Since the financial and food price crises of 2007, market instability has been a topic of major concern to agricultural economists and policy professionals. This volume provides an overview of the key issues surrounding food prices volatility, focusing primarily on drivers, long-term implications of volatility and its impacts on food chains and consumers.

The book explores which factors and drivers are volatility-increasing and which others are price level-increasing, and whether these two distinctive effects can be identified and measured. It considers the extent to which increasing instability affects agents in the value chain, as well as the actual impacts on the most vulnerable households in the EU and in selected developing countries. It also analyses which policies are more effective to avert and mitigate the effects of instability.

Developed from the work of the European-based ULYSSES project, the book synthesises the most recent literature on the topic and presents the views of practitioners, businesses, NGOs and farmers’ organisations. It draws policy responses and recommendations for policy makers at both European and international levels.

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FOOD & AGRICULTURE / ECONOMICS / ENVIRONMENT & SUSTAINABILITY
Chapter 2
Volatility in the after-crisis period
A literature review of recent empirical research

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1 Introduction

In this chapter, we present a literature review of the agricultural and food price volatility patterns observed over the last decade. We focus on studies published in peer-reviewed journals, but also include a selected number of working papers, policy briefs and discussion papers (‘grey literature’) from international organisations or research institutes. This literature is categorised and analysed from different dimensions in this section. We divided the literature according to its methodological approach into theoretical, descriptive empirical and modelling categories. Besides these categories, we added another dimension regarding the contribution of the papers to the theory behind volatility and its drivers and spillover effects, changes in volatility patterns and summary papers. We present these papers based on different statistical methods, which are used to analyse the volatility phenomenon in food and agricultural prices.

Food price volatility is a major focus of research and policy advising of many international organizations or research institutes, such as FAO, IFPRI, NBER, IMF, World Bank, etc., in particular since the food price crisis of 2007–2008 brought the issue of food price development back to the top of the international political agenda. Two major examples of comprehensive studies on this topic include an FAO book edited by Prakash (2011) and The Economics of Food Price Volatility by Chavas et al. (2014).

In general, the food price volatility literature can be categorised in studies aiming at

- theoretical aspects of price volatility analysis,
- empirical analysis of price volatility drivers,
- volatility spillover effects,
- relation between energy markets and agricultural markets,
- interaction between spot and futures price volatility,
- price formation in futures markets.

In the following, we will present a brief overview of empirical studies in each of the above categories. A more detailed analysis can be found in Brümmer et al. (2013).
2 Theoretical aspects of price volatility analysis

Poon and Granger (2003) and Granger and Poon (2005) are two major papers in the area of forecasting volatility in financial markets. In these papers, the authors review different theoretical concepts of price volatility, provide empirical models to estimate the volatility and present some empirical studies. They note that the generalised autoregressive conditional heteroskedastic (GARCH) model class is ‘the most popular structure for many financial time series’ (Poon and Granger, 2003, p. 484). Gouel (2012) presents a review over the major theoretical studies on the issue of agricultural price volatility.

Symeonidis et al. (2012) analyse the relation between stock levels and the shape of the forward curve. They use daily futures prices on grains and livestock for the US market. As predicted by the theory of storage, they demonstrate that low (high) inventory is related to curves in backwardation (contango) and price volatility is a decreasing function of stock levels for most of the considered commodities. Karali et al. (2011) employ weekly data for soybean, maize and wheat in the US futures market to test whether modelling volatility as a stochastic instead of a deterministic variable leads to improved inference about its relationship with seasonality, storage and time to delivery. The results show that volatility decreases the closer the time to delivery for soybeans and wheat and increases for maize.

Onour and Sergi (2011) compare the performance of models, when considering a normal instead of a t-distribution, to capture volatility in food commodity prices. This implies that the normality assumption of the residuals may lead to unreliable volatility results. Long-term memory or long-term dependence processes in agricultural futures prices are considered by Jin and Frechette (2004). They find that allowing for fractional integration in the variance equation (fractionally integrated generalized autoregressive conditional heteroskedastic, FIGARCH) is suitable for modelling long-term dependence in the volatility component. Sephton (2009) extends the fractional integration idea by considering the leverage effect for the same dataset as in Jin and Frechette (2004). He finds that a fractionally integrated asymmetric power ARCH approach captures the long-term dependence in futures prices for some of the crops better than the FIGARCH model, as some agricultural commodities futures display asymmetric leverage effects.

