UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT

DISCUSSION PAPERS

THE GROWING INTERDEPENDENCE BETWEEN FINANCIAL AND COMMODITY MARKETS

No. 195
October 2009

UNITED NATIONS

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Acknowledgement: Part of this paper draws on the author's contributions to UNCTAD (2009a and 2009b). The author is grateful to Dietrich Domanski, Chris Gilbert, Ugo Panizza, and seminar participants at the University of London for comments on earlier drafts. Juan Pizzaro provided excellent research assistance and econometric advice. The opinions expressed are solely those of the author and do not necessarily reflect the views of UNCTAD or its Member States.

UNCTAD/OSG/DP/2009/3

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***JEL classification**: F36, O13, G11, G14*

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THE GROWING INTERDEPENDENCE BETWEEN FINANCIAL AND COMMODITY MARKETS

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Abstract

Financial investment has become increasingly important on commodity exchanges. This paper distinguishes two types of financial investors and emphasizes differences in their position taking motivation and price impacts. Index traders follow a passive strategy holding virtually only long positions. Money managers trade on both sides of the market and attempt to maximize short-term returns. Regression analysis indicates that: (i) index trader positions are particularly influenced by roll returns, while money managers emphasize spot returns; and that: (ii) money managers moved from emphasizing diversification to a more speculative strategy by taking commodity positions that are positively, rather than negatively, related to developments in equity markets. Granger-causality tests indicate that these differences translate into different price impacts: (i) index trader positions have a causal price impact particularly for agricultural commodities; and (ii) money managers had a causal impact during the sharp increases in the prices for some non-agricultural commodities.

I. INTRODUCTION

Much of the recent commodity price developments have been attributed to changes in fundamental supply and demand relationships. However, the extreme scale of the price changes since 2002, and the fact that prices increased and subsequently declined across all major categories of commodities, suggests that, beyond the specific functioning of commodity markets, broader macroeconomic and financial factors that operate across a large number of markets need to be considered to fully understand recent commodity price developments.

A major new element in commodity trading is the greater importance of financial investment on commodity exchanges. Financial investors regard commodities as an asset class (comparable to equities, etc) and do not necessarily trade on the basis of fundamental supply and demand relationships in specific commodity markets. If financial investment has a price impact, commodity price developments will no longer merely reflect changes in fundamentals but also be subject to influences from financial markets.[1] As a result, market participants with a commercial interest in physical commodities (i.e. producers and consumers) will face increased uncertainty about the reliability of signals emanating from the commodity exchange exchanges. Managing the price risk of market positions and making storage, investment and trading decisions will become more difficult.

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[1] This paper focuses on potential effects on price levels. For potential effects on price volatility see Domanski and Heath (2007), IMF (2008a) and UNCTAD (2009b).

A range of studies has explored the extent to which financial investment has affected recent commodity price developments. The studies published before early 2009 usually found little evidence to support this hypothesis.[2] More recently, however, there appears to be an emerging consensus, at least among policymakers, that financial investors have affected commodity price developments to an extent that warrants a tightening of supervision and regulation of commodity futures exchanges (Gensler, 2009; United States Senate, 2009).[3]

Most existing studies on the link between financial investment and commodity price developments have concentrated on a specific type of financial investors: Domanski and Heath (2007) and IMF (2006) focus on so-called 'non-commercial' market participants (i.e. money managers such as hedge funds), whereas Gilbert (2009) and Masters (2008, 2009) emphasize so-called 'index traders' (i.e. financial investors that try to replicate the returns of a particular commodity futures index). IMF (2008b) looks at the impact on commodity price developments of both these types of financial investors but does not explore differences in their trading behaviour and restricts the analysis of index-trader effects on prices to those agricultural commodities for which data are readily available.

The major new element of this paper is the explicit distinction between these two types of financial investors – money managers and index traders – in terms of both their trading motivations and their impact on commodity price developments. The paper also presents novel estimates of index trader positions in four non-agricultural markets (copper, gold, natural gas and crude oil) for which no official data are available.

The main empirical finding of this paper is that index traders appear to have affected the prices of a wide range of commodities over the past three and a half years, while those of non-commercial traders excluding index traders have tended to affect the prices mainly of non-agricultural commodities when their prices were increasing sharply. The empirical findings also point to an increased positive relationship between financial investor positions on commodity futures exchanges and equity market developments, and to a decreased importance of hedging against dollar depreciation as a determinant of position taking. Both these changes have created a greater interdependence between financial and commodity markets.

The remainder of the paper is structured as follows. The next section briefly discusses aggregate evidence on financial investment in commodity markets and the general motivation that underlies such investment. Section III discusses two channels through which financial investors may cause the functioning of commodity exchanges to deviate from an ideal efficient market – information failures and weight-of-money effects. Section IV assesses the importance of different types of financial investors on commodity exchanges. Section V conducts an econometric exploration of the trading motivations of both money managers and index traders, as well as Granger-causality tests of the impact of their position taking on commodity price developments. Section VI concludes.

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[2] See, for example, IMF (2006, 2008a, 2008b) and (CFTC, 2008a). For a sharply contrasting view see Masters (2008). The careful econometric studies by Domanski and Heath (2007) and Gilbert (2008) provide more mixed results.

[3] Confronting the various arguments made by academics and policymakers regarding the impact of speculation on oil price developments, the recent paper by Khan (2009: 8) also concludes "that speculation drove an oil price bubble in the first half of 2008."

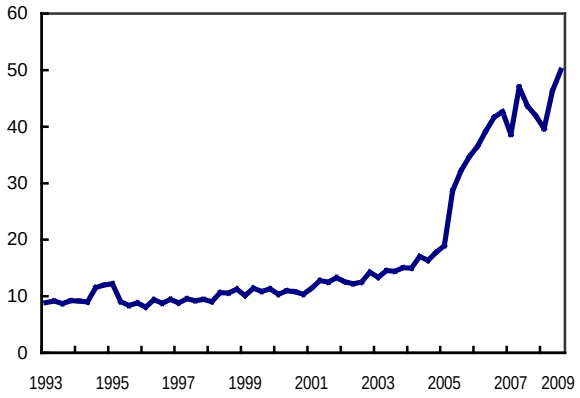
II. THE INCREASING PRESENCE OF FINANCIAL INVESTORS IN COMMODITY MARKETS

Most financial investors in commodities take positions on commodity futures and options markets.[4] Financial investors have been active on such markets since the early 1990s. However, in the aftermath of the dot-com crash on equity markets in 2000, their involvement increased, rising dramatically in early 2005, as reflected in aggregate measures of financial investment in commodity markets: the number of futures and options contracts outstanding on commodity exchanges worldwide rose more than threefold between 2002 and mid-2008 (figure 1), and, during the same period, the notional value of commodity-related contracts traded over the counter (OTC) (i.e. contracts traded bilaterally, and not listed on any exchange) increased more than 14-fold, to $13 trillion (figure 2).[5] Financial investments in commodities fell sharply starting in mid-2008 before picking up again more recently.

Figure 1

FUTURES AND OPTIONS CONTRACTS OUTSTANDING ON COMMODITY EXCHANGES, DECEMBER 1993–JUNE 2009

(Number of contracts, millions)

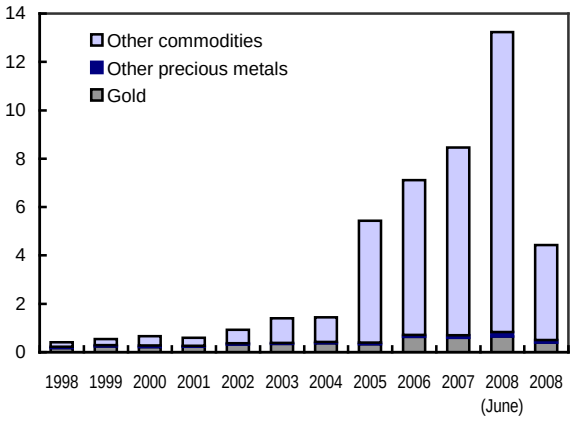


Source: BIS, *Quarterly Review*, September 2009, table 23B.

Figure 2

NOTIONAL AMOUNT OF OUTSTANDING OVER-THE-COUNTER COMMODITY DERIVATIVES, DECEMBER 1998–DECEMBER 2008

(Trillions of dollars)



Source: BIS, *Quarterly Review*, September 2009, table 22A.

Financial investors in commodity futures markets regard commodities as an asset class, comparable to equities, bonds, real estate, etc. They take positions in commodities as a group based on the risk-return properties of portfolios that contain commodity futures relative to those that are confined to traditional asset classes. This strategy supposes that commodities have a unique risk premium which is not replicable

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[4] Financial investors can gain exposure on commodity markets also through spot market activities (i.e. buying and accumulating physical commodities in inventories). This strategy mainly aims at hedging against inflation and it is usually confined to the relatively small markets for precious metals such as gold and silver. It is more difficult to pursue this physical market strategy for other commodities, especially because of the greater storage costs they entail.

[5] The Bank for International Settlements (BIS) is the only source that regularly provides publicly available information about OTC commodity trading. However, commodity-specific disaggregation is not possible with these data. 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.

by combining other asset classes, and that they form a fairly homogenous class which can be put together through a few representative positions (Scherer and He, 2008). Long-term empirical evidence in fact indicates that commodity futures contracts exhibit the same average return as investments in equities, but over the business cycle their return is negatively correlated with that on equities and bonds. Moreover, the returns on commodities are 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) traditionally have been relatively low (Gorton and Rouwenhorst, 2006).[6]

Contrary to equities and bonds, commodity futures contracts also have good hedging properties against inflation (i.e. their return is positively correlated with inflation). This is because commodity futures contracts represent a bet on commodity prices, such as those of energy and food products that 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. However, IMF (2008b: 63) shows that measured in a currency basket, commodity prices are generally less correlated with the dollar and the sign of the correlation is reversed. 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.

