trader found the regulations insufficient as they applied only in the United States, and believed they should be extended to at least the G-20. The requirement for OTC transactions to be processed through clearing houses was seen as one of the big improvements of the Dodd-Frank Act, and it was generally agreed as being very necessary. Most traders seemed at least slightly acquainted with the main provisions of the Dodd-Frank Act, whereas there was hardly any awareness of the EU's regulatory initiative. Therefore the only comment made was that it was "soft" on commodity markets. Most traders said they had no comments or would need more information before making any comments.

Other suggestions for regulation included introducing the need to back financial players' transactions with more capital (i.e. reduce leverage). One grain trader called for banning high frequency trading, since some traders received information earlier than others, which was unacceptable. A sugar trader suggested that further research be done on the effects

of high frequency trading before banning it. An oil trader also suggested that automatic trading be monitored closely. One trader proposed that proprietary trading of large financial institutions be prohibited. However, the general attitude towards bans was negative, as most believed bans to be rather ineffective and favoured free markets.

Some traders thought the current regulatory frameworks may be too narrow. While one trader believed more regulations should apply to the G-20 countries, another thought they should be global in nature due to economic globalization. Improved communication between traders and regulators was also considered urgently necessary, as, in the words of one trader, "The regulators are lagging behind the reality." An oil trader said regulators should be given more resources.

Grain traders mentioned the lack of convergence between futures and cash prices as one factor impairing the functioning of the wheat market. It was also suggested that compelled load-out and additional delivery locations would be helpful. The former, in particular, would "kill speculators." However, the grain traders did not expect the Chicago Mercantile Exchange to introduce compelled load-out, because this would reduce volume, diminishing the CME's income.

Opinions on strategic inventories were also divided. Traders who strongly favoured such inventories thought these would help stabilize the markets. One trader suggested that strategic inventories should be held by governments in various parts of the world, and certainly not only by a few investors. However, another trader emphasized that the market would work without such intervention. The cost of holding, especially by individual companies, was mentioned as an argument against strategic inventories.

5.4.2. Financial players

General features of trading activity

Financial players use all instruments, and trade both at exchanges and OTC, depending on the needs of their clients. Financial players also provide their clients with different types of structured products. Two of the financial institutions that participated in the survey concentrate on trade finance and therefore partly share the perspective of physical traders. Generally the financial players interviewed are a less homogeneous group than the physical traders, and their experiences and views diverged significantly.

Sources of information used

Financial players mentioned using official statistics about fundamentals most often. There was a strong focus on crude oil, where important sources of information were reported to be data from the International Energy Agency (IEA) as well as the Joint Organizations Data Initiative (JODI, see box 1). Data from the latter are particularly important for non-OECD countries.

One banker at a large financial institution, who focuses on the oil market, reported paying much more attention to financial markets than to fundamentals. For him the most relevant information includes the US$ exchange rate, "sentiments in equity and commodity markets" and CFTC data. He expressed his main concern as being, "What is the market thinking?" For the longer term, GDP growth, the Purchasing Managers Index (PMI), unemployment data and other economic indicators are other sources of information. Nevertheless, he emphasized that financial investors tend to look at financial data, although they contend to base their judgement on fundamentals.

The role of fundamentals

Most respondents considered supply and demand as the main drivers of price developments in the medium term. In the longer term, demography, strong growth in the BRIC countries (Brazil, the Russian Federation, India and China) and the effects of a rising middle class on consumption patterns were mentioned as demand factors. They envisaged rising commodity prices owing to insufficient resources.

One banker in trade finance disagreed with the view that fundamentals determine prices in the medium term. He stated that since 2007–2008 commodity markets had been disconnected from fundamentals and that there was a wide gap between the paper market and the physical market. He doubted that commodities were in the middle of what he called a "jumbo cycle", saying that in reality there was "no shortage of commodities." This is why his bank was also reluctant to finance, for example, the purchase of physical sugar, as it doubted that the sugar could be sold at a profit.

Inventories are one variable that clearly has a strong impact on prices. However, assessments of the current situation differed widely, also because a lot of data was viewed as being flawed and or not easily available (for example, concerning China).

The role of financial investors

The interviewed financial players were less outspoken about the role of their peers in commodity markets. The general view was that financial investors have become increasingly interested in commodities in the past 10 years. One banker, who focuses on oil, stressed that all commodities have become an asset class of their own.

Abundant liquidity due to an expansionary monetary policy and low returns on other assets were mentioned as one reason for investing in commodities. The respondents believed that price effects of financial investors are limited to the short term. An asset manager said that speculators could corner the market in the short run because of their strong financial power. In the short run there appear to be strong correlations between different markets, because financial players follow a "risk on/risk off" pattern in their trading.

The difficulty of gauging the effects of financialization on commodity prices was stressed, because "speculators" can barely be distinguished from physical traders. One banker stated that speculators actually help to mitigate excesses in the markets.

All interviewed financial players agreed that financial investors could not drive up commodity prices in the long run.

A striking feature of all interviews was that little differentiation was made between different types of financial players, such as index funds or hedge funds. Many respondents labelled all financial players as "speculators".

Regulation and policy responses

As with the physical traders, there was general agreement that more transparency was a key issue in commodity markets. For effective regulation it was necessary to know who was playing in the market. Respondents believed Europe needs the sort of reporting provided by the CFTC in its *Commitments of Traders* reports. One banker said it would be helpful to have more information on the timing of financial players' interventions.

A financial trader did not believe financial investors were an issue. According to him, positions would not be highly concentrated if there was enough transparency. With transparency the market would regulate itself. Therefore OTC transactions should be regulated and positions published to avoid market manipulation, position concentration and systemic risks. Greater transparency of OTC trading was also mentioned by others as vital, both in Europe and the United States.

One banker described position limits as "already very strict". With regard to position limits, enforcement seemed the real issue. The respondents largely agreed that investors would find ways around position limits, such as splitting positions or starting physically-backed exchange-traded funds.

They believed that if regulations were too tight, trading might move to other (less regulated) regions. One banker contended that the only way to prevent financial investments from driving commodity prices would be to stop financial investors from investing in commodities at all, which would not be feasible.

There were two opposing opinions with regard to strategic stocks: one group of respondents welcomed strategic stocks as a mechanism to stabilize prices. One person agreed that in principle strategic stocks would be beneficial in the long run, but building them up would spur further price hikes in the short run. Others emphasized only the negative price effects of building stocks and strongly advised against doing so. Another problem mentioned by one banker concerned the timing of interventions. If the market price was seen as a fair price, it would be difficult to decide whether and when to intervene. It would also be difficult to assess what would be a fair price. A virtual intervention mechanism as suggested by von Braun and Torero (2008) would suffer from similar flaws.

Several financial players did not express any particular views on regulation. One banker stressed that regulating commodity markets would be difficult, as those markets were highly liberalized and the players very creative. This is why regulation tends to be circumvented. He added that the objective of

regulations should be the creation of a level playing field for consumers and producers and not that of obtaining additional taxes.

5.4.3. Others

Interviewees belonging to the third group operate close to the markets. However their business activities do not usually include position-taking. One consultant reported that he traded for his own account at the ICE. Therefore they may be more neutral market observers.

