

Heumesser, Christine; Staritz, Cornelia

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Financialisation and the microstructure of commodity markets: A qualitative investigation of trading strategies of financial investors and commercial traders

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WORKING PAPER 44

Financialisation and the microstructure of commodity markets - a qualitative investigation of trading strategies of financial investors and commercial traders

Christine Heumesser and Cornelia Staritz

ÖFSE – Austrian Research Foundation for International Development

OKTOBER 2013

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Austrian Research Foundation for International Development /
 Österreichische Forschungsstiftung für Internationale Entwicklung – ÖFSE
 A-1090 Vienna, Sensengasse 3
 Phone ++43 / 1 / 317 40 10 / Fax ++43 / 1 / 317 40 10-150
 Mail: office@oefse.at WEB: <http://www.oefse.at> <http://www.centrum3.at> <http://www.eza.at>

List of abbreviations

ADM	Archer Daniels Midland
BIS	Bank of International Settlements
CBOT	Chicago Board of Trade
CEA	US Commodity Exchange Act
CFMA	Commodity Futures Modernization Act
CFTC	US Commodity Futures Trading Commission
CIT	Supplemental Commodity Index Traders Report
CLN	Commodity Linked Notes
CME	Chicago Mercantile Exchange
COT	Commitment of Traders
CPO	Commodity Pool Operators
CSCE	Coffee, Sugar and Cocoa Exchange
CTA	Commodity Trading Advisors
DCOT	Disaggregated Commitments of Traders
DJ-UBSCI	Dow Jones-Union Bank of Switzerland Commodity Index
EMH	Efficient Market Hypothesis
ETFs	Exchange Traded Funds
ETPs	Exchange Traded Products
EU	European Union
FTT	Financial Transaction Tax
HFT	High Frequency Trading
HRW wheat	Hard Red Winter Wheat
ICE	Intercontinental Exchange
IMF	International Monetary Fund
IPE	International Petroleum Exchange
ISDA	International Swaps and Derivative Association
KCBT	Kansas City Board of Trade
LIC	Low-Income Country
LME	London Metal Exchange
MA	Moving Average
MAL	Long Term Moving Average
MAS	Short Term Moving Average
NYBOT	New York Board of Trade
NYCE	New York Commodity Exchange
NYMEX	New York Mercantile Exchange

NYSE	New York Stock Exchange
OTC	Over The Counter
S&P GSCI	Standard & Poor's Goldman Sachs Commodity Index
SAP	Structural Adjustment Programs
SRW wheat	Soft Red Winter Wheat
US	United States

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Abstract

The financialisation of commodity derivative markets, reflected in the increased presence of financial investors, and its effects on commodity prices and the fundamental roles of these markets, i.e. price discovery and price risk management for commercial traders, have been controversially discussed. This working paper provides an analysis of the microstructure of commodity derivative markets with a focus on the commodities coffee, cotton, wheat and aluminium. Two questions are in the center: firstly, how, in the context of financialisation, have the composition of traders and their trading strategies changed, and, secondly, how have the increasing presence and trading strategies of financial investors affected commercial traders, price discovery and hedging. The analysis builds on interviews with different types of market participants and relevant stakeholders. The paper finds that the increasing and often dominating role of financial investors has changed the microstructure of commodity derivative markets in terms of trading volumes and open interest positions, market participants, investment products and strategies, speed and complexity. The common classification of traders put forward by the US Commodity Trading Futures Commission seems to abstract too much from the reality in commodity markets given the multiple and interrelated roles of traders. Financial investors may have multiple roles, which include physical trading, and large commercial traders such as multinational trading houses typically pursue hedging and speculative trading strategies. Though financial investors are widely believed to increase the likelihood of excessive short term price fluctuations and commercial traders take into account their presence and strategies in their own trading behavior, they impact commercial traders in different ways. Large commercial traders seem not to be concerned about their increasing role or even perceive their presence as advantageous. But smaller commercial traders that do not have the resources and capacity to interact actively with derivative markets seem to find it more difficult to use markets for hedging given the increased complexity, speed and short-terminism and related higher risks and costs.

1. Introduction

In the last years, there has been extensive academic and political discussion on commodity prices. In the 1980s and 1990s, many commodity prices remained relatively low and stable. However, this changed in the early 2000s when prices of a range of commodities started to increase with price hikes in mid 2008 and 2011 and end 2012, alongside high volatilities. This has reignited interest in the drivers of commodity prices and the consequences for consumers, producers and governments in particular in low-income countries (LICs). Commodity price dynamics have crucial implications for LICs that are often affected on the import and export side through increasing import costs, volatile export revenues and macroeconomic impacts, i.e. on the balance of payments, public finances, inflation and exchange rates. As many LICs are net importers of basic commodities such as fuel and food, commodity price dynamics have direct effects on food and energy security, poverty and economic stability as has been most dramatically reflected in recent food crises. On the export side, commodity dependent LICs have benefited from rising revenues but the high price volatility has also highlighted their vulnerability and difficulties in managing their economies (FAO 2011; Nissanke 2011; von Braun/Tadesse 2012). Agriculture is the dominant sector in many LICs and farmers are often directly affected by global commodity price volatilities.

For several decades, international and national price stabilization mechanisms were in place to stabilize commodity prices and deal with commodity price volatility that has always been a major feature of commodity markets. After these mechanisms were largely dismantled in the 1980s (at the national level often in the context of Structural Adjustment Programs (SAPs) of the World Bank and the International Monetary Fund (IMF)), there was no consensus on how to deal with volatile commodity markets on the international level. Instead, a range of alternative mechanisms were put forward focusing not on international action but on market-based instruments (Nissanke 2011; Nissanke/Kuleshov 2012). Most prominently, commodity deriva-

tive markets have been promoted for price discovery and price risk management. Futures prices are typically used as a reference to price commodities on decentralized spot markets. They transmit information on global supply and demand conditions to producers and consumers, which typically base their production, investment or consumption decisions on these prices (Hernandez/Torero 2010; Peri et al. 2013). Hedging price risk on commodity derivative markets has been promoted as a central risk management tool in particular for producers and governments in LICs (World Bank 2011), even though it has been qualified as complex and only successful if embedded in a set of national policies (Dana et al. 2006). Both economic roles can only be fulfilled in an effective way if commodity derivative markets operate effectively and are linked to and reflect fundamental factors in price formation. Otherwise, physical commodity traders could neither rely any longer on price signals emanating from derivative markets for making informed decisions, nor use these markets for hedging price risks. Under such conditions, these markets would cease to perform their intended fundamental function.

In this context, the relative importance of different factors influencing commodity price formation, such as cyclical or structural changes in commodities' demand and supply fundamentals, macroeconomic developments and speculation has been discussed controversially.¹ Many of these recent discussions focus on whether the increased presence of financial investors that treat commodities as an asset class and link between commodity and financial markets, labelled as "financialisation" of commodity markets (Domanski/Heath 2007)², have had an impact on price developments. The constitution of the microstructure of commodity markets has been singled out as key to understanding the influence of these different factors on price formation (see e.g. Nissanke 2011; Mayer 2009; UNCTAD 2009b, 2011). Market microstructure research typically investigates the process by which traders' information and (buying or selling) actions are translated into contract volumes and prices; the different behavioral patterns of heterogeneous actors with different information, motives and trading strategies and their interactions; and their impacts on price dynamics and formation, market structure, and the fundamental roles of these markets (Madhavan 2002, 2000; O'Hara 1999; Nissanke 2011, 2012; Mayer 2009, 2012; UNCTAD 2009b, 2011).

The large part of recent analyses assessing the role of financial investors in commodity derivative markets is based on quantitative, often econometric, modeling approaches and relies on market description and data provided by the US Commodity Futures Trading Commission (CFTC) (for an overview see Ederer et al. 2013). Starting in the 1980s, the CFTC classified commodity traders as commercial traders that hedge their physical exposure, and non-commercial traders that take over the price exposure for a risk premium hoping to profit from changes in prices (CFTC 2013a). Since 2006, a more detailed categorization of commodity traders is provided by CFTC, differentiating between commercial traders that pursue hedging, index funds or swap dealers that mainly pursue passive long-only investment strategies, and money managers that pursue active trading strategies taking long and short positions. However, traders being part of these trader classes are not homogenous, their trading strategies are dynamic and interrelated (see sub-section 4.2. and 4.3.), leading to an increased complexity of commodity derivative trading (Meyer 2013). For instance, as is shown below, commercial traders are not only involved in hedging but also in arbitrage and speculation using the same type of trading systems as investment banks or hedge funds. Hence, the interrelatedness between different classes of traders and the complexity of commodity derivative markets related to the increasing link between commodity and financial markets have

¹ There have been major shifts on the fundamental side of many commodities. The following fundamental and macroeconomic factors are most widely cited: (i) the rapid growth in demand from fast growing emerging countries, (ii) alternative uses of agriculture commodities for energy production (biofuels), (iii) supply constraints, (iv) weather related supply shocks, also related to climate change, (v) low interest rates, and (vi) the depreciating US Dollar (for a discussion on these factors see Ederer et al. 2013).

² Financialisation can be described in its broadest sense as "the increasing role of financial motives, financial markets, financial actors and financial institutions in the operation of the domestic and international economies" (Epstein 2005: 3) or "the increased activity of non-financial business on financial markets" (Stockhammer 2004, 720); and "the rise of incomes from financial investment" (Stockhammer 2004: 720) (Kaltenbrunner et al. 2012).

increased (Meyer 2013; Büyükşahin/Robe 2012; Tang/Xiong 2010) which is not easily captured through CFTC data and quantitative approaches alone.

Hence, this paper aims to contribute to the literature on the microstructure of commodity derivative markets by investigating:

- i. the composition and trading strategies of different types of traders, i.e. financial investors and commercial traders, and how they have changed in the last decade; and
- ii. how the increasing presence and trading strategies of financial investors have affected commercial traders, the structure of commodity derivative markets, and their fundamental roles, i.e. price discovery and hedging of price risks.

Methodologically, the paper uses a qualitative interview-based approach but also relies on academic literature and a range of non-scientific documents, including articles in the financial press and traders' or stakeholders' blog entries. Our interview partners included commodity market participants, such as commercial traders, financial investors and brokers, and stakeholders from commodity exchanges, commodity organizations and associations, or research. The focus of the interviews was on four commodities traded on different exchanges: soft red winter (SRW) and hard red winter (HRW) wheat traded on the Chicago Board of Trade (CBOT) and the Kansas City Board of Trade (KCBT) respectively; coffee and cotton traded on the Intercontinental Exchange (ICE) in New York; and aluminium traded on the London Metal Exchange (LME). However, several interview partners, particularly financial investors, representatives of commodity exchanges, financial market experts and some commodity market experts, talked more generally about developments on commodity derivative markets and not specifically about the four commodities. Also, related literature, articles and blog entries often cover commodity derivative markets more generally. Hence, our analysis and findings throughout the paper are often more general, related to the overall functioning of and developments on commodity derivative markets; where they refer specifically to one of the four commodities this is explicitly stated.

The interviews had two objectives: (i) to get an insight into and understanding of trading strategies and recent changes of the microstructure of commodity derivative markets; and, (ii) to get an overview of the views of different types of traders on the impacts of these changes, particularly the increasing importance of financial investors and their trading strategies, on commodity prices and the functioning of commodity derivative markets. Hence, the interviews have an explorative and a judgemental function. We thus conducted explorative expert interviews, which are seen as a way to collect subjective data rather than objective representative facts with the aim to explore a rather unknown field of knowledge (Mieg 2005; Honer 1994). Hence, the interviews were not intended to be representative but were designed as a qualitative enquiry. Separate guideline questionnaires were developed for commercial traders, financial investors, and stakeholders, which were however adapted during the interview according to the specific expertise of the interviewee (for the basis version see Appendix 1). The interviews took on average one hour. The interviews took place from October 2012 to March 2013 in London, New York, Washington DC, and Vienna and via telephone or Skype. Overall, 49 interviews were conducted, which are classified as commercial traders (15), financial investors including banks, hedge funds and commodity trading advisors (CTAs) (10), brokers (3), representatives of commodity exchanges (3), commodity market experts including representatives of commodity organizations and associations, analysts, researchers and consultants (16), and financial market experts (2) (for an overview see Appendix 2).

The paper is structured in four sections. The next section gives an overview of the literature on microstructure related to behavioural finance and its role in explaining price formation and developments on financial markets in general. Section 3 discusses the specificities of commodity derivative markets, their roles and functions, and the different types of traders with a focus on the increasing importance of financial investors since the early 2000s. Section 4, the central part of the paper, assesses the trading strategies of different types of traders in

commodity derivative markets and investigates the impact of financial investors and their trading strategies on commercial traders and the fundamental functions of these markets. It focuses on index investors, money managers, the new type of “physical market financial investors” (particularly relevant for storable metals, including aluminium) and commercial traders. In assessing trading strategies (sub-sections 4.2 and 4.3), we rely on findings of the explorative interviews in addition to academic literature and non-scientific documents. The assessment of impacts on the fundamental functions and commercial traders is largely based on judgments and views of different types of traders interviewed but also complemented by literature and documents (sub-section 4.4). In section 4, we also discuss the technical, institutional and regulatory context of commodity trading (sub-section 4.1). The last section concludes.

2. Microstructure of financial markets

The role of speculators in financial markets has for long been a source of interest and controversy. There is a large literature related to behavioural finance on the microstructure of financial markets and its impact on prices and the functioning of these markets. Market microstructure research has in particular focused on three aspects: price discovery and price formation, i.e. looking inside the “black box” by which supply and demand translate into prices on financial markets; market structure and design, i.e. how various rules and regulations affect this “black box”; and information and market transparency, i.e. how knowledge of the working of the “black box” affects traders’ behavior (Madhavan 2002). Also the normative dimension of markets’ microstructure, i.e. how market design should look like, how transparent markets should be, or whether all orders should be treated the same way, are of importance (O’Hara 1999). In this respect, the behavior, motives and trading strategies of heterogeneous actors and their interactions, and the impacts on price dynamics and formation and on market structure are in the center of the analysis (Nissanke 2011, 2012; Mayer 2009, 2012; UNCTAD 2009b, 2011). Microstructure research often employs quantitative modeling to assess traders’ behavior and its consequences (O’Hara 1999). Such models have been developed for and applied to a variety of markets, including money markets, asset markets and most importantly foreign exchange markets; however only to a very limited extent to commodity derivative markets.³ In contrast, econometric estimations have been extensively employed to investigate the effect of financial investors on commodity prices, in particular for agricultural commodities and crude oil (for an overview see Ederer et al. 2013).

Concerning the microstructure of commodity derivative markets and financial markets more generally, there are broadly two main hypotheses on the behaviour of traders and the functioning of markets that are also captured in the different types of quantitative models: the efficient market hypothesis (EMH) that sees speculators generally as stabilizing and the noise trader hypothesis (which is also labelled bull-and-bear hypothesis by Schulmeister (2009, 2012)) that states that speculators can also have de-stabilising effects. While both hypotheses state the important role of information flows and the impact of fundamental factors and macroeconomic developments on commodity prices they differ in their views regarding the potential additional impact of speculators and their trading strategies on influencing and accelerating price movements and volatility.

The EMH (Fama 1965, 1970; Friedman 1953) assumes that financial market prices are determined almost exclusively by fundamental factors as traders build their expectations according to the future development of fundamentals. Markets are assumed to be generally efficient in absorbing and processing instantaneously information regarding market funda-

³ Shiller (1984) estimated such a model for the money market. Schleifer and Summers (1990) and deLong et al. (1990) developed influential models of asset markets in which different types of traders, including rational fundamental and irrational noise traders, affect prices. The approach has, however, been most widely adapted to model the foreign exchange market (see among others De Grauwe et al. 1993; De Grauwe/Grimaldi 2006; Hommes 2006; Menkhoff et al. 2009; Jeanna/Ross 2002). Only few models have been developed for commodity futures markets (e.g. Redrado et al. 2008; Reitz/Slopek 2008; Ter Ellen/Zwinkels 2010; Vansteenkiste 2011).

mentals. If there is competition on the market “on the average the full effects of new information on intrinsic values will be reflected nearly instantaneously in actual prices” (Fama 1965: 39). Market participants are expected to act rationally, evaluate assets according to fundamentals, and update their price expectations independently based on publicly (e.g. public announcements on harvest forecasts or changes in oil production) and privately available information. Thus, the current price reflects all information available at a certain point in time, such that gaining profits by merely predicting prices is unlikely. According to this hypothesis, prices follow a random walk as the arrival of new information is random and unpredictable.⁴ Due to the predominance of rational market participants, uninformed speculation cannot distort prices in any systematic and/or persistent way. If uninformed speculation drives market prices away from fundamentally-determined levels, informed speculators will take advantage of the profitable trading opportunity with the result that prices will return to their fundamental values (Clarke et al. 2001).

The EMH has been challenged by theories of noise trading, herd behaviour and speculative bubbles. This contrasting view can be labelled as noise trader or bull-and-bear hypothesis. It states that, apart from fundamental factors, speculation can exert a substantial influence on commodity prices as price dynamics are driven by the expectations of heterogeneous, not fully rational traders. There are different agents active in financial markets with different beliefs, motives and strategies, and their interaction determines price formation. Traders can be roughly classified in informed traders that are interested in physical markets as well as noise traders and uninformed traders whose trading strategies are not based on fundamentals.⁵ The latter may respond to factors other than information on fundamentals and/or may misinterpret certain information as genuine price signals. By incorporating these signals from other asset markets or past prices into their trading strategy, they perpetuate the “informational” value of these signals across the market (UNCTAD 2009b: 61). Given that traders often use similar trend-following trading techniques, this can lead to herd behaviour⁶, i.e. when traders act following the actions of a larger group rather than acting independently based on the information available to them, collectively generating “the trends that they individually identify and follow” (UNCTAD 2009b: 61). In this context, acting against the trend, even if justified by information on fundamentals, can be irrational and even informed traders may revise their trading strategies based on the behavior of noise and uninformed traders leading to complex interrelations among different types of traders (Keynes 1936; UNCTAD 2011).⁷ Thus, noise and uninformed trading combined with herd behaviour can increase short-term price volatility and lead to an overshooting of prices, causing prices to move in a sequence of long-term upward trends (bull markets) and downward trends (bear markets) (Schulmeister 2009, 2012). Whether financial markets function efficiently and prices are based on fundamentals

⁴ The EMH comes in three forms (Clarke et al. 2001): The weak form of the EMH states that current prices fully incorporate information contained in the past history of prices only. The idea is that past prices are arguably the most public and most easily available information. The semi-strong form of the EMH states that current prices fully incorporate all publicly available information, which includes past prices but also other forms of possibly relevant information on fundamental or macroeconomic factors. The strong form of the EMH states that current prices incorporate all existing public and private information. This implies that no one should be able to generate profits even if trading on non-public information.