Two broad groups of financial investors on commodity exchanges may be distinguished according to differences in position taking motivation.[7] Money managers, such as commodity trade advisors and commodity pool operators who may operate hedge funds, have short-term investment horizons and take positions on both sides of the market. This enables them to earn positive returns in both rising and declining markets. Some money managers may conduct research on individual commodities and thus react to changes in commodity market fundamentals. But the great majority rely on computerized 'technical' tools, such as trend identification algorithm and investment rules (which may include various kinds of arbitrage trades). These technical tools may be calibrated to signals from commodity markets alone or also include signals from other asset markets. Computerized technical trading often automatically triggers changes in position taking and hence risks creating trends that the programmes then identify and follow. This can result in herd behaviour and price bubbles.

Money managers have been active on commodity exchanges for many years. However, it is likely that they changed their trading behaviour. Traditionally, they may have taken positions on commodity exchanges for strategic reasons with a view to diversifying their portfolios. But with the growing acceptance – including as a reaction to the influential study by Gorton and Rouwenhorst (2006) – of the notion that commodities as an asset class are a quasi natural hedge of positions on equity markets they may have given less priority to such diversification motives and concentrated on return considerations. Section V below will further discuss this potential change in position taking behaviour.

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[6] These salient features are based on data for periods in which few investors were actually following this strategy. Whether these features have prevailed also in more recent periods remains untested.

[7] Financial investors must be distinguished from traditional speculators. Traditional speculators have normally been the counterparties of producers and consumers of the physical commodities who use futures markets to offset price risk. Traditional speculators react to changes in commodity market fundamentals and mostly trade in only one or two commodities on which they have intimate knowledge. Hence, position taking by traditional speculator does not transmit signals from financial to commodity markets.

The presence on commodity exchanges of the second type of financial investors – index traders – is a relatively recent phenomenon. Index traders follow a passive investment strategy (i.e. they take no view on the performance of individual commodities). 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.[8] The investor purchases parts in a commodity index from the bank. 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] Index funds buy forward positions (often relating to futures contracts with a remaining maturity of about 75 working days, i.e. roughly three calendar months), which they sell as expiry approaches (at about 25 working days, i.e. roughly one calendar month, prior to expiry of the contract) and use the proceeds from this sale to buy forward positions again. This means that investors who own, say, the October crude oil contract will sell that contract and buy the December contract before delivery begins on the October contract. Then they will later "roll" from November into January, and so on. This process – known as "rolling" – gives rise to a roll yield which is positive when the prices of futures contracts are progressively lower in the distant delivery months (i.e. in a "backwardated" market) and negative when the prices of futures contracts with longer maturities are progressively higher (i.e. 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.

Two common indexes are the Standard & Poor's Goldman Sachs Commodity Index (S&P GSCI) and the Dow Jones-Union Bank of Switzerland Commodity Index (DJ-UBSCI) (previously called Dow Jones-American International Group Commodity Index, DJ-AIGCI).[11] These indexes are composites of futures contracts on a broad range of commodities (including energy products, agricultural products and metals) traded on commodity exchanges.

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[8] There are three basic types of instruments related to commodity indexes (United States Senate, 2009: 83–88). Commodity index swaps are the most common index instrument. Of relatively smaller importance are exchange-traded funds and exchange-traded notes that offer index-related shares for sale on a stock exchange.

[9] A long position is a market position that obligates the holder to take delivery (i.e., to buy a commodity). This contrasts 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. Open interest is the total number of futures contracts, long or short, in a market that has been entered into and not yet liquidated by an offsetting transaction or fulfilled by delivery.

[10] The roll yield can be positive independent of the term structure of futures contract when in the period during which index traders hold a contract the increase in spot prices is sufficiently high to fully compensate the contango.

[11] 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 primarily rely 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.

III. FINANCIAL INVESTMENT AND COMMODITY MARKET EFFICIENCY

Scepticism is often expressed with regard to the link between financial investment and commodity price developments. This scepticism is usually based on the efficient market hypothesis.[12] According to this view, 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 (e.g. when harvest forecasts or changes in oil production are announced), or when private information is incorporated in prices through transactions. When this is the case, the value of a futures contract will be an unbiased estimate of the spot price on the delivery date specified in the futures contract. Policymakers, especially central bankers, commonly base part of their decisions on this feature as they use the price of commodity futures contracts as a proxy for the market's expectations of future commodity spot prices (Svensson, 2005; Greenspan, 2004).

There are at least two reasons why the efficient market hypothesis may fail in relation to commodity markets, at least in the short run, so that the value of futures contracts will not serve this price discovery purpose.[13] First, changes in market positions may occur in response to factors other than information about market fundamentals. Second, individual market participants may make position changes that are so large relative to the size of the market that they move prices (the so-called "weight-of-money" effect). Significant impacts of these two factors will cause mechanisms that would prevent prices from moving away from levels determined by fundamental supply and demand factors – the efficient absorption of commodity-related information and sufficiently strong price elasticity of supply and demand – to be relatively weak on commodity markets.[14]

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[12] Another source of scepticism, which was widely discussed in the blogosphere in the first half of 2008, relates to an argument introduced by Krugman (2008) in relation to oil prices. According to this argument speculative activity that drives prices above fundamental equilibrium levels will cause market imbalances and excess supply, which eventually must result in inventory accumulation. Oil inventories had not increased, so that, according to this reasoning, speculation cannot have played a role in the 2008-oil-price hike. However, Khan (2009: 5) argues that data on oil inventories are notoriously poor (most non-OECD countries, which account for almost half of world demand for crude oil and include very large consumers such as China, do not report data on oil inventories, and oil stored in tankers distorts the inventory data reported by OECD countries) so that one should not draw strong inferences from such data. More generally, the short-run elasticity of commodity supply and demand is extremely low, so that only very sharp and lasting price changes can be expected to trigger significant supply and demand responses and related changes in inventories. Hence, the accumulation of inventories will occur only gradually and spot prices will overshoot during this process.

[13] The study by the United States Senate (2009) on the wheat market emphasizes a third mechanism, namely the lack of convergence between the price of wheat futures contracts and the price of wheat in the cash market. The study found "significant and persuasive" evidence that index traders were one of the major causes for this lack of price convergence upon contract expiration.

[14] As a result, futures prices are less accurate forecasts than simple alternative models such as a random walk without drift, i.e. expecting no change from current spot prices (see Alquist and Kilian, 2007, for such evidence related to oil prices). Bernanke (2008) also highlights the difficulty in obtaining a meaningful gauge for future commodity price movements from signals obtained from commodity futures markets and emphasizes the importance of finding alternative approaches to forecasting commodity market movements.

To examine how different sorts of information may influence market positions, it is useful to group market participants into three categories based on differences in their rationale for position taking: informed traders, uninformed traders and noise traders.[15]

Informed traders rely on information about current market fundamentals and on forecasts of future market conditions. On commodity markets, informed traders are those market participants who have an interest in the physical commodity (i.e. producers and consumers) and use commodity futures exchanges to hedge price risk, as well as traditional speculators that have usually been their counterparties in hedging. Both these types of traders have intimate knowledge of specific commodity markets and base their position taking on fundamentals. Informed traders, nonetheless, face two difficulties in assessing commodity market developments: (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; and (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 data on current global commodity supply and demand conditions are published with long time lags and are frequently revised. Therefore, informed traders must formulate price expectations on the basis of partial and uncertain data. This may lead them to focus on a small number of available signals, with the attendant risk of herding and copying the behaviour of others. Alternatively, it may cause traders to consider past price movements themselves as a good guide to future developments.

Noise traders trade for broader strategic reasons, and make position changes irrespective of prevailing conditions on commodity markets. On commodity markets, index traders and money managers that calibrate their technical tools to signals from other asset markets behave like noise traders: they change their total positions in commodities based on information relating to other asset markets but which has no relevance for commodity markets. In addition, index traders tend to change the composition of their positions in commodities in response to different price changes for different commodities with a view to maintaining a specific commodity's predetermined weight in a commodity index. It is difficult for other traders to judge whether market prices are changing because of the position changes of the noise traders or as a response to new information about market fundamentals.

Uninformed traders, who glean information on future price developments from current and past price movements, are particularly exposed to such situations. They follow what may be called "momentum strategies" – buying commodities that have experienced rising prices and selling those that have underperformed. Uninformed traders observe price movements but are unable to identify whether price changes were caused by informed or noise trading. Hence, they risk misinterpreting a noise trader's position change as a genuine price signal and, by incorporating this signal into their trading strategy, perpetuate the "informational" value of this signal across the market. Given that uninformed traders often use similar trend identification techniques, they run the risk of collectively generating the trends that they then individually identify and follow. On commodity markets, money managers who calibrate their trade identification algorithms and investment rules to signals from commodity markets are likely to behave like momentum traders.

One effect of momentum trading that uses statistical analysis tools for position taking is that the resulting changes in positions can be anticipated by other market participants. Thus it provides continued arbitrage possibilities. Informed traders, who know the fundamental value of a commodity, will try to benefit from such profit opportunities. Informed traders working for financial institutions will do this in order to meet

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[15] The following discussion is based on recent financial market models that show how speculators can affect prices beyond the very short term (Harrison and Kreps, 1978; De Long et al., 1990; Banerjee, 2009; Cao and Ou-Yang, 2009).

their institutions' short-term performance targets or reporting requirements, even if doing so implies going against signals from long-term fundamental supply and demand factors (de Long et al., 1990). This can lead to speculative bubbles. The same kind of snowball effect can be created by financial investors when they react to signals from other, non-commodity markets.

A second reason why the efficient market hypothesis may fail on commodity markets relates to the fact that the number of counterparties (especially those with an interest in physical commodities) and the size of their positions are less than perfectly price elastic. Thus, large orders may face short-term liquidity constraints and cause significant price shifts. This implies the possibility of a "weight-of-money" effect: position changes which are large relative to the size of the total market have a temporary, or even a persistent, price impact. As a result, market participants that take large positions can move prices. This possibility is particularly high in commodity markets where the short-run price elasticity of both production and consumption is very low, and hence the physical adjustment mechanisms of markets are weak. As a result, in tight markets with minimum inventory levels, the relevance of expectations based on longer-term fundamental factors sharply declines, which makes it difficult to determine a market price solely on the basis of fundamentals.