The role of financial players

There is a general perception that financial players have played a more and more important role in commodity markets in recent years. One consultant specializing in oil observed that oil has become an asset class of its own, whereas a few years ago it was only traded by informed people. The recent emergence of exchange-traded funds makes people trade commodities in the same way as shares. Thus a large number of market participants do not care about the fundamentals of the underlying. Consequently, it is the financial participants who drive prices in the short run. Although fundamentals always determine the price level in the medium to long term, short-term fluctuations can be quite damaging to the market. News agencies that report on the oil market are also perceived to have an influence. They try to explain all price movements by fundamentals, although some price movements are the outcome of additional inflows of funds into the market or of technical trading.

One consultant observed that financial investment in commodities are increasing and will continue to do so in the coming years. According to him this has two main effects:

- Price volatility increases. There is always some volatility in the markets, but financial players clearly add to it, because their participation results in more money in the market and often all market participants move in the same direction. Over- and undershooting can be as much as 20 per cent.
- With financial investors active mostly in derivatives markets, discrepancies between cash and futures markets arise that disrupt the markets. Activities in the cash markets require more expertise and effort. As financial investments increase, the problems of convergence will get worse.

Another consequence of financial investors' presence in commodity markets is the increasing short-run correlation between commodity markets and other financial markets. If investors face margin calls in the equity market or some other financial market, they sell commodity derivatives to meet margin calls. The ensuing price reactions have no relation to fundamentals. High-frequency trading and actively managed funds increase the correlation between commodity derivatives markets and other financial markets.

A broker reported noticing a greater involvement of financial players in physical trading and physical traders in financial markets. According to him, after a sharp decline of activities (reflected in outstanding notional amounts), banks that had closed down their trading desks were now back in the market. However, the risk appetite had declined. At the same time there was more liquidity on the exchanges than before the crisis, which was being provided by banks, hedge funds and managed funds. He noted that commodities were more and more perceived as "currency" while there was a crisis of fiat money. The broker also observed increased volatility in commodity markets due to large inflows of money from financial investors but also to high leverage in derivatives markets compared with the physical market. Not only had the volatility of the flat price increased, but also that of the spreads.

Regulation and policy responses

The two consultants considered transparency as a key issue. They stressed that the lack of transparency made it difficult to regulate commodity markets without hurting market participants that use derivatives markets purely to hedge. They believed that if Europeans ensured at least as much transparency as the CFTC, this would be a big step forward.

One consultant drew attention to the fact that banks had an information advantage, because they knew their customers' trading intentions.

The broker did not express any opinion on transparency, but warned of tendencies to over-regulate in

times of crises. He stated that as commodity markets were not used by the general public, they could be regulated to a lesser extent. He also noted that margins served to limit risk, and saw position limits as helpful as long as they did not discourage trade.

Political decisions such as the mandate to blend gasoline with biofuels or subsidizing commodities were seen as problematic as well as grain subsidies in the Middle East. Due to the latter, milling grain (instead of feed grain) was being fed to animals.

One consultant suggested the introduction of higher initial margins and strict position limits as steps to mitigate systemic risk which might ensue from swaps mainly in energy markets. However, he noted that the industry was already reacting by shifting more business to clearing houses.

5.5. Summary

There was broad consensus on a number of issues among the commodity market experts who were interviewed for this study.

The common view was that the role of financial investors had become more important in recent years. Due to their financial strength they could move prices in the short term, leading to increased volatility, which may harm markets and drive hedgers with an interest in the physical commodities away from commodity derivatives markets. The increased volatility had resulted in more margin calls and thus higher financing requirements.

None of the interviewees doubted that commodity prices were determined by the fundamentals of supply and demand in the medium to long term. Relevant variables were global demand, population growth, inventories and also political measures, of which the most frequently mentioned was the promotion of biofuels. Nevertheless, the type of information used by market participants suggests that financial market information is much more important for trading decisions than is commonly acknowledged.

All interviewees agreed that market transparency needed to be increased, especially in Europe, where it had important gaps, but also in the OTC market in the United States. The adoption of reporting as provided by the CFTC in its *Commitments of Traders* reports would be a big step in the right direction, but more would be necessary.

Concerning other regulatory issues and awareness of current regulations and reforms, respondents differed widely. Generally they paid more attention to United States regulations such as the Dodd-Frank Act, whereas only a minority of those interviewed had a clear idea about the European Commission's regulatory initiative.

There was substantial scepticism about bans (e.g. of high-frequency trading) and position limits. The general belief was that regulations were rather difficult to enforce.

6. POLICY CONSIDERATIONS AND RECOMMENDATIONS

The crucial role of information in commodity price formation has long been recognized, but what kind of information determines the behaviour of the most powerful market participants has seldom been investigated. Is it mainly information about the specific market of a given commodity or is it information of a more general nature, i.e. information about the world economy or about long-term trends that can hardly be directly related to the existing supply and demand situation?

In recent years, rapid industrialization, urbanization and changes in dietary habits in emerging economies, especially in Asia, have caused an increase in demand for commodities. And repeated news about these developments may well have signalled to market participants the beginning of a new commodity super cycle. This signal from the demand side has combined with a growing, though at times potentially deceptive, belief that there are obstacles to a commensurate increase in commodity supply. With regard to oil, for example, there has been a debate about whether the point of "peak oil" will be reached in the near future. With regard to agricultural commodities (including barley, cocoa, maize, sugar and wheat, which have been the focus of this study), news about slower growth of agricultural productivity has added to already growing concerns about land use, water shortages, and, more generally, the link between agricultural production and climate change.

Moreover, first-generation biofuels, which are based on food stocks, seem to have sharply increased the relevance of information on energy for trading in agricultural commodities, and vice versa. The neglect of investment in research into ways of improving growth in commodity supply over the past few decades, when commodity prices were low, is identified as the main cause of these supply constraints. As a result, together with uncertainty about demand, a stream of information on the growing cost of profitable investment in sustained and resilient commodity supply growth has signalled to market participants that the probability of falling commodity prices is rather low. Consequently, information about fundamental supply and demand in commodity markets today has been supplemented by expectations that prices could rise at any time soon, and for a long period of time.

In such a situation of enhanced price uncertainty, the traditional roles of commodity futures exchanges in price discovery and risk management have gained increasing importance. Commodity exchanges appropriately fulfil this role if market participants, in addition to using publicly available information, trade on the basis of independent and individual information derived from an intimate knowledge of specific events relating to commodity markets and on their own plans to supply or demand commodities.

However, the financialization of commodity trading has increasingly jeopardized this function of commodity exchanges. Financial investors in commodity markets base their position-taking on risk and return considerations for which information about other asset markets and the overall economy play a key role, as do financial motives more generally. Such trading behaviour, while relying on similar types of information, also anticipates the price impact of that information in similar ways. Taken together, the financialization of commodity trading poses the risk of herd behaviour and of self-fulfilling prophecy due to the pecuniary power of these market participants.

