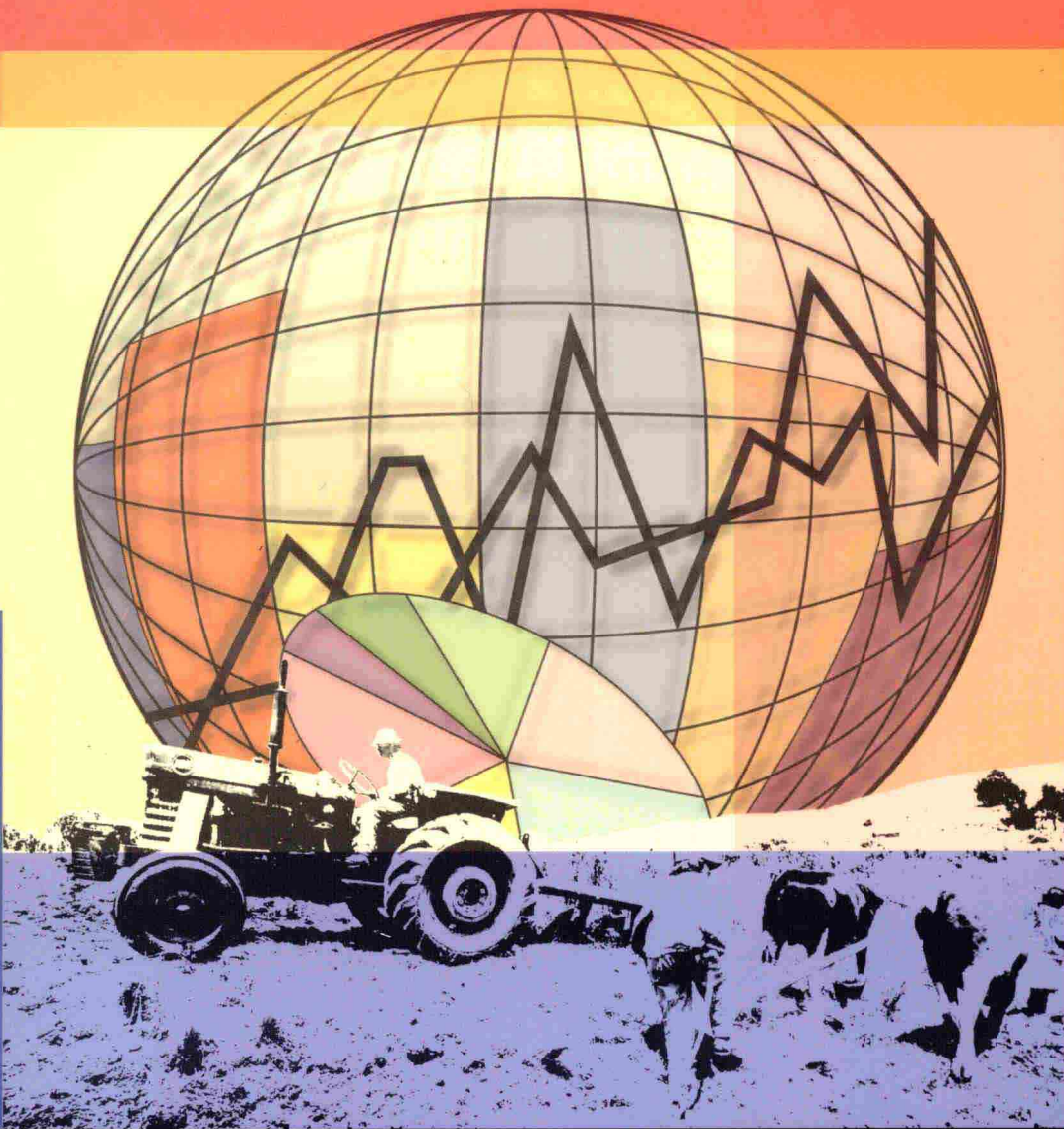


# COMMODITY MARKET REVIEW

2009-2010



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# Foreword

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The purpose of the Commodity Market Review (CMR), a biennial publication of the FAO Trade and Markets Division, is to examine in depth issues related to agricultural commodity market developments that are deemed by FAO as current and crucial for FAO's Member countries. The significant food price increases of 2007–08 and their negative effect on food security and poverty in developing countries prompted a shift in policy thinking towards making global markets less fragile and more resilient.