The weight-of-money effect relates primarily to index-based investment. Index-trader positions can be large relative to the size of the entire market, as shown below. One reason for their relatively large size relates to the fact that index traders take virtually only long positions and that they take positions across many commodities in proportions that depend only on the weighting formula of the particular index, independent of the specific market conditions for the individual commodities contained in the index. Hence, large positions taken by index traders implies a significant risk that the weight-of-money effect will exacerbate the price impact of trading in response to factors other than information about commodity market fundamentals. Moreover, informed traders who know that buy-side investment is dominated by index-based investment will demand a higher risk premium to engage in short positions with a view to compensating the risk that large index-based buying may push prices to ever higher levels. Both these mechanisms can cause speculative bubbles.

IV. POSITION TAKING OF DIFFERENT TYPES OF FINANCIAL INVESTORS

Making the analytical distinction between informed, uninformed and noise traders, discussed in the previous section, is straightforward in principle but in practice making this separation is not easy. The Commodity Futures Trading Commission (CFTC) – the institution mandated to regulate and oversee commodity futures trading in the United States – publishes trading positions in anonymous and summary form in its weekly *Commitments of Traders* (COT) reports. The CFTC classifies market participants as "commercial" if they are hedging an existing exposure, and as "non-commercial" if they are not.[16] The main purpose of these reports is to improve transparency about activity in futures markets. However, it is widely perceived that, as a consequence of the growing diversity of futures market participants and the greater complexity of their activities, the COT data may fail to fully represent such activity (CFTC, 2006a). This is because those hedging, and therefore defined as commercial market participants, have normally been considered as being those entities that use transactions in futures contract 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, such

[16] 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).

as commodity index traders. These dealers have no commercial interest in the physical commodities – they 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 started to issue a Supplementary Report with data on positions of commodity index traders (CITs) for 12 agricultural commodities (CFTC, 2006b).[17] The index trader positions include 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.

The remainder of this section examines: (i) the net long position of index traders; (ii) the net long positions of non-commercial traders excluding index traders; (iii) spread positions of non-commercial traders; and (iv) the size of individual financial positions.

A. Index traders

The data published in the COT Supplementary Report can be used to estimate the development of index-based positions in agricultural products on United States commodity exchanges. To prevent different price movements for different commodities from unduly influencing the results, the estimation is based on data on the number of contracts, and to better reflect its evolution over time it is expressed as index numbers. The estimation results suggest that the size of net long positions of index traders in agricultural products on United States commodity exchanges more than doubled between January 2006 and May 2008 (see figure 3).[18] Index trader positions recorded sharp rises in the first quarter of 2006 and between the fourth quarter of 2007 and the second quarter of 2008. They fell sharply in the third and fourth quarters of 2008 but, starting in March 2009, have rebounded to their levels of end-2006.

The question arises as to whether the above index for agricultural commodities is representative also of index trader positions in non-agricultural products. There are three main reasons why this may be the case. First, the weights of individual commodities in the commodity futures indexes change only slowly and marginally. Second, the data on total index-trader positions that CFTC (2008b: 36) reports on the basis of a questionnaire to which 34 swap dealers and index funds responded indicate that the weights of individual commodities in terms of notional value are indeed fairly stable; the weights of the 12 agricultural products on the basis of which the above index was calculated moved from 36.6 per cent in December

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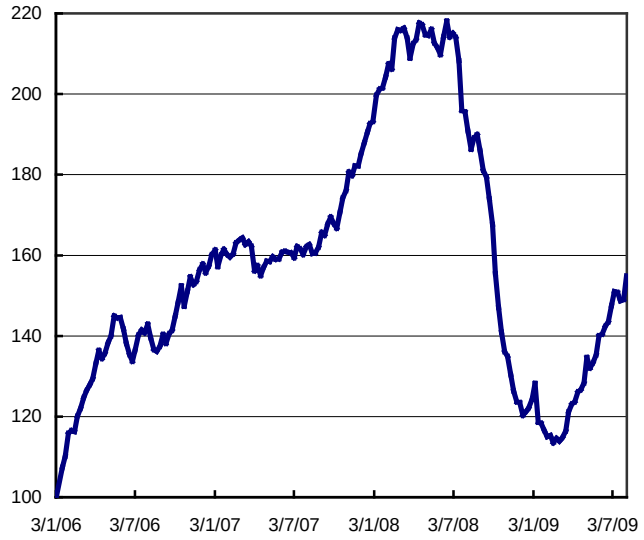
[17] These 12 commodities are: feeder cattle, live cattle, cocoa, coffee, cotton, lean hogs, maize, soybeans, soybean oil, sugar, Chicago wheat and Kansas wheat. The reports have so far not included similar data for energy and metals markets because *inter alia* many swap dealers in metals and energy futures contracts have physical activities on their own account so that it is difficult to separate hedging from speculative activities (CFTC, 2008b: 48–49).

[18] This estimation mainly follows the methodology used to calculate the 'Corazzolla index' in Gilbert (2009). However, the Corazzolla index maintains the individual product weights calculated for 3 January 2006 throughout the sample period. By contrast, for the estimation in this paper these weights are adjusted weekly for changes in the value of the futures contracts for the individual commodities and annually for changes in the weight of each of the 12 commodities in the S&P-GSCI and DJ-UBSCI. The annual re-weighting is based on the assumption that all index traders follow the energy-heavy S&P GSCI or the agriculture-heavy DJ-UBSCI, with an imposed fixed market share of 50 per cent each of the S&P GSCI and the DJ-UBSCI. These methodological differences change the estimation results for agricultural positions only marginally. But they are necessary to make similar estimations for those commodities that are not covered by the COT Supplementary Report (see below).

Figure 3

ESTIMATED NET LONG POSITIONS IN AGRICULTURAL PRODUCTS OF COMMODITY INDEX TRADERS ON UNITED STATES COMMODITY EXCHANGES, JANUARY 2006–AUGUST 2009

(Index numbers January 2006 = 100)



Source: Author's calculations based on data from Bloomberg, Goldman Sachs, Dow Jones Indexes, and CFTC.

2007 to 36.7 per cent in March 2008 and 36.1 per cent in June 2008.[19] Third, the development of index trader positions in crude oil calculated by Masters (2009: 13) closely resembles that of the index shown in figure 3.

An application of the estimated index to non-agricultural commodities that allows an assessment of index traders' market shares in terms of number of contracts (i.e. the variable that will be used in the econometric estimations below) requires an estimate of index trader positions at the beginning of the sample period (3 January 2006). This may be done by calculating the notional value of a futures contract on that date, combined with the assumption that all index traders follow the S&P GSCI or the DJ-UBSCI with an imposed fixed market share of 50 per cent each of the S&P GSCI and the DJ-UBSCI.

The results of this estimation for four non-agricultural commodities – copper, gold, natural gas and crude oil (West Texas Intermediate, WTI) – expressed as shares in total open interest is shown in figure 4. The figure also shows the same measure, based on actual data from the COT Supplementary Report, for four agricultural products (maize, soybeans, soybean oil, and wheat traded on the Chicago Board of Trade). The figure indicates that the importance of index positions in the open interest on United States commodity exchanges has been relatively stable, except for copper, but also that its size strongly diverges across commodities (figure 4). Index positions are particularly important in the copper (30–75 per cent) and wheat markets (35–50 per cent), account for about 15–30 per cent in the markets for crude oil, maize, soybeans and soybean oil, but are of comparatively low importance in the gold and natural gas markets (about 10 per cent).[20]

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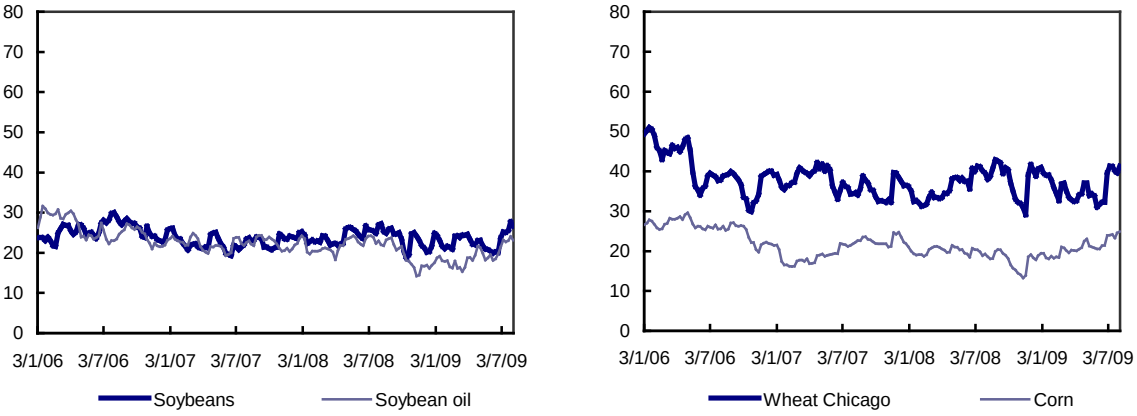
[19] The fact that the number of survey respondents remained unchanged over the sample period implies that the absence of significant changes in commodity weights may be taken as representative of total index trader positions. By contrast, the fact that the absolute size of these weights of agricultural products are close to that of agricultural products in the agriculture-heavy DJ-UBSCI, but more than double that in the, at least as important, S&P GSCI, indicates that the proportions of the data reported by CFTC (2008b: 36) cannot be taken as representative of index trader positions on United States commodity exchanges. Indeed, the data reported by CFTC (2008b) comprise more than index trader positions on commodity exchanges and also include exchange-traded funds and exchange-traded notes, which are traded on stock exchanges, as well as indirect investment through over-the-counter swap agreements with financial firms.

[20] It should be noted that these data refer only to United States commodity exchanges. For the copper market the London Metal Exchange (LME) is more important than the New York Mercantile Exchange (NYMEX) to which the data in figure 4b refer. Thus, the data indicated in figure 4b are likely to overestimate index trader investment in the copper market overall. However, this is of little importance in the present context because arbitrage between the LME and NYMEX markets is near perfect.