Even more worrisome is the fact that herding fundamentally changes the behaviour of markets and the role that information plays in determining the right prices. As explained in this study, herding

behaviour undermines the specific advantage of free markets based on the collection of vast amounts of independent and individual information about supply and demand. For example, the argument traditionally presented to defend the participation of powerful financial market participants in commodities markets, namely their role in price discovery and their provision of liquidity, is no longer tenable once herding becomes a dominant feature of those markets.

Price discovery by a large number of financial investors in the market is possible due to the efficient and quick processing of information about their specific supply and demand. However, unfortunately it is usually the wrong price that they "discover", since it is not necessarily related to supply and demand in the market of the specific commodity. Nevertheless, as this price is easily discovered, it is taken to be the benchmark price on the market, and often overrules the prices found in smaller sub-markets or those determined by the price reporting firms such as Platts and a few others that try to base their pricing on market fundamentals in the physical markets.[38]

Similarly, it might be appropriate to question whether market participants that are subject to herding actually bring liquidity to the market. A liquid market is one where many different participants with different sets of information and preferences are able to find counterparts who are willing to accept an offer to sell or buy because they have a different view of how a market is evolving. The Hayekian or atomistic market mentioned earlier would be characterized by such conditions. A market with a strong element of herding, which implies that many and powerful participants use the same information, will not display those characteristics of differing views and dispositions.

In light of these developments, it is necessary to consider how the functioning of commodity futures exchanges and off-exchange OTC trading could be improved in a way that would enable commodity futures exchanges to better fulfil their role of providing reliable price signals to commodity producers and consumers, or at least prevent them from sending the wrong signals. Accordingly, this section examines: (i) how information and transparency in physical commodity markets could be improved; (ii) the need for tighter regulation of financial investors; and (iii) the need for broader international policy measures, including price stabilization schemes.

6.1. Improving transparency in physical commodity markets

Greater transparency in physical markets would enable the provision of more timely and accurate information about commodities. Comprehensive information relating to oil would include spare capacity and global stock holdings, and for agricultural commodities, it would include areas under plantation, expected harvests, stocks and short-term demand forecasts. This would allow commercial market participants to more easily assess current and future fundamental supply and demand relationships. Currently, insufficient information makes it difficult for commercial participants to determine whether a specific price signal relates to changes in fundamentals or to financial market events. This lacuna also facilitates the intentional introduction of misinformation, such as "research-based" price forecasts by big banks that have taken financial positions in commodity markets, and can therefore potentially reap financial benefits if those forecasts turn out to be accurate. Overall, the availability of high quality and consolidated, timely information on fundamental supply and demand relationships in physical markets would reduce uncertainty and thus the risk of market participants engaging in herd behaviour.

To achieve greater transparency in physical markets, there needs to be better producer-consumer dialogue and improved data collection, analysis and dissemination. Oil market participants can benefit from the JODI World Database (see box 1), which covers production, demand, refinery intake and output, imports, exports, closing stock levels and stock changes. While this initiative has greatly improved transparency in the oil market, several gaps remain. For example, the data are published at monthly intervals and therefore do not provide adequate

information about short-term events on which active financial investment strategies are based. Perhaps more importantly, the database does not include information on spare capacity. As pointed out by Kaufmann (2011), it was the lack of information on spare capacity in non-OPEC oil-producing countries that caused the sudden slowdown in the growth rate of non-OPEC crude oil supply after 2004, which caught market participants by surprise and ignited a sudden increase in oil prices. Also, the database does not include information on oil bunkered in cargo vessels, which is often owned by the private sector, so that associated information is commercially sensitive and remains undisclosed. Collecting and publishing such information in aggregate form in such a way that its proprietary character would not be jeopardized would be an important step towards greater transparency, and could help prevent sharp, short-term price changes.

There is even less transparency in the physical market for agricultural products. While information is available from various sources, as discussed earlier, the capacity of countries and international organizations to produce consistent, accurate and timely agricultural market data and analysis remains weak. Indeed, extreme weather events in both 2007–2008 and 2010 took the international community by surprise. The resulting increased uncertainty may well have induced misinformed, panic-driven price surges and triggered increased speculative investment that amplified the price increases.

Perhaps the most important gap in transparency in the physical market for agricultural commodities concerns information on stocks. There are multiple reasons for poor stock data, a major one being that a significant proportion of stocks is now held privately, which makes information on stocks commercially sensitive. As a result, stock data published by international organizations are an estimated residual of data on production, consumption and trade. Enhanced international cooperation could improve transparency by ensuring public availability of reliable information on global stocks. The JODI oil market database could serve as a model for such an initiative.

6.2. Improving transparency in futures and OTC commodity markets

The ability of any regulator to understand what is moving prices and to intervene effectively depends upon the ability to understand the market and to collect the required data. However, at present comprehensive data are not available, particularly for off-exchange derivatives trading. While traders on OTC commodity markets benefit from the information that traders on organized futures exchanges provide for price discovery, they do not provide comparable information of their own.

As expressed in paragraph 13 of the Leaders' Statement of the G-20 Summit in Pittsburgh in September 2009, as well as in the conclusions of the Task Force on Commodity Futures Markets (IOSCO, 2010), which was created by IOSCO in September 2008, transparency on OTC markets could be improved by registering contracts in a trade repository.[39] This would be important especially for non-standardized, illiquid contracts where counterparty risk involves end users of derivatives who hedge commercial risk in commodities. While such data would need to remain confidential, their availability to regulators would reduce the risk of market abuse. The rules proposed by the European Commission (2010), which, *inter alia*, envisage central clearing requirements for standardized contracts, including those involving index funds, would also help improve transparency and reduce counterparty risk. In order to capture contracts that are primarily used for speculation rather than for hedging commodity-related commercial risk, contracts involving transactions that are intended to be physically settled should be exempted from such clearing requirements.[40]

Significantly more information is available for trading on commodity futures exchanges, especially in the United States (as discussed in section 4.2), which accounts for a substantial proportion of commodity futures trading. Measures designed to

ensure similar reporting requirements for trading on European exchanges, for which only very limited data are publicly available at present, would considerably improve transparency of trading on exchanges.

6.3. Tighter regulation of financial investors

Regulation of commodity exchanges needs to find the right balance between being overly restrictive in the imposition of limits on speculative position holdings and being overly lax, including in surveillance. If too restrictive, regulation could impair the hedging functions of commodity exchanges. On the other hand, if surveillance and regulation are not strict enough, prices would be able to move away from levels warranted by fundamental supply and demand conditions, and would thus equally impair the hedging functions of the exchanges.