⁵ UNCTAD (2009b) classified index investors as noise traders as they take positions in relation to the development of other asset markets as part of investors’ portfolio allocations (also money managers that calibrate their trading strategies to signals from other markets are classified as noise traders), and money managers as uninformed traders as they typically apply trend-following technical trading techniques reacting to past price movements unable to identify if they are based on fundamentals or noise.

⁶ Different types of herding can be identified (UNCTAD 2011): Irrational herding conveys no new information to the market as it acts on beliefs or sentiments which are not justified by fundamentals. Rational herding behavior can be classified into spurious herding – where traders facing similar decision making problems and information sets take similar decisions – and intentional herding. The motives behind intentional herding may be conformity-based, reputation-based, compensation-based or information-based. Information-based herding describes a situation where agents feel incompletely informed and believe they can enrich their information by observing and imitating the behavior of other agents (UNCTAD 2011). The first three herding motives may be related to asset managers’ pressure to deliver performance which is often a relative concept in finance as fund performance is compared with respect to a benchmark index or with other rival funds. Given risk aversion, many asset managers prefer to remain close to the benchmark rather than trying to beat the market which could also result in underperforming it (Bicchetti/Maystre 2012).

⁷ As described by Keynes “beauty contest”, in such a context it is rational to trade by trying to outguess market sentiments and moving ahead of the herd by “anticipating what average opinion thinks average opinion to be” (Keynes 1936: 156).

depend therefore on their microstructure, i.e. whether markets are dominated by “rational” informed traders acting on market fundamentals or by “irrational” noise and uninformed traders.

Two further hypotheses that relate to the noise trader/bull-and-bear hypothesis have been put forward in the context of the increasing presence of financial investors on commodity derivative markets – the “weight of money hypothesis” and the “excess co-movement hypothesis”. The weight of money hypothesis (Mayer 2009; UNCTAD 2009b, 2011) is stated in the context of the increasing importance of index investors that generally take very large positions on one side of the market. It argues that individual market participants may make position changes that are so large relative to the size of the market that they move prices temporarily or even persistently. This is particularly relevant in commodity futures markets as some may not be sufficiently liquid to absorb large order flows (Gilbert/Pfuderer 2012; Irwin/Sanders 2012). The number of counterparties in commodity futures markets (especially those with an interest in physical commodities) and the size of their positions are less than perfectly price elastic. In this context, large orders may face short-term liquidity constraints and cause significant price shifts.

The “excess co-movement hypothesis” (Pindyck/Rotemberg 1990) investigates the co-movement of different commodity prices as well as the co-movement of commodity and other financial asset prices. The hypothesis asks whether the co-movement in commodity prices can be explained in terms of demand-supply relationships in physical markets that are subject to common macroeconomic developments (i.e. current or expected changes in aggregate demand and/or supply, interest rates, inflation, exchange rates). Co-movements can be excessive if they are above what can be explained by such common fundamental and macroeconomic developments. Additionally, co-movements of commodity and financial asset prices have become relevant. Traditionally, investments into commodities were seen as a possibility to diversify portfolios given the low or negative correlation of commodity prices with returns of traditional assets such as stocks and bonds (Gorton/Rouwenhorst 2006). More recently, however, this negative correlation between commodity and financial asset returns has not been confirmed (Basu/Gavin 2011). Amongst other factors, the increasing influence of financial investors have been suggested to influence this co-movement as they hold commodity derivatives as part of their investment portfolio using similar trading strategies. The consequences include that commodity prices are increasingly exposed to swings in sentiments in financial asset markets in general and influenced by market liquidity cycles in global finance (Nissanke 2011; Mayer 2009; for an overview of empirical tests of the co-movement hypothesis see Ederer et al. 2013).

3. Specificities of commodity derivative markets

3.1. Functions of commodity derivative markets

Commodities are traded on commodity spot and derivative markets. On spot markets physical commodities with immediate delivery are traded by actual producers and consumers. Commodity derivatives are traded on exchanges (also called futures markets) or over the counter (OTC) and give holders the right (“options”) or the obligation (“forwards” or “futures”) to trade a physical commodity in the future at a given price. Futures contracts are standardized as the quantity, quality, maturity date and delivery location are spelled out. They can be bought and sold on exchanges without the ultimate buyer and seller having any direct connection. Exchange trading goes through a clearing house which demands certain transparency and security requirements. A large proportion of commodity derivatives are however traded OTC which means that they are traded bilaterally between parties outside of exchanges. These transactions are neither standardized nor regulated which provides flexibility but also risks as there is no instance that guarantees payment (TheCityUK 2011; Basu/Gavin 2011). Besides regulated futures markets and bilateral OTC trading there exist trading platforms, which are either offered by exchanges themselves or by investment firms or market

operators (Vander Stichele 2012). The network of, and consequently competition between, exchanges and trading platforms offers market participants a range of execution options and have become an important source of profits for their providers (Haldane 2011). Usually, traders on derivative markets do not physically receive commodities as contracts are either written this way (cash settled contracts as opposed to delivery settled contracts) or contracts are cancelled out by purchasing the opposite contract close to or on expiry date. Typically, only 2 % of futures contracts result in the delivery of physical commodities (FAO 2010). Hence, the profit or loss of the traders (apart from fees) arises from the price difference when the contract is made and the market price when it is due.

Commodity futures markets provide two important functions to stakeholders participating in spot markets – price discovery and hedging of price risks. Firstly, trading on futures markets enables the open market discovery of prices. Spot markets of commodities are often geographically dispersed because commodities are bulky and costly to transport and the prices in these markets can vary substantially. Centralized futures markets are widely accepted as an indicator for overall supply and demand conditions across spot markets and are used as benchmarks for spot transactions (Masters/White 2008). This mechanism reduces price asymmetries and benefits commodity producers and consumers who are disconnected from markets and may receive sub-optimal price offers from better informed trading partners. It also conveys a more accurate understanding of market supply and demand conditions. For instance, the futures price can help producers to determine the optimal time to deliver goods, which can translate into a reduction of intra-seasonal price volatility. The futures price for the coming season may guide production and investment decisions and thus reduce inter-seasonal price fluctuations (UNCTAD 2009a). In grain and energy markets, spot market participants price nearly all spot market transactions at the futures price plus or minus a local basis or differential that typically reflects the product's grade, quality, location and cost of transportation, and bargaining power. For example, the grain futures prices quoted by the Chicago Mercantile Exchange (CME), the world's largest exchange of agricultural commodity derivatives, tend to be incorporated directly into grain trade contracts all over the world. For coffee, a trader describes pricing as follows: „The futures price is the determinant all along the chain. It feeds right down through because at any point on any given day there is not going to be anyone who is able to put a price that is drastically much higher or lower than anyone who is basing themselves on the futures market.” (statement of a coffee trader, c.f. Bargawi/Newman 2009, 12).⁸

Secondly, commodity futures markets enable spot market participants to hedge against the risk of price fluctuations in spot markets making incomes reliable which is particular important as commodity prices tend to be very volatile.⁹ Hedging means that a physical trader of a commodity takes the opposite position to its physical position on derivative markets.¹⁰ For example, a producer would sell futures contracts in contrast to its spot market position where he/she is holding the commodity to secure against falling prices. A processor would buy futures contracts to secure against increasing prices. Hence, if the price of the commodity should develop in an unfavorable direction, the loss at the spot market can be captured by the gain in the derivative market. Alternatively, spot market participants can also buy options which give the holder the opportunity (but not the obligation) to buy or sell a physical com-

⁸ Concerning crude oil, Platts, the leading pricing service for the energy industry, describes the pricing mechanism this way: “In the spot market (...) negotiations for physical oils will typically use NYMEX as a reference point, with bids/offers and deals expressed as a differential to the futures price.” (UNCTAD 2011) The International Cocoa Organization (ICCO 2010) states: “(Futures) markets for cocoa in London and New York play a vital role in the formation of prices for physical cocoa throughout the world. Indeed, in this respect, London and New York function as the benchmark for prices paid.”

⁹ High price volatility is related to specific characteristics of commodities. Although the particular reasons for commodity price volatility differ by commodity, one important common factor is low short-run elasticities of supply and demand which means that any shock in production or consumption (that are frequent for many physical commodities) translates into significant price fluctuations as demand and supply cannot adjust quickly. For example for agriculture commodities, adverse weather conditions and pests can lead to a crop shortfall that can push up prices if the shortfall cannot be absorbed by inventories as the short-term demand elasticities are low and no supply adjustment is possible (UNCTAD 2009b).

¹⁰ Commercial traders can engage in hedging at exchanges by direct membership of an exchange or through an exchange-accredited broker or they can pursue multilateral transactions on trading platforms or bilateral OTC transactions.

modity in the future at a specific price and within a specific period of time regardless of the market price (CFTC 2013d). The advantage of options versus futures contracts is that they do not require an adjustable margin fee. For futures, a deposit has to be paid to the clearing house in advance to cover the risk the trader has taken on through this contract (the so-called initial margin). Every day after closing, the value of each trader's position is calculated (i.e. "marking to market"); if the trader's balance falls below the deposit a margin call is issued, i.e. a request by the clearing house or broker to pay extra funds (the so-called variation margin or margin call; CFTC 2013d). This requires permanent access to funds, in particular in volatile markets, which is often difficult in particular for smaller commercial traders. A disadvantage of options contracts on the other side is their substantially higher price in the form of an option premium compared to futures. Commercial traders can also hedge on OTC markets with the advantage of being able to trade highly customized contracts tailored to the need of the trader and lower margin requirements. The disadvantage is the higher counterparty risk as there is no clearing and limited risk management through margin payments.

Hedging however requires that futures and spot prices converge at least to a reasonable level once futures expire¹¹; otherwise hedging does not work as it is not possible to use futures for hedging as losses in one market cannot be effectively offset by gains in the other (Masters/White 2008). The difference between the commodity spot and futures price is defined as the basis, which varies according to the grade, quality, location or cost of transportation of the commodity. Significant variations can also occur related to changing expectations such as expected crop shortages in the future so that futures prices may rise more rapidly than spot prices (US Senate 2009). Even if futures prices correlate with spot prices, perfect convergence is unlikely related to costs associated with the delivery process (Irwin et al. 2011) and different types of hedging risks (i.e. specification risk, contract risk, basis risk and exchange rate risk, see section 4.3.2 for a more detailed discussion on problems related to hedging particularly in LICs). Besides convergence between spot and futures prices, also the relationship between the prices of futures contracts with different maturities referred to as the term structure or futures curve is of importance. Contango describes a market where distant futures prices are higher than near-month futures prices or the current spot price. Backwardation describes the contrary where distant futures prices are lower than nearby futures and the current spot price, implying that the demand for a commodity today is higher than in the future, or that expected supply in the future will be higher than today.¹²

3.2. Actors on commodity derivative markets

Traditional actors on commodity derivative markets are commercial traders – producers and consumers of commodities that trade on spot markets and try to reduce their price risks through hedging – and non-commercial traders, referred to as speculators. Non-commercials do not have an underlying physical commodity position to hedge but take over the price exposure from hedgers in exchange for a risk premium.¹³ As commodity futures contracts do not pay interest, rents or dividends, the only return a trader can achieve is a favorable change in the price of the contract. Therefore, buying futures contracts without having an underlying physical position to hedge is considered speculation and not investment (Mas-

¹¹ Theoretically, the differential between spot and futures prices, called "basis", can be derived from the "theory of storage" or "non-arbitrage theory" (Kaldor 1939; Pindyck 1994; Hernandez/Torero 2010). This approach determines the futures prices as the spot price adjusted to the "cost of carry", i.e. the sum of the cost of storage and the interest rate, and the convenience yield. The convenience yield refers to the benefits that accrue to the owner of a physical commodity but not to the owner of a contract for future delivery and is based on the commodities' consumption use, e.g. the possibility to use commodities as inputs in production or to gain from temporary shortages (Dwyer et al. 2012; Hull 2002).

¹² The concept applied here explains differentials by the "theory of storage" (see footnote 11). The alternative approach, known as normal backwardation was developed by Keynes (1930) and Hicks (1939) and refers to expected spot prices at expiry and is based on the insurance function of futures markets. If a commodity market is characterized by producers who sell future contracts, the speculators will engage in long positions only if they can gain on average which is only the case if futures prices are above the expected futures prices. The producers would lose money overtime which can be regarded as an insurance fee for the reduced risk (Hull 2002).

¹³ Empirical analyses show that besides the risk premium, speculators' profits can be derived from other sources. Other relevant premia might be a liquidity premium or a price forecast premium (see e.g. Brooks et al. 2013; Aulerich et al. 2013).

ters/White 2008). Speculators provide an essential function as they accept price risks and provide liquidity by actively trading in futures. As a basis for decision-making, speculators may rely on information on commodity fundamentals, macroeconomic developments or any other commodity or non-commodity related developments or trends, or on technical trading strategies based on past price patterns (Gilbert 2008; Schulmeister 2009, 2012). Traditional speculators on commodity futures markets have been until recently dominated by experts of physical markets that trade in only one or few commodities and whose activities were closely linked to fundamental supply and demand dynamics (Masters/White 2008).

Over the last two decades and in particular since the early 2000s, a third category of actors has become important on commodity derivative markets – financial investors, in particular banks, investment firms, institutional investors and hedge funds that invest in commodities as an asset class similar to stocks, bonds and real estate assets (Gilbert 2008; UNCTAD 2009b). Three factors are particularly important for the increasing involvement of financial investors (Bass 2011): First, since the late 1990s commodity prices have risen related to fundamental factors and were expected to rise further which made them an attractive investment object. Second, important technical, institutional and regulatory changes, namely the deregulation of commodity derivative (along other financial) markets, the emergence of new investment instruments and the shift to electronic and largely extended trading hours, have taken place (see section 4.1 for a more detailed discussion). In the US, the significant regulatory change occurred in 2000 through the Commodity Futures Modernization Act (CFMA) that deregulated commodity trading by exempting OTC trading from oversight and control and by raising, circumventing and eliminating position limits (Gosh 2010; see Staritz/Küblböck 2013 for a discussion on commodity markets regulation). In this context, investment banks and asset management companies (e.g. hedge funds) have developed innovative financial products to get exposed to commodity price developments to attract new investors. Also, large commercial traders such as commodity trading houses have developed new business lines selling financial services to profit from this new trend. Third, trading on commodity derivative markets is related to broader developments in financial markets as can be seen in the context of the dot-com crisis in 2000/01 and more pronounced in the global financial crisis of 2008/09 where financial investors searched for new investment opportunities given the losses and low returns in traditional investments (i.e. stocks, bonds, real estate). By trading commodity derivatives, financial investors also aimed to diversify their portfolios given the perceived low or negative correlation with returns of traditional assets (Gorton/Rouwenhorst 2006) and to pursue inflation- and currency-hedging (IMF 2008; UNCTAD 2011).

Financial investors are generally divided into two main groups – index investors that follow passive long-only trading strategies with longer-term horizons and money managers that follow active trading strategies with shorter-term horizons (Mayer 2009; Farooki/Kaplinisky 2011; UNCTAD 2011). Index investors are largely institutional investors such as pension funds, sovereign wealth funds, university endowments, public and private foundations and life insurance companies, but also retail investors. They use commodity indices, which are composites of futures contracts of a broad range of commodities, as a vehicle to become involved in commodities. Commodity indices include long futures positions taking advantage of the long-term increase in commodity prices without taking into account the supply and demand fundamentals of individual commodities. Pension fund consultants for example have been advocating portfolio allocations of between 5 and 12 % to commodity indices (Masters/White 2008); financial advisors often recommend that investment portfolios hold a share of around 3 to 7 % in commodities (Vander Stichele 2012). A survey by Barclays in 2012 states that for more than 70 % of the participants the appropriate long-term average weighting for commodities in a portfolio is over 6 % (Cooper et al. 2012). Since futures contracts expire regularly and need to be rolled over to newer contracts which requires an active involvement in derivative markets, most institutional investors outsource the futures trading to swap dealers. Swap dealers which are usually investment banks enter in an OTC swap agreement with the index investor and “hedge” their swap exposure through an offsetting

futures contract on commodity exchanges.¹⁴ Most retail investors do however not use swap dealers but invest in different types of exchange traded products (ETPs), most widely exchange traded funds (ETFs) that have been developed more recently. They track commodity indices or single commodities through index- or commodity-related shares that are traded on stock markets (see section 4.2.1).

Money managers are financial intermediaries with generally much shorter time horizons, including investors such as hedge funds, commodity pool operators (CPOs), CTAs, proprietary trading desks of banks or investment firms, and institutional investors (Farooki/Kaplinisky 2011). Their investments are generally smaller in size compared to index investors. They follow more active trading strategies and take positions on both sides of the market (long and short), seeking to take advantage of arbitrage and speculation opportunities, which enables them to earn positive returns in rising and declining markets (Mayer 2009). These investors, particularly traditional CTAs, may base their trading strategies on fundamental or macroeconomic developments using information and conducting research on fundamental supply and demand factors of specific commodities, or use a mixture of fundamental-based and technical trading strategies. In particular with the increasing role of large hedge funds in commodity derivative markets, the presence of technical trading strategies based on price trend identification and extrapolation, i.e. trend following or momentum trading techniques, has however increased (Gilbert 2008; Schulmeister 2009). These technical tools may be calibrated to price signals from commodity markets alone or also include signals from other asset markets (Mayer 2009).

Table 1 gives an overview of these different types of traders according to the classifications of the CFTC which provides the only publically available data on the changing composition of market participants in US commodity futures markets. In the Commitments of Traders (COT) reports weekly open interest positions¹⁵ are classified in commercial (hedgers), non-commercial (speculators) and non-reporting traders (all traders with positions below the reporting threshold set by exchanges). Swap dealers' positions are reported as hedges as they "hedge" a financial position and are thus largely classified as commercial. In 2007, the CFTC started to release the Supplemental Commodity Index Traders (CIT) reports, in which the positions of index traders for twelve agricultural futures markets are provided from 2006 onwards.¹⁶ Following further complaints about the lack of transparency, the CFTC started to publish the Disaggregated Commitments of Traders (DCOT) report in September 2009. DCOT is available for twelve agricultural and a number of energy and metals futures markets and dates back to June 2006. The traders' categories include processors and merchants (commercial traders), swap dealers, money managers, other reporting traders, and non-reporting traders. The index trader category of the CIT reports does not directly coincide with the swap dealer category in the DCOT reports because the swap dealer category includes also swap dealer that do not have index-related positions and the index trade category includes also pension and other investment funds that place index investments directly in futures markets (UNCTAD 2011).¹⁷ A main limitation of the CFTC reports is that they classify traders and not trading strategies, counting all positions of one trader in one trader class based on their main activity even though the trader may be involved in different business

¹⁴ Swap dealers counterparties may not only be index investors but also commercial or other types of traders. In agriculture markets swap dealers correspond well with index investors. However, swap dealers in energy and metal markets conduct a substantial amount of non-index swap transactions.

¹⁵ Open interest describes the total number of futures contracts long, i.e. purchased contracts outstanding, or short, i.e. sold contracts outstanding, for a given commodity in a delivery month or market that has been entered into but has not yet been liquidated by an offsetting transaction or fulfilled by delivery. The open interest for a given market is aggregated across all contract expiration months.