Figure 4a

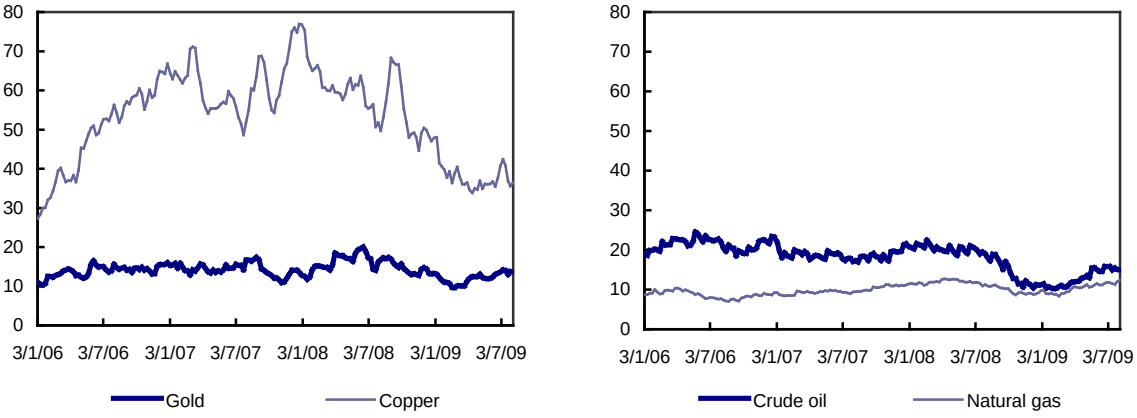
NET LONG POSITIONS OF INDEX TRADERS ON UNITED STATES COMMODITY EXCHANGES, PER CENT OF TOTAL OPEN INTEREST, SELECTED AGRICULTURAL COMMODITIES



Source: Author's calculations based on CFTC databases.

Figure 4b

ESTIMATED NET LONG POSITIONS OF INDEX TRADERS ON UNITED STATES COMMODITY EXCHANGES, PER CENT OF TOTAL OPEN INTEREST, SELECTED NON-AGRICULTURAL COMMODITIES



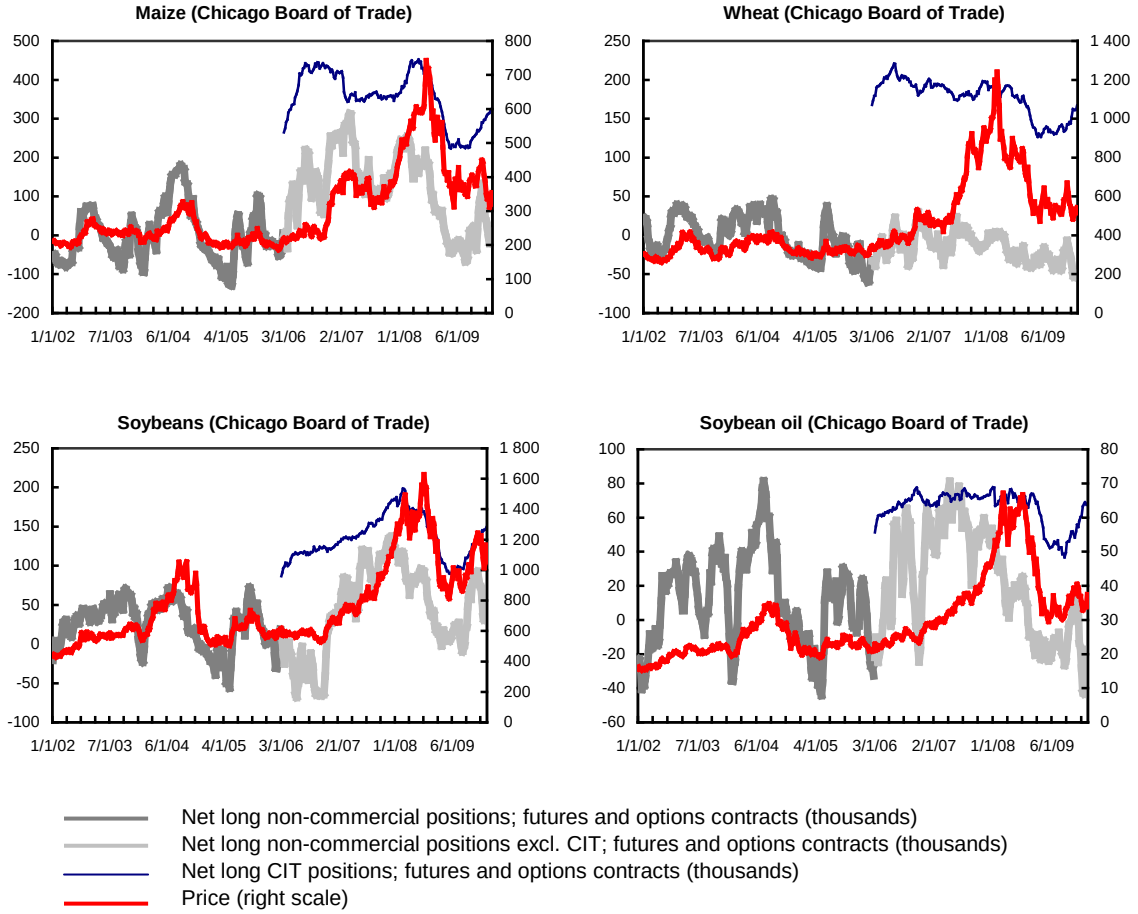
Source: Author's calculations based on CFTC databases.

B. Non-commercial traders excluding index traders

To gauge the importance of index-trader positions relative to those taken by other financial investors it is useful to compare the net long positions of index traders with those of non-commercial market participants. For agricultural commodities, the required data are readily available form the CFTC Supplementary Report. For non-agricultural commodities, the above estimation of index-trader positions needs to be complemented by an estimation regarding the share of index-trader positions included in the commercial trader category and that included in the non-commercial trader category. Assuming that the distribution of index-trader positions between the commercial and non-commercial trader categories is the same for agricultural and non-agricultural commodities, this may be done by calculating such a measure for agricultural commodities, weighted by their importance in index-trader positions, and applying this measure to the non-commercial positions that the CFTC reports for non-agricultural commodities.

Figure 5

FINANCIAL POSITIONS AND PRICES, SELECTED COMMODITIES, JANUARY 2002–JULY 2009



This calculation indicates that on average 85–90 per cent of index-trader positions are included in the commercial trader category.

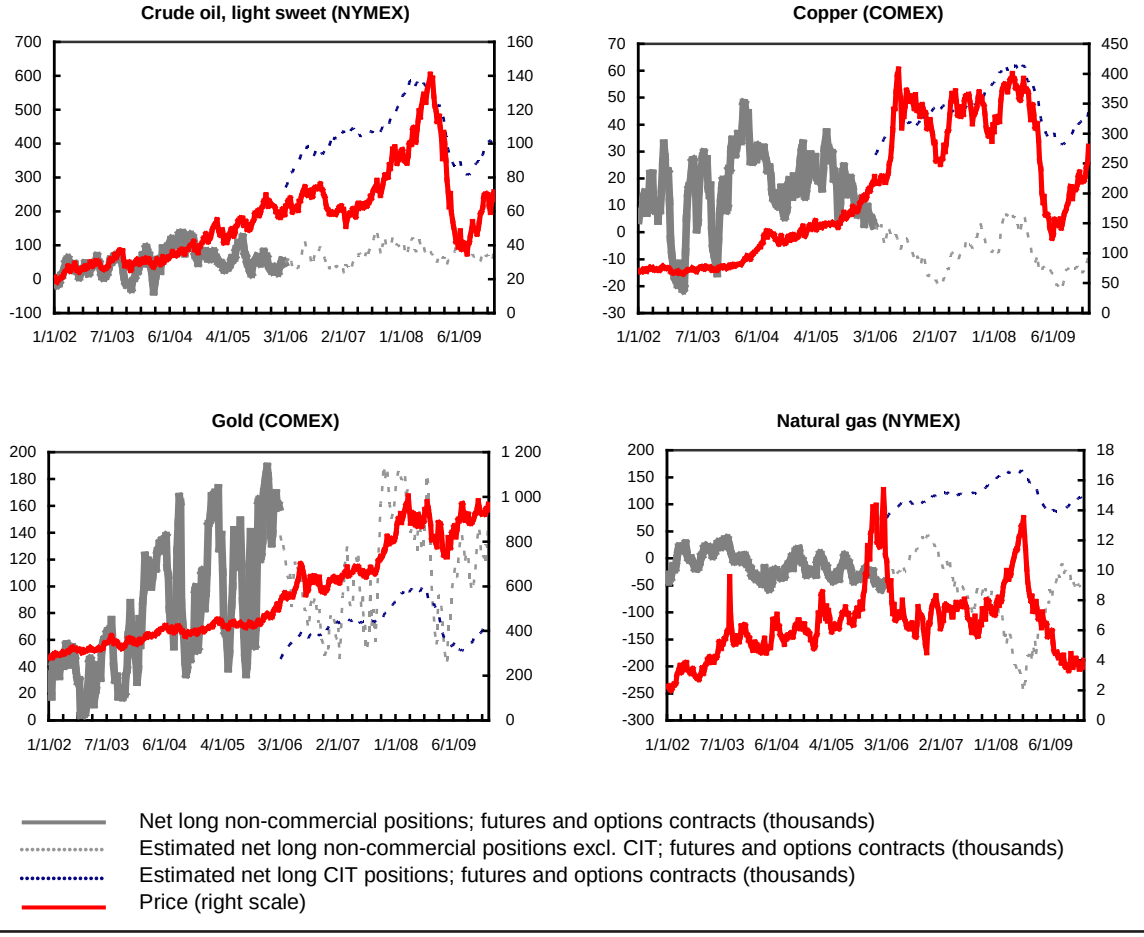
Figure 5 compares, for the period January 2006–July 2009, the net long positions taken by index traders with those taken by non-commercial traders excluding index traders for the four agricultural and the four non-agricultural commodities already considered above. It indicates that index-trader positions are significantly higher for all the selected commodities, except gold. The estimated relatively low importance of index trader positions on gold futures exchanges suggests that for precious metals financial investors may prefer acquiring commodities positions by buying and accumulating physical commodity in inventories.[21]

Figure 5 also shows, for the period January 2002–December 2005 (i.e. the period before index trader data become available), net long non-commercial positions for the eight commodities and compares, for the period January 2002–July 2009, the evolution of financial positions with that of commodity prices. This

[21] According to Barclays Capital (cited in Financial Times, 3 September 2009: 24), precious metals account for three fourths of exchange-trade products which, in turn, account for one third of managed commodity assets (which is only slightly less than index trading). Exchange-traded products are backed by physical inventories.