Egelkraut and García (2006) indicate that the implied forward volatility has better predictive power for agricultural commodities whose uncertainty resolution is concentrated in space and time. Reitz and Westerhoff (2007) develop a simple commodity market model, which explains the cyclical nature of commodity prices (agricultural and nonagricultural) by considering the behaviour of two types of heterogeneous agents, the fundamentalists and the technical traders. The results show that technical traders progressively enter the market as price deviates from its long-run equilibrium. This trend-following pattern initially enforces mispricing in the market. However, simultaneously the
fundamentalists become more active, forcing the price back to its fundamental value and leading to cyclical motions.

3 Empirical analysis of price volatility drivers

There are some studies, which, despite being based on empirical results, do not present explicitly quantitative estimates. For instance, Gilbert and Morgan (2010) recognise that the volatility levels during the recent crisis period were not as high as they were in the 1970s (except for rice). Nevertheless, they argue that factors like global warming–related climate shocks, oil price volatility transmitted via biofuel production and the relative large investment in index funds of futures markets may permanently increase volatility, especially in grain markets. Anderson and Nelgen (2012), using annual prices for major agricultural crops, assess the trade responses of 75 countries to provide empirical evidence on how governments, both in developing and developed countries, reacted during the past price spikes. The responses of agricultural-importing and agricultural-exporting countries are offsetting; therefore, the domestic price-stabilizing effect of their interventions was ineffective.

Nissanke (2012) states that the financialisation of commodity markets served as a transmission channel of the financial crisis from the developed to the developing world. He proposes more regulation and transparency for futures markets, minimal stockholding of essential commodities and innovative market-oriented stabilization mechanisms like virtual reserve holdings or multitier transaction taxes. Wright (2011) identifies as a major cause of food price volatility the low grain stock levels due to mandated diversions for biofuels. He concludes that accumulated shocks, such as the long drought in Australia and further biofuels boost due to an oil price spike, would have caused panic leading to a cascade of export bans and taxes.

The last group of selected literature uses different statistical methods to examine the food price volatility drivers. Zheng et al. (2008) apply an exponential GARCH (EGARCH) model to examine whether unexpected news affects food price volatility. They use monthly prices for 45 foodstuffs in the United States. The results confirm that the amplifying effect of the news is present only in one-third of the products. They argue that the increasing concentration of the distribution and retailing of food on large firms is absorbing the price volatility. Hayo et al. (2012) measure, using a GARCH model, the impact of the US monetary policy on the price volatility of different commodities (agricultural, livestock, energy and metals). They arrive at the conclusion that expected target interest rate changes and communications decrease volatility, whereas unexpected interest rate movements and innovative measures increase it. Du et al. (2011) use a model of stochastic volatility with Merton jump (SVMJ) in returns to investigate the role of speculation on crude oil price variability and to what extent the volatility in oil price transmits to agricultural commodity markets. Using weekly futures prices on oil, maize and wheat, they
conclude that scalping, speculation and petroleum inventories explain crude oil price volatility. Oil price shocks appear to trigger sharp price changes in agricultural commodities, especially on the maize and wheat markets, arguably because of the tightening interconnection between the energy and food markets.

Geman and Ott (2014) have measured the intra-annual and inter-annual price volatility for maize, soybeans and wheat from the US market and rice from Thailand. They have used coefficient of variation (CV) as a measure of volatility. The fixed effect panel model is used to run CV on explanatory variables as potential drivers. Results show that there are quantitatively important differences between inter- and intra-annual volatilities. The historically low stock-to-use ratio of wheat, soybeans and especially maize since the beginning of the 2000s explains a major part of the intra-annual volatility and the inter-annual volatility. However, it is quantitatively less important. Macro factors, such as trade restrictions, exchange rate depreciations against the US dollar and oil prices, seem to play a more important role in explaining the inter-annual volatility. The open interest of futures markets as a proxy for speculation activity fails to find a positive impact on commodity prices volatility.

3.1 Volatility spillover effects

A considerable share of the literature on food price volatility covers volatility spillover effects between markets, with different foci. One strand of the literature analyses linkages between commodity markets and macroeconomic variables, a second strand looks into the transmission of volatility along the supply chain and yet another strand concentrates on spillovers between closely related commodity markets.