¹⁶ The twelve commodities included are: feeder cattle, live cattle, cocoa, coffee, cotton, lean hogs, maize, soybeans, soybean oil, sugar, Chicago wheat and Kansas wheat.

¹⁷ Since recently, the CFTC issues a quarterly Index Investment Data report, which provides a more precise measure of commodity index investment than CIT and DCOT. It measures positions before internal netting by swap dealers and covers twelve agricultural markets plus seven energy and metals markets. The data was gathered through a "special call" in 2008 targeting 43 entities engaged in commodity index investment, which has allowed CFTC to collect the total notional value of the institutions' commodity index business and the according number of futures contracts.

lines and trading strategies (CFTC 2013a; for a more detailed discussion on limitations of this data see Ederer et al. 2013).

Table 1: Types of traders on commodity derivative markets

		Activities	Examples of actors
	<i>CFTC Commitments of Traders (COT)</i>		
Traditional Actors	Commercial traders	Engage predominantly in the production, processing, trading or consumption of physical commodities; use derivatives to hedge risks associated with those activities; but specifically larger ones also engaged in arbitrage and speculation; not subject to position limits	Farmers, producers, merchants, intermediaries, processors, agro-processing companies, commodity trading houses, consumers, airlines
	Non-commercial traditional speculators	Take positions on both sides of the market (long and short); traditionally focus on few commodities and their fundamentals but with importance of financial actors diverse trading strategies; classified as non-commercial traders and thus subject to position limits	Specialised commodity investment firms or units in banks and other financial institutions specialized in commodities; with importance of financial actors changed to diverse group of investors, including banks, hedge funds, institutional investors, etc.
	<i>CFTC Supplemental Commodity Index Traders (CIT)</i>		
New Actors: Financial Investors	Index investors	Take long position in a range of commodities through indices or ETPs; number of traders is relatively small but positions are large; mostly classified as commercial traders (through swap dealers) and exempted from position limits	Institutional investors, e.g. pension funds, sovereign wealth funds, university endowments, public and private foundations, life insurance companies; also retail investors
	<i>CFTC Disaggregated Commitments of Traders (DCOT)</i>		
	Swap dealers	Take over exposure from counterparties, largely index investors but also other traders, through swaps; hedge on futures markets; in soft commodities nearly all swap dealers are linked to index investors; in hard and energy commodities swap deals also engage in physical markets; exempted from position limits	Dominated by four banks that hold around 70 % of swap positions, in 2008: Goldman Sachs, Morgan Stanley, JP Morgan, Barclays Bank, in 2012: Bank of America, JP Morgan, Goldman Sachs, Citibank; Others: Merrill Lynch, Deutsche Bank, HSBC, Credit Suisse, Rabobank, UBS
	Money managers	Engage in futures trading on behalf of clients or themselves; take long and short positions; active and shorter-term trading strategies; arbitrage and speculation; different strategies but majority uses technical trading; subject to position limits	CTAs, CPOs, hedge funds, proprietary trading desks of banks or investment firms, institutional investors

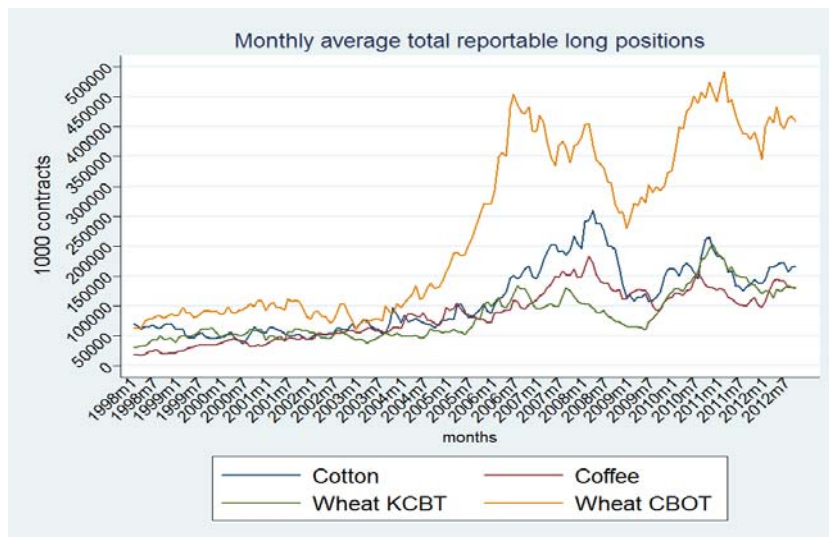
Source: Adapted from UNCTAD (2011: 19).

3.3. Volumes and positions on commodity futures markets

According to the Bank of International Settlements (BIS), trading volume of commodity derivative contracts rose sharply, in particular since 2005. Trading volumes declined in the second half of 2008 in the context of the financial crisis but picked up again in early 2009 on commodity exchanges. In contrast, OTC commodity trade has continued to fall, which is likely to be related to a risk reduction of investors following the dramatic increase in the previous three years (TheCityUK 2011). OTC trade however still accounts for the majority of commodity derivative trading. The number of outstanding derivative contracts on commodity exchanges increased from roughly 12.7 million contracts in March 2002 to 47 million in March 2008 and 37.5 million in December 2012. The notional value of outstanding OTC commodity derivatives increased from US\$0.77 trillion in March 2002 to US\$13.23 trillion in March 2008 and stood at 2.99 trillion in June 2012 (BIS 2013). Barclays Capital reports data on the value of commodity assets under management in commodity exchanges. Commodity-linked investments by financial investors increased from US\$13 billion at the end of 2003 to roughly US\$260 billion in mid 2008. After a dip in 2008, investments almost doubled in 2009 and reached US\$430 billion in January 2013 (Barclays Capital 2013).

For our focus commodities, we use the DCOT reports to assess the development of open interest positions by trader class between 2006 and 2012¹⁸; for data prior to 2006 we use COT data. For aluminium that is traded at the LME there is no CFTC data available; data availability is limited and will be discussed separately below. Figure 1 shows the monthly average total long open interest positions since 1998. The figure clearly shows the increase in positions in all four markets in the 2000s. Positions had a first peak in mid 2008. In the second half of 2008 open positions fell in the context of the financial crisis. However, trading on commodity exchanges has picked up strongly since early 2009 reaching new peaks in 2010 and 2011/12 respectively.

Figure 1: Development of total long open interest positions, COT data



Source: CFTC (2012a).

¹⁸ DCOT reports do not sufficiently differentiate between index investors and swap dealers. However, in agriculture markets, including our focus commodities wheat, coffee and cotton, the correspondence between index investors and swap dealers is quite close as the large majority of swap dealers conduct index-related activities while swap dealers in some energy and mineral markets conduct a substantial amount of non-index swap transactions.

Tables 2 and 3 show the total positions of different trader groups in long and short futures contracts, respectively. Clearly, index traders emerged as a major participant in commodity futures markets since the early 2000s. For coffee, cotton and SRW wheat, swap dealers hold the highest share of long positions. But their share seems to decline towards 2012. The share held by money managers seems to increase from 2006-2012 for coffee, cotton and SRW wheat. For coffee, cotton and SRW wheat, money managers are present on the long side of the futures market with a share of 15 to 30 %. For HRW wheat, the largest share fluctuates between commercial traders and money managers. Concerning short positions, for coffee, cotton, HRW and SRW wheat, the share is highest for producers and merchants, ranging between 46 % (SRW wheat in 2012) and 76 % (coffee in 2008), and, as expected, lowest for swap dealers, ranging between 0 and 9 %. The prominence of commercial traders on the short side is consistent with hedging of producers being more important than hedging by consumers. Money managers hold 5-13 % of short contracts in HRW wheat, 12-25 % in SRW wheat and 9-29 % in cotton and coffee, with the latter being a similar share as in long futures contracts. Generally, the share of non-reporting traders – that hold positions less than the predetermined reporting level – in long and short positions has declined over the period 2006-2012, or has remained stable. In particular long positions in HRW wheat declined from 22 % to 15 % and for coffee from 11 % to 6 %; short positions for HRW wheat from 26 % to 20 %. Non-reportables include a mix of traders and trading motives but may provide a window on the relative activity of non-professional speculators and small commercial hedgers. Their decline is much more dramatic when compared to levels in the 1990s where they held as much as 50 % of open interest in some grain futures markets (Irwin/Sanders 2012).

Table 2: Annual average position of trader groups in long futures contracts, measured as the proportion of annual average total open interest in that market, DCOT data

	Prod./ Merch	Swap dealers	Money managers	Other rep.	Non- rep	Prod./ Merch	Swap dealers	Money managers	Other rep.	Non- rep
Cotton, ICE					Coffee, ICE					
2006	17%	48%	15%	9%	11%	26%	30%	18%	15%	11%
2007	14%	44%	21%	10%	12%	26%	29%	25%	13%	8%
2008	16%	46%	19%	9%	10%	24%	39%	24%	8%	6%
2009	9%	50%	26%	4%	11%	25%	37%	23%	8%	8%
2010	19%	36%	30%	5%	10%	18%	37%	28%	9%	7%
2011	25%	31%	23%	10%	11%	27%	32%	27%	7%	7%
2012	18%	36%	22%	14%	10%	37%	27%	21%	9%	6%
Hard red winter wheat, KCBT					Soft red winter wheat, CBOT					
2006	17%	19%	26%	15%	22%	18%	51%	17%	4%	10%
2007	22%	23%	26%	11%	18%	11%	51%	22%	5%	11%
2008	30%	19%	23%	9%	19%	8%	52%	24%	5%	11%
2009	26%	21%	23%	10%	19%	10%	51%	23%	5%	11%
2010	27%	21%	25%	12%	15%	14%	53%	17%	7%	10%
2011	26%	18%	29%	9%	17%	13%	51%	18%	7%	11%
2012	24%	26%	27%	7%	15%	10%	46%	27%	7%	10%

Source: CFTC's Disaggregated Commitments of Traders (DCOT) report, CFTC 2012b.

Note: 2006 starts in June, values for 2012 until October; Proportion is calculated as categories' long position divided by sum of all trader categories' long positions; Spread positions are not considered.

Table 3: Annual average position of trader groups in short futures contracts, measured as the proportion of annual average total open interest in that market, DCOT data

	Prod./ Merch	Swap dealers	Money mana- gers	Other rep.	Non -rep	Prod./ Merch	Swap dealers	Money mana- gers	Other rep.	Non- rep
Cotton, ICE					Coffee, ICE					
2006	55%	1%	30%	5%	9%	64%	0%	23%	7%	7%
2007	69%	3%	16%	6%	6%	71%	1%	19%	5%	5%
2008	70%	7%	10%	7%	6%	76%	3%	10%	7%	4%
2009	69%	9%	9%	7%	7%	72%	7%	11%	3%	6%
2010	72%	7%	6%	10%	5%	75%	7%	10%	2%	6%
2011	62%	13%	8%	8%	9%	72%	8%	9%	4%	6%
2012	50%	6%	21%	14%	9%	55%	5%	27%	6%	7%
Hard red winter wheat, KCBT					Soft red winter wheat, CBOT					
2006	68%	0%	4%	2%	26%	61%	2%	12%	8%	17%
2007	65%	0%	5%	4%	25%	52%	5%	15%	9%	19%
2008	60%	1%	5%	4%	30%	50%	5%	14%	13%	18%
2009	58%	0%	13%	3%	26%	43%	6%	22%	12%	18%
2010	67%	2%	8%	4%	19%	50%	6%	19%	9%	15%
2011	69%	3%	5%	4%	19%	51%	4%	18%	10%	16%
2012	64%	1%	9%	6%	20%	46%	5%	25%	10%	15%

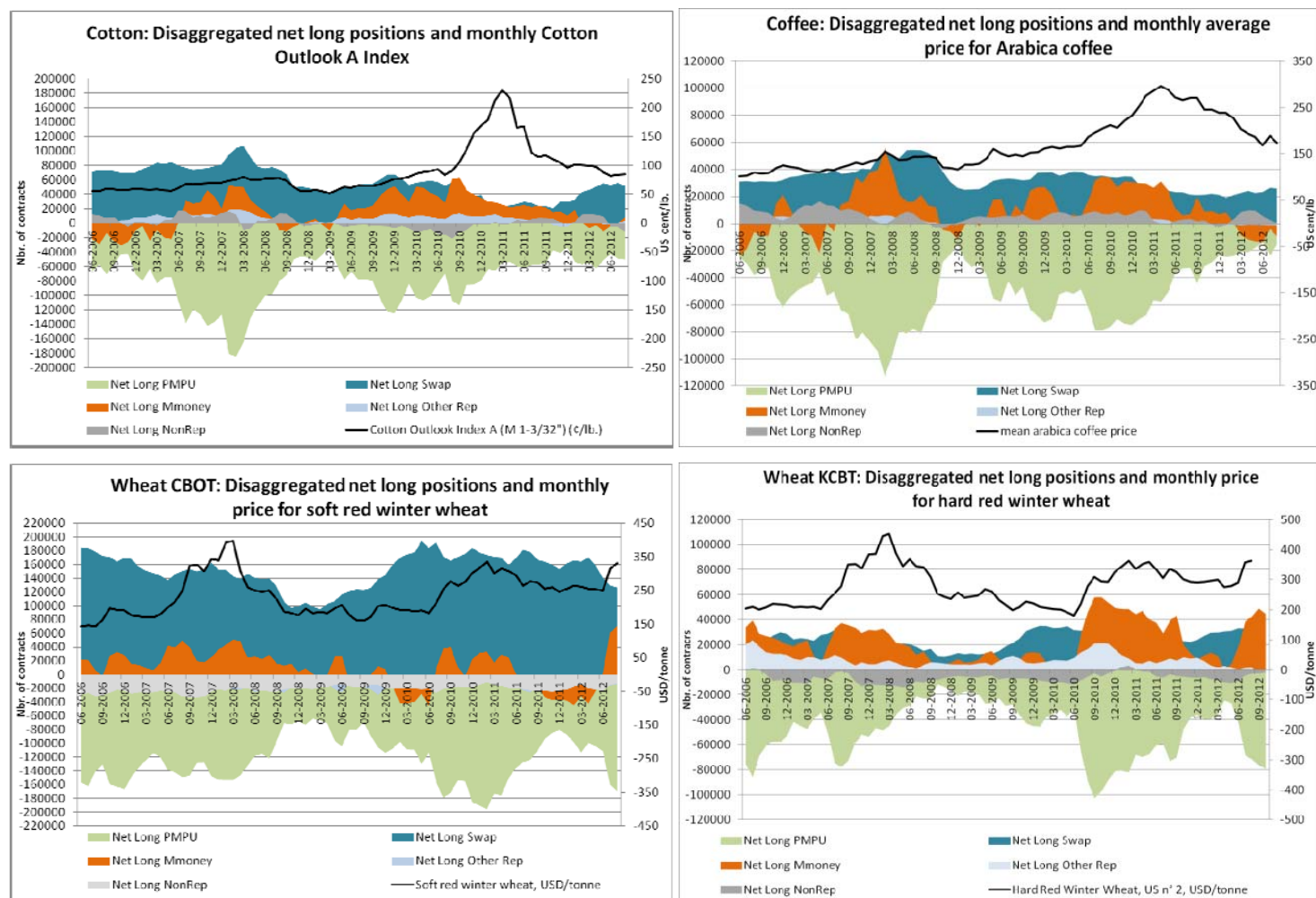
Source: CFTC's Disaggregated Commitments of Traders (DCOT) report, CFTC 2012b.

Note: 2006 starts in June, values for 2012 until October; Proportion is calculated as categories' short position divided by sum of all trader categories' short positions; Spread positions are not considered.

For implications on prices, traders' net long positions, i.e. traders' long positions minus traders' short positions, are particularly important as they represent the buying or selling pressure a group of traders exerts on prices.¹⁹ These are presented in relation to monthly commodity prices in Figure 2. Unsurprisingly, the total net long positions of producers and merchants are negative, and of swap dealers positive for all focus commodities. Money managers take alternating, i.e. positive and negative net long positions, highlighting their active trading strategies. At first sight, there seems to be an obvious correlation between money managers' net long positions and commodity prices.

¹⁹ The sum of demand for and supply of futures, i.e. long and short positions, is always zero. Hence, each trader that sells futures (short positions) needs another trader that buys futures (long positions). Hence, higher total positions or a higher trading volume have no clear effect on prices. What is more interesting is the net positions of certain types of traders. If the positions cannot be bought or sold at current prices, it can lead to increasing or declining prices to be able to find a partner for the contract. Clearly, the extent of this pressure also depends on the price-sensitiveness of the respective trading strategies.

Figure 2: Net long positions in relation to the respective commodity prices, DCOT data

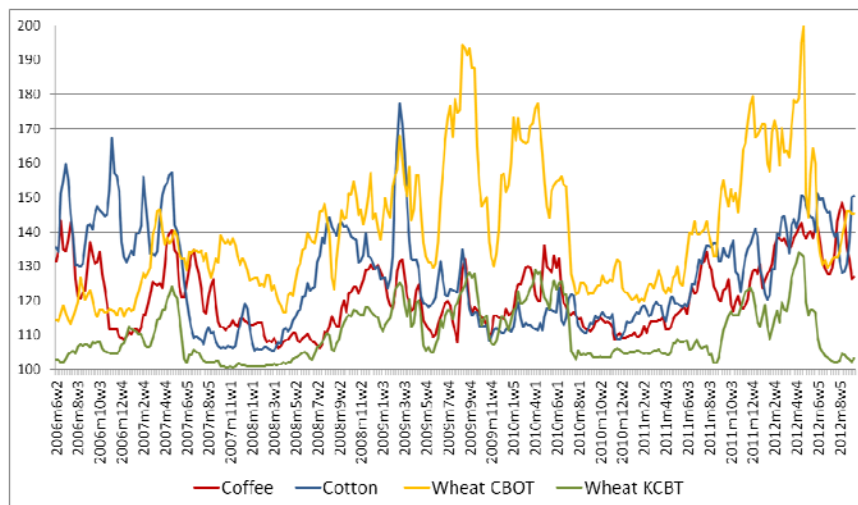


Source: CFTC (2012b); monthly commodity prices from UNCTADStat (2012).

Note: Own elaboration.

Increased participation of non-commercial traders does not necessarily imply excessive speculation. Speculation is necessary for the functioning of commodity derivatives markets and the execution of hedging activities. What may be problematic is, however, an excessive or “inadequate” level of speculation, i.e. a level of speculation which exceeds the need to satisfy hedging transactions, which may distort price dynamics. Working (1953, 1960) developed an index to measure the adequacy of speculative positions in relation to hedging positions by commercial traders, reflecting the extent by which the level of speculation exceeds the minimum necessary to absorb long and short hedging positions.²⁰ Figure 3 shows this index for our four focus commodities using weekly DCOT data (CFTC 2012b). It reveals that the level of speculation – represented by swap dealers/index investors’ and money managers’ positions – exceeds the level of hedging demand – commercial traders’ positions – for the whole period and that the index fluctuates quite strongly for all four commodities. For the period June 2006 to September 2012, average excessive speculation accounts for 10 % and 21 % for HRW wheat and coffee and does hardly exceed 30 % and 40 % respectively. Excessive speculation is on average higher for cotton accounting for 27 %, with peaks surpassing 60 % in late 2006 and reaching nearly 80 % in early 2009. For SRW wheat, the index reveals the highest level of excessive speculation with an average of 40 % and peaks around 90 % and 100 % in late 2009 and mid-2012 respectively. However, this data has to be interpreted cautiously as it assumes that all positions by commercial traders involve hedging activities. Additionally, the index only points out an increased level of speculation, but does not allow conclusions on the potentially distorting impact of specific trading strategies (see section 4).