Figure 5 (concluded)

FINANCIAL POSITIONS AND PRICES, SELECTED COMMODITIES, JANUARY 2002–JULY 2009



Source: Author's calculations based on weekly data from Bloomberg and CFTC.
Note: CIT = commodity index traders.
Price refers to $/barrel for crude oil, cents/bushel for wheat, maize and soybeans, $/million British thermal unit (mmBtu) for natural gas and cents/lb for copper and soybean oil.

comparison provides only scant evidence of a correlation between position and price changes.[22] While there clearly are periods and commodities where positions and prices have moved together, especially during the recent downturn 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 non-commercial positions or index trader positions during the steep price increase from mid-2007 to the end of the first quarter of 2008. By contrast, during the same period there appears to have been a positive correlation between market positions and prices in the maize and soybean markets, while the evidence is mixed for the soybean oil, gold and natural gas markets.

For oil and copper, financial positions declined along with prices in the second half of 2008. Evidence for the earlier increases in copper prices is more mixed: net long positions by non-commercial traders

[22] The absence of any *systematic* difference in price developments between commodities that are traded on futures exchanges and those that are not is sometimes cited as further evidence for an absence of any significant impact of financial investors on price developments (ECB, 2008: 19).

excluding index traders declined during the period of the sharpest price increase – roughly from the beginning of 2004 through mid-2006 – but there appears to be a much closer correlation for the period early-2007–early-2008. For oil, positions by non-commercial traders excluding index traders exhibited strong volatility, even as oil prices rose almost continuously from the beginning of 2007 through the second quarter of 2008. By contrast, there appears to be a fairly close correlation between the estimated net long index-trader positions and oil price development over the entire period (January 2006–July 2009) for which such positions could be estimated.

Figure 5 also indicates that, since the beginning of 2009, there has been an increase in the net long positions of both index traders and non-commercial participants excluding index traders. This suggests that after the strong decline in their positions during the second half of 2008, both these groups are once again taking large positions on commodity markets.

While the evidence in figure 5 does not point to a long-standing correlation between position and price changes across the selected eight commodities, for most of them some correlation is present over sub-periods, as peaks and turning points seem to occur around the same time across the two series. This suggests that any analysis of a relationship between position and price changes may be sensitive to the choice of time period. This issue will be analysed more closely in section V below.

C. Spread positions of non-commercial traders

The above evidence on net long positions gives an incomplete picture of speculative activities by non-commercial traders. According to Alquist and Kilian (2007: 34) a "natural measure of the relative importance of speculative activities is the number of non-commercial spread positions expressed as a percentage of the reportable open interest positions". Holding spread positions in a specific commodity implies the purchase of a futures contract regarding one delivery month against the sale of a futures contract for another delivery month of the same commodity.[23] This means that spread positions can indicate overall speculative activity but, depending on how they are constructed, such positions may reflect speculation on rising or falling prices.

There has been a marked and sustained increase in the importance of non-commercial spread positions in energy markets, as well as in some agricultural markets (figure 6). In the crude oil market, spread positions started to increase sharply in late-2003 as well as in early-2005, and the percentage share of spread positions in total open interest has remained at historically high levels. In the natural gas market, spread positions increased in mid-2001 and this increase intensified in mid-2004. Between early-2006 and mid-2008, there was a strong and sustained increase in the importance of spread positions in the markets of the four agricultural commodities shown in the figure. For copper and gold, spread positions have been more volatile. As noted by Alquist and Kilian (2007), there have been other spikes in speculative activity in the past, but the recent increases in non-commercial spread positions are unprecedented over the past 20 years: between 2005 and 2008, the percentage shares in question doubled for oil, gas and soybean oil, and they increased four-fold for gold, copper, wheat, corn, and soybeans. This indicates substantial speculative behaviour in all these markets.

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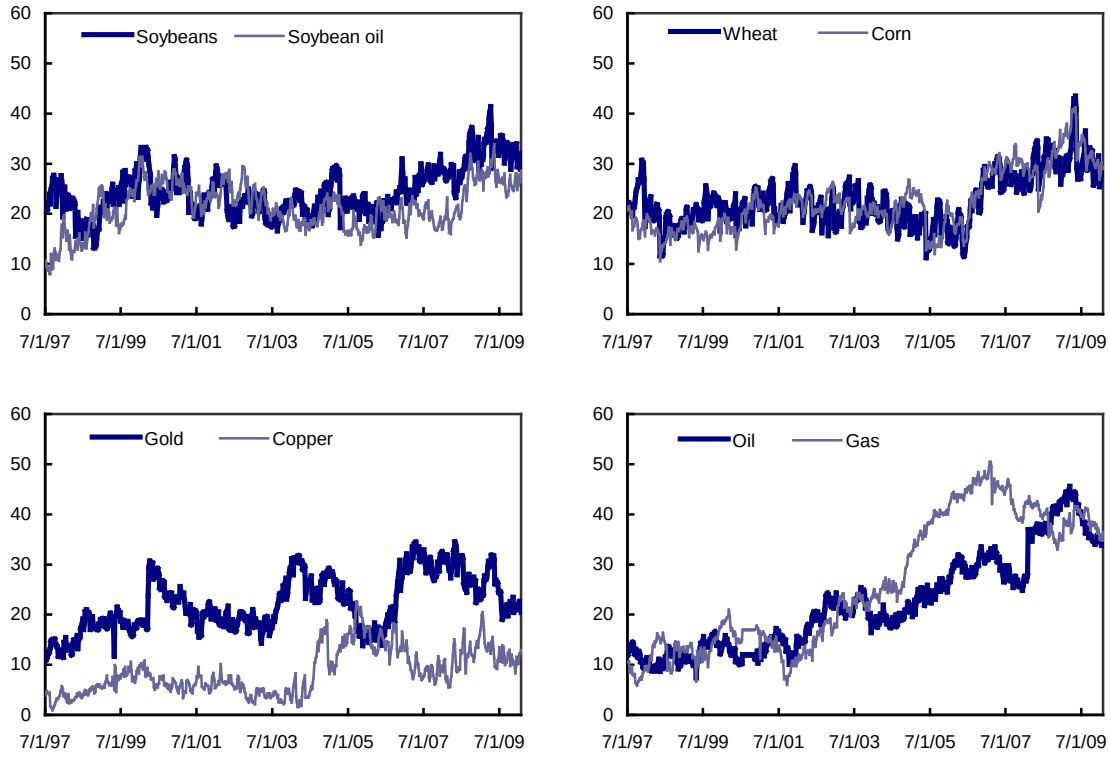
[23] This implies that taking spread positions is particularly important in markets with strong seasonality.

Figure 6

SHARE OF NON-COMMERCIAL SPREAD POSITIONS IN TOTAL OPEN INTEREST, SELECTED COMMODITIES, 1997–2009



Source: CFTC database.

D. The size of individual financial positions

A primary concern often expressed with respect to the financialization of commodity trading relates to the magnitude of index trader activity, combined with the fact that such traders tend to take only long positions. Table 1 provides evidence of the relative share of both long and short positions held by different trader categories in those agricultural markets for which the CFTC has been publishing disaggregated data for January 2006 onwards.[24] For each commodity, the data cover the 52-week period prior to the date when the price for the respective commodity reached its peak. They clearly show that index traders are present almost exclusively in long positions, and that they account for a large portion of the open interest in some food commodity markets. Indeed, over the periods covered by the data, the relative shares of index traders in total long positions in cotton, live cattle, feeder cattle, lean hogs, and wheat traded on the Chicago Board of Trade (CBOT) were significantly larger than the positions of commercial traders in those commodities, while they were roughly of equal size for maize, soybeans and wheat traded on the Kansas City Board of Trade (KCBOT).[25]

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[24] Using data on bank participation in futures markets, Sanders, Irwin and Merrin (2008: 9) show that index trader activity in grain markets started in 2003, and that the most rapid increase in trader positions occurred between early 2004 and mid-2005. Given that the CFTC's index trader data start only in 2006, they cannot reflect these events.

[25] UNCTAD (2009b: 64) shows evidence for the period 2006–2008 with qualitatively identical results.