Tighter regulation of financial investors would facilitate intervention when irregularities are detected. Similar regulations should be adopted in all commodity exchanges and countries in order to avoid regulatory migration. In this sense, regulation of the major commodity exchanges in Europe needs to catch up with that in the United States, but it also needs to be tightened in both of them. Tighter regulation could include the following measures:

- An initial measure could be the introduction of position limits on individual market participants and categories of market participants (such as money managers), as well as on positions of market participants taken in the same commodity but on different exchanges. Exemptions from such position limits should not be granted to hedge financial risk, as is the case in the United States, where swap dealer exemptions (which also apply to commodity index funds) are granted with regard to position limits imposed on some agricultural commodities. The issue of position limits is currently under discussion in both the European Union (European Commission, 2010) and the United States.[41] Such regulatory action relating to positions for energy commodities, especially those taken by hedge funds, is also relevant for agricultural commodities. This is because it has been shown that hedge funds drive the correlation between equity and commodity markets, and that food prices have become more closely tied to energy prices (Tang and Xiong, 2010; Büyüksahin and Robe, 2010). However, since the limited availability of data at present makes it difficult to determine what levels would be appropriate for position limits, it may take a long time before such limits can be introduced. As an interim step, the introduction of position points could be considered, whereby a trader reaching a position point would be obliged to provide further data, on the basis of which regulators would decide whether or not action is needed (Chilton, 2011).
- A second measure could be the application of the Volcker rule (which prohibits banks from engaging in proprietary trading) to commodity markets. At present, banks that are involved in the hedging transactions of their clients have insider information about commercially based market sentiment. This enables them to use such information to bet against their customers. Such position-taking provides false signals to other market participants and, given the size of some of these banks, can move prices away from levels normally determined by fundamentals, in addition to provoking price volatility.
- A similar rule could be applied to physical traders, prohibiting them from taking financial positions and from betting on outcomes that they are able to influence due to their strong economic position in the physical markets (see Blas and Farchy, 2010, for a recent example).

6.4. Price stabilization schemes and other mechanisms

The financialization of commodity futures trading has made it necessary not only to consider issues relating to market transparency and regulation, but also the issue of overcoming excessive commodity price volatility through supply-side measures. This is of particular importance for food commodities, because any sudden increase in demand or major shortfall in production – or both – when stocks are low, will rapidly lead to significant price increases. Physical stocks of food commodities need to be rebuilt to an adequate level urgently in order to moderate temporary shortages, and to be able to rapidly provide emergency food supplies for crisis relief to the most vulnerable.

The accumulation of buffer stocks to smoothen price volatility and guarantee minimum price levels has been a controversial issue. It may be difficult to finance and guarantee the accumulation of sufficiently large physical inventory stocks, especially of food commodities, for them to function as buffer stocks. Moreover, it has often been argued that it is impossible for governments or government agencies to understand and follow the market. However, in markets that are driven by herding, any government agency should be able to understand market developments to the same extent as market participants because it has access to similar information as those participants. As in the case of currency and, more recently, the bond markets, it is possible for a central bank or another agency to engage in the financial markets as a market maker or as the one institution that is able to shock the market when it overshoots.

Holding large inventories around the world has often been judged economically inefficient, and it has been recommended that net food importing countries should rely on global markets rather than on building their own reserves. However, it is clear that newly imposed trade restrictions (particularly for rice) played a role in exacerbating the spiralling increase in food prices in early 2008. This has added to anti-globalization sentiments and to a more favourable assessment of the protection that food reserves can provide.

To counter food price hikes, and as part of efforts to prevent humanitarian crises, von Braun and Torero (2008) – echoed by the G-8 summit in June 2008 – have proposed a new, dual global institutional arrangement: a minimum physical grain reserve for emergency responses and humanitarian assistance, and a virtual reserve and intervention mechanism. The latter would enable intervention in the futures markets if a "global intelligence unit" were to deem market prices as differing significantly from an estimated dynamic price band based on market fundamentals.

In addition, a multi-tier transaction tax system for commodity derivatives markets has been proposed. Under this scheme, a progressive transaction tax surcharge would be levied as soon as prices start to move beyond the price band defined either on the basis of commodity market fundamentals (Nissanke, 2010) or on the basis of the observed degree of correlation between the return on investment in commodity markets, on the one hand, and equity and currency markets on the other. Both proposals deserve due consideration.

Even if such price stabilization mechanisms could be made to work satisfactorily, it would not make more physical commodities available on markets, except for emergency situations. Given that the historically low level of inventories was one determinant of the abrupt price hikes in food commodities in early 2008, the question remains as to what kinds of incentives could be fostered to increase production and productivity in developing countries, particularly of food commodities. Incentives could include a reduction of trade barriers and domestic support measures in developed countries. At the same time, increased investment, including through the provision of more official development assistance to agriculture in developing countries, is certainly necessary in this context.

7. CONCLUSIONS

Financialization has strongly affected the functioning of commodity markets. Due to the increased participation of financial players in those markets, the nature of information that drives commodity price formation has changed. Contrary to the assumptions of the efficient market hypothesis (EMH), the majority of market participants do not base their trading decisions purely on the fundamentals of supply and demand; they also consider aspects which are related to other markets or to portfolio diversification. This introduces spurious price signals to the market.

In an environment of substantial uncertainty with respect to the quality and timeliness of information about fundamentals – especially inventories – it may be a rational strategy to follow others' strategies rather than act on one's own information. This is all the more so if market participants know that the majority of their peers are also following such strategies. The study finds strong evidence confirming such herd behaviour in commodity markets based on an analysis of cross-market correlations, price behaviour with respect to economic announcement and commodity price behaviour across business cycles. Its findings support and complement those of other studies.

The analysis was complemented by 22 interviews with commodity market participants from different backgrounds. They reported widespread herd behaviour and different types of technical trading. Physical traders, in particular, emphasized that the activities of financial players have strong effects on commodity markets and sometimes impair the functioning of commodity futures for hedging.

In a situation of widespread herding, the assumption of an atomistic market, where participants trade individually and independently of each other on the basis of their own interpretation of fundamentals, thus does not hold any more. The price discovery mechanism is seriously distorted. Prices can move far from levels justified by the fundamentals for extended periods, leading to an increasing risk of price bubbles. Due to these distortions, commodity prices do not always provide correct signals about the relative scarcity of commodities. This impairs the allocation of resources, has negative effects on the real economy and leads to food crises, thereby threatening the lives of the poorest.

To restore the proper functioning of commodity markets, swift political action is required on a global scale. It should focus on the following measures:

- Increasing transparency in physical markets and providing better and more timely data on fundamentals.
- Increasing transparency of OTC markets and exchanges by providing more data on market participants and position-taking, at least to regulators. This is particularly urgently needed in Europe.
- Tighter regulation, including imposition of position limits and banning proprietary trading by financial institutions that are involved in hedging the transactions of their clients.
- Establishing a government-administered virtual reserve mechanism and direct intervention into the physical or the financial market need to be considered. In financialized commodity markets, as in currency markets, intervention may even make it easier for market participants to recognize the fundamentals. Moreover, introducing a transactions tax system which could generally slow down financial market activities. All these measures deserve serious political consideration even if some more sophisticated schemes may prove difficult to implement quickly.