Figure 3: Workings’ Speculative “T” Index



Source: CFTC (2012b).

Note: Own elaboration.

²⁰ Working's speculative “T” index is typically calculated as (Working, 1960, 1953):

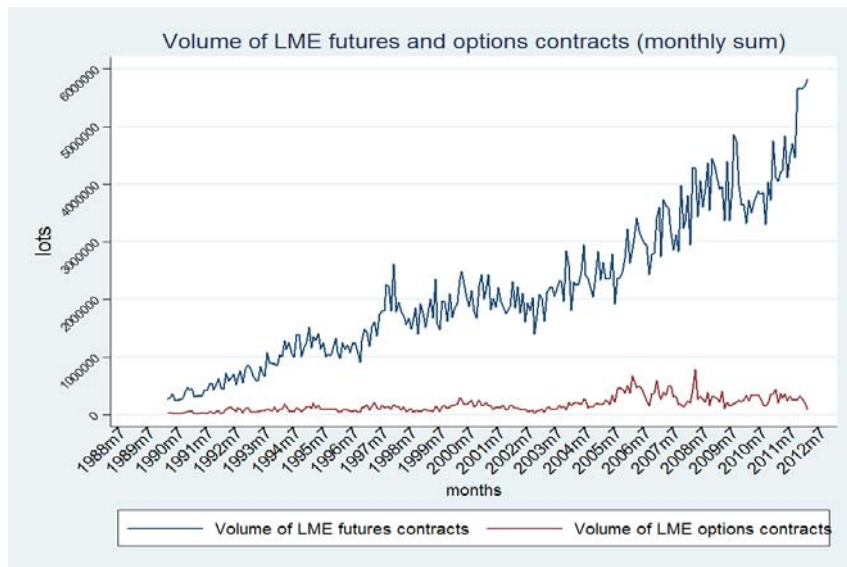
$$T = \left[1 + \frac{NC \text{ OI Short}}{C \text{ OI Short} + C \text{ OI Long}} \right] \cdot 100 \quad \text{if } C \text{ OI Short} \geq C \text{ OI Long} \quad \text{Or}$$

$$T = \left[1 + \frac{NC \text{ OI Long}}{C \text{ OI Short} + C \text{ OI Long}} \right] \cdot 100 \quad \text{if } C \text{ OI Short} < C \text{ OI Long}$$

Where *OI Long* refers to open interest in long futures contracts, *OI Short* refers to open interest in short futures contracts, *NC* means non-commercial traders, i.e. the sum of open interest of swap dealers and money managers, *C* refers to commercial traders. The minimum value of the “T” index is 100, suggesting that speculation by non-commercial traders is not in excess to commercial hedging needs. Values above 100 suggest that there is more speculation in the market than the minimum needed to offset short and long hedging needs. The T index as calculated here, does not take into account the impact of other reportable and non-reportable traders, as their classification in the commercial/non-commercial category is not clear (see also Peck 1981, 1980; Sanders et al. 2008).

For aluminium, there exist no CFTC data as its main derivative market is the LME which does not report position data on classes of traders and not even total open positions, neither at the exchange level nor at the regulatory authority level. The only data reported by LME is the aggregate volume of futures and options contracts traded. Volume data can be seen as a proxy showing the inflow of funds, including speculative funds by financial investors, in the aluminium futures market but has to be taken cautiously. Figure 4 shows the increase in the monthly sum of trading volume from around 2 million lots to nearly 6 million lots between 2000 and 2011.²¹

Figure 4: Monthly LME Aluminium futures and options trading volume



Source: Received upon request.

4. Microstructure of commodity derivative markets

In this section, we discuss first the technical, institutional and regulatory context of commodity derivative trading. Second, we assess the trading strategies of financial investors, including index funds and money managers that trade on commodity derivative markets and the new investor class of “physical market financial investors”. Third, we analyze different types of commercial traders, and problems related to hedging. Fourth, we assess the impacts of the changing microstructure of commodity derivative markets on commercial traders, price discovery and hedging with a focus on our focus commodities coffee, cotton, wheat and aluminium.

4.1. Technical, institutional and regulatory context of commodity trading

The last decade has been characterized by several structural changes on the technical, institutional and regulatory side of commodity trading with important implications on the microstructure of commodity derivative markets. These developments enabled the large increase in trading volumes and open interest and the substantial presence of financial investors. In particular, the following trends have been important: (i) deregulation of commodity derivative trading in the 1990s and 2000s; (ii) financial innovation and the emergence of new investment instruments and products; (iii) technical developments including the shift to electronic trading and largely extended trading hours on most exchanges and other trading platforms;

²¹ 1 lot aluminium is equivalent to 25 tonnes.

and (iv) market concentration at exchanges and the shift to (often publicly traded) for profit exchanges and fragmentation at less regulated trading platforms.

Concerning the first two trends, only important regulatory changes in the 1990s and 2000s, amongst them the abolishment or expansion of position limits and other deregulations, allowed the considerable entry of financial investors on commodity derivative markets. In this context, investment banks and asset management companies (e.g. hedge funds) have developed innovative financial instruments and products, including commodity index funds and different types of ETPs, to provide easy access to commodity futures markets and facilitate exposure to commodity price developments to attract new investors. Also, large commercial traders such as commodity trading houses have developed new business lines selling financial services to profit from this new trend (see section 4.2 and 4.3). The deregulation trend has however partly been reversed in the context of the financial crisis and the recent commodity price hikes with new regulations being proposed and implemented in the US and the EU. New regulations focus largely on improving transparency, regulating OTC trade, installing position limits and strengthening regulatory authorities and international cooperation (for a discussion on regulatory changes and current proposals in the US and EU see Staritz/Küblböck 2013).

An important condition for the rise of financial investors in commodity derivative markets was the shift from pit trading to electronic trading that has particularly accelerated since 2005 with largely extended trading hours and reduced transaction costs. Since the modern inception of commodity futures markets in Chicago during the 1850s, the basic structure of these markets, the way trading was conducted and the main types of participants have been quite stable until the 2000s (Irwin/Sanders 2012). Commodity futures markets changed from primarily broker-based telephone/open outcry pit trading to electronic trading platforms that are computer systems which enable the direct access to markets and the electronic placement of orders. Hence, electronic trading together with technological improvement in communication tools allowed easier and direct access to commodity derivative markets and reduced transaction and trading costs. Traders previously required a broker to access commodity derivative markets. Today, traders can open futures accounts, deposit and withdraw funds, and trade without ever talking to a broker. Electronic trading interfaces can be accessed on mobile devices which allow 24 hours access to markets (Irwin/Sanders 2012). With electronic trading also automated trading became possible which is a prerequisite for technical and algorithmic trading by financial investors such as money managers (see section 4.2.2).

After accounting for less than 2 % of the futures trading volume from 2000-2005, electronic trading on commodity markets took hold in 2006 and expanded quickly.²² In 2012, nearly 91.5 % of exchange trading volume in US futures markets was executed electronically (CFTC 2013b). For CBOT wheat, futures volumes traded electronically accounted for 1 % of total futures volume for the period 2000-2003 which increased to 36 % in 2004-2008 and to 96 % in 2009-2011 (Irwin/Sanders 2012). After 142 years, ICE ceased open outcry trading completely in 2012 and is the only full electronic trading exchange (Nicholson 2012). However, open outcry trading still plays a significant role at the LME. It takes place between 11.40am and 5pm in the Ring where each LME metal is traded for five minutes by ring dealing members that include 11 actors.²³ Ring trading is still the most liquid period of trading but it runs concurrently with LME's electronic trading platform LMEselect, which was established in 2001 and is available from 1am to 7pm, and the 24 hours inter-office telephone market between LME members where all contracts can be traded (LME 2013). Other exchanges also still have open outcry trading pits at least for specific contracts and specific time periods where however generally only relatively small volumes are traded. Concerning trading time,

²² Electronic trading in the options market expanded slower partially due to a more complicated order and strategy system (Irwin/Sander 2012).

²³ The 11 ring dealing members are Amalgamated Metal Trading Limited, ED&F Man Capital Markets Limited, INTL FCStone Ltd., J.P. Morgan Securities, Jefferies Bache Limited, MAREX Financial Limited, Metdist Trading Limited, Newedge UK Financial Limited, Société Générale, Sucden Financial Limited, and Triland Metals Limited (LME 2013).

in pit trading all trading volume was concentrated in approximately 4 hours. Today, cotton 2 futures contracts at the ICE can be traded between 9pm and 2.30pm (EDT) on the next day (ICE 2013a) and coffee C futures contracts can be traded between 3am and 2pm (EDT) (ICE 2013b). The CME group has recently reduced the trading hours in CBOT and KCBT grains and oilseeds markets, as a reaction to customers' feedback. Electronic trading takes place between Sunday and Friday from 7pm to 7.45am; floor and electronic trading takes place between Monday and Friday from 8.30am to 1.15pm (CT) (CME Group 2013a).

Traders interviewed generally state that electronic trading and the longer trading hours have increased liquidity on markets and made trading more flexible, particularly facilitating work for customers in Asia and Australia, but it may not solve the problem that the trading volume is spread out over a long period of time. Further, electronic trading and long trading hours allow immediate reactions but also demand continuous awareness of the market. For instance, traders may not want to keep orders over night in case "something" happens. Therefore, some traders demand a concentration of trading in a smaller number of hours. Electronic trading is also suggested to have reduced market abuse as trading is more transparent now. Other traders interviewed claim however that with electronic trading less information is available, in particular for small traders as it has become more complex to get an overview of market developments. In the open outcry system, it was more or less known which brokerage houses relate to which trading houses. By observing their activities, traders could get an idea who was doing what. Electronic trading grants large commodity companies or trading houses more privacy as other traders do not know who stands behind certain orders (Interviews 2012/13). A further technical novelty is the algorithmic matching system where contracts are matched and cleared by machines. This may pave the way for an increase in cyber-criminality which is increasingly viewed as a systemic risk. Apparently, 53 % of exchanges have suffered a cyber attack in 2012, in which typically computers or passwords are hacked and electronic transfers of assets and orders performed (NZZ 2013).

In the past decade, there were several large scale mergers and acquisitions that increased market concentration at exchanges. Concerning our focus commodities, wheat is traded on the CBOT and the KCBT. CBOT is the oldest commodity exchange, established in 1848 by the State of Illinois. It merged with the CME into the CME Group in 2007. Also the KCBT, chartered in 1876, was incorporated into the CME Group in late 2012. Hence, the CME Group hosts the most important agricultural futures markets, including a range of important exchanges (i.e. CME, CBOT, KCBT, NYMEX and COMEX) and is thus the largest futures exchange company (CME Group 2012, 2013b). The ICE on which Arabica coffee and cotton are traded became a publicly traded company in 2005. The Coffee, Sugar and Cocoa Exchange (CSCE) merged with the New York Cocoa Exchange in 1979 and with the New York Cotton Exchange in 1998. It worked as a subsidiary of the New York Board of Trade (NYBOT), which was acquired by ICE in 2007. The ICE also acquired the International Petroleum Exchange (IPE), which is now ICE Europe and operates as Europe's leading open outcry energy futures exchange. ICE acquired the Climate Exchange and the European Climate Exchange in 2010 and the New York Stock Exchange (NYSE) Euronext in December 2012 (Salmon 2012). In light of the merger with NYSE Euronext, ICE has become a leader in multiple high volume markets (Vodicka 2012). Until 2012, the LME was owned by its members, including brokers, commercial traders and banks such as Goldman Sachs, Barclays and Citigroup. The exchange was bought for US\$2.2 billion by Hong Kong Exchanges & Clearing in 2012 (Kocieniewski 2013). Besides managing derivative trading, it oversees 719 warehouses around the globe. It is the largest and most important exchange for metals where more than 80 % of non-ferrous metals business is conducted (LME 2013).

As the CME Group, the ICE and the LME, also most other commodity exchanges are now publicly traded for profit corporations that are listed on stock exchanges which has created a "market for markets" (Vorbach/Wixforth 2012). Derivative exchanges are becoming more profitable than stock exchanges (Salmon 2012). The market valuation of the ICE is around US\$10 billion and that of the CME Group US\$20 billion. In contrast, the NYSE Euronext

which was acquired by the ICE in December 2012 is estimated to be worth less than US\$10 billion (The Economist 2013). Exchanges have incentives to increase trading volumes, provide new products and develop new markets to attract more traders as they are paid based on the volume of contracts. As speculators, particularly the ones using short term trading strategies, trade much more than hedgers, exchanges have incentives to provide a regulatory infrastructure to attract these traders, including high frequency trading (HFT) (Timms 2013). Smaller commercial traders interviewed feel that exchanges are too much bound to their shareholders and they are not interested anymore in accommodating the interest of small traders. One cotton trader stated that “ICE has basically changed the commodity futures trading game from a hedger friendly to a spec friendly casino” (Interviews 2012/13). An example are the commodity specific committees, e.g. the Cotton Committee at the New York Cotton Exchange (NYCE) that was composed of traders, producers, mills, etc. and dealt with questions relevant to physical traders. However, after being acquired by the ICE the major decisions have been made by the Board of Directors, in which no cotton expert is present (Interviews 2012/13).

The concentration at the exchange level is in contrast to the fragmentation concerning alternative multilateral trading platforms. Such platforms that are largely managed by banks use quick trading technologies, have low fees and require low or no securities or margins. Hence, traders can use these platforms without having to pay exchange fees and fulfil their stricter regulations, transparency and security requirements. On the other side, these platforms are riskier and there is limited transparency and oversight. The largest share of trading takes place bilaterally OTC, where customized contracts can be traded and no clearing takes place. OTC markets are even less regulated than trading platforms and have been in the focus of current reform discussions in the US and the EU that aim to reduce OTC trade shifting it to multilateral trading platforms and exchanges and aim at establishing certain transparency and security requirements for remaining OTC transactions (for a discussion on current regulations, see Staritz/Küblböck 2013).

4.2. Trading strategies of financial investors

This section discusses financial investors and their diverse trading strategies organized along the broad trader classes of index investors including index linked investments such as index swaps and ETPs, money managers and “physical market financial investors”. Thereby, we take into account that certain players appear in more than one class of traders as they have multiple roles and pursue different trading strategies. In particular investment banks have multiple roles in commodity derivative markets. They offer, on the one side, services to clients for hedging and speculative purposes, including commodity investment products (e.g. indices, ETPs), OTC commodity derivatives (i.e. swaps), and loans to commodity traders. On the other side, they have been also active as proprietary traders speculating on commodity prices on their own account. Furthermore, more recently, investment banks have also become involved in physical commodity markets, from owning mines and warehouses to holding physical inventories and providing transport services. The top three investment banks in commodities revenue in 2012 were Goldman Sachs, JP Morgan and Morgan Stanley. The next most important group of investment banks – called tier two performers – included the Deutsche Bank, Barclays and UBS; Bank of America Merrill Lynch, Citigroup and Credit Suisse were in the so-called tier three (Kolesnikova et al. 2013). Also hedge funds have multiple roles by investing their own capital and those of their clients, and some also offer funds in which institutional investors can invest. As we will see in section 4.3, also large commodity companies and trading houses have multiple roles pursuing arbitrage and speculative trading strategies in addition to hedging and offering financial services to clients.

4.2.1. Index investors

“Traditional” index investors

The first index, Standard & Poor’s Goldman Sachs Commodity Index (S&P GSCI), was developed in 1991. Within two years, analysts were looking to the GSCI for commodity price movements. The Dow Jones-Union Bank of Switzerland Commodity Index (DJ-UBSCI, earlier called DJ-AIG) was developed in 1998 which together with the S&P GSCI developed to industry benchmarks and are estimated to account together for 90 % of all investments in commodity indices in January 2013 (Cooper/Sha 2013). The S&P GSCI includes 24 commodities with a high energy weighting that are weighted according to their worldwide production values and the DJ-UBSCI includes 19 commodities that are weighted based on worldwide production and liquidity factors (Masters/White 2008). Besides the S&P GSCI and the DJ-UBSCI, there exists a range of smaller indices such as the Deutsche Bank Liquid Commodity Index, the Standard & Poor’s Commodity Index, and the Reuters/Jefferies CRB Index. Overall there exist over 150 different index-related products which can be purchased for commodity market exposure (CRU 2012).

Indices differ in terms of index composition, commodity selection criteria, rebalancing strategy, weighting scheme and rolling mechanism (Tsui/Dash 2011). The commodities selected for an index range between 6 and 24. Typically, a committee selects these commodities based on a variety of criteria such as relevance to the global economy, liquidity, trading history, location of the commodity exchange or the currency of the contract. An index can be value-based – such that the number of futures contracts is adapted dynamically to hold a specified value – or quantity-based, where the share of commodities is held fixed so that the weight of the index changes (Schneeweiss et al. 2009; Masters/White 2008). If for example a pension fund allocates certain funds to an index, the pension fund trader or more often the swap dealer has to buy contracts of the different commodities that are part of the index according to their respective weights. If the whole amount cannot be sold by buying contracts at the current price, they will pay higher prices to induce other traders to sell. Index investors are thus price-insensitive; their buying depends on the composition and the weights of the index that may be changed once a year (but differences are generally not very large) and the demand of customers, most importantly the portfolio allocation decisions of institutional investors (Masters/White 2008; Schneeweiss et al. 2009; Mou 2010).

Because commodity futures contracts typically expire every one to three months, futures part of commodity indices have to be “rolled over” from the expiring contract to contracts with later maturities before expiration.²⁴ Most traditional indices follow standard rolling strategies that trade the most liquid contract, i.e. the contract closest to expire. The “roll” for an index occurs according to predetermined rules, which include the exact time of the roll. For instance, the roll for the SP-GSCI occurs from the 5th to the 9th business day of each month and for the DJ-UBSCI on business days 6th to 10th (Frenk/Turbeville 2011). On each of these days the index transfers a predetermined share of its weights, e.g. 20 %, from the expiring contract to the next futures contract (Masters/White 2008). The frequency and timing of rolls differ across indices and within indices for different commodities. For instance, agricultural commodities are typically rolled forward 4 or 5 times a year and livestock commodities 6 to 8 times a year. The SP-GSCI rolls energy commodities every month while gold and silver are rolled five times a year; the DJ-UBSCI roles energy commodities every second month. The chosen roll schedule can impact index’ performance as for example large roll windows imply a higher flexibility and may prevent that futures are rolled under detrimental market conditions. An index’ return is therefore based on spot and roll returns. The spot return captures changes in futures prices whereas roll returns refer to the profits or losses generated from the rolling of the futures contracts which is influenced by the term structure. Roll returns are positive when

²⁴ To roll contracts, index-based traders generally enter into pre-packaged trades called “calendar spread” where they simultaneously buy more distant futures and sell those closer to expiration futures.

the market is in backwardation, because the contract nearly expiring will be more expensive than the nearby contracts that are bought, and negative when in contango (Schneeweiss et al. 2009).