Countries responded to the food price surge through a spectrum of policies. A number of countries chose to intervene directly in the market by managing food reserves in order to stabilize domestic prices. Several food importing countries reduced import tariffs, while many producing countries limited, or even banned, exports in order to avoid food shortages and further price increases. There have also been proposals for establishing international mechanisms to either counteract speculation in futures markets, or establish regional physical food reserves.

This biennial CMR is devoted to exploring a variety of issues relevant to the recent price surge. It focuses on a number of key topics that feature highly in discussions among analysts and policy-makers and discusses a number of policy options, both international and domestic. It also draws a number of lessons from the price episode and the policy reactions. The main drivers of the surge, including the effect speculation had in futures markets, are examined. Different aspects of public buffer stock policies, including their effectiveness to stabilize prices, are discussed, while a number of proposals are put forth that aim to assure import supplies to net food importing developing countries during crises.

The articles included in this CMR are all written by collaborators and staff of the FAO Trade and Markets Division and have undergone both internal and external review. They are published as a contribution of FAO to the ongoing policy debate on food price surges, as well as to increase general awareness of the relevant issues and provide policy guidelines.

Alexander Sarris  
Director  
FAO Trade and Markets Division  
Rome, May, 2010

# Introduction

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**GEORGE RAPSOMANIKIS AND ALEXANDER SARRIS<sup>1</sup>**

**EDITORS, COMMODITY MARKET REVIEW 2009–2010**

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<sup>1</sup> FAO Trade and Markets Division

## 1. INTRODUCING THIS ISSUE

In 2008, the world experienced a dramatic surge in the prices of commodities. The prices of traditional staples such as maize, rice and wheat increased significantly, reaching their highest levels in nearly thirty years. In October 2008, the price upswing decelerated and prices decreased sharply in the midst of the financial crisis and the wake of economic recession. Although many food prices fell in excess of 50 percent from their peaks in June 2008, they continue to remain at a significantly higher level than that of 2005. Price volatility has been considerable, making planning very difficult for all market participants. In general, commodity prices are characterized by volatility with booms and slumps punctuating their long run trend. Both abrupt changes and long run trend movements in agricultural commodity prices present serious challenges to market participants and especially to commodity dependent and net food importing developing countries.

The long-run behaviour of prices is not well understood and the issue of which are the main drivers of booms and slumps remains controversial. For example, the long-run decline in real agricultural prices is often attributed to weak demand combined with production and productivity increases. Volatility is frequently thought of as the result of droughts and other supply shocks. However, shocks in the demand for commodities can also trigger price surges. Macroeconomic policies also play a vital role in determining price behaviour. Speculation is also thought to contribute to price surges. Nevertheless, on the whole, economists suggest that none of these factors by itself appears to explain price behaviour satisfactorily.

Little is known on the frequency, magnitude and persistence of price spikes such as those of 1973–74 and the one in 2007–08. Both price episodes took place during periods of rapidly accelerating economic activity, driven by growth and macroeconomic policies, such as increases in money supply. Both ended with economic recession. However, fast economic growth on its own does not always lead to price surges. Many other conditions should also prevail in order for a price spike to take shape.

In 2008, in a manner similar to the 1974 price boom and slump, low interest rates played a central role in influencing commodity price movements by encouraging economic activity and fast growth. Low interest rates also shape the behaviour of market participants to hold or not commodity inventories. Indeed, a number of empirical studies have acknowledged the contribution of expansionary money supply policies in the recent price surge.

Market fundamentals play an important role. For example, crop failures in the years before 1974 intensified the food price surge. In 2008, stagnant productivity and tight food markets, low global inventories and strong demand for crops from the biofuel sector in an environment of rapidly increasing oil prices all affected the movements of prices. In the debate that followed, the role of futures markets and the impact of speculation on prices received particular attention. Trading in agricultural futures markets was not a central feature during the 1974 price surge. However, since the 1980s and especially now, futures markets are an integral part of the food market system. Over the 2005–2008 period agricultural futures prices increased dramatically and the question whether the food price rise was a phenomenon similar to a 'speculative bubble' lingers in the minds of many observers.