Macroeconomic factors

The interaction among food commodity prices and macroeconomic variables has been an important area of research on food price volatility. Udoh and Egwaikhide (2012) considered the theory of Dutch Disease Syndrome to be a theoretical framework for analysing the effects of oil price fluctuations on food price volatility in Nigeria. They conclude that oil price volatility has a complementary relation with domestic inflation in food prices of Nigeria.

The potential effects of short-run deviations between relative food prices and specific macroeconomic factors on food price volatility are investigated by Apergis and Rezitis (2011). They find cointegration between relative food prices and macroeconomic variables (real public deficit, real money supply, real exchange rate and per capita income), and all macroeconomic variables exerted an effect on relative food prices. Moreover, results are valid with and without the presence of a structural break (1992 CAP restructuring). Apergis and Rezitis (2003) investigate the volatility spillover effects between food
and macroeconomic fundamentals. They find significant and positive effects of macroeconomic volatility on food prices volatility.

**Volatility spillovers in commodity markets**

Serra (2011a) assesses the linkages between price volatility at different levels of the Spanish beef marketing chain resulting from the Spanish bovine spongiform encephalopathy (BSE) crisis. She concludes that during turbulent times, price volatilities can be negatively correlated, hence stabilizing one market might trigger additional instability in other related markets.

Rezitis and Stavropoulos (2011) examine the implications of rational expectations in a primary commodity sector with the use of a structural econometric model with endogenous risk. They apply a multivariate GARCH model for major meat markets in Greece (beef, lamb, pork and broiler). They conclude that uncertainty caused by price volatility is a restrictive factor for the growth of the Greek meat industry. Hernandez et al. (2014) consider the potential bias that may arise when considering agricultural exchanges with different closing times in the three geographical areas of the United States, Europe and Asia. They used futures prices of maize, wheat and soybeans. The results show that the agricultural markets included in their study are highly interrelated. There are both own- and cross-volatility spillovers and dependence between most of the exchanges. They have recognised a higher interaction between the United States (Chicago) and both Europe and Asia compared with Europe and Asia. Furthermore, Chicago plays a major role in terms of spillover effects over the other markets, especially for maize and wheat. China and Japan also show important cross-volatility spillovers for soybeans.

**Relation between energy markets and agricultural markets**

The interconnection between the energy market and the cereal market and the volatility spillovers among these markets has been an important issue, which has attracted the attention of researchers more and more during recent years. The results of these studies are sometimes contradicting, depending on the approaches they followed or the markets they analysed. It could be the case that by following different statistical approaches for analysing spillover effects in the same market, no volatility spillover can be found or one-way volatility spillover from energy market to cereal market can be recognised. Different strands in the literature on interconnectivity between agricultural commodities and energy markets can be identified. In one group of studies, e.g. Busse et al. (2011) or Liu (2014), the pure correlations between energy and cereal market volatilities are analysed without any attempts to determine the direction of these volatility linkages. The larger part of the literature includes analyses of the direction of spillover effects between the commodity markets (e.g. Serra et al., 2011; Serra, 2011b; or Trujillo-Barrera
A critical issue in this type of analysis is the sample period selection. Some studies, such as those of Du and McPhail (2012) and Nazlioglu et al. (2013), have found critical points in time at which the spillover effects were significantly different before or after that critical period. Multivariate GARCH models are the major statistical tools in this field of research, but other approaches are also used to deal with the relation between the energy market and cereal market volatility. Furthermore, some studies have considered additional exogenous variables as potential drivers of price volatility in both markets simultaneously.

Two examples of volatility cross-correlation studies are by Liu (2014) and Busse et al. (2011). Liu (2014) has tested the nonlinear cross-correlations between crude oil (West Texas Intermediate) and agricultural commodities in the United States for the period of January 1994 to December 2012 with the help of daily spot prices. The results of Podobnik’s $Q$ test shows a highly significant cross-correlation between oil and agricultural commodity volatility series. The results show that during the period of crisis, cross-correlation coefficients between crude oil and agricultural commodity markets are stronger than those during a common period. He concludes that the high oil prices partly contribute to the food crisis. Busse et al. (2011) analyse the behaviour of price volatility of the EU biofuel markets during and after the 2006–2008 event. They mention that the model does not allow for conclusions about causal mechanisms of volatility spillovers, neither is it suitable for assessing the magnitude of influence of one market on the other. They found a nonstable and increasing correlation between the returns of rapeseed at MATIF (Marché à Terme International de France) and crude oil prices. They concluded that the correlations of rapeseed price returns with vegetable oil and soybean price returns on the spot market are much lower than those with crude oil. Du and McPhail (2012) and Nazlioglu et al. (2013) separated the sample period into two subsamples, before and after the food price crisis, and also found spillover effects from agricultural or biofuel markets to the energy market.