The majority of institutional investors (estimations speak of 85-90 %, Masters/White 2008) outsource the futures trading and rolling to banks, so-called swap dealers. They enter OTC commodity index swaps where the investor agrees to pay the three months Treasury bill rate plus a management fee to the bank and the bank agrees to pay the return based on the price development of the index (Masters/White 2008; Tang/Xiong 2009). The swap dealer “hedges” its swap exposure through an offsetting futures contract on commodity exchanges.²⁵ The four largest swap dealers in 2008 were Goldman Sachs, Morgan Stanley, JP Morgan and Barclays Bank that controlled around 70 % of commodity index swaps positions (Masters/White 2008); in 2012 the largest four were Bank of America, JP Morgan, Goldman Sachs and Citibank also holding around 70 % of commodity index long futures contracts according to the International Swaps and Derivative Association (ISDA) (Briese 2012). These large investment banks profit therefore from index based investment strategies as they receive fees from managing these products. Often they also take advantage of opportunities for arbitrage and speculative profits through their proprietary trading activities, in particular during the roll period (Mason/Stempel 2012). Most retail investors do however not use swap dealers but invest in different types of ETPs to get exposure to commodity price developments (see below).

Hence, trading strategies of traditional index investors differ considerably from traditional speculators on commodity futures markets, in particular in the following ways:

- **Index biased:** Index investors invest in a broad basket of commodities depending on their composition and weighting formula to be exposed to commodity price developments and have little interest in individual commodities and their supply and demand fundamentals.
- **High volume:** Index investors are largely institutional and to a lesser extent retail investors investing large volumes and hence holding the majority of (long) positions in most commodity futures markets.
- **Long term:** Pension funds and other institutional investors typically have long term investment time horizons of years or even decades. Hence, (long) futures positions are maintained for a long time.
- **Long only:** Index investors typically only invest in long positions betting on long-term increasing commodity prices.
- **Passive price-insensitive:** The volume invested is relatively independent of prices of specific commodities as it depends on the composition and weights of the index and the demand of customers, most importantly the portfolio allocation of institutional investors.
- **No delivery:** As index investors are not interested in physical commodities, they roll their positions from expiring futures contracts to new ones with later maturity.

“New generations” of index investors

In the last years, the sharp increase in investments in the relatively small commodity derivative markets, the global financial crisis and related bear markets, and a shift in the term structure for several commodities from backwardation to contango have decreased the returns of traditional commodity indices and led to an outflow of funds (Johnson/Farge 2013). Commodity indices for portfolio diversification have also become less effective as the negative correlation between commodity and financial asset returns cannot be broadly confirmed anymore (Basu/Gavin 2011). Hence, several commodity indices have made losses and

²⁵ Hence, swap dealers use commodity exchanges for hedging purposes and were classified as commercial traders by the CFTC. But contrary to commercial traders that hedge physical positions they hedge financial positions.

started to underperform (Johnson/Brock 2010; Johnson/Farge 2013; Onstad 2012). For instance, the SP-GSCI and the DJ-USBCI have lost around 4 % from January to April 2013 while the S&P 500 equity index has risen by 12 % (Johnson/Farge 2013). In this context, banks and asset managers have re-assessed passive investment strategies and tried to develop more complex and sophisticated commodity index products in recent years. Dunsby and Nelson (2010) differentiate between three types of indices: first generation indices (or traditional indices) are passive and track prices of a constant basket of the most widely produced commodities in the most liquid part of the futures curve (as described above); second generation indices that pursue active curve management to maximize roll returns; and third generation indices that pursue active commodity selection to choose or weight commodities based on their attractiveness. Cooper and Sha (2013) estimate that more than 60 % of index funds still pursue passive strategies, around 30 % more active rolling and selection strategies, and around 10 % even invest in short positions pursuing long-short strategies.

Second generation indices pursue active curve management, such as the UBS Bloomberg Constant Maturity Commodity Index and the JP Morgan Commodity Curve Index. These indices invest in a fixed range of commodities (as traditional indices) but within individual commodities their positions are spread across several contract expirations (Tsui/Dash 2011). When contango is spread evenly across expirations these indices perform the same as first generation indices. When contango is more pronounced at the front end of the futures curve they will perform better. When markets are in backwardation and backwardation is concentrated in the front end of the curve, these indices will underperform. Some index funds use an algorithm to choose points along the forward curve for rolling to maximize the roll return (S&P Global Research 2011; Tsui/Dash 2011). Third generation indices pursue active curve management and select commodities not only once but throughout the year. These indices include or overweight commodities that are expected to have high returns and omit or underweight commodities that are expected to have low returns. The selection can be pursued through the use of discretionary analysis or through the use of quantitative model-based analysis. The Summer Haven Dynamic Commodity Index, for example, optimizes contract selection to minimize contango effects and maximize backwardation effects as well as systematic model-based commodities selection by selecting 14 of 27 eligible commodities and rebalancing their weights monthly. Some indices also tap into new commodities that were traditionally little used as price benchmarks (Vander Stichele 2012).

After the rising trend in commodity prices was interrupted in mid-2008, investors moved more generally away from passive, long-only indices to more active funds that also invest in short positions. For example, the Commodity Long/Short Strategy Fund of the hedge fund Forward Management screens 24 commodities and chooses the 10 that have either risen or fallen the most based on a performance over one to six months, and the Morningstar Long/Short Commodity Index uses a systematic trend following strategy to establish long and short positions in twenty different commodities (Pleven 2012). Such products can not anymore be classified as index-based products but are part of active investment strategies of money managers. As a result of the increasing use of active trading strategies, the relative importance of index investors in open positions has declined since 2007 whereas the share of money managers increased for most commodities. Although index investments reached new heights in absolute terms in 2012, their share declined from 65 to 85 % between 2005 and 2007 to about 35 % in mid 2012 (Cooper et al. 2012). For our focus commodities coffee and cotton the share of index investors/swap dealers in long positions peaked in 2009 (with 50 % and 37 % respectively) and declined thereafter reaching 36 % and 27 % on average respectively in 2012. The share of index investors/swap dealers for SRW and HRW wheat peaked in 2008 (with 52 % and 30 %) and declined to 36 % and 24 % in 2012 respectively.

Exchange traded products

After commodity index funds were criticized for high costs at the expense of investors in particular due to the roll-over of contracts, banks and asset managers have developed commodity ETPs that have gained importance since around 2009. ETPs give retail and institutional investors a pay-off linked to the return on a single commodity or an index of commodities. Their shares are traded on stock markets which makes them easier accessible to smaller investors and more widely tradable. The most widely used ETPs are ETFs. ETFs are investment companies that sell creation units to financial institutions. The financial institution pays for those creation units with securities that mirror the portfolio that the ETF wishes to target. Shares of the creation units are then sold in the secondary market to retail or institutional investors (Irwin/Sanders 2012). Traditional commodity ETFs track the price of a basket of commodities that are part of long established commodity indices. There are also single commodity ETFs that track the price of a single commodity which are called exchange-traded commodities (ETCs). Most commodity ETFs (around 70 %) are based on the value of precious metals; the rest includes other metals, energy and soft commodities (Vander Stichele 2012). Another common ETP are exchange traded notes (ETNs) that are similar to ETFs except the financial institution sells a debt instrument in the secondary market where the payout is indexed to the security bundle being tracked (Irwin/Sanders 2012; SEC 2013). ETPs have grown most sharply since the outbreak of the financial crises. They increased from US\$16 billion in 2006 to US\$211 billion in January 2013 which is however largely driven by investments in gold products (Cooper/Shah 2013).

As with index funds, an increasing number of ETFs are actively managed that seek to outperform traditional indices by intervening in the composition and weighting of the index (Vander Stichele 2012). In contrast to the large majority of commodity indices, there exist a small but increasing number of reverse or inverse ETPs where the creation units are funded by short positions in the tracked market. Most ETPs use futures contracts as their basis (so-called synthetic ETPs) and, as with bilateral swap contracts, the issuing financial institution hedges and rolls its financial exposure in commodity futures markets. However, there are also ETPs based on physical commodities. Physically backed ETPs or ETFs track spot prices of commodities and provide investors with the return on the spot price of the metal, less the fees for holding physical commodities. They are managed by financial institutions that buy or sell physical commodities in amounts according to investors' money inflows. Because precious metals are less costly to store per volume, most physically backed ETFs are in precious metals (80 % are in gold, Kosev/Williams 2011). More recently, physically backed ETFs in aluminum, copper, palladium and other metals have been developed or are being considered. In December 2010, UK-based ETF Securities launched three ETFs backed by physical LME metals for copper, nickel and tin. In May 2011, physically-backed ETFs were launched for aluminum, lead and zinc. In December 2012, JP Morgan was approved to launch a physically-backed copper ETF on the New York Stock Exchange (CRU 2012; Terazano 2012).

4.2.2. Money managers

Money managers are a diverse group of traders, including a range of investors, most importantly hedge funds, CPOs, CTAs, proprietary trading desks of banks or investment firms, and institutional investors. They follow more active trading strategies and take positions on both sides of the market (long and short), seeking to take advantage of arbitrage and speculation opportunities, which enables them to earn positive returns in rising and declining markets (Mayer 2009). They follow a variety and usually a mix of trading strategies. Trading strategies are broadly differentiated in fundamental trading, which is based on market fundamentals, and technical trading, based on past price movements. They are also differentiated in discretionary and systematic trading. Technical trading largely involves systematic technical trading, which uses computer models or algorithms such as in classical trend following strategies. In contrast, discretionary technical trading uses a variety of chart analysis,

indicators or other information for trading decisions. Fundamental trading strategies are largely discretionary, based on decisions referring to fundamental data analysis, but can also involve a systematic component. Also time horizons differentiate trading strategies (e.g. from several weeks to weekly or daily trading and HFT). Some traders specialize by commodity sector developing an expertise in a specific market such as metals, grains or energy; others specialize by investment style (e.g. constructing trend following, macro or fundamental based trading frameworks). Money managers also adapt their trading strategies to the behavior of other market participants and the reality they experience in commodity derivative markets. If commercial traders are dominant, money managers may adapt their trading strategies more to supply and demand fundamentals; if index investors or other speculators are dominant to the trading strategies of these actors (Interviews 2012/13; Masters/White 2008). In many markets money managers are however a dominant trader class and hence also other market participants, particularly commercial traders, adapt their strategies to their behavior (see section 4.4). Overall, it is difficult to classify the group of money managers as there are always new trading strategies and combinations of strategies evolving. Still, five trading strategies can be roughly identified: arbitrage, macro traders, fundamental-based traders, technical traders and HFT (Table 4).

CTAs are individuals or organizations hired by an institutional investor, a fund or individual client to provide advice and services related to trading in commodity futures, options or/and swaps contracts. They act as asset managers following a set of investment strategies; two major styles being technical and fundamental based trading. Gilbert (2012) suggests that most CTAs follow systematic technical trading strategies (probably over 90 %). However, more traditional CTAs may employ discretionary strategies based on fundamental supply and demand factors or mixed strategies that combine fundamentally based analysis with technical trading (Interviews 2012/13). CPOs receive or solicit funds for the purpose of trading commodity futures or options and either make trading decisions on behalf of the pool or engage CTAs to trade for them (CFCT 2013b). Hedge funds are more diverse, generally larger and less transparent and regulated than CTAs and CPOs²⁶. They invest their own capital and on behalf of institutions and rich individuals. They generally use high levels of leverage to increase the impact of the assets under their management (Gilbert 2012). They may follow trend following techniques based on past prices, discretionary strategies following generalist or specialist knowledge, models based on broad macroeconomic or commodity-specific developments, or they may be opportunistic and may not follow consistent strategies over time (Tilton et al. 2011). The largest hedge funds are generally trend-followers (Interviews 2012/13). Blenheim Capital Management was reported in March 2012 to be the largest commodity hedge fund with US\$5 billion in assets (Jones/Farchy 2012). Commodity hedge funds tend to increasingly use more aggressive trading strategies e.g. including very short term strategies such as HFT and strategies that bet on price volatility (Vander Stichele 2012). Proprietary traders of banks or investment firms trade commodities on their own account with strategies borrowed from CTAs or hedge funds (Tilton et al. 2011).

²⁶ CTAs and CPOs are regulated by the CFTC under the CEA which governs all futures trading activities in the US.

Table 4: Classification of money managers and their trading strategies

Classification	Discretionary/ systematic trading	Factors	Time horizon
Arbitrage	discretionary or systematic	price differences between markets, assets or spreads	intra-day
Macro traders	discretionary or systematic	macro data: exchange and interest rates, unemployment, growth	weekly, monthly
Fundamental based traders	largely discretionary	fundamentals: supply and demand conditions of specific commodities	weekly, monthly, yearly
Technical/ Algorithmic traders	largely systematic	past prices: trend following, momentum trading	intra-day, daily, weekly
High frequency traders	largely systematic	price differences and order book movements	intra-day, nano-seconds

Source: Interviews 2012/13.

Arbitrage

Arbitrage is a trading strategy that takes advantage of price differences between two or more markets. It involves entering matching deals that capitalize upon this imbalance. Concerning commodity markets, arbitrage can take place between spot and futures prices²⁷ but also between different futures prices or markets, for instance between the LME and the Shanghai Futures Exchange (Sheppard 2010). Trading ahead of index investors' rolling is a specific type of arbitrage trading (see section 4.4.2). Scalping is another method of arbitrage focusing on small price gaps created by the bid-ask spread whereby a purchase is made at the bid price and a sale at the ask price to gain the bid/ask difference. This normally involves establishing and liquidating a position quickly, usually within minutes or even seconds and is therefore often pursued by HFT (see below). Scalpers act similar to market makers who aim to maintain the liquidity and order flow in a market; in some markets, they even fulfil the role of market makers (Haldane 2011). Scalpers usually employ systematic technical trading strategies, but there are also discretionary technical scalpers which have however declined in importance in the context of electronic trading (Milton 2013; Barros 2013).

Macro trading

Macro traders use models that include macro data and developments such as exchange rates, interest rates, unemployment rates, growth rates, etc. or any other financial market information, globally or for specific regions or countries such as the US or China. Hence, macro models include information from other financial market segments such as exchange or interest rates or US labour market data that do not need to be directly linked to fundamental demand and supply conditions of specific commodity markets. UNCTAD (2011) shows that the impact of US employment data in 2010 on cocoa and WTI oil futures in the minutes after the announcement is similar to the impact on equity markets. They conclude that macro and other financial market data used for trading strategies in other financial markets spills over to commodity futures trading. Thus, global macro or financial market events used as a basis for trading strategies may impact commodity prices independent from fundamentals in specific physical commodity markets. Macro trading may be discretionary or systematic.

²⁷ There should be no significant difference in value between a futures contract for a tonne of wheat for delivery today and an actual tonne of wheat. If there is a difference, arbitrageurs who are willing and able to take physical delivery, such as large commodity companies or traders and some hedge funds or investment banks, can seek to profit from differing prices between futures near their delivery date and the price of the physical commodity (WDM 2011).

Fundamental-based trading

Fundamental strategies focus on specific commodity markets and attempt to forecast prices by analyzing supply and demand factors and other market information, collecting data and conducting detailed research. Fundamental-based traders generally only trade in a small number of commodities or even just in one specific commodity. They use production and consumption data and/or estimates such as data from the USDA on agricultural markets and often are or work with sector specialists that employ specialized knowledge, in-depth analysis and fundamental information sources in an attempt to gain an informational advantage. Questions such as how long will copper mine production continue to lag demand, or will China re-start idle aluminum smelter capacity quickly or slowly form the basis of their trading decisions. The typical timeframe of investments is several weeks or months up to over a year but this depends on the underlying commodity where fundamentally based developments may occur in quite different time frames. Also, once new data emerges that violates the fundamental reason for investing, they can also enter and/or exit markets quickly (CRU 2012). Fundamental trading strategies are largely discretionary but they can also involve a systematic component that relies on fundamentally based computerized trading.

Technical or algorithmic trading

An important share of money managers rely on computerized systemic technical trading systems based on price trend identification and extrapolation (Gilbert 2008; Schulmeister 2009, 2012). Over the 1990s, the importance of technical trading has increased, becoming the most widely used trading technique in asset markets. Particularly in foreign exchange markets between 30 and 40 % of professional traders use technical trading systems (Schulmeister 2012). Also in commodity futures markets technical trading techniques have increased in importance. A criterion for technical trading strategies is high liquidity as traders always need to be able to buy and sell positions. As the trading volume in commodity futures markets has increased since the early 2000s, many markets now fulfil the liquidity criterion but the focus of technical trading is still on the most liquid markets such as crude oil, grains, certain metals and few other agricultural commodities such as coffee and cotton (Interviews 2012/13). Sheppard (2011) quoted the chief executive officer of the CME Group saying that 45 % of volume exchanged on the NYMEX was computer driven. In 2010 algorithmic trading accounted for 50 % of trading volumes in a number of important CME markets (CFTC 2013b).

Technical trading strategies are based on very different signals; the majority is however generally based on models that derive buy and sell signals from the pattern of past price movements aiming to take advantage of a market trend on the long or short side (Schulmeister 2012). Therefore, they use market indicators such as price or volume-based indicators related to moving averages, price correlations, rate of price changes, reversal patterns or money flows (Interviews 2012/13). These technical strategies may be calibrated to price signals from commodity markets alone but also from other asset markets including stock or currency markets (Mayer 2009). The models may use daily or intra-day price information (ranging from tick data to hourly data) and may make price decisions once a day or more often. The threshold to change positions may also differ with some models reacting quickly to new price trends and others only after price trends have been pronounced (Interviews 2012/13). In a market with a well established trend in place, technical traders can stay invested for a longer time but generally they have a rather short term time horizon of days or perhaps weeks (CRU 2012). Two different approaches can be used for isolating price trends in these models (Schulmeister 2012): Qualitative approaches (that can be also classified as discretionary technical approaches) rely on the interpretation of typical configurations of the ups and downs of price movements like “head and shoulders” or “top and bottom” formations and contain therefore a subjective element. Quantitative approaches (that can be also classified as systematic technical approaches) try to identify trends using statistical transformations of past prices. These models produce clearly defined buy and sell signals generating orders

according to a specific algorithm. Generally computer systems are used to automate the execution of the trading strategy allowing the execution of repetitive tasks at great speeds.