Annex table A.1

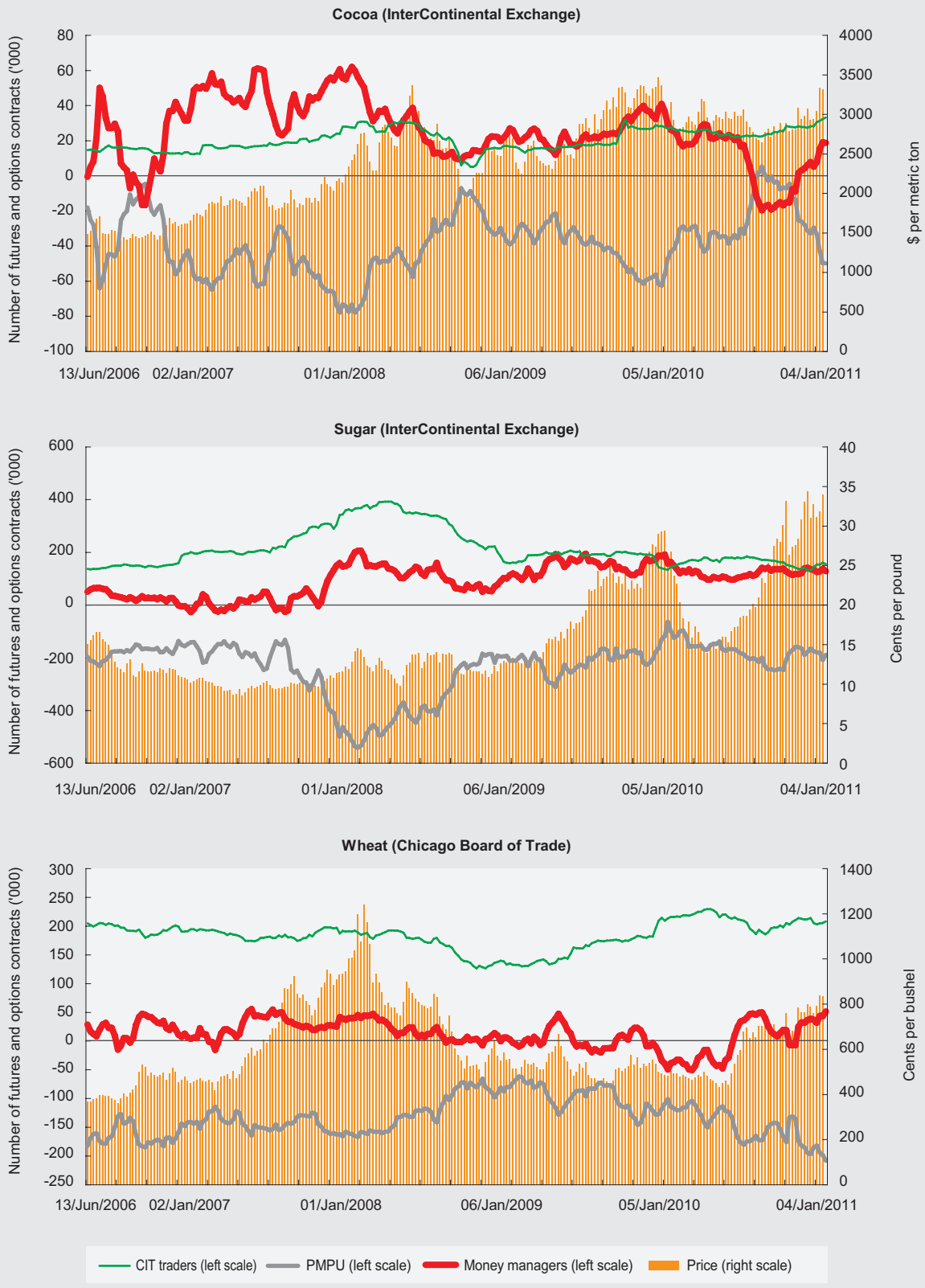
WORLD PRODUCTION OF BIOFUELS

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
					Production *(thousands of barrels per day)*					
World										
Total biofuels	315.1	344.3	405.9	501.5	556.3	661.5	854.6	1 127.0	1 489.7	1 635.5
Biodiesel	15.8	21.0	27.5	35.8	44.3	77.2	142.0	202.9	270.9	308.2
Ethanol	299.3	323.3	378.4	465.7	512.0	584.3	712.6	924.1	1 218.8	1 327.3
North America										
Total biofuels	109.2	119.6	144.3	187.9	227.3	265.2	340.2	472.8	667.8	767.4
Biodiesel	0.0	0.6	0.7	0.9	1.8	6.1	17.1	33.7	45.9	35.2
Ethanol	109.2	119.1	143.6	186.9	225.5	259.1	323.0	439.2	621.9	732.2
Central and South America										
Total biofuels	185.1	198.8	221.4	254.8	257.0	285.2	330.6	429.9	539.4	534.4
Biodiesel	0.1	0.2	0.4	0.4	0.5	0.5	2.2	15.2	38.6	57.9
Ethanol	185.0	198.6	221.0	254.4	256.5	284.6	328.3	414.6	500.7	476.4
Europe										
Total biofuels	17.7	22.6	31.7	41.4	50.4	82.1	141.1	168.6	202.2	234.6
Biodiesel	15.7	20.2	26.3	34.3	41.6	68.1	113.2	137.5	155.0	172.6
Ethanol	2.0	2.4	5.4	7.1	8.8	14.1	27.8	31.1	47.2	62.0
Asia and Oceania										
Total biofuels	2.9	3.1	8.3	17.2	21.1	28.2	41.7	54.2	76.8	93.5
Biodiesel	0.0	0.1	0.1	0.1	0.3	2.2	9.1	15.8	28.8	38.5
Ethanol	2.9	3.0	8.2	17.1	20.8	26.0	32.6	38.4	48.0	54.9
Rest of the world										
Total biofuels	0.2	0.2	0.2	0.2	0.5	0.8	1.1	1.5	3.5	5.6
Biodiesel	0.0	0.0	-0.0	0.0	0.1	0.3	0.3	0.7	2.5	3.9
Ethanol	0.2	0.2	0.2	0.2	0.4	0.5	0.8	0.8	1.0	1.7
					Year-on-year growth rate *(per cent)*					
World										
Total biofuels		9.3	17.9	23.6	10.9	18.9	29.2	31.9	32.2	9.8
Biodiesel		33.0	30.9	30.2	23.8	74.2	83.9	42.9	33.5	13.7
Ethanol		8.0	17.0	23.1	9.9	14.1	22.0	29.7	31.9	8.9
North America										
Total biofuels		9.5	20.6	30.2	21.0	16.7	28.3	39.0	41.2	14.9
Biodiesel			22.2	35.5	96.4	236.3	179.9	96.4	36.4	-23.3
Ethanol		9.0	20.6	30.2	20.6	14.9	24.7	36.0	41.6	17.7
Central and South America										
Total biofuels		7.4	11.3	15.1	0.9	11.0	15.9	30.0	25.5	-0.9
Biodiesel		100.0	100.0	0.0	25.0	8.7	313.7	577.9	153.3	50.0
Ethanol		7.4	11.2	15.1	0.8	11.0	15.3	26.3	20.8	-4.9
Europe										
Total biofuels		27.4	40.6	30.6	21.6	63.1	71.8	19.5	19.9	16.0
Biodiesel		28.3	30.5	30.5	21.2	63.6	66.4	21.4	12.8	11.3
Ethanol		20.0	125.0	30.7	23.9	60.7	98.0	11.7	51.6	31.5
Asia and Oceania										
Total biofuels		6.9	168.4	107.2	22.4	33.6	47.9	30.0	41.8	21.6
Biodiesel			20.0	16.7	114.3	633.3	313.6	73.6	82.4	33.7
Ethanol		3.4	173.3	108.5	21.6	25.0	25.4	17.8	25.0	14.4
					Share in world production *(per cent)*					
North America										
Total biofuels	34.7	34.7	35.6	37.5	40.9	40.1	39.8	42.0	44.8	46.9
Biodiesel	0.0	2.7	2.5	2.6	4.1	7.9	12.1	16.6	16.9	11.4
Ethanol	36.5	36.8	38.0	40.1	44.0	44.3	45.3	47.5	51.0	55.2
Central and South America										
Total biofuels	58.7	57.8	54.5	50.8	46.2	43.1	38.7	38.1	36.2	32.7
Biodiesel	0.6	1.0	1.5	1.1	1.1	0.7	1.6	7.5	14.3	18.8
Ethanol	61.8	61.4	58.4	54.6	50.1	48.7	46.1	44.9	41.1	35.9
Europe										
Total biofuels	5.6	6.5	7.8	8.3	9.1	12.4	16.5	15.0	13.6	14.3
Biodiesel	99.4	95.9	95.6	95.9	93.9	88.1	79.7	67.8	57.2	56.0
Ethanol	0.7	0.7	1.4	1.5	1.7	2.4	3.9	3.4	3.9	4.7
Asia and Oceania										
Total biofuels	0.9	0.9	2.0	3.4	3.8	4.3	4.9	4.8	5.2	5.7
Biodiesel	0.0	0.5	0.4	0.4	0.7	2.8	6.4	7.8	10.6	12.5
Ethanol	1.0	0.9	2.2	3.7	4.1	4.4	4.6	4.2	3.9	4.1
					Share in total biofuels *(per cent)*					
World										
Biodiesel	5.0	6.1	6.8	7.1	8.0	11.7	16.6	18.0	18.2	18.8
Ethanol	95.0	93.9	93.2	92.9	92.0	88.3	83.4	82.0	81.8	81.2
North America										
Biodiesel	0.0	0.5	0.5	0.5	0.8	2.3	5.0	7.1	6.9	4.6
Ethanol	100.0	99.5	99.5	99.5	99.2	97.7	95.0	92.9	93.1	95.4
Central and South America										
Biodiesel	0.1	0.1	0.2	0.2	0.2	0.2	0.7	3.5	7.2	10.8
Ethanol	99.9	99.9	99.8	99.8	99.8	99.8	99.3	96.5	92.8	89.2
Europe										
Biodiesel	88.7	89.4	83.0	82.9	82.6	82.9	80.3	81.5	76.7	73.6
Ethanol	11.3	10.6	17.0	17.1	17.4	17.1	19.7	18.5	23.3	26.4
Asia and Oceania										
Biodiesel	0.0	3.2	1.4	0.8	1.4	7.8	21.8	29.2	37.5	41.2
Ethanol	100.0	96.8	98.6	99.2	98.6	92.2	78.2	70.8	62.5	58.8