The main body of literature found only unidirectional spillover effects from energy markets to agricultural markets or no spillover effects. Serra (2011b) analyses the volatility spillovers between weekly prices of crude oil, ethanol and sugar in Brazil. She finds that shocks in crude oil and sugar markets cause an increase in the volatility of the ethanol price and the ethanol price volatility increases as a response to the increased sugar price volatility. Moreover, ethanol markets are found to have a reduced capacity to increase instability in the sugar and crude oil markets.

Serra et al. (2011) analyse the volatility spillovers among ethanol and sugar from the Brazilian market and crude oil from international markets by using spot prices. They find that increases in crude oil prices lead to higher ethanol prices and that the adjustment process is slow, which ends up in higher volatility in the ethanol market. Additionally, increases in sugar prices are also found to increase ethanol price levels and volatility.
Trujillo-Barrera et al. (2012) test the volatility spillovers among crude oil, maize and ethanol markets in the United States by using futures prices. The results show volatility transmission from crude oil to the maize and ethanol markets and volatility spillovers from the maize to the ethanol market. They find no evidence of volatility spillovers from ethanol to maize. They conclude that the maize and ethanol markets have been closely connected during this period.

Simultaneous analysis of volatility spillovers between the energy market and agricultural markets by including the effects of exogenous drivers is followed by Serra and Gil (2013). They study the monthly volatility spillovers between maize and biofuel spot prices. Additionally, they use the stock-level forecasts of maize and interest rate as exogenous drivers of food price volatility. The stock-to-disappearance forecasts are found to reduce maize price instability. Additionally, the instability in ethanol markets destabilises maize markets, and interest rate variability brings more volatile food prices.

Interaction between spot and futures price volatility

The major focus of some of the studies is the relation between futures and spot markets. Will et al. (2012) conclude, based on a review of 35 empirical studies, that according to the current state of research, the alleged financial speculation in commodity futures markets does not have a significant impact on spot prices’ level or volatility. They find that changes in the fundamental factors seem to be the real drivers of price volatility.

Further studies test the causal effects of futures price speculation on spot prices using different methods, data and assumptions. Algieri (2012) looks for relationships between excessive speculation and price volatility, using as proxies for speculation the share of total open interest positions held by noncommercial traders and speculative pressure. She applies Granger causality tests to find reciprocal effects between futures markets and volatility in spot markets for wheat, maize, soybean, palm kernel, palm oil, barley and rice. Her findings show no significant relationships for rice and soybeans. In the case of wheat, volatility leads the speculation, whereas for maize there is a more complex bidirectional relation. Bohl and Stephan (2012) use expected and unexpected speculative open interest as explanatory variables, controlling for aggregate trading volume and aggregate open interest. They apply a GARCH model using weekly spot and futures prices for maize, soybeans, soft red wheat and sugar. Their results reveal that even though futures prices tend to lead spot prices in agricultural markets, the speculation seems not to hinder the price discovery process. Von Braun and Tadesse (2012) used a seemingly unrelated regression model to test the impact of supply shocks (production), oil price shocks and futures market speculation on spot returns and volatility. They consider monthly spot prices for maize, wheat, rice and soybeans. The realized volatility is calculated as the standard deviation from the long run average price. The trading volumes
of commercial and noncommercial positions in futures markets are used as a proxy for speculation. The results show that speculation has a larger impact than oil and supply shocks on spot price spikes, and oil shocks have a larger impact than speculation and supply shocks on spot price volatility.

Beckmann and Czudaj (2014) investigate the volatility spillover between various agricultural futures markets. They used futures for maize, cotton and wheat in the United States and found that the impact of the volatility of maize futures returns on the returns of cotton and wheat futures is statistically significant, but differs for both markets. The authors indicate that potential speculation effects on one market could be contagious for other markets and cause an increase in volatility in agricultural futures markets. They conclude that the recent rise in the interdependence of futures markets could be held responsible for the increase in volatility in agricultural prices in the past few years.