There exist many variations of trend following models but most commonly moving average (MA) models and momentum models are used (Schulmeister 2009, 2012): The basic version of the first type is a short term MA (MAS) where the lengths varies between 1 and 10 days and a long term MA (MAL) where the lengths varies between 20 and 50 days. The trading rule of the basic MA models is as follows: “Buy (go long) when the short-term (faster) moving average crosses the longer-term (slower) moving average from below and sell (go short) when the converse occurs. Or equivalently: Hold a long position when difference MAS-MAL is positive, otherwise hold a short position.” (Schulmeister 2012: 39). Momentum trading uses the difference between the current price and that i days ago with the following basic rule: “Buy (go long) when the momentum $M(i)$ turns from negative into positive and sell (go short) in the opposite case. Or equivalently: Hold a long position when $M(i)$ is positive, otherwise hold a short position.” (Schulmeister 2012: 39). Besides trend following strategies, traders may also follow counter trend and mean reversion strategies. Mean reversion strategies suggest that an asset tends to have an average price over time and deviations from the average price are expected to revert to the average, where the standard deviation of the most recent prices is often used as a buy or sell indicator. When the current market price is less than the average price, the commodity is considered attractive for purchase, with the expectation that the price will rise. When the current market price is above the average price, the market price is expected to fall (Rockefeller 2011).

High frequency trading

High-frequency funds started to become particularly popular in 2007/08. In 2009 HFT firms, which represented only 2 % of all trading firms, accounted for 73 % of all US equity trading volume (Iati 2009). HFT in energy futures on the NYMEX was estimated to account for around 15 % in 2011 and is estimated to double to 30 % in 2014 in US commodity derivative markets (Sheppard/Spicer 2011). HFT has been very profitable for exchanges given the increased trading volume. Exchanges have therefore an incentive to not lose the volumes of trade HFT brings to the markets (Sheppard/Spicer 2011). For instance, exchanges offered HFT to co-locate their servers close to their data centres, which gives HFTs access to prices a fraction faster than competitors (Najarian 2013).

HFT is a technologically advanced method of conducting algorithmic trading at ultra-high speed. It uses sophisticated technological tools and computer-based algorithms to trade on a very rapid basis, relying heavily on the processing speed of their trades and on their access to markets. This even includes co-locating their server in the same building as or in the approximate neighbourhood of exchanges to receive information faster (Rose 2009). Contrary to other types of algorithmic trading, which focus on price levels and maintain positions over a period of time, HFT traders attempt to collect tiny gains on short term market fluctuations (McGowan 2010). An investment position in HFT may be held for only seconds, or fractions of a second, with the computer trading in and out of positions thousands or tens of thousands of times a day. They aim to capture just a fraction of a cent per trade but given the frequency of trading these fractions may accumulate fast to significantly positive (or negative) results during a day. At the end of a day, HFT hold generally no open positions in the market. HFT may involve a range of strategies, including arbitrage on price differences and trading based on order book movements, but there is very little known about the specific strategies in commodity derivative markets. HFT are often defined using the following criteria: (i) holding times in a trading venue's system which are generally very short (i.e. seconds or fractions of seconds), (ii) proportion of cancelled orders or cancellation ratios that are often high as a large share of offers are not executed, and (iii) means, speed or frequency of order entry and transaction (CFTC Technical Advisory Committee 2012).²⁸

²⁸ A CFTC working group on HTF suggested also the following definition of HFT as a form of automated trading that employs: (i) algorithms for decision making, order initiation, generation, routing, or execution, for each individual transaction, without

4.2.3. *Physical market financial investors*

Prior to 2008, financial investors did not generally hold physical commodities but used derivative markets to get exposure to commodity price developments. A newer phenomenon is the involvement of financial investors, particularly investment banks and hedge funds, in commodity spot markets by buying and accumulating inventories of physical commodities (CRU 2012). This strategy used to be confined to precious metals as it is more difficult and involves higher costs to store other types of commodities. However, it has recently also been extended to other storable commodities which largely includes metals such as aluminium, copper and zinc. For agricultural commodities, this trading strategy has not been important given the difficult storability and high storage costs. Aluminium is the most extreme example of how industrial metals are strengthening their role as hard asset investments in the aftermath of the financial crisis (Interviews 2012/13). This shift can be also seen in the increasing importance of physically-backed ETPs or ETFs (as discussed above in section 4.2.1). Investments in physical commodities are largely confined to larger players as managing these transactions requires economies of scale and specialized expertise. Storage of physical commodities requires further cheap funds and hence low interest rates. As in particular banks have access to low interest rates, they are the most prominent physical market financial investors (Interviews 2012/13). For example, in 2009, Goldman Sachs, Barclays and JP Morgan reportedly controlled physical commodities worth £16 billion which is more than three times the amount they controlled in 2008 (Henn 2011). Goldman Sachs, Morgan Stanley and JP Morgan own large volumes of aluminium, copper and zinc (Blas 2013c). Besides holding physical commodities, investment banks also own and operate warehouses as well as pipelines and ports. For instance, Goldman Sachs owns 79 % of the warehouses in Detroit that are approved by the LME (Kocieniewski 2013).

The increasing role of financial investors in physical commodities is related to regulatory changes in the US. For much of the last century, the US Congress tried to keep a wall between banking and commerce by forbidding banks to own non-financial businesses (and vice versa) to minimize risks and avoid conflicts of interest. But in the context of financial market deregulation in the 1980s, investment banks won regulatory approval to buy companies that traded in oil and other commodities. Other restrictions were weakened or eliminated during the 1990s, when some banks were allowed to expand into storing and transporting commodities. Over the past decade, a handful of bank holding companies have sought and received approval from the Federal Reserve to buy physical commodity trading assets. By owning warehouses, pipelines and ports and being involved in physical and derivative commodities trade, conflicts of interest or even insider trading may occur which is forbidden in other financial asset markets (Kocieniewski 2013).

4.3. **Trading strategies of commercial traders**

Most actors in a typical commodity value chain, i.e. producers, cooperatives, intermediaries, traders, exporters/importers, processors, manufacturers, consumers, as well as producing and consuming countries' governments, look at futures prices for price discovery and may engage in hedging to reduce their price risks. Taking the example of coffee, the value chain consists of producers who supply local traders, cooperatives or exporters, international trading companies, and processors like roasters that deliver the product to supermarkets or coffee houses and chains (Dana/Gilbert 2008). If producers hedge, they typically engage in short futures positions and are concerned by inter-annual price uncertainty given their generally annually investment and production decisions. There are a range of local intermediaries, including traders, producer groups, cooperatives, intermediate aggregators, stockholders and processors, which buy from producers and sell to exporters, international trading companies

human direction, (ii) low-latency technology that is designed to minimize response times, including proximity and co-location services, (iii) high speed connections to markets for order entry, and (iv) high message rates (orders, quotes or cancellations) (CFTC Technical Advisory Committee 2012).

or international processors. Intermediaries are generally long the commodity, but have shorter time horizons than producers and are concerned by price variability over the period in which they hold the commodity. But they can also be short if they sell to consumers prior to purchasing the product.²⁹ Roasters and manufacturers that use coffee as an input and end consumers go long to secure their input prices. For many end consumers, coffee accounts only for a relatively small share of their input costs and hence hedging is less important than for producers, traders and processors for whom coffee is often their major product. Banks also play a role as they may lend money to actors in the value chain with specific price exposure. Also governments have a direct and indirect exposure to commodity prices – for instance through tax revenues or when governments directly engage in guaranteeing price stabilization funds. The necessity of using derivative markets for hedging depends on trading and contract arrangements in specific value chains, e.g. if buyers such as processors or supermarkets offer fixed prices in advance, and on commodity related policies and regulations to cope with price risks, e.g. price stabilization mechanism or funds (Dana/Gilbert 2008).

As is clear from the above, the group of commercial traders is very diverse and heterogeneous from small producers and cooperatives to large multinational commodity companies, processors or supermarkets to governments. The trading strategies of these diverse actors are also very different with particularly large commodity companies and trading houses being involved in hedging as well as arbitrage and speculative activities. This is why in the following we discuss firstly trading strategies of large commodity companies and trading houses and secondly of smaller commodity producers and traders that face particular constraints in hedging.

4.3.1. *Large commodity companies and trading houses*

Trading of many physical commodities has concentrated significantly. For many commodities few large global producers, processors, and particularly trading houses dominate the physical market. The share of commodity production that is traded on world markets is called “addressable” markets referring to volumes accessible to trading houses and excluding commodities produced for a company’s own use and commodities that are not internationally traded. Trading houses account for the large majority of the “addressable” market share (Blas 2013c). Consolidation is related to the low price period in the 1980s and 1990s which lead to bankruptcies and acquisitions and mergers. Concentration at the trader level was initially driven by the erosion of marketing margins associated with improvements in communications technology. But it has further increased related to the need to engage in commodity derivative markets to cope with price risks. Small to medium traders have faced difficulties and several were wiped out of the market when prices moved against them in the context of high price volatility particularly in the early 2000s, or when the financing of margin calls became impossible (Kaltenbrunner et al. 2012). For instance, for cotton, the extreme volatility in cotton futures markets in early 2008, tightened credit conditions and declining cotton demand forced several major cotton traders into bankruptcy or merger.³⁰ This increased market concentration also opened the door for a range of large multi-commodity trading firms to the cotton business (ICAC 2009). Despite consolidation, competition for the large trading houses has picked up from financial institutions and particularly banks that have ventured into physical commodity trade (as discussed in section 4.2.3).

²⁹ There are five large international coffee trading companies that account for a market share of above 55 %. These large companies typically hedge all of their coffee trades, executing these operations through their in-house futures and options desks (Bargawi/Newman 2009).

³⁰ For instance the largest cotton merchant Allenberg Cotton Company, founded 1921, was acquired in 1983 by Louis Dreyfus Commodities and was now acquired by Dunavant Enterprises, which is one of the largest privately owned cotton merchandising companies. Weil Brothers Cotton, founded 1878, announced in November 2008 to exit the cotton business as risks associated with cotton trade have become too large. Similarly, Paul Reinhart America, a subsidiary of Paul Reinhart Switzerland, which is among the largest cotton traders in Europe, filed for bankruptcy (ICAC 2009).

The Financial Times published an article on the top 20 independent trading houses in April 2013. The top 20 trading houses have posted almost US\$250 billion of net profit over the past decade. The revenues from ten of the world's largest independent trading houses – Vitol, Glencore, Trafigura, Cargill, Mitsubishi, Archer Daniels Midland (ADM), Noble, Wilmar, Louis Dreyfus and Mitsui – hit US\$1.2 trillion in 2012, which is roughly equivalent to the GDP of Spain or South Korea (Table 5). The net income of the largest trading houses since 2003 is suggested to be larger than the combined income of the large Wall Street banks Goldman Sachs, JP Morgan Chase and Morgan Stanley, or more than the five biggest car manufacturers combined (Blas 2013a, 2013b). Further, new trading houses from Asia, such as Hong Kong's Noble or Singapore's Olam or Hin Leong have emerged (Schneyer 2011). Despite the crucial role of these companies, there is limited information as there is a large transparency gap in the commodity trading industry. Even though some companies are publicly listed, many of the largest trading houses are privately or even family-owned, for instance Glencore, Louis Dreyfus Group, or Koch Industries, and disclose little or no information (Blas 2013a, 2013b). Commodity trading houses are also largely unregulated in contrast to banks and other financial investors but recently there have been calls for increasing oversight and regulation (Day-Robinson/Tozer 2013). Switzerland is still the main hub of commodity traders, offering incentives such as the so-called auxiliary regime in some cantons which offer attractive incentives to firms earning the majority of their revenues outside the country (Day-Robinson/Tozer 2013). But other cities such as Hong Kong, Dubai, Kuala Lumpur and above all Singapore, which even developed a specific program for global traders in 2001, offer attractive conditions, particulars very low taxes, to attract trading houses (Blas 2013a, 2013b).

The leading independent energy trading houses are Vitol, Glencore, Trafigura, Mercuria and Gunvor that together handled more than US\$15 million barrels of oil a day in 2012. Glencore and Trafigura form a duopoly that controls as much as 60 % of some markets such as zinc. For aluminium, the big three commercial players are Alcoa, Norsk Hydro and Rusal. The so-called ABCD group of the US Archer Daniels Midland (ADM), Bunge and Cargill and the French Louis Dreyfus that dominates global trade in agriculture, handles about half of the world's grain and soybeans trade flows. In smaller markets such as coffee, cotton, cocoa or sugar relatively unknown companies command extraordinary power. For instance, the Germany-based and family-owned Neumann Kaffee Gruppe is behind the beans that go into one of seven cups of coffee. Ecom Agroindustrial mills more coffee beans than any other company and supplies companies such as Nestlé and Starbucks (Blas 2013a). Similarly, in 2009, the 13 largest cotton companies – of which 4 were government organizations and 9 privately owned companies – traded 26 % of world cotton production. These traders include Allenberg Cotton, Cargill Cotton, Dunavant Enterprise, Olam International, Chinatex or Ecom Agroindustrial (ICAC 2009).

These players are involved in hedging their physical commodity exposure and often dominate commercial trading activities on commodity futures markets. As with financial investors engaging increasingly in physical commodity markets, large commodity companies and traders have also had increasingly multiple roles (Interviews 2012/13). They are found to increase their arbitrage and speculative involvement in financial markets by investing on their own account, by managing third party money or selling investment products, becoming “financialised” and resembling financial holding companies with a spectrum of financial services and investments. The proportion of company revenues coming from such financial activities has grown with respect to revenues derived directly from the trading of physical commodities. Commodity trading companies have increasingly placed “risk management” at the centre of their core competencies, referring to in-house research departments and futures brokerages that cater for traders of physical commodities and other financial investors looking to diversify their portfolios (Newman 2009). Newman (2009) also finds that transnational commodity trading companies have increasingly engaged in speculative hedging. In contrast to routine hedging associated purely with the mitigation of price risks related to physical commodity trading, positions are taken based on their anticipation of how prices will evolve in

the future. These developments indicate that derivative trading by large commercial trading houses and financial investors has become increasingly similar regarding motives and trading strategies.

Table 5: Top 10 independent trading houses

	Revenue (2012)	Country	Establishment	Commodities	Other
Vitol	US\$303bn	Netherland	1966	Oil, gas, coal, sugar, grains	World's largest energy trader
Glencore	US\$214bn	UK, Hong Kong	1974	Energy, metals and minerals, agriculture	Asset heavy business model
Cargill	US\$134bn	US	1865	Agriculture commodities	World's largest trader of agricultural commodities, biggest market share in sugar, corn, wheat
Trafigura	US\$120bn	Netherlands, Switzerland	1993	Crude oil and refined products	40 % of freely traded market of refined copper, lead, zinc
Noble Group	US\$94bn	Hong Kong, Singapore	1987	Energy, metals, agriculture	some assets
ADM	US\$89bn	US	1902		Industrial and processing capabilities, one of largest producers of corn-based ethanol and top corn trader
Mitsubishi	US\$70bn	Japan	1954	From noodles to iron ore	Largest Japanese trading house, asset heavy model
Louis Dreyfus Commodities	US\$57bn	France	1851		
Mitsui & Co.	US\$67bn	Japan	1947		Second largest Japanese trading house; investor in natural resources
Wilmar	US\$45bn	Singapore	1991	Vegetable oil	Controls quarter of the vegetable oil market and 60 % of retail market for packaged and bottled vegetable oil in China

Source: Blas (2013c: 8).

Some commodity companies and traders have own speculative trading services units. For instance, Balarie Capital Management which is a division of Archer Financial Services owned by ADM Investment Services whose parent company is ADM offers derivative products and services, including in commodities, to speculative investors (Vander Stichele 2012). In the last 20 years, Cargill has opened at least five financial subsidiaries, some of which are involved in speculative activities on commodities markets (Oxfam 2011). Others own hedge funds (Vander Stichele 2012): Black River – a hedge fund with estimated assets of US\$6 billion in October 2011 – is an independently managed subsidiary of Cargill. Cargill Risk Management and Financial Unit (of which Black River is part) provides risk management and investment products for Cargill business units and external clients, including producers, pension funds, hedge funds and endowment communities. Armajaro Asset Management LLP (US\$1.5 billion under management) owns seven hedge funds of which four are engaged in commodity derivative trading. It is owned by Armajaro Holdings that owns Amarjaro Trading which is one of the world's largest traders in soft commodities specializing in cocoa, coffee and sugar, Armajaro Derivatives which is the risk management part specializing in OTC hedging products for clients, and Armajaro Securities which provides a wide range of financial services and products, including commodity derivatives to institutional clients and hedge funds. Galena is owned by Trafigura and is the investment manager of seven hedge funds with US\$1.7 billion under management at the end of 2011. Galena's commodity hedge funds only invest in those commodities that Trafigura is conducting business in (Vander Stichele 2012).

4.3.2. *Smaller commodity producers and traders*

Despite the acknowledgement of limitations, hedging has been widely promoted as an instrument for price risk management for producers and other actors, including governments, in emerging and developing countries (Gilbert, 1996, 1985; Varangis/Larson 1996; World Bank 1994; Blas 2011; Wroughton 2011; Nissanke 2011). However, in particular smaller commercial traders at several stages of the value chain (producers, cooperatives, traders, exporters) in LICs face several risks and barriers in using derivative markets for hedging. There are a range of risks which compromise the effectiveness, efficiency and quality of hedging. These include basis risk as well as specification, contract, margin and exchange rate risk that are particularly prevalent in developing countries (Claessens/Qian 1993; UNCTAD 2009a).

Basis risks arise when the commodity futures price is imperfectly correlated to the spot price. The quality of a hedge, i.e. the degree to which it eliminates price exposure, depends on the correlation of changes in the local price and the futures price. Though the hedge quality is always imperfect, as the local spot price reflects local as well as global market conditions, agents in developing countries might be particularly affected as price movements in developing countries will not always correlate well with global exchange prices. The basis risk is considered high and futures contracts are considered less effective when the correlation of changes in the local and futures price is lower than 80 % (Dana/Gilbert 2008). Specification risks imply that the hedged commodity differs from the underlying commodity traded in the futures contract, for example a regional type of wheat is not traded on the main futures markets in Chicago and Kansas. Contract risks arise when the size of futures contracts does not correspond to the volumes physically traded which for small commercial traders may be often too low. Further, the date of the planned spot transaction may not be the same as the maturity date of the futures contract. Most hedging instruments are limited to maturities of less than three months (as the risk premium becomes very large for longer maturities) which may be too short for physical traders. Another risk concerns exchange rates as commodity derivative trading takes place largely in US Dollars, UK Pounds or Euros. This risk can be reduced by borrowing in the same currency as applied in the overseas futures market or by engaging in foreign exchange futures markets which, however, would require additional liquidity (Morgan et al. 1999). Finally, traders on futures markets have to provide a deposit, or initial margin, with a clearing firm. The margin is typically a small share of the underlying as-

set's value and is balanced on a daily basis. If the trader has engaged in long positions and the current daily futures price is less than the contracted futures price, the trader suffers a loss in his account balance. When the margin falls below the initial margin there is a margin call and the trader has to replenish the margin before the next trading day. To react to margin calls, traders need access to liquid financial reserves, which might constitute an impediment in particular for traders in LICs with no well developed financial systems or limited access on competitive terms (Morgan et al. 1999).