Although researchers have reached a common understanding on what triggered the behaviour in food prices in 2008, the relative importance of these drivers is not yet clear. There is also little to advise on the future frequency, magnitude and persistence of price surges, as the above observations suggest that many conditions have to concur for such an event to occur. It is certain that price surges will take place periodically and given that the main driving forces are macroeconomic in nature, little can be done to prevent them.

Nevertheless, the scope for policy advice and for mechanisms to effectively manage price booms and volatility is compelling.

Many governments, policy think tanks, and analysts have called for improved international mechanisms to manage sudden food price rises. The recent food market episode occurred in the midst of another important longer-term development, namely the shift of developing countries from the position of net agricultural exporters to that of net agricultural, especially basic food, importers. The contribution of food price increases to growing levels of poverty and food insecurity around the developing world appears to have galvanized attention on food price volatility and to have strengthened the efforts to formulate institutional mechanisms in order to instill more confidence, predictability and assurance in global markets of basic food commodities.

This issue of the Commodity Market Review focuses on a number of key topics that are related to the recent price episode. It contains selected papers from a two-day workshop entitled 'Institutions and Policies to Manage Global Market Risks and Price Spikes in Basic Food Commodities'. These papers review different aspects of the price surge. Which are the main drivers of volatility? Has speculation in the futures markets contributed to the food price spike? Have export restrictions amplified the surge? Were national buffer stocks successful in stabilizing prices? How can the international community assure that low income food importing countries have access to imports when prices surge? The answers to these questions have important policy implications, especially for shaping a more stable market environment, instilling more confidence and assurance in the markets.

## 2. SOURCES OF VOLATILITY

In the first paper, Balcombe explores the nature and causes of price volatility in agricultural commodity prices over time. The contribution of factors such as the level of stocks, yields, export concentration and the volatility of oil prices, interest rates and exchange rates is analysed. Most of these factors have been thought of as crucial in giving rise to the recent price surge. In addition to these factors, the article assesses the existence of the periodic form of volatility. Past volatility can be a significant predictor of current volatility giving rise to periods with either high or low price volatility. Such volatility patterns are commonly found in markets where prices are partly driven by speculative forces.

An important aspect of this study lies in the measurement of volatility. Agricultural commodity prices, as well as interest and exchange rates are decomposed in trends, cyclical and seasonal components. Within this approach, volatility is not just defined in terms of ex post changes in the series, but in terms of the variance of the shocks governing the volatility of series' components. Using this method, the influence of other variables on these variances can be estimated. Given the different frequency of the data, the analysis is based on two econometric methods. In the first method monthly data on commodity prices, interest rates and exchange rates is used. In the second method, the author employs a panel estimator utilising variables such as stocks, yields and export concentration, for which data are available annually.

Using monthly data, the results indicate that nearly all commodities have significant trend and cyclical components. Volatility seems to spill across agricultural markets with markets experiencing common shocks, rather than being isolated from each other. Past volatility is also found to be a significant predictor of current volatility. This suggests that volatility in commodity prices is persistent with periods of relatively high volatility followed by periods of relatively low volatility. As in many financial markets, this pattern hints upon speculative behaviour contributing towards volatile prices.

Quite importantly, oil price volatility is found to be a significant predictor of volatility in prices for a majority of food commodities. Given the period analyzed, which for some commodities spans more than 40 years, this result suggests that volatility in energy prices has been a determinant of volatility in agricultural prices even before agriculture became a provider of energy through the production of energy crops, such as sugar and maize. As the integration of the energy and agricultural markets strengthens, through biofuels, there is the possibility that the role of oil prices in determining agricultural price volatility may even be more significant in the future. Besides oil prices, exchange rate volatility also impacts the volatility of prices for slightly more than half of the commodities analyzed.