Table 1

FUTURES AND OPTIONS MARKET POSITIONS, BY TRADER GROUP, SELECTED AGRICULTURAL COMMODITIES, AVERAGES FOR 52 WEEKS PRIOR TO PRICE PEAK DURING PERIOD JANUARY 2006–JULY 2009

(Per cent and number of contracts)

	Long positions							
	Percentage share in total positions				*Average position size*			*Speculative limits*
Commodity	*Non-commercial*	*Com-mercial*	*Index*	*Non-reporting*	*Non-commercial*	*Com-mercial*	*Index*	
Maize	42.5	24.7	22.5	10.4	1 225	1 632	16 069	22 000
Soybeans	45.6	19.4	23.5	11.5	749	1 088	6 566	10 000
Soybean oil	40.0	28.0	22.6	9.5	949	1 765	4 347	6 500
Wheat CBOT	41.2	12.0	39.0	7.9	612	866	**8 065**	6 500
Wheat KCBOT	37.3	24.5	22.0	16.2	746	684	1 994	6 500
Cotton	45.4	18.6	27.9	8.1	448	1 113	4 407	5 000
Live cattle	37.8	9.8	44.8	7.6	661	389	**5 380**	5 150
Feeder cattle	48.2	11.1	27.3	13.5	323	147	524	1 000
Lean hogs	36.6	10.1	43.2	10.1	474	1 045	**4 417**	4 100
	Short positions							
	Percentage share in total positions				*Average position size*			*Speculative limits*
Commodity	*Non-commercial*	*Com-mercial*	*Index*	*Non-reporting*	*Non-commercial*	*Com-mercial*	*Index*	
Maize	33.4	49.5	1.2	15.9	638	2 583	1 659	22 000
Soybeans	31.7	51.8	0.8	15.7	273	2 006	610	10 000
Soybean oil	24.1	69.7	0.8	5.4	423	3 755	631	6 500
Wheat CBOT	42.3	41.3	3.0	13.4	564	1 910	1 239	6 500
Wheat KCBOT	18.2	59.5	0.2	22.1	421	1 094	216	6 500
Cotton	36.5	58.6	1.0	4.0	326	3 348	658	5 000
Live cattle	34.3	45.0	0.8	19.9	498	968	383	5 150
Feeder cattle	34.4	20.2	1.5	44.0	166	159	222	1 000
Lean hogs	40.5	42.5	1.5	15.6	481	2 166	599	4 100

Source: CFTC and author's calculations; speculative limits from Sanders, Irwin and Merrin (2008: 25).
Note: Dates of price peaks are as follows: maize: 17 June 2008; soybeans: 4 March 2008; soybean oil: 4 March 2008; wheat CBOT: 11 March 2008; wheat KCBOT: 11 March 2008; cotton: 4 March 2008; live cattle: 2 September 2008; feeder cattle: 4 September 2008; lean hogs: 12 August 2008.

While the number of index traders is relatively small, their average long position is very large (middle panel of table 1), sometimes more than 10 times the size of an average long position held by either commercial or non-commercial traders. Positions of this order are likely to have sufficiently strong financial power to influence prices (Capuano, 2006). As a result, speculative bubbles may form and price changes can no longer be interpreted as reflecting fundamental supply and demand signals. All of this can have an

extremely detrimental effect on normal trading activities and market efficiency, despite position limits that exist to contain speculation.[26]

During the periods reflected in the table, index traders actually exceeded speculative position limits in wheat contracts on the CBOT, as well as in live cattle and lean hogs contracts, and for the other commodities they came much closer to these limits than did the other trader categories (right-hand panel of table 1). Exceeding speculative limits is perfectly legal for index traders, as they are generally classified as commercial traders, and therefore are not subject to speculative position limits set by the CFTC. But, as noted by Sanders, Irwin and Merrin (2008: 8), "it does provide some indirect evidence that speculators or investors are able to use … [existing] instruments and commercial hedge exemptions to surpass speculative limits".

V. THE IMPACT OF FINANCIALIZATION ON POSITION TAKING AND PRICE DEVELOPMENTS

A. The impact of return and diversification motives on position taking

This section provides an econometric estimation of the relationship between the activity of financial investors on commodity exchanges and possible motivating determinants. The objective of this examination is to obtain a general sense of the motivations that underlie financial investment. During the period 1997–2001, commodity price developments were relatively smooth and financial investments in commodity markets were low. Booms in commodity prices and financial investments started roughly in 2002, commodity prices and index trader investments sharply increased in 2007 and peaked roughly in mid-2008. This analysis therefore distinguishes three periods: January 1997–December 2001, January 2002–December 2006, and January 2007–June 2008.

Given that two types of financial investors with different motivating determinants have been active on commodity markets, the estimations are done on two different dependent variables: (i) the share of net long non-commercial positions in total open interest; and (ii) the share of net long CIT-positions in total open interest. The positions of some index traders are included in the positions reported for non-commercial traders, but available data do not allow subtracting these index trader positions from total non-commercial positions either for the non-agricultural commodities included in the analysis or for the agricultural commodities prior to 2006. However, this is likely to affect the results only marginally because, as already mentioned, data for the agricultural commodities and the period since January 2006 indicate that only about 10–15 per cent of index trader positions are from the non-commercial trader category.

The estimations are done for four agricultural products (maize, wheat, soybeans and soybean oil) and four non-agricultural products (copper, gold, crude oil and natural gas). Following Domanski and Heath (2007), the explanatory variables included in the analysis reflect motivations related to either return or diversification. Return motivations are captured by: (i) the percentage change in the price of the futures

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[26] Speculative position limits define the maximum position, either net long or net short, in one commodity futures (or options) contract, or in all futures (or options) contracts of one commodity combined, that may be held or controlled by one entity during different periods of trading. Speculative position limits are meant to reduce the likelihood that a single entity can obtain positions large enough to manipulate the market. The CFTC or the exchange on which the respective contract is traded can grant commercial entities with large merchandising needs a hedge exemption from these limits so that they can obtain futures markets position large enough to match their underlying physical commodity needs. The responsibility for enforcement of speculative position limits is shared between the CFTC and the futures exchanges. The CFTC establishes speculative position limits only on a limited group of agricultural commodities. For all other commodities, futures exchanges establish their own limits 'where necessary and appropriate' given certain statutory rules (for details, see CFTC, 2008b: 55–56).

Table 2

REGRESSION RESULTS: NON-COMMERCIAL POSITIONS

Dependent variable: share of net long non-commercial positions in total open interest

	Return	*Roll*	*Volatility*	*Interest*	*Correlation*	*Inflation*	*Dollar*	*Adjusted R^2*
Expected sign	+	+	+/-	-	-	+	+	
				January 1999–December 2001				
Gold	1.20***	50.08**	-7.79	14.16	-6.80	25.61***	-42.51	0.56
Copper	0.83***	-60.59***	-1.38	-4.51	-27.77	7.01	-2.00	0.64
Crude oil	0.02	-0.41	0.68**	1.59	-4.90**	5.41***	10.66	0.53
Natural gas	0.02	-0.86*	1.42	-0.63	4.18	7.16	13.72	0.30
Corn	0.41***	1.04	-2.38	2.90	7.15	6.73***	-36.93*	0.29
Wheat	0.13	3.24	-0.54	8.33**	22.00***	8.71***	-37.40**	0.17
Soybeans	0.41***	3.77	-1.70	2.39	-3.25	22.75***	42.44***	0.60
Soybean oil	0.25*	1.00	1.16	2.61	-13.02**	4.78	-5.15	0.13
				January 2002–December 2004				
Gold	0.60**	-13.91	-4.34	-14.08	-11.52*	-2.25	50.19	0.30
Copper	0.38	12.58**	-8.31***	-27.69**	-4.09	1.99	0.86	0.20
Crude oil	0.02	-3.12**	3.19***	-26.38***	8.03**	-6.63***	35.94***	0.53
Natural gas	0.05**	-1.76	-0.01	-4.34	2.31	-4.06**	18.44	0.40
Corn	0.66***	-0.53	-4.14**	6.92	32.73***	1.96	44.98	0.37
Wheat	0.74***	-1.12	10.10*	6.40	17.55*	-22.97***	30.67	0.36
Soybeans	-0.06	-3.04	-3.73***	-0.99	-24.55**	17.67***	39.66	0.58
Soybean oil	0.29	-2.12	-6.18***	31.35**	-6.01	39.53***	57.76	0.53
				January 2005–June 2008				
Gold	0.29*	21.57	1.64	8.60	-10.55	-10.04	-32.96	0.06
Copper	0.22***	-9.29***	-2.66***	-16.52***	7.42	16.27	35.14***	0.82
Crude oil	0.08**	1.92**	-1.24	3.00**	-1.28	6.08***	-21.79**	0.28
Natural gas	0.05***	-0.67***	-0.38	4.87*	-7.85	17.84***	-60.62***	0.69
Corn	0.05	-2.18***	-0.35	10.17***	3.24	-6.85	14.29**	0.67
Wheat	0.10	-1.57**	0.40	6.68**	5.46	-1.40	61.66**	0.39
Soybeans	0.18**	-1.05	4.84***	14.99***	1.85	-12.33	-15.72	0.71
Soybean oil	0.51*	-4.18***	2.69*	18.59***	13.02***	31.25**	-54.20*	0.45

Source: Author's calculations based on data from Bloomberg and CFTC.
Note: Results based on Newey-West standard errors and covariance (lag truncation=12).
*** Significant at the 1 per cent level.
** Significant at the 5 per cent level.
* Significant at the 10 per cent level.

contract for which delivery has started (*return*); (ii) the size of the roll return (*roll*), defined as twelve-month moving averages of the difference in the values of the first and the third futures contracts following that on which delivery has started, divided by the price of the first contract; (iii) volatility (*volatility*), defined as twelve-month moving averages of the standard deviation of monthly percentage changes in three-month futures prices; and (iv) the opportunity cost of investing in commodities (*interest*), defined as the three-month world interest rate (proxied by averaging the interest rates of Canada, Germany, Japan, Sweden, the United Kingdom and the United States). The expected sign of the coefficients on the variables *return* and *roll* is positive (greater investment is correlated with larger returns), negative for *interest* (a higher interest rate implies higher opportunity costs) and undetermined for *volatility* (higher volatility may improve returns but lowers risk-adjusted returns). Diversification motivations are captured

Table 3

REGRESSION RESULTS: INDEX-TRADER POSITIONS

Dependent variable: share of net long index-trader positions in total open interest

	Return	*Roll*	*Volatility*	*Interest*	*Correlation*	*Inflation*	*Dollar*	*Adjusted R^2*
Expected sign	+	+	+/-	-	-	+	+	
				January 2006–June 2008				
Gold	-0.02	-3.78	0.90**	-2.03	-5.03**	4.94*	10.23	0.51
Copper	-0.18*	5.41*	2.71***	14.40***	1.83	-8.99	44.50***	0.83
Crude oil	-0.05***	-0.64	2.53***	-1.28	2.65**	-1.74	13.33	0.50
Natural gas	0.00	0.19***	-0.08	-0.97	2.30**	-4.46***	7.19	0.83
Corn	0.07	1.58***	-1.26***	-2.55***	-1.24	12.37***	-24.25***	0.59
Wheat	-0.14***	0.77	0.56	-3.22***	1.90	-0.04	-47.66	0.45
Soybeans	-0.05***	1.62**	-0.75**	-0.30	0.06	7.64**	2.91	0.47
Soybean oil	-0.06**	4.80***	0.43***	2.10**	-0.53	2.68**	-19.36***	0.77

Source: Author's calculations based on data from Bloomberg and CFTC.
Note: Results based on Newey-West standard errors and covariance (lag truncation=12).
*** Significant at the 1 per cent level.
** Significant at the 5 per cent level.
* Significant at the 10 per cent level.

by: (i) the twelve-month moving average of the correlation between the variable *return* and the percentage change in the S&P 500 equity price index (*correlation*); (ii) expected inflation (*inflation*), defined as the difference between nominal and real 10-year United States bonds; and (iii) the dollar-euro exchange rate (*dollar*). The expected sign of the coefficient on *correlation* is negative (assuming that investors take commodity positions to diversify and hedge their positions in equity markets) and positive for *inflation* and *dollar* (assuming that investors hedge against inflation and a depreciation of the dollar exchange rate). The estimation uses monthly data (including the roll variable precludes the use of weekly data).[27] All independent variables are lagged once. Given that a variable definition based on moving averages implies an overlapping observation structure, the estimation is based on Newey-West adjusted standard errors and covariance.