Due to the switch to electronic trading, market access was facilitated and transaction and trading cost declined (Irwin/Sanders 2012). However, other risks prevail and may even be accelerated by lack of knowledge, resources and capacities to interact actively with futures markets following futures price developments and engaging in hedging and other trading strategies. In particular in developing countries, limited access to information or finance on competitive terms, high technical barriers and transaction and financial costs, infrastructure deficiencies, and a cumbersome process of execution further constrain hedging activities (Nissanke 2011; Nissanke/Kuleshov 2012; UNCTAD 2009a). Further, local actors generally rely on intermediaries, mostly banks and brokers to access hedging instruments, often even international intermediaries of branches and subsidiaries of TNCs which further increases the costs of hedging (Nissanke/Kuleshov 2012). Brokers may also be reluctant to work with unknown and possibly risky smaller clients in developing countries (Morgan et al. 1999). In this context, it is often not the individual producer or trader that hedges but cooperatives or other associations of producers or traders that can act on a larger scale (Interviews 2012/13).

4.4. Impact of financial investors on market structure and commercial traders

The crucial question is how financial investors' trading strategies have impacted on the market structure and on commercial traders that use these markets for price discovery and hedging. After discussing general impacts on market structure and commercial traders, we assess the potential impact of the three types of financial investors, i.e. index investors, money managers, and physical markets financial investors. When assessing this impact, it has to be taken into account that the classification of traders and interactions among traders with different motives and trading strategies are complex. The direct equation of commercial traders with informed hedgers and of financial investors with noise and uninformed traders does not capture the actual complexity of trading. In a context of uncertainty about market developments and often unreliable market information, e.g. on supply and inventories, commercial traders may have limited information as a basis for price expectations and may base their trading strategies also on the behaviour of other market participants following market sentiments. This may be perfectly rational when traders believe that they can glean market information by observing and imitating the behaviour of other agents (UNCTAD 2011). Consequently, it may be difficult to distinguish between price signals that are based on fundamentals and "distorted" price signals introduced by market participants that trade on the basis of other information or sentiments. This may be accelerated by the limited capacities of some commercial traders to absorb and process information. Additionally, if certain trader classes and trading strategies dominate other traders must respond to their behaviour even if it may involve moving away from fundamental based trading by informed traders as "leaning against the market" can be expensive (UNCTAD 2011). Further, as discussed above, commercial traders are not only engaged in fundamentally-based hedging activities but increasingly also in arbitrage and speculative trading using similar trading systems as investment banks and hedge funds. On the other side, traditional speculators and some financial investors may be well informed about fundamental market developments using detailed fundamental-based analysis and models on specific commodities for their trading decisions.

4.4.1. General impact of financial investors

Our interviews revealed that financial investors' behaviour, in particular the trend following trading of hedge funds and the switching and rolling of index investors, is closely analyzed by commercial traders and taken into account in their trading strategies. Financial investors' behaviour plays an increasing role when commercial traders discuss hedging and trading strategies with their brokers; traders stated that they talk to their broker every day about the behaviour of large hedge and index funds (Interviews 2012/13). Commercial traders may postpone or adapt their strategies to what index investors and money managers are doing, e.g. if hedge funds are expected to trade or index funds to roll their positions. They have to take into account the trading behaviour of financial investors as otherwise they may position themselves "against the market", e.g. when they go long in nearby futures during the roll period of large indices or when they trade on the opposite side of money managers using trend-following techniques. For instance, the most popular technical trading systems are followed by other traders (no matter which trading strategy they follow) as by observing the transactions and open positions indicated by them they can draw conclusions about the behaviour of other actors and their potential price effects (Interviews 2012/13; see also Schulmeister 2012). Commercial traders tend to look not only at fundamentals but also financial market information trying to anticipate the factors that determine financial investors' decisions. As one trader interviewed by UNCTAD (2011) put it "the banks are trying to understand our markets and we try to understand their markets." In this respect trading has become more complex as it requires monitoring the complex and increasingly short-term trading strategies of financial investors. The complexity has further accelerated by the shift to electronic trading and extended trading hours. Longer trading hours makes trading more flexible and allows for immediate reactions but also demand continuous awareness of the market which has been challenging for smaller commercial traders interviewed (Interviews 2012/13).

Larger commercial traders interviewed tend not to be too concerned with the increasing presence of financial investors on commodity derivative markets. Some traders stated that they can profit from the trading behaviour of financial investors, in particular from the largely passive and price-insensitive trading behaviour of index investors. Some further state that the presence of money managers and index investors has allowed commercial traders who are well financed and of reasonable size, to move large amounts of contracts more easily. High volatility may also have a positive effect for some large traders as this provides more opportunities to fix prices higher (producers) or lower (buyers). Most agree that the market has become more profitable for large commodity companies and trading houses that have their own hedging and increasingly also financial services units that invest in commodities on their own account pursuing different trading strategies and/or develop products for clients (Interviews 2012/13).

For smaller commercial traders and even more for traders based in developing countries that do not have own financial services units and the knowledge, resources and capacities to interact that actively with futures markets, hedging has tended to become an even more difficult risk management instrument. Amongst other factors, the recent changes in the functioning of derivative markets and the often dominant role of financial investors seem to have made hedging more expensive and risky for this class of traders. The costs of hedging have generally increased and the financial requirements have become larger. For instance, when coffee prices were extremely high in 2010, many small companies defaulted as they could not fulfill their margin requirements anymore (Interviews 2012/13). Smaller commercial traders interviewed have also complained about hedging becoming more complicated given the longer opening hours of exchanges (related to the switch to electronic trading) and the increasing short terminism of trading, including intra-day volatility of commodity prices which leads to more frequent margin calls requiring permanent access to finance (Interviews 2012/13). For instance, related to high volatility, margin levels (as a proportion of contract value) increased by 142 % in maize, 79 % in wheat and 175 % in soybean on the CBOT from January 2003 to December 2008 (UNCTAD 2009). In this context, several commercial trad-

ers that used to hedge have or are thinking to abandon hedging on futures markets (Interviews 2012/13; see also Masters/White 2008; Nissanke 2011, 2012). A study by the Common Fund for Commodities (CFC) that evaluates the outcomes of a pilot project on cocoa price risk management confirms these difficulties. Four cooperatives in Ivory Coast employed option instruments which should offer a floor price to avoid exposure to high price fluctuations. The scheme failed as the cooperatives found the management of unpredictable hedging costs too risky and the brokerage costs too high. The study confirms that hedging risks proved difficult and costly for producers given the increasingly complex nature and high costs of financial markets (Nissanke/Kuleshov 2012).

4.4.2. *Impact of index investors*

In the empirical literature, there is little evidence of a significant relationship between index investors' positions and changes in commodity prices (for an overview of empirical studies see Ederer et al. 2013). However, though subject of controversial debate, there are indications of how index investors' trading strategies can impact on commodity futures prices. Index funds and ETFs have a large and relatively price-insensitive constant demand for long commodity futures contracts (see section 4.2.1). This may lead to an increase in prices as the required supply of futures contracts (short positions) may only be reached by higher prices.³¹ Informed traders seeing that long positions largely reflect index-based investment may further 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 up. Both these mechanisms can cause speculative bubbles (Mayer 2012). Even though index investors are largely passive and long only investors through their portfolio re-allocations their trading can also lead to a pressure on declining prices if for example in the context of bear markets investors reduce their investments in commodity indices or adapt their composition and/or weights (Briese 2012). The co-movement of prices of different commodities which are part of indices is presented as a further indicator of the price impact of index investors (Tang/Xiong 2010; Bicchetti et al. 2011). The majority of empirical analyses support the finding that the trading strategies of index investors play a crucial role in explaining the increased co-movement of commodity prices and commodity and other financial asset prices (for an overview of empirical studies see Ederer et al. 2013).

Index investors may also have an impact on the term structure of commodity prices. Due to the large size of index investments, their rolling may push the price of the nearby contract, which index traders are selling, down and the price of the next contract, which index traders are buying, up, leading at least to a temporarily underpricing of the old and overpricing of the new contract. Empirically, such a change in the term structure can be generally supported. Parsons (2010) and Kemp (2010) show that oil markets were mostly in backwardation before the 2000s. More recently, they are in contango, which has become "the new normal" in oil markets. For the S&P GSCI, until 1991 the whole range of commodities traded mostly in backwardation, during the rest of the 1990s and the early 2000s market structure was balanced between backwardation and contango, and since the late 2004 contango has become large on average (Kemp 2010; Chada 2010). The increasing presence of contango has impacted negatively on the roll yields of index investors which has motivated the development of more active index-based products (as discussed in section 4.2.1). Several researchers directly link this development to the entry of index funds especially since 2004 (see for example Kemp 2010; Frenk/Turbeville 2011; Aulerich et al. 2012).³² There are however also

³¹ As one advisor with a focus on agricultural commodities put it: "When the large index (and speculative) funds are buying more aggressively than the commercial hedgers are willing to sell, the market must go up until supply and demand get back into balance. When large index (and speculative) funds are selling more aggressively than the commercials are buying, the market must go down until the supply and demand get back into balance." (Hacket Financial Advisors 2012)

³² Frenk and Turbeville (2011) investigate changes in six commodity price spreads from 1983-2011 before, during and after the roll period of the GSCI. They suggest that futures price spreads are in contango during the roll period more frequently and of greater average magnitude than during the non-roll period. Aulerich et al. (2012) find that during the roll period CIT positions appear to increase the spread for wheat and soybean, in particular when the size of the CIT position is large.

contrasting results finding that index investors do not impact the futures spreads (Irwin et al. 2009, 2011; Brunetti/Reiffen 2011; Hamilton/Wu 2012).³³

A study by the US Senate (US Senate 2009) emphasizes a third potential impact of index investors on commodity prices investigating how commodity index traders affected the price of wheat contracts traded on the CME. Typically, prices in the futures markets converge towards prices in the spot market towards contract expiration. The investigation found “significant and persuasive” (US Senate 2009, 2) evidence that index traders were one of the major causes for increases in the price of wheat futures contracts relative to the spot market price. This lack of convergence between the price of wheat futures contracts and the price of wheat in the spot market impaired the hedging ability of commercial traders. They argue that index investors have created additional demand for wheat futures contracts, which is unrelated to corresponding supply and demand in the spot market causing a relative increase in futures prices (US Senate 2009). Grain traders interviewed by UNCTAD (2011) confirm this stating the lack of convergence between futures and spot prices as one factor impairing the functioning of the wheat market.

Thus, higher prices related to index investors’ trading strategies could have a direct impact on commercial traders, questioning the role of futures markets for price discovery and as a benchmark for physical contracts and production, consumption and investment decisions. This may provide misleading price signals and may trigger reactions that are not justified by fundamental supply and demand conditions. At least this may lead to greater insecurity about the reliability of futures market signals. Concerning the term structure, commercial traders assess the term structure to form beliefs about future price developments. Backwardation is not necessarily interpreted as a signal that prices will decrease whereas contango is generally interpreted as a signal for increasing prices as more investors have started to place themselves at the front end of price curves (Frenk/Turbeville 2011; Onstad 2012). Hence, an influence of index investors on term structures would constitute an artificial price signal suggesting that commodity prices increase in the future. Limited convergence between spot and futures prices related to index investors trading strategies would increase the basis risk for commercial traders and impair the management of price risks through hedging and the use of futures markets as reliable benchmarks for price developments.

Most traders interviewed state that index investors are now “a fundamental part of the equation”; without their presence the markets would work and contracts would be written differently. Money managers and commercial traders adapt their strategies to what index investors are doing and in particular to when index investors are rolling. Rolling creates arbitrage and speculative opportunities. Hence, market participants, and in particular banks’ proprietary trading desks which tend to have more detailed information on their customers’ trading strategies that include index investors, can exploit the roll periods of large indices by pursuing a front-running long-short strategy (Interviews 2012/13). Mou’s (2011) analysis of the Goldman roll indicates that up to US\$26 billion was made through arbitrage of the Goldman roll between 2000 and 2009. For example, a trader could short the March contract anticipating that it will be relatively underpriced during the roll period and at the same time long the April contract expecting it to be relatively overpriced when the Goldman roll happens.

Other than on the generally important role of index investors in commodity derivative markets, the views of traders interviewed differ on their impact on liquidity and prices. Some state that index investors brought liquidity and that this could decrease volatility, as they are “non-emotional” investors and therefore stabilize prices. Others question the argument that

³³ Irwin et al. (2009/2011) analyze spreads in CBOT corn, wheat and soybeans futures markets for the period 1995-2009 and find that the magnitude of the spread during the roll period disappears a couple of days after the roll, but the average difference between the spread and a non spread period are not statistically different. Brunetti and Reiffen (2011) suggest that the roll by major index traders is announced well in advance and does not introduce new information to the market. Similarly, Garcia et al. (2011) do not find a tendency for spreads to increase or decrease over time as index positions increase. Also Hamilton and Wu (2012) who investigate the roll period of 12 agricultural commodities find little evidence regarding the relationship between spreads and index positions.

index investors provide liquidity or even state that they affect liquidity negatively. This is particular the case as they only provide liquidity, firstly, in one direction competing for a large share of available short positions and hold on to them in the long term crowding out long commercial interests and, secondly, in a specific period which may not be the time in which the market may need it. For instance, during a steep multi-day price increase in cotton in March 2008, large passive investors did not exit their positions so that not enough liquidity was available for cotton traders to get out of their positions. One trader states that he may prefer not to be in the market when knowing that a high proportion (up to 60 %) of “massive passives” is present because he might not be able to get out of the positions when needed. Some traders state that index investors may impact the markets only at the beginning of the year, when the index is rebalanced; others see however increasing price trends more generally related to index investors due to their constant buying strategy. One interviewee states that to know that there is a constant buyer means that the level of the floor prices can be increased as long as it goes. However, some interviewees also suggest that, as index investors’ trading strategies are publicly known and their participation is to a large extent predictable, their effect can be discounted. Due to their passive buying strategies, index investors are quite broadly believed to have a smaller effect on prices and markets than money managers (Interviews 2012/13).

4.4.3. *Impact of money managers*

Concerning money managers, in particular the effects of technical trading and trend following strategies on accelerating periods of increasing or decreasing prices and increased short-term volatility of prices have been discussed. Despite the diversity of trend following approaches, many traders still use similar forms of statistical analysis to inform their trading strategies (see section 4.2.2; Schulmeister 2009, 2012). This can create a self fulfilling cycle whereby traders collectively generate and then follow price trends disconnected from supply and demand fundamentals. Herding may play an important role in this and can be rational. If the market is dominated by trend following traders, even if traders had new fundamental information it could be difficult to lean against the market without losing. Although individually rational, the overall effect of trend following strategies may however destabilize markets. Herding may be further accelerated through institutional incentives, including pressure to deliver performance and managers’ payment structures. Asset managers have to meet their institutions’ short-term performance targets, even if doing so implies going against signals from long-term fundamental supply and demand factors. Further, as they are paid according to their relative performance compared to a benchmark index or with other rival funds, they have a strong incentive to replicate successful trading strategies. Given risk aversion, many asset managers prefer to remain close to the benchmark rather than trying to beat the market which could also result in underperforming it (Biccetti/Maystre 2012; Gilbert 2012). In markets dominated by few large players, even individual traders could move the market. For example, if Goldman Sachs controlled 20 % of the open interest in the wheat futures market, they would have the resources to initiate an upward price trend, and they would then also be the first to start selling before the herd movement reverses itself (UNCTAD 2011). In addition to past commodity prices, technical trading strategies may also use signals from other markets or macroeconomic or other financial market indicators, thus increasing price correlation across markets. This may lead to a spillover of the financial market logic to commodity markets by using any economically relevant new information for trading that may not be related to the fundamentals of specific commodities (Mayer 2012).

Most traders interviewed stated that money managers may particularly have an effect on short term price movements within a day to a week. Such speculators thus have the potential to dominate markets for a short while, though in the long run, markets generally revert to fundamentals. For coffee and cotton, interviewees generally agreed that most extreme price movements could be traced to fundamental events but that these movements tend to be exaggerated by fund participation. One trader speaks of super-cycles or mini cycles – when prices are higher or lower than they fundamentally need to be – on top of price movements

caused by fundamentals. Some traders state that speculators can also have an effect on longer term price trends for several weeks or months, in particular in between harvests where the market may not reflect fundamentals. Some traders also stated that technical trading and particularly the activities of hedge funds increase the correlation between commodity derivatives markets and other financial markets (Interviews 2012/13). Generally, it seems that money managers may have an impact on prices particularly in the short term in certain market conditions but not in others. Under “tranquil” conditions with a low volatility in fundamentals, markets may be dominated by informed traders that can prevail and counteract destabilising forces by irrational traders and keep asset prices to their fundamental value. However, as uncertainty and volatility of fundamentals increases, noise and uninformed traders may become dominant and also informed traders may switch to destabilising speculation which may disconnect prices from their fundamental level and increase volatility (Interviews 2012/13; Nissanke 2012).

Trading strategies of money managers seem to have become more short term (Interviews 2012/13) which is most strongly seen in the increasing role of HFT. Views on the effect of HFT by traders interviewed diverge which is also due to the fact that very little is known about their presence in commodity derivative markets. Some interviewees stated that they are hardly present in the commodity derivative markets of cotton and coffee as the markets are too thin; others state that their presence has increased. Concerning impact, the one side states that many HFT firms act like market makers and provide liquidity to the market, which has lowered volatility and helped narrow the bid-offer spreads making trading cheaper. For coffee markets, some stated that HFT have a large impact when bid-ask spreads are large due to seasonal differences in supply and demand. The other side states that HFT has increased liquidity and volatility, particularly intra-day volatility that is not related to fundamental conditions, increasing uncertainty. In particular very short term volatility within a day is relatively new for many commodity derivative markets (Interviews 2012/13). The dangers of HFT were most clearly seen in the “flash crashes” that took place in the international sugar market in late 2010 and the cocoa market in early 2011. Falling prices triggered the computerized models to automatically sell, fuelling a downward trend that led to prices falling 11 % for sugar and 12.5 % for cocoa in a matter of minutes (Blas 2010; Meyer 2011; Bowley/Neuman 2011). Supporting this view, some traders interviewed stated that HFT has the potential to distort prices, add noise, increase short term volatility, and thus frustrate commercial traders and make their trading more complicated. It was also pointed out that HFT is not helpful for hedging, because positions are not held over long time periods. For smaller commercial traders, short term and intra-day volatility has made hedging more difficult and expensive as they have to follow the markets more regularly and require permanent access to funds given potential daily margin calls. Several smaller commercial traders interviewed stated that in this context it is difficult to use futures and the only alternative to circumvent margin calls may be options which however have very high fees (Interviews 2012/13).