The role of index fund speculation

A number of studies concentrate on the impact of index fund speculation on the level and volatility of futures prices. Although most of the authors arrive at similar conclusions, their methodologies, data sets and assumptions differ widely. Brunetti et al. (2011) also apply Granger causality tests using generalized methods of moments with Newey-West robust standard errors. They use five commodities, but only maize from agricultural futures markets and data from the Large Trader Reporting System (LTRS). Their findings demonstrate that speculators do not lead price changes; rather, they reduce market volatility and add liquidity to the system.

Irwin and Sanders (2012) test the ‘Masters hypothesis’, applying the Fama-MacBeth cross-sectional regression test. They argue that the variation of index funds across markets at a given point in time may be more informative than the behaviour of one market across time. They use quarterly data for maize, soybeans, soybean oil, wheat, cotton, live cattle, feeder cattle, lean hogs, coffee, sugar and cocoa futures prices. The findings fail to demonstrate the Masters hypothesis. There is no significant evidence of index funds activity affecting returns or volatility in the considered futures prices, implying that the markets are sufficiently liquid and futures traders do not confuse index fund position changes with changes in markets’ fundamentals. Sanders and Irwin (2011) look into the impact of index fund investment in the US commodity futures market. They use log relative returns of weekly nearby futures contracts for wheat, soybean, maize and commodity index trader (CIT) data. They use Granger causality tests and long-horizon regression. The results do not show any evidence of linking commodity index positions with the grain futures market prices.

Gilbert (2012) focuses on the impacts of speculative trading on grain price volatilities. He uses the cash prices and four front futures contracts on the Chicago Board of Trade (CBOT) for soft wheat, maize, soybeans and soybean oil.
Additionally, he uses position data from the CBOT Commitments of Traders report. The results do not present any statistically significant effects of financialisation on cash and futures returns of Chicago grains and vegetable oil markets.

Manera et al. (2012) conduct a detailed study on the speculation spillover issue. They use four energy commodities from the New York Mercantile Exchange (NYMEX) and five agricultural commodities. The returns of futures price series are taken from Thomson Financials. Working’s (1960) T index is calculated by using Commodity Futures Trading Commission (CFTC) data. This index measures the excess of speculation relative to hedging activity. Macroeconomic data consists of Moody’s corporate bond yield, the Treasury bill, the S&P 500 index and a weighted exchange rate index of the US dollar. The results of econometric model show that speculation, which is measured by Working’s T index, does not seem to significantly affect returns. Additionally, the results show that a depreciation of the US dollar increases futures prices. The S&P 500 has a significant and positive effect on the returns. They do not detect a relevant impact of speculation on the returns in their own market or other markets.

4 Conclusions

Price volatility on agricultural and food markets has attracted considerable attention in the literature, both in mainstream agricultural economics and in related fields. This attention is reflected in a growing number of studies published in peer-reviewed journals, as well as in a number of high-profile reports from relevant organisations. In addition, the scientific community has responded to policymakers’ concerns by publishing many working papers and technical reports (so-called grey literature), a substantial number of which will go to the journal over the course of the next years.

This already rich (and still expanding) body of literature allows for developing a relatively clear picture about the driving factors of price volatility patterns in the past years. The literature seems in broad agreement that the fundamental factors explain most of the observed price volatility increases in recent times. Supply and demand factors, which in the short run lead to thinner markets and thus make the price-finding mechanism more susceptible to the arrival of new information, can be identified as the major drivers. Many of these drivers will continue to play out in the medium and long run. On the supply side, climate change might increase the frequency of rare detrimental weather events, which will generally lead to higher price volatility. The stagnation in terms of productivity growth in agriculture, in particular in OECD countries, exacerbated by land diversion for nonagricultural purposes, will certainly not help in mitigating the susceptibility of agricultural and food markets for episodes of high price volatility. On the demand side, population and income growth are often mentioned as long-run driving factors. These long-term trends will be difficult to change, in contrast to another major driver, biofuel policies.
The specific instruments employed in this policy field often lead to additional demand, which is very price-inelastic. Given that current biofuel policies are not responsive in their requirements to short- and medium-run price changes in the main input markets, price volatility will be elevated.

However, information on stocks is an important factor, too. Much of the decentralised stockholding is not regularly monitored; even if public or private entities have the necessary information, these are still often treated as state secrets (public bodies) or as potentially very rewarding private information (private bodies). With increasingly integrated agricultural markets worldwide, national-level information on carryover stocks, in particular in key exporting or importing countries, spills over to global markets. Country-specific statistical information systems have an important role to play in the future, as does the global coordination of information on available stocks, which is now pushed forward within the AMIS initiative.