A comparison of the results reported in tables 2 and 3 leads to two broad observations. First, return considerations are substantial determinants of position taking by both index traders and non-commercial traders. Index trader positions are strongly influenced by roll returns: the coefficient on the roll return variable is highly statistically significant for five of the eight commodities, always with the expected sign. By contrast, non-commercial trader positions are mainly determined by spot returns: the coefficient on the spot return variable is statistically significant for several of the eight commodities across the three sample periods, and it has the expected sign in the vast majority of the estimations. This finding reflects the difference in trading motivations between the two types of financial investors, with index traders emphasizing a passive long-only strategy in which rolling futures contracts from one month to another is a key characteristic, and non-commercial traders following a more active strategy with position taking on both sides of the market in which benefits from short-term price movements is a key determinant of profitability.

Second, diversification objectives appear to have given way to more speculative motives. For the first sample period (January 1999–December 2001), the results in table 2 are in line with those reported by Gorton and Rouwenhorst (2006) as the vast majority of the significant coefficients on *correlation* and

[27] The results reported for the third period in table 4 are robust to using net long non-commercial positions excluding index trader positions and the period January 2006–June 2008.

inflation have the expected sign. They indicate that non-commercial traders were taking commodity positions to hedge against adverse developments in equity markets and inflation rates. By contrast, for the third sample period (January 2005–June 2008), the results indicate that non-commercial traders were taking positions that were positively, rather than negatively, related to developments in equity markets and that they served as a hedge against dollar depreciation much less than in the first period.

Taken together the results indicate the importance of return motives for financial investors, as well as the rising importance of speculative position taking. But they also show that the two categories of financial investors follow different investment strategies. These results raise the question as to how changes in the scale and character of involvement of financial investors in commodity markets have affected the price dynamics of these markets. This will be the focus of the remainder of this section.

B. Financial position taking and commodity price developments

Granger causality tests have often been used to examine causal lead and lag dynamics between changes in the positions of financial investors on commodity futures exchanges and changes in commodity prices. Most existing studies that use such Granger-causality tests have not found evidence of a systematic impact on prices of positions taken by non-commercial traders. To the contrary, they have tended to find a statistically significant causal relationship between the movement of commodity futures prices and measures of position changes (see, e.g. IMF, 2008b).

The results of these studies suffer from a number of data problems, including the aggregation of trader positions across maturities, the fact that weekly data cannot identify very short-run effects even though intra-week, or even intra-day, trading activity may be significant, and, most importantly, the fact that they usually concentrate on non-commercial traders thereby ignoring the bulk of index trader positions. However, their most important shortcoming is that they do not distinguish between the effects of index traders and those of non-commercial traders excluding index traders.

Distinguishing between these two types of financial investors to examine causal lead and lag dynamics between position taking and price developments may be based on the Autoregressive Distributed Lag (ADL) model suggested by Gilbert (2008). Accordingly, the following equation was estimated:

$$r_t = \alpha_0 + \sum_{j=1}^{3} \alpha_j r_{t-j} + \sum_{j=1}^{3} \beta_j x_{t-j} + \sum_{j=1}^{3} \gamma_j z_{t-j} + \varepsilon_t \qquad (1)$$

where r_t is the weekly change in the price of the commodity's nearby futures contract, x_t is the weekly change in net long positions of index traders, z_t is the weekly change in the net long positions of non-commercial traders excluding index traders, and ε_t is an error term. The estimation was done for four agricultural commodities – maize, soybeans, soybean oil and wheat – and for the non-agricultural commodities – copper, natural gas, gold and crude oil – for which both the index trader positions and the positions of other non-commercial traders were estimated, as explained above. Three null hypotheses were tested for each of the 8 commodities:

(1) Index positions do not Granger-cause prices: $H_0^1 : \beta_1 = \beta_2 = \beta_3 = 0$

(2) Non-commercial positions excluding index positions do not Granger-cause prices:

$H_0^2 : \gamma_1 = \gamma_2 = \gamma_3 = 0$

(3) Index positions and non-commercial positions excluding index positions have identical effects on prices: $H_0^4 : \beta_j = \gamma_j$ (j=0,…,3)

The first null hypothesis was used to test also for reverse causality.

Table 4

GRANGER-CAUSALITY TESTS: COMMODITY PRICES AND FINANCIAL POSITIONS, JANUARY 2006–JUNE 2009

	Index positions do not Granger-cause prices	*Non-commercial positions excluding index positions do not Granger-cause prices*	*Index positions and non-commercial positions excluding index positions have identical effects on prices*	*Prices do not Granger-cause index positions*	*Prices do not Granger-cause non-commercial positions excluding index positions*
	$F_{3,169}$	$F_{3,169}$	$F_{3,169}$	$F_{3,172}$	$F_{3,172}$
Maize	1.22	1.13	1.70	1.42	0.40
Soybeans	3.27**	0.61	2.49*	1.50	0.07
Soybean oil	2.76**	0.08	2.57*	0.29	0.97
Wheat	0.65	0.53	0.21	0.33	0.30
Copper	2.54*	3.46**	0.12	0.37	0.86
Gold	1.91	0.95	1.89	5.30***	0.78
Natural gas	0.54	1.88	0.67	1.42	0.60
Crude oil	4.79***	2.08	5.28*	1.08	1.00

Source: Author's calculations based on data from Bloomberg and CFTC.
Note: *** Significant at the 1 per cent level.
** Significant at the 5 per cent level.
* Significant at the 10 per cent level.

Given the evidence from figure 5 above that the correlation between position and price changes may be stronger in some periods than in others, and the fact that index traders follow a long-only strategy and hence tend to exert upward pressure on prices, the Granger-causality tests were done for two periods: the first period starts in January 2006, when the index-trader data begin, and ends in June 2009, when commodity prices appear to have terminated their downward overshooting and started a relatively stable sideward movement; the second period spans the 52-week period prior to the price peak of the specific commodity.[28]

Regarding the entire period January 2006–June 2009, there is strong evidence that changes in the positions of index traders, as well as those of non-commercial traders excluding index traders, Granger cause commodity price changes (table 4). The results indicate that index traders cause changes in the prices for soybeans, soybean oil, copper and crude oil, while they suggest a causal impact of position changes by non-commercial traders excluding index traders only for copper. The results also show that the positions of the two types of financial investors have non-identical effects for prices in soybeans, soybean oil and crude oil. The tests on reverse causality reveal that it is only index position taking in gold that is affected by price development in a statistically significant way. This result is not surprising because, as already mentioned, financial investment in physical inventories (which is not reflected here) is much more important for precious metals such as gold than in other commodities. There is no indication for reverse causality between prices and the positions of non-commercial traders excluding index traders for any of the eight commodities.

[28] For the agricultural products the same dates as in table 3 were used, while the dates for the non-agricultural products are as follows: copper: 22 April 2008 (given that the absolute price peak of 23 May 2006 is too early in the sample period to allow for meaningful test results); gold: 18 March 2008; natural gas: 1 July 2008; crude oil: 1 July 2008.

Table 5

GRANGER-CAUSALITY TESTS: COMMODITY PRICES AND FINANCIAL POSITIONS, 52 WEEKS PRIOR TO PRICE PEAK DURING PERIOD JANUARY 2006–JUNE 2009

	Index positions do not Granger-cause prices	*Non-commercial positions excluding index positions do not Granger-cause prices*	*Index positions and non-commercial positions excluding index positions have identical effects on prices*	*Prices do not Granger-cause index positions*	*Prices do not Granger-cause non-commercial positions excluding index positions*
	$F_{3,42}$	$F_{3,42}$	$F_{3,42}$	$F_{3,45}$	$F_{3,45}$
Maize	3.59**	1.86	3.03**	1.29	0.58
Soybeans	2.46*	1.16	2.98**	0.57	0.90
Soybean oil	4.65***	2.46*	5.42***	0.15	1.26
Wheat	0.99	1.26	0.37	2.21*	1.07
Copper	0.86	3.28**	1.33	0.99	0.35
Gold	0.33	0.04	0.33	3.29**	0.17
Natural gas	1.16	1.91	1.22	1.47	0.23
Crude oil	0.33	2.70*	0.84	2.33*	1.42

Source: Author's calculations based on data from Bloomberg and CFTC.
Note: *** Significant at the 1 per cent level.
** Significant at the 5 per cent level.
* Significant at the 10 per cent level.

Taken together, these results suggest a significant impact of financial investment on price developments in a wide range of commodities over the past three and a half years. This significant impact of index trader positions on price developments, combined with the absence of reverse causality, and the fact that index traders do not take positions based on commodity market fundamentals, may also be interpreted as indicating that the efficient market hypothesis fails in relation to commodity markets.