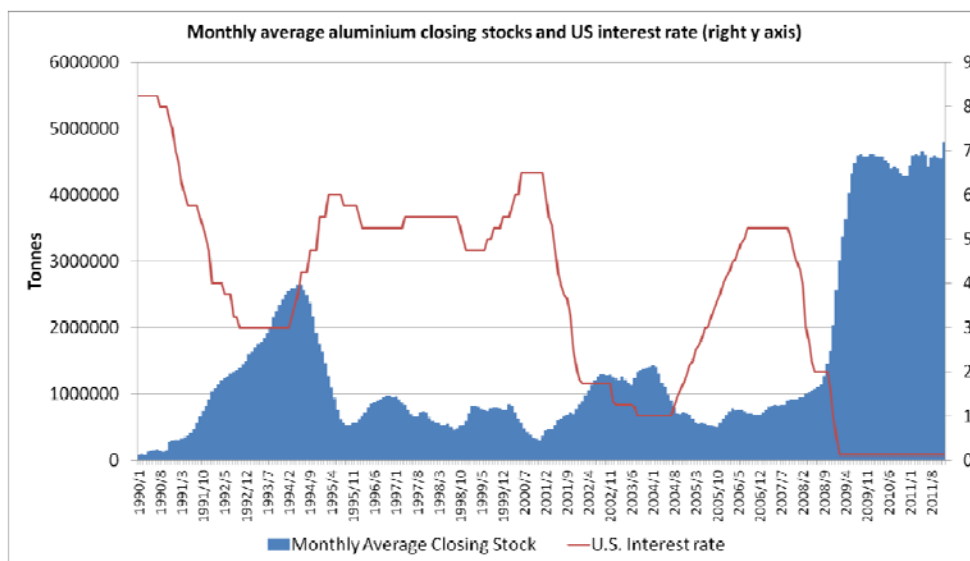
4.4.4. Impact of physical markets financial investors

Holding physically commodities directly or through physically backed ETFs which are then stored and kept away from commercial traders directly affects physical markets and may push prices up. But also on the other side, if ETFs are for example sold in a panic because prices are dropping, the massive selling of the physical commodities underlying the ETF could accelerate price declines. As a result, spot prices can become directly (and not through futures prices) driven by financial motives rather than by supply and demand of physical commodities. Some precious metals analysts say that ETF buying has become one of the most important drivers of prices in their markets (Farchy 2012). The involvement of financial investors in physical markets can also distort actual physical trading activities and lead to conflicts of interest and manipulation. There have been instances in which financial investors’ hoarding of physical commodity reserves have resulted in the insufficient release of commodities from warehouses (Interviews 2012/13).

This issues became prominent through a New York Times investigation in 2013 (Kocieniewski 2013) that shows how Metro International Trade Services, one of the US biggest storers of aluminium and a Goldman Sachs subsidiary, owns 27 industrial warehouses in the Detroit area where it stored more than a quarter of the available supply of aluminium. Goldman was criticized for shuffling the metal between the warehouses to comply with the LME pricing regulations that stipulate that metals cannot sit in warehouses but that a certain share has to be moved out each day. This shuffling lengthened the storage time which increased rent payments for Goldman and the price paid by manufacturers and consumers. According to the New York Time article, aluminium analysts say that before Goldman bought Metro International three years ago, warehouse customers used to wait an average of six weeks for delivery but the waiting time has grown to more than 16 months. These delays are a major reason the premium on aluminum sold in the spot market has doubled since 2010. Global premiums as a percentage of the aluminium LME price stood at a record 13 % in 2012, after averaging 5 % between 2007 and 2011 (Farchy 2012b). After aluminium, Goldman Sachs and other banks such as JP Morgan³⁴ are now also considering copper (Kocieniewski 2013). Besides investment banks, also large commodity trading houses have been involved in this business, most importantly Glencore and Trafigura (Farchy 2012b).

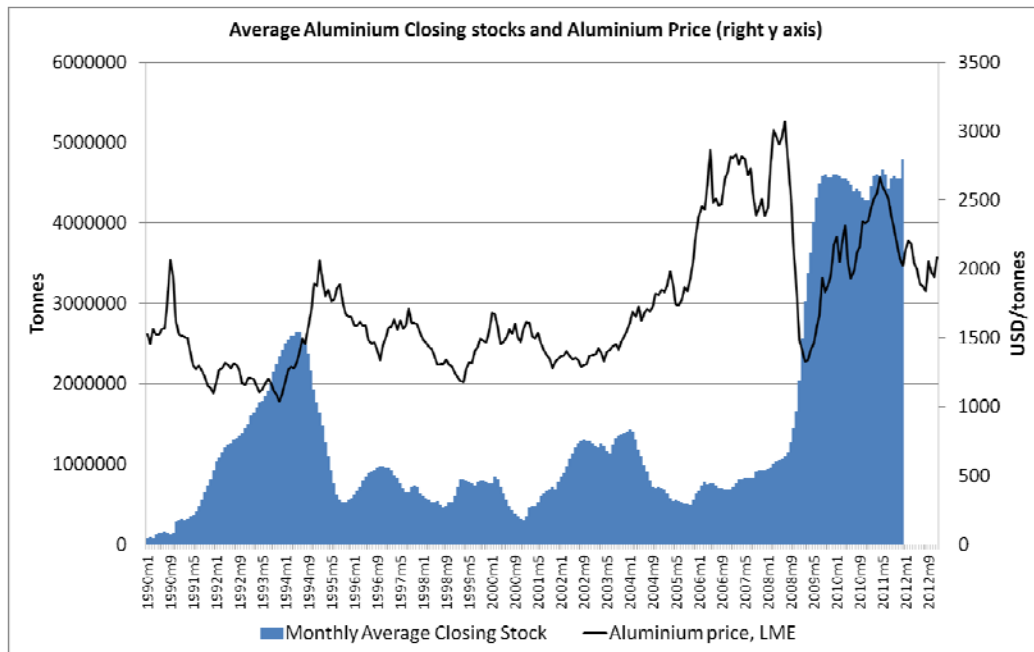
For the case of our focus commodity aluminium, an assessment of the LME data on stocks reveals the importance of physical investments by financial investors. Stocks have been built up substantially in recent years which is related to low interest rates since 2009 which is the most important cost factor of holding inventories (Figure 5). Figure 6 portrays the relation between aluminium stocks at LME registered warehouses and prices. Looking at the whole 2000s, higher stocks at LME registered warehouses go together with lower prices. This is expected as when supply exceeds demand stocks are built up and prices decline. But this relationship has changed in recent years where high stocks go along with high prices. This seems in accordance with high stocks being related to financial investors' stock holding, expecting prices to increase further (Interviews 2012/13). The Financial Times (Deripaska 2012) estimates that the average share of aluminium locked in LME warehouses under financial deals stayed at an average of 65 % in the second quarter of 2012. Chief executive of Rusal, Oleg Deripaska, states that "Capital inflows driven by index investors and hedge funds in particular have distorted the supply/demand equilibrium, sending a wrong signal for the players in the market." (Deripaska 2012)

Figure 5: Development of US interest rate and global aluminum closing stocks



Source: US Interest rate (BIS 2012); Aluminium stocks received upon request.

³⁴ JP Morgan announced however in July 2013 that it will abandon its physical commodity business (Wirtschaftswoche 2013).

Figure 6: Development of monthly aluminium price and global aluminium closing stocks

Source: Aluminium price (UNCTADStat 2012); Aluminium closing stocks received upon request.

Generally, the multiple roles of financial investors as well as large commodity companies and trading houses lead to a blurring of classes of traders which raises the issue of circumventing position limits and other regulations in place for speculative traders as well as conflicts of interest and market manipulation. For example, given the connection of banks, hedge funds or financial services units and physical trading companies or investment units, financial actors have privileged access to trading analysis and strategies to speculate. This can lead to manipulation and disruption of trading on physical and derivative markets. This is amplified for commercial traders by the lack of transparency on hedge funds or financial services units belonging to physical commodity companies which makes it difficult for supervisors and regulators to determine which positions are commercial or speculative ones and to prevent manipulative behavior from combined strategies in physical and derivatives markets.

5. Conclusions

Financial investors have played an increasing and often dominating role in commodity derivative markets since the early 2000s which has changed the nature and microstructure of these markets. The most important trends in the last decade can be summarized as (i) strongly increasing trading volumes and open interest positions with an increasing share of financial investors who do not trade based on fundamentals; (ii) largely extended trading hours related to electronic trading and technological improvements, increased speed and complexity; (iii) increasing variety of investment products and strategies with a trend from passive to active trading strategies, including new generations of index products, ETPs/ETFs, an increasing share of trend following trading strategies, and the emergence of HFT; (iv) lack of transparency regarding classes of traders and trading strategies given the multiple roles of financial investors and large commercial traders, such as physical commodity companies and trading houses; and (v) intensifying interconnectedness between financial and commodity markets given the role of financial investors (as well as large commercial traders) that invest in commodities as an asset class in their portfolio. The crucial question is how these trends have impacted on commodity price developments, market structure and particularly commercial traders that use these markets for price discovery and hedging and hence on the fundamental functions of these markets.

The classification of traders and interactions among traders with different motives and trading strategies are complex. The current classification of traders that is largely based on CFTC definitions where commercial traders are typically equated with informed hedgers and financial investors with noise and uninformed speculators abstracts too much from the reality in commodity markets given the multiple and interrelated roles of traders. Financial investors have become increasingly involved in trading physical commodities, and large commercial traders, e.g. multinational commodity companies and trading houses increasingly pursue speculative trading strategies or have separate financial services units or hedge funds. Hence, the boundaries between the physical commodity business and financial investments have become blurred. These multiple roles of commercial traders and financial investors raise crucial questions related to conflicts of interest and manipulation. Large commercial traders can use their position as „commercial traders“, exempt from position limits, to engage in or facilitate speculation, and may have the additional benefit of information about the underlying physical market.

Concerning price developments, trading strategies of financial investors, in particular money managers employing trend following strategies, are widely believed to have a distorting effect on short term price developments and increase the likelihood of excessive short term price fluctuations. Longer term price trends are however seen to be largely based on fundamental supply and demand conditions. The impact of index investors is assessed more controversially among traders and stakeholders interviewed. The impact of financial investors seems to differ however in different market conditions. Under “tranquil” fundamental conditions, markets may be dominated by informed traders that keep asset prices to their fundamental value; as uncertainty related to fundamentals increases, noise and uninformed traders may become dominant and also informed traders may switch to destabilising speculation. Hence, the effectiveness of the markets’ price discovery function can at least be questioned in the context of insecurity about the price formation process and to what extent prices are still largely determined by fundamental supply and demand conditions particularly in the short term.

Concerning the impact on commercial traders, the results indicate that financial investors’ behaviour, in particular the trend following trading of hedge funds and the switching and rolling of index investors, is closely analyzed by commercial traders and taken into account in their trading strategies. For instance, they may postpone their trading if hedge funds are expected to trade or index funds to roll their positions to avoid positioning themselves “against the market”. In this respect trading has become more complex as it requires monitoring the complex trading strategies of other actors. The complexity was further accelerated by the shift to electronic trading and extended trading hours. This has made trading more transparent, flexible and allows for immediate reactions but also demands continuous awareness of the market which has been challenging for smaller commercial traders interviewed.

The group of commercial traders is very diverse and heterogeneous from small producers and cooperatives to large multinational commodity companies, trading houses or supermarkets to governments with different trading strategies. Clearly, also the impact of financial investors on commercial traders is quite different for large commodity companies or trading houses and smaller commercial traders, associations and producers. Larger commercial traders interviewed tend not to be too concerned with the increasing presence of financial investors on commodity derivative markets. Some traders even stated that they can profit from their trading behaviour, in particular the largely passive and price-insensitive trading behaviour of index investors which allows moving large amounts of contracts more easily. Generally, most agree that the market has become more profitable for large commodity companies and trading houses with own financial services units.

For smaller commercial traders that do not have own hedging and financial units and the resources and capacities to interact that actively with futures markets, the situation seems to be different. Particularly for smaller commercial traders in developing countries hedging has always been a difficult instrument related to limited access to information and finance, high

transaction and financial costs, and high technical barriers. Further, basis, specification, contract, margin and exchange rate risks that are particularly prevalent in developing countries often further reduce the effectiveness and quality of risk management through hedging. Hence, most smaller producers do not hedge by themselves but, if at all, through cooperatives or other associations on a larger scale. However, recent changes in the functioning of commodity derivative markets seem to have contributed to make hedging even more complex, expensive and risky for this class of traders. Though changes such as electronic trading have reduced transaction costs, other costs of hedging, such as time needed to monitor market developments and financial requirements to engage in commodity derivative markets have increased. Smaller commercial traders interviewed have particularly complained about the increasing short terminism of trading and the related intra-day volatility of commodity prices which leads to more frequent margin calls requiring permanent access to finance. In this context, several commercial traders that used to hedge have or are thinking to abandon hedging on futures markets.

Hence, the financialisation of commodity derivative markets, expressed in the increased presence of financial investors and their trading strategies, has made the fundamental functions of commodity derivative markets contentious. This leads to the conclusion that regulations of commodity derivative markets would be required to ensure that they fulfil their fundamental roles of price discovery and hedging for all types of commercial traders. This would require limiting the dominance of financial investors in commodity derivative (and physical) markets and ensure the dominance of fundamentally based trading strategies. Necessary steps, which are in detail discussed in Staritz and Küblböck (2013), could involve (i) more transparency and public data on trader classes and trading strategies in derivative and physical markets; (ii) more stringent position limits for all types of speculators on individual and classes' positions with exemptions only for genuine hedging activities of commercial traders and on certain trading strategies, including index-based investments, technical trading and HFT; (iii) a multi-tier financial transaction tax (FTT) to stabilize prices in phases of high volatility and discriminate against very short term trading strategies³⁵; and (iii) prohibition of proprietary trading by financial investors and commercial traders that are involved in derivative and physical markets. A prerequisite for effective regulation is a pro-active, flexible and dynamic approach that reflects on the risks of failure and adapts regulations if necessary given the changing dynamics and complexities of commodity derivative markets.

Our analysis shows that for an important group of commercial traders, commodity derivative markets tend to be even less an effective way to cope with commodity price risks given the recent developments. Therefore, besides regulations of commodity derivative markets to limit the dominance of financial investors, broader reforms would be necessary to make hedging more accessible for small commercial traders by solving practical challenges such as the financing of margins and basis, specification and contract risks, and considering their needs when it comes to designing new derivatives instruments. In addition, new arrangements to cope with commodity price instability at the international and local level would be needed. At the local level, such instruments could include local grain banks, warehouse receipt systems, insurance systems, the reintroduction of marketing boards or other price stabilization systems that would need to be embedded in broader agricultural and industrial development strategies. At the international level, counter-cyclical financing facilities could play a role to mitigate income shocks from commodity price movements (see e.g. Wiggins/Keats 2009; von Braun/Torero 2008; Nissanke/Kuleshov 2012).

³⁵ A FTT could be adaptable to different market conditions. The very small permanent tax rate of around 0.001 or 0.1 % under normal tranquil conditions would not impede fundamental market developments and price discovery. But if market volatility becomes excessive with large short-term fluctuations beyond a dynamic price band defined on the basis of commodity specific fundamentals, a much higher tax rate of 50 to 80 % would automatically kick in acting as a circuit breaker (Schulmeister 2009; Nissanke 2011).

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Authors

Christine Heumesser is Researcher at the Austrian Research Foundation for International Development (ÖFSE) and the University of Natural Resources and Life Sciences (BOKU) in Vienna. She holds Master degrees in Economics and Political Sciences from the University of Vienna. Her research focuses on agricultural and environmental economics.

Cornelia Staritz is Senior Researcher at the Austrian Research Foundation for International Development (ÖFSE) and Research Associate at Policy Research in International Services and Manufacturing (PRISM), University of Cape Town, South Africa. Prior to that, she worked at the International Trade Department of the World Bank in Washington D.C. and the Vienna University of Economics and Business. She holds Master degrees in Economics and Commerce and a Doctorate in Economics from the Vienna University of Economics and Business and a PhD in Economics from the New School for Social Research in New York. Her research focuses on economic development, international trade, global value chains and production networks, private sector development, and commodity-based development.

Appendix 1: Interview guidelines (basis version)

1. What are the main changes/developments on commodity derivative markets in recent years? Please list the top 5 changes/developments in terms of importance.
2. Have you felt a growing influence of financial investors in commodity derivative markets? If yes, how would you describe their influence and what are the main channels and instruments?
3. Do you observe any specificities for different types of commodities, in particular regarding cotton, coffee, wheat and aluminium?
4. Do you broadly agree that financial investors have an influence on commodity price developments? Please explain why. In which commodity markets has their impact been strongest?
5. Do you agree with the opinion that commodity prices no longer reflect market fundamentals? Please explain why.
6. Which factors (e.g. fundamental, macro, speculation) influence the level and volatility of commodity prices most? Is the impact of financial investors more relevant for commodity price levels or volatility? Do they have a different impact in the short and longer term?
7. Has the presence of financial investors changed the behavior and trading strategies of other actors, in particular physical traders and traditional speculators?
8. Has the role of commodity derivative markets for price discovery and hedging changed given the increasing importance of financial investors? Do you observe differences for different types of commodities? Please explain.
9. Where do you conduct your transactions – on exchanges or OTC or other trading platforms? Why do you choose this way of trading? What do you trade (which underlying)?
10. Has your company bought physical commodities or is it considering doing so? Why?
11. Which instruments do you use and why? To what extent do you engage in instruments like index funds or ETNs/ETFs? Does your company engage in fundamental-based, macro and/or technical trading? What are the main factors/inputs in your trading strategies?
12. What kind of information do you rely on for your trading decisions in the short and longer term?
13. What are your main concerns regarding recent developments in commodity derivative markets?
14. What do you consider as the most important measures to stabilize commodity prices and ensure the efficient functioning of commodity derivative markets?
15. What are the main challenges in regulating commodity derivative markets? What is your assessment of the US Dodd-Frank Act in this respect? What is your assessment of the EU's regulatory initiatives (in particular MiFID)?

Appendix 2: List of interviews

Type of actor	Commodity focus	Location	Nr. of interviews	Total nr. of interviews
Commercial traders	Coffee	New York	4	15
		London	1	
		Telephone	1	
	Cotton	Telephone	3	
	Wheat	Vienna	2	
		Telephone	2	
	Metals/Aluminium	London	2	
Financial investors (banks, hedge funds, CTAs)	All commodities	Vienna	4	10
	All commodities	London	3	
	All commodities	Telephone	3	
Brokers	Coffee, Cotton, Metals/Aluminium	London	2	3
	Metals/Aluminium	New York	1	
Representatives of commodity exchanges	Different commodities	London, New York, Washington	3	3
Commodity market experts (representatives of commodity organizations and associations, analysts, researchers, consultants)	Coffee	London	1	16
		Washington	1	
	Cotton	Washington	2	
		Telephone	1	
	Metals/Aluminium	London	1	
		Telephone	1	
	Different commodities	Washington	6	
	Different commodities	Telephone	3	
Financial market experts		New York	2	2