Source: UNCTAD secretariat calculations, based on EIA.

Annex figure A.1

PRICES AND NET LONG FINANCIAL POSITIONS, BY TRADER CATEGORY, SELECTED COMMODITIES, JUNE 2006–FEBRUARY 2011



Source: UNCTAD secretariat calculations, based on weekly data from Bloomberg; and CFTC.
Note: CIT traders = commodity index traders; PMPU = producers, merchants, processors, users.

NOTES

1 The glossary gives a more detailed definition of the EMH.

2 Under certain assumptions the difference between forward and futures prices can be neglected (see Hull, 2003: 51–52 and 68–69). In theory, the forward and futures prices should be identical if interest rates are constant. The difference is noticeable if interest rates are correlated with the commodity price. Apart from stochastic and correlated interest rates, differences in real life can be explained *inter alia* by taxes, transaction costs and margin requirements at the exchanges. Pindyck (1990) estimated these differences for several commodities and concluded that they were negligible. Therefore, in this section no difference is made between the two terms.

3 This simplified formula represents the composition of the futures price. For the actual calculation of the futures price there are several possibilities, depending on whether continuous compounding is applied and whether the storage cost is a fixed amount or proportional to the value of the asset (for details see Hull, 2003).

4 Volatility is a measure of price variation from one period to another. A period of high price volatility is characterized by a large number of price variations.

5 This is evidenced by the frequently quoted examples of commodity price bubbles created by financial investors, including the tulip mania in Holland in the 1630s, the Mississippi Bubble in France and the South Sea Bubble in England in the early 1700s (Garber, 1990).

6 Financial innovation has played a facilitating role, as tracking commodity indexes, such as the Standard and Poor's Goldman Sachs Commodity Index (S&P GSCI), is a relatively new phenomenon. Commodity market deregulation, such as enacted by the Commodity Futures Modernization Act (CFMA) of 2000, was a further facilitating factor, as discussed in UNCTAD 2009b: 76–77.

7 Commodity investment can also take the form of holding physical stocks, but this is generally considered profitable only for precious metals, or buying shares in enterprises that produce commodities. However, the correlation between a firm's share price and the price of the underlying commodity may be low, *inter alia* because of the additional layer of management and company risk that may swamp the underlying commodity risk. A recent example is the movement of the oil price following the oil spill from a BP oil platform in the Gulf of Mexico: the oil price rose while BP's share price fell.

8 In the S&P GSCI, weights are based on five-year averages of relative world production quantities; energy products usually account for about two thirds of the total index. In the DJ-UBSCI, weights are also based on five-year averages but rely primarily on the relative amount of trading activity of a particular commodity; weights are limited to 15 per cent for individual commodities and to one third for entire sectors in order to allow for a greater degree of diversification across commodities.

9 A long position is a market position that obligates the holder to take delivery (i.e. to buy a commodity), in contrast with a short position, which obligates the holder to make delivery (i.e. to sell a commodity). The aggregate of all long open positions is equal to the aggregate of all short open positions. For individual traders, net long positions are total long positions minus total short positions.

10 For explanations of these terms, see section 2 and the glossary.

11 Notional amount refers to the value of the underlying commodity. However, traders in derivatives markets do not own or purchase the underlying commodity, hence notional value is merely a reference point based on underlying prices. The limited transparency of data on OTC markets is underlined by the fact that the category "other commodities" accounted for roughly 40 per cent of the total OTC exposure in the late 1990s, but now constitutes 80–90 per cent.

12 The IMF commodity price index (2005=100) declined from 203 in the second quarter of 2008 to 99 in the first quarter of 2009. Over the same period of time, the UNCTAD non-oil commodity index (2000=100) fell from 294 to 188 and the oil price index from 430 to 157.

13 Part of the following discussion draws on UNCTAD, 2009b.

14 More precisely, among the types of firms engaged in business activities that can be hedged and therefore classified as "commercial" by the CFTC are merchants, manufacturers, producers, and commodity swaps and derivative dealers. The CFTC classifies as "non-commercial" all other traders, such as hedge funds, floor brokers and traders, and non-reporting traders (i.e. those traders whose positions are below the reporting thresholds set by an exchange).