Agriculture nowadays is integrated into the overall economy (even though most countries interfere in agricultural markets much more intensively than in other sectors of the economy). The interdependencies with nonagricultural markets exist both on the input and output sides. Increasing integration implies also that price volatility from input markets will have repercussions on agricultural and food markets. This mechanism has been established in the literature for fossil fuel price volatility (and is exacerbated through biofuel policies). However, as a part of the overall economy, agricultural price formation will also be subject to the impacts of overall economic policy, in particular monetary policy. Inflationary risks will affect price volatility directly and indirectly (because many investors view agricultural assets as relatively safe from inflation).

The role of speculation and financialisation for price volatility on agricultural and food markets, however, is less clearly identified in the literature. This is not surprising since speculation itself is a very broad phenomenon, which is difficult to capture quantitatively. Financialisation, on the other hand, is a relatively new phenomenon, but again is not always consistently defined across different studies. However, the literature seems to have reached a broad consensus on one specific aspect of financialisation, namely, the role of index funds for price volatility on futures markets. As of today, there is no sound scientific evidence in favour of a volatility-increasing impact of index funds’ trading activities on agricultural futures. On the contrary, there is a tendency to find price volatility reducing impacts of index fund trading for major cereals. Reforms to the regulatory framework for futures markets should hence be applied rather carefully, so as not to hamper the price discovery and hedging functions of those markets, although additional transparency requirements should be imposed as swiftly as possible.

A much less debated driver of volatility is the wide field of trade policies. The experience from the 2007–2008 food price crisis showed that policy responses from both importing and exporting countries have the potential to
increase price volatility in international markets. Initially triggered by concerns about domestic food price inflation, both the reduction of import barriers and the implementation of export restrictions are essentially attempts to export domestic problems to the international market. Unfortunately, the current WTO regime is not adequate to tackle these issues. A renewed impetus for the multilateral trade negotiations looks like a promising pathway toward better functioning of the international markets during a food price crisis. From our point of view, the multilateral framework is better suited for imposing self-discipline in such trade policies than is the approach via negotiations on bilateral and regional trade preferences (which seems to be currently the first choice by many important trading blocs).

Notwithstanding the quite substantial body of literature reviewed in this study, there are still some important research needs. A first set of issues is related to the methodological dimension. Price volatility is inherently unobservable and has thus to be estimated. Such estimation requires many conceptual choices. The estimates for and the interpretation of price volatility depends crucially on these choices. Even if conceptual clarity has been reached, there are many estimation methods available. In order to apply these, additional assumptions are necessary, which often turn out to be rather restrictive. The impact on the generated volatility estimates is not always clear, and there is a danger that some of the estimated price volatility patterns might be driven by inappropriate estimation methods.

In terms of product coverage, there is a strong focus in the existing literature on cereal markets. On the one hand, this is perfectly understandable since cereal prices are still the key prices for agricultural and food markets. On the other hand, the lack of attention toward livestock and noncereal staple crops is unsatisfactory, since livestock products and staple crops are nowadays often more important for farmers and consumers than cereal prices. Farmers in the European Union generate a substantial share of their revenues from livestock production; rural households in developing countries crucially depend on price development for local staple crops. Lack of appropriate data and heterogeneous product quality are two standard excuses for the focus on the relatively liquid international cereal markets, but researchers should view this as a challenge, not a hindrance, for further analyses of price volatility in agricultural and food markets.

Finally, the identification of policy impacts with the goal to establish causal links between policy intervention and price volatility developments is also not yet settled in the existing literature. Instead of focusing too strongly on causality, the concept of predictability might prove to be more fruitful in applied research. In particular, if certain factors are useful in predicting future price volatility, then these are also natural candidates for inclusion in medium- and long-term models, with the aim of also capturing observable price volatility patterns in these models.
Notes
1 Scalping refers to a trading strategy that opens and closes contract positions within a very short period of time to realize small gains.
2 Defined as the level of speculation that surpasses the need of hedging transactions and market liquidity.
3 The Masters hypothesis was named after the hedge fund manager Michael Masters, who argues that the large buy-side positions from index funds created a bubble in commodities, moving prices far away from their fundamental values.

References