Turning to the 52-week period prior to a commodity's price peak, overall the results indicate that index traders affected the prices of agricultural commodities, while non-commercial traders excluding index traders affected the prices of non-agricultural commodities, especially copper and crude oil (table 5). There is some evidence for reverse causality between prices and index trader positions for gold, but also for wheat and crude oil though the respective coefficients have a fairly low level of statistical significance.[29] Similarly to the results on the entire sample periods, the results in table 5 also suggest that the price effects of the two types of financial investors are not identical.

[29] With respect to crude oil, it could be argued that this reverse causality between spot prices and index trader positions is related to the term structure of futures contracts. The crude oil market was in contango for much of the period during which oil prices strongly increased. This implies that the roll return on crude oil futures contracts was negative unless a strong increase in the value of oil futures across all contract maturities occurred and that it was large enough to compensate for the contango in the term structure. This condition for earning positive returns might have led index traders to adopt a more careful attitude and pay greater attention to actual commodity price developments. This would also explain why the test results indicate a causal impact of index trader positions on oil prices during the entire sample period (when they supposedly followed their characteristic passive position taking strategy) but not during the period of the particularly sharp price increase (when they might have paid more attention to actual spot market developments).

The above results, nonetheless, are conservative estimates of the impact of financial investment on commodity price development. They cannot account for the impact of non-commercial traders' spread positions, given that the price impact of any spread position depends on the specific way how long and short positions are combined. As noted above, the share of spread positions in open interest has strongly increased particularly in energy markets, and it is likely that this increase has impacted price developments.

VI. CONCLUSIONS

The increasing importance of financial investment in commodity trading appears to have caused commodity futures exchanges to function in such a way that prices may deviate, at least in the short run, quite far from levels that would reliably reflect fundamental supply and demand factors. Financial investment weakens the traditional mechanisms that would prevent prices from moving away from levels determined by fundamental supply and demand factors – efficient absorption of information and physical adjustment of markets. This weakening increases the proneness of commodity prices to overshooting and heightens the risk of speculative bubbles occurring.

The main result of the empirical investigation in this paper is that a distinction needs to be made between the two types of financial investors in commodity exchanges (money managers and index traders) in order to account for their impact on commodity price developments. The positions of index traders appear to have affected the prices of a wide range of commodities over the past three and a half years, while those of non-commercial traders excluding index traders have tended to affect the prices mainly of non-agricultural commodities when their prices were increasing sharply. The increased positive relationship between financial investor positions on commodity futures exchanges and equity market developments, and the apparent decreased importance of hedging against dollar depreciation as a determinant of position taking, have created a greater interdependence between financial and commodity markets.

These effects of the financialization of commodity futures trading have made the functioning of commodity exchanges increasingly contentious. They risk reducing the participation of commercial users because commodity price risk hedging becomes more complex and expensive. They also cause greater uncertainty about the reliability of signals emanating from the commodity exchanges with respect to making storage decisions and managing the price risk of market positions. It has therefore become necessary to consider how the functioning of commodity futures exchanges could be improved so that they can continue to fulfil their role of providing reliable price signals to producers and consumers of primary commodities and contributing to a stable environment for development.

Regulatory changes designed to keep pace with commodity market developments, in particular the participation of new trader categories such as index funds, play a key role in this respect. It is indispensable to broaden and strengthen the supervisory and regulatory powers of mandated commodity market regulators. The ability of any regulator to understand what is moving prices and to intervene effectively depends upon its ability to understand the market and to collect the required data. Such data are currently not available, particularly for off-exchange derivatives trading. Yet such trading and trading on regulated commodity exchanges have become increasingly interdependent. Hence, comprehensive trading data need to be reported to enable regulators to monitor information about sizeable transactions, including in similar contracts traded over the counter that could have an impact on regulated futures markets. In addition to more comprehensive data, broader regulatory mandates might be required. Supervision and regulation of commodity futures markets may need to be enhanced, particularly with a view to enabling regulators to counter unwarranted impacts from off-exchange trading on commodity exchanges.

A substantial part of commodity futures trading is executed on exchanges located in the United States, which the Commodity Futures Trading Commission (CFTC) is mandated to regulate. It is therefore

encouraging to see that the new CFTC-chairman Gary Gensler (2009: 2–3) in his address to the United States Senate Subcommittee on Financial Services on 2 June 2009 recognized that we “experienced … an asset bubble in commodities” and “commodity index funds and other financial investors participated in the commodity asset bubble” and that the United States government has taken first legislatory action to address some of the problems that appear to have impaired the proper functioning of commodity futures exchanges.

REFERENCES

Alquist R and Kilian L (2007). What do we learn from the price of crude oil futures? Discussion Paper No. 6548. London, Centre for Economic Policy Research (CEPR).

Banerjee S (2009). Learning from prices and the dispersion in beliefs. Mimeo. Kellogg School of Management. Northwestern University, 31 July.

Bernanke B (2008). Outstanding issues in the analysis of inflation. Speech delivered at the Federal Reserve Bank of Boston's 53rd Annual Economic Conference. Chatham (Mass), 9 June.

Cao HH and Ou-Yang H (2009). Differences of opinion of public information and speculative trading in stocks and options. *Review of Financial Studies*, 22(1): 299–335.

Capuano C (2006). Strategic noise traders and liquidity pressure with a physically deliverable futures contract. *International Review of Economics and Finance*, 15(1): 1–14.

CFTC (2006a). Comprehensive Review of the Commitments of Traders Reporting Program. *Federal Register,* 71(119): 35627–35632.

CFTC (2006b). Commodities Futures Trading Commission Actions in Response to the "Comprehensive Review of the Commitments of Traders Reporting Program", 5 December. Available at: http://www.docstoc.com/docs/873643/Comprehensive-Review-of-the-Commitments-of-Traders-Reporting-Program.

CFTC (2007). Report on the oversight of trading on regulated futures exchanges and exempt commercial markets. Available at: http://www.cftc.gov/stellent/groups/public/@newsroom/documents/file/pr5403-07_ecmreport.pdf.

CFTC (2008a). *Interim Report on Crude Oil. Interagency Task Force on Commodity Markets*. Washington, DC, CFTC. Available at: http://www.cftc.gov/stellent/groups/public/@newsroom/documents/file/itfinterimreportoncrudeoil0708.pdf.

CFTC (2008b). *Staff Report on Commodity Swap Dealers & Index Traders with Commission Recommendations*. Washington, DC, CFTC. Available at: http://www.cftc.gov/stellent/groups/public/@newsroom/documents/file/cftcstaffreportonswapdealers09.pdf.

CFTC (2009). About the commitments of traders reports. Available at: http://www.cftc.gov/marketreports/commitmentsoftraders/cot_about.html.

De Long JB, Shleifer A, Summers LH and Waldmann RJ (1990). Noise Trader Risk in Financial Markets. *Journal of Political Economy*, 98(4): 703–738.

Domanski D and Heath A (2007). Financial investors and commodity markets. BIS Quarterly Review, March: 53–67.

ECB (2008). *Monthly Bulletin*, Frankfurt, European Central Bank, September.

Gensler G (2009). Testimony before the United States Senate Subcommittee on Financial Services and General Government, Committee on Appropriations. Available at: http://www.cftc.gov/stellent/groups/public/@newsroom/documents/speechand testimony/opagensler-2.pdf.

Gilbert CL (2008). How to understand high food prices. Mimeo. University of Trento and University of London, 17 November.

Gilbert CL (2009). How to understand high food prices. Mimeo. Paper prepared for the 2009 ICABR conference, Ravello, June.

Gorton G and Rouwenhorst KG (2006). Facts and fantasies about commodity futures. Working Paper No. 10595. National Bureau of Economic Research (NBER), March.

Gorton G, Hayashi F and Rouwenhorst KG (2007). The fundamentals of commodity futures returns. Working Paper No. 13249. National Bureau of Economic Research, July.

Greenspan A (2004). Oil. Remarks to the National Italian American Foundation. Washington, DC, 15 October. Available at: http://www.federalreserve.gov/boarddocs/speeches/2004/200410152/default.htm.

Harrison JM and Kreps DM (1978). Speculative investor behaviour in a stock market with heterogeneous expectations. Quarterly Journal of Economics, 92(2): 323–336.

IMF (2006). *World Economic Outlook*, Autumn. Washington, DC, International Monetary Fund.

IMF (2008a). *World Economic Outlook*, Autumn. Washington, DC, International Monetary Fund.

IMF (2008b). *Global Financial Stability Report*, Annex 1.2. Washington, DC, International Monetary Fund.

Khan MS (2009). *The 2008 oil price "bubble"*, Policy Brief 09/19. Peterson Institute for International Economics. Washington, DC, August.

Krugman P (2008). *The oil nonbubble*. New York times, 12 May.

Masters MW (2008). Testimony before the United States Senate Committee of Homeland Security and Government Affairs. Washington, DC, 20 May.

Masters MW (2009). Testimony before the Commodities Futures Trading Commission, 5 August.

Sanders DR, Irwin SH and Merrin RP (2008). The adequacy of speculation in agricultural futures markets: too much of a good thing? Marketing and Outlook Research Report 2008–02. Department of Agriculture and Consumer Economics. University of Illinois at Urbana-Champaign. Forthcoming in Review of Agricultural Economics.

Scherer B and He L (2008). The diversification benefits of commodity futures indexes: a mean-variance spanning test. In: Fabozzi FJ, Füss R and Kaiser DG, eds. *The Handbook of Commodity Investing*. Hoboken (NJ), Wiley: 241–265.

Svensson LEO (2005). Oil prices and ECB monetary policy. Princeton University. Mimeo. Available at: http://www.princeton.edu/svensson/papers/ep501.pdf.

UNCTAD (2009a). The Global Economic Crisis: Systemic Failures and Multilateral Remedies. United Nations publications, Sales No. E.09.II.D.4, New York and Geneva.

UNCTAD (2009b). *Trade and Development Report 2009*. United Nations publications, Sales No. E.09.II.D.16, New York and Geneva.

United States Senate (2009). *Excessive Speculation in the Wheat Market*. United States Senate Permanent Subcommittee on Investigations. Washington, DC, 24 June. http://levin.senate.gov/newsroom/supporting/2009/PSI.WheatSpeculation.062409.pdf.

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