15 These 12 commodities are: feeder cattle, live cattle, cocoa, coffee, cotton, lean hogs, maize, soybeans, soybean oil, sugar, Chicago wheat and Kansas wheat. The reports have so far not included similar data for energy and metals markets because, *inter alia*, many swap dealers in metals and energy futures contracts have physical activities on their own account, which makes it difficult

to separate hedging from speculative activities (CFTC, 2008: 48–49). The CFTC explains that these index trader data should ultimately be considered as estimates because, for example, "some traders assigned to the Index Trader category are engaged in other futures activity that could not be disaggregated …. Likewise, the Index Trader category will not include some traders who are engaged in index trading, but for whom it does not represent a substantial part of their overall trading activity" (CFTC, Commitments of Traders, Explanatory Notes, available at: http://www.cftc.gov/MarketReports/CommitmentsofTraders/ExplanatoryNotes/index.htm).

16 Asymmetric exposure to leverage is one factor that may create greater risk. For example, when highly leveraged financial investors with long positions face margin calls because they are subject to adverse price movements, they may not be able to pay this additional margin unless they liquidate their position. At the same time, commercial participants with short positions may prefer holding their positions until expiry and accept physical delivery. In this situation, a sudden and rapid selling pressure ignited by financial investors will not be contained by commercial participants. As a result, prices will move rapidly and excessively. Leverage may be a particularly important issue on OTC markets because these markets are characterized by a high degree of concentration and much higher leverage ratios than usually observed on futures exchanges. According to the International Swaps and Derivatives Association (2010), only about 60 per cent of commodity derivatives trades are collateralized, compared with over 90 per cent of credit derivatives trades. The low level of collateralization of the former implies higher leverage ratios. Although the relationship between OTC markets, futures exchanges and spot markets is not entirely clear, the high concentration and high leverage ratios in OTC markets pose systemic risks to commodity markets, and financial stability more generally.

17 Uncertainty in decision-making may be a defining characteristic of commodity markets. This is because: (i) medium- and longer-term commodity supply and demand conditions are subject to considerable uncertainty, for example because of unknown depletion rates of non-renewable resources and unknown effects of climate change on agricultural production; (ii) inventory data, which provide valuable signals for short-term price expectations, suffer from significant measurement errors (Gorton, Hayashi and Rouwenhorst, 2007; Khan, 2009); and (iii) data on current global commodity supply- and-demand conditions are published with long time lags and are frequently revised. Therefore, even well-informed traders must formulate price expectations on the basis of partial and uncertain data.

18 Experimental evidence on persistent judgemental errors in decision-making abounds (see, for example, Ariely, 2010).

19 High-frequency trading (HFT) is a technologically advanced method of conducting algorithmic trading at ultra-high speed. Contrary to other types of algorithmic trading, which focus on price levels and maintain positions over a period of time, HFT traders attempt to benefit from price volatility and usually close out their positions by the end of a trading day. HFT has attracted considerable attention following allegations that it caused the so-called "flash crash" on United States equity markets on 6 May 2010. Some observers have also blamed algorithmic trading for the increase in price volatility on sugar markets since November 2010 ("High-speed trading blamed for sugar rises", *Financial Times*, 8 February 2011).

20 Similar mechanisms apply when investors follow the advice of analysts who overweigh public information and underweigh their own private information in their messages. Conformity to other analysts' messages increases investment in the recommended asset and the associated return. This, in turn, improves the analysts' reputations.

21 Casual observation suggests that the release of USDA reports on livestock and agricultural crops have significant price effects.

22 Such price predictions can have considerable impact if they come from a reputed source. For example, Arjun Murti, a Goldman Sachs analyst, gained considerable fame between 2004 and 2008 when his successive predictions of ever higher oil prices appeared to be vindicated by market developments. According to media reports, other investors questioned whether Goldman Sachs' own traders were benefiting from these predictions, but the bank's chief executive denied such accusations ("An oracle of oil predicts $200-a-barrel crude", *New York Times*, 21 May 2008).

23 While this "true number" is necessarily hypothetical, frequent disclosure of disaggregated data on positions taken by different trader categories in futures exchanges and OTC markets could provide valuable information in this context.

24 Cipriano and Guarino (2010), for example, show that in equity markets intraday herding can have very significant price effects.

25 Phillips and Yu (2010) indicate that this problem can be solved by using an information criterion, rather than the beginning of the data series, to determine the date of the first observation.

26 Phillips and Yu (2010), on examining the migration of price bubbles across equity, bond, currency and commodity markets (cocoa, coffee, cotton, crude oil, heating oil, platinum and sugar) since the mid-1990s, find a sequence of price bubbles, each followed by a financial collapse. They show that with the eruption of the subprime crisis in August 2007, financial investment transited from the United States housing and mortgage markets onto certain commodity and foreign-exchange markets. Growing awareness of the serious impact of the financial crisis on real economic activity both in the United States and globally caused the general collapse of asset prices in mid-2008. With respect to commodity prices, their results point to a price bubble in crude oil between March and July 2008, in heating oil between March and August 2008, and in platinum between January and July 2008, while no price bubbles are detected in cocoa, coffee, cotton and sugar. This supports the finding of Gilbert (2010a), whose product sample overlaps with that of Phillips and Yu (2010) only with respect to crude oil, for which he identifies a price bubble during the first half of 2008. Phillips and Yu (2010: 26) explain that early phases of speculative bubbles are characterized by only small price divergences from fundamental values, and are therefore statistically indistinguishable. This may explain why the estimated date for when the oil price bubble begun is somewhat later than the observed beginning of the rapid price increase.

27 More precisely, Kaufmann et al. (2008) specify the near-month price of crude oil on NYMEX as a function of:

(i) the equivalent of days of consumption of existing OECD crude oil stocks; (ii) a factor that reflects OPEC capacity utilization, OPEC's share of global oil production and the extent to which OPEC members cheat on their quota; (iii) United States refinery utilization rates, which may be subject to abrupt temporary disturbances during the hurricane season; and (iv) expectations as reflected by the difference between the price for the 4-month and the price for the 1-month futures contract for WTI on NYMEX. This difference indicates whether the market is in backwardation or contango, with contango providing an incentive to build and hold stocks, thereby bolstering demand and ultimately prices. On the basis of this relationship, price changes can be estimated with an error correction model, where first differences of the above variables as well as the forecasting errors of previous periods are taken as independent variables.

28 In March 2011, Goldman Sachs estimated the impact of speculation on the oil price to be about 20 per cent (see, http://www.cnbc.com/id/42544993).

29 However, other structural models for the oil market ascribe much of the recent price developments to fundamental supply and demand factors. These models do not infer demand shocks from an econometric model, but treat repeated revisions of forecasts of real income growth in emerging and advanced economies as a series of exogenous demand shocks for the global crude oil market (e.g. Kilian and Hicks, 2009). However, it is hard to believe that informed oil traders would be repeatedly surprised by the impact on oil demand of buoyant growth in emerging economies. Moreover, any such calculation is extremely sensitive to assumptions about the short-run price elasticity of supply and demand.

30 For simplicity, these graphs show the net positions of only three trader categories. All graphs omit the category "other speculators". The graphs for the agricultural products also omit the category "swap dealers", whose positions correspond closely to that of the category "CIT traders". Given that no data for the category "CIT traders" are available for crude oil, the respective graph shows the category "swap dealers". However, it should be noted that, contrary to agricultural commodities, for energy commodities, such as crude oil, the positions taken by "swap dealers" and "CIT traders" may differ significantly. This is because swap dealers operating in agricultural markets undertake only a few transactions that are not related to index investments. Swap dealers in energy markets, by contrast, conduct a substantial amount of such non-index related transactions, which is the very reason why the CFTC has excluded energy commodities from its CIT reports. The CFTC (2008) estimates that in 2007–2008, less than half of the long swap dealer positions in crude oil futures were linked to index fund positions. This may also explain why swap dealer positions in crude oil are significantly more volatile that those in agricultural markets.

31 Comparable data for barley were not available.

32 In descriptive statistics, a box plot (also known as a box-and-whisker diagram or plot) is a convenient way of graphically depicting groups of numerical data through their five-number summaries: the smallest observation (sample minimum), lower quartile (Q1), median (Q2), upper quartile (Q3), and largest observation (sample maximum). A box plot may also indicate which observations, if any, might be considered outliers. Box plots display differences between populations without making any assumptions of the underlying statistical distribution; in other words, they are non-parametric. The spacing between the different parts of the box helps indicate the degree of dispersion (spread) and skewness in the data and also helps identify outliers. Box and whisker plots are uniform in their use of the box: the bottom and top of the box are always the 25th and 75th percentile (i.e. the lower and upper quartiles, respectively), and the band near the middle of the box is always the 50th percentile (or the median). The ends of the whiskers (i.e. the lower and upper adjacent values) represent the lowest datum still within the 1.5 interquartile range (IQR) of the lower quartile, and the highest datum still within the 1.5 IQR of the upper quartile.

33 See "Hedge Funds' Pack Behaviour Magnifies Swings in Market", *Wall Street Journal* (online), 14 January 2011.

34 In the early 1990s, many countries in the world experienced recessions, but these recessions did not occur simultaneously. In Germany, for example, the boom after reunification delayed the cyclical downturn. For this reason no recession is identified for the world as a whole.

35 Given that these time series begin only in 1991, for the period 1975–1991 a proxy series was constructed on the basis of the growth rates of the industrial production series of the Organisation for Economic Co-operation and Development (OECD) for all its member States. OECD industrial production and world industrial production show fairly similar dynamics in the early 1990s – that is, before the strong growth of the emerging economies unsettled this relationship.

36 Not all traders differentiated between individual groups of non-commercial traders.

37 NYSE LIFFE initiated a trial period for commitments of traders' reports starting on 28 September 2010 (NYSE LIFFE, 2010). This step followed complaints by cocoa consumers in early July 2010, and threats to shift business to the ICE.

38 The fact that "price reporting firms" are needed for price discovery in the physical markets is a clear indication that these global markets in general are very different from the kind of atomistic markets that still dominate the standard economic models. Usually, commodity markets are not very transparent, and many of them are segregated regionally to an extent that gives rise to huge price differentials.

39 For details on how planned rule-making in the United States is expected to deal with this issue, see Dodd-Frank Act 2010, sections 727 and 763, as well as Gensler, 2010.

40 Such exemptions are envisaged in the Dodd-Frank Act 2010, section 721.

41 The CFTC released its draft proposals on 26 January 2011, accessible at: http://www.cftc.gov/ucm/groups/public/@lrfederalregister/documents/file/2011-1154a.pdf.

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GLOSSARY*

Arbitrage: Transaction that exploits opportunities for risk-free profits that arise because assets are mispriced.

Algorithmic trading: Trading strategy that bases buying and selling decisions on computer programmes using information on past price developments.

Backwardation: Market situation, where futures prices are progressively lower with rising maturities. (In some cases the term is used to describe a situation where the futures price is below the expected future spot price.)

Carry trade: Carry trade speculation is a strategy in which an investor sells (e.g. by incurring debt in) a currency with a relatively low interest rate (i.e. the so-called "funding currency") and uses these funds to purchase short-term assets denominated in a different currency yielding a higher interest rate.

Contango: Market situation, where futures prices are progressively higher with rising maturities. (In some cases the term is used to describe a situation where the futures price exceeds the expected future spot price.)

Convenience yield: Utility derived from holding an inventory.

Cost of carry: Interest and storage cost associated with inventories.

Derivative: Financial instrument whose value depends on the value of an underlying asset.

Efficient Market Hypothesis (EMH): An investment theory that states it is impossible to "beat the market" because stock market efficiency causes existing share prices to always incorporate and reflect all relevant information. According to the EMH, stocks always trade at their fair value on stock exchanges, making it impossible for investors to either purchase undervalued stocks or sell stocks for inflated prices. As such, it should be impossible to outperform the overall market through expert stock selection or market timing, and that the only way an investor can possibly obtain higher returns is by purchasing riskier investments.

Fiat money: Money which only represents a claim on its issuer, but has no intrinsic value.

High frequency trading is a technologically advanced method of conducting algorithmic trading at ultra-high speed.

Index investor: Investor or fund who tracks the movements of an index.

Initial margin: Customers' funds put up as security for a guarantee of contract fulfilment at the time a futures market position is established.

Long position: Position resulting from the purchase of a derivatives contract.

Noise trader: A trader who bases trading decisions on considerations which are unrelated to the respective market thus introducing noise signals into the market.

Open interest: The total number of futures contracts long or short in a delivery month or market that has been entered into and not yet liquidated by an offsetting transaction or fulfilled by delivery. (Also called open contracts or open commitments)

Price volatility: A measure of price variation from one period to another. A period of high price volatility is characterized by a large number of large price variations.

Rolling: The process of selling a futures contract before its expiry and buying a new futures contract of a later delivery month.

Roll yield: Also called "roll return", profit from rolling.

Short position: Position resulting from the sale of a derivatives contract.

Swap: An agreement to exchange cash flows in the future according to a prearranged formula.

* Part of this glossary draws on definitions available on the CFTC's and the ECB's websites and on Investopedia.com.

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United Nations Conference on Trade and Development

7 July 2011
English only

Price Formation in Financialized Commodity Markets: The role of information

Corrigendum

Page viii, paragraph 5

For the first sentence *substitute*

To complement the theoretical and empirical findings, 21 interviews were conducted with various commodity market participants, ranging from physical traders to financial investors, but also including a broker and two consultants.

Page 37

For the existing table 4 *substitute*

Table 4
CLASSIFICATION OF INTERVIEWEES

Physical traders	Grains: 4; crude oil: 3; cocoa: 2; sugar: 2
Financial players	Banks: 5; asset management: 1; independent financial trader: 1
Others	Consulting: 2; brokerage: 1

Note: The numbers refer to the interviews. In some cases, several persons participated in the interview.

Page 38, section 5.2, last paragraph

For the sixth (next to last) sentence *substitute*

In addition, one broker and two consultants were interviewed.

Page 55, paragraph 3

In the first sentence, *for* 22 interviews *read* 21 interviews