The panel data approach complements the above results. Stock levels have a significant and downward effect on price volatility for each of the three markets for which data on stocks exist, (wheat, maize and oilseeds). This finding is consistent with expectations that as stocks become lower, the markets become more volatile. Low stocks weaken the buffer capacity of the market and limit the possibility of adjustment to supply and demand shocks without wide price changes. Finally, the empirical evidence also suggests that overall, agricultural price trends are significant. These trends are independent of the variables used to explain volatility. This is an important result. It means that price volatility will increase only if there are changes in its determinants, such as stock levels, exchange rates, or oil prices.

The paper sets an agenda for further research, as well as one for policy formulation. If speculative behaviour in either futures or spot markets results in increasing price volatility at periods, there is need for further analysis in exploring the nature of speculation in agricultural markets and the extent to which it affects prices. Buffer stocks are also seen as a policy solution to price volatility by many developing countries. However, the experience with public buffer stocks suggests that, although there are positive examples, in some cases such interventions have been disruptive, rather than stabilizing. These issues are the subject matter of the papers that follow.

### 3. THE ROLE OF FUTURES MARKETS

The papers by Gilbert, and Hernandez and Torero, both examine the functioning of the agricultural futures markets during the price surge and focus on the behaviour of market actors and their impact on prices. Gilbert centres his attention on non-commercial participants, studying their behaviour and assessing their contribution to price rises. The paper attempts to answer a question which lingers in the minds of many an analyst: Is the food price surge similar to a financial 'speculative bubble'? Torero draws attention to the linkages between futures prices and spot market prices during the surge. His analysis extends the argument on the impact of speculative behaviour from futures to cash markets.

Futures markets perform two essential functions. First, they facilitate the transfer of price risk and increase liquidity between agents with different risk preferences. The second major economic function of future markets is price discovery. Commercial traders, including producers and processors of agricultural commodities, utilize futures contracts to insure their future inventories against the risk of fluctuating prices. Non-commercial traders, such as speculators, operate in futures markets for possible gains from futures prices increases.

This decade has witnessed a significant increase in commodity futures trading by a new class of non-commercial actors composed of institutional investors. Gilbert discusses both commercial and non-commercial participants and focuses his analysis on a particular class of institutional actors, the commodity index investors. These are comprised of pension funds,

university endowments, banks and sovereign wealth funds and regard commodity futures as an asset class comparable to traditional asset classes such as equities and bonds. Their behaviour in futures markets differs from that of traditional speculators in several ways. These actors engage in trading by taking long-term positions on a number of commodities, rather than in specific futures markets. They follow commodity portfolios or indices that comprise of energy, metal or food commodities such as the Goldman Sachs Commodity Index (S&P GSCI) and the Dow Jones AIG commodity index (DJ-AIG). They also 'roll over' their futures contracts. Futures contracts have an expiration date and commodity index investors maintain their commodity futures position by periodically selling expiring futures contract and buying contracts which expire later.

Researchers suggest that the returns to commodity futures are negatively correlated with returns to equities and bonds. This makes commodity futures an attractive vehicle for portfolio diversification. In addition to this property, historically commodity futures are shown to be attractive, with returns equal or even higher than those of equities and bonds. Gilbert looks into the components of the returns of such investments. He concludes that investments in a passive commodity index could have bought diversification of an equities portfolio at a lower cost than through bonds. However, he finds that profitable investment in commodity futures will likely depend on adoption of an active investment strategy, rather than simply tracking a standard index.

Such considerations give rise to questions on the contribution of commodity index funds to the food price spike through trend-following behaviour. Gilbert reviews the literature on the impact of extrapolative speculating behaviour on future prices. He suggests that, in spite of the argument that actors with information on supply and demand will always bring prices to their fundamental values, in tight markets with low stocks it will be very difficult to assess the market-clearing price on the basis of longer-term fundamental factors. This difficulty may allow the weight of the speculative money to determine the level of futures prices.

Gilbert assesses the conjecture that increases in index-based investment have contributed to increases in futures prices of maize, wheat soybeans and soybean oil by means of Granger causality tests. The tests indicate that changes in index positions had a persistent positive impact on soybean prices over the sample considered. However, there is no evidence for similar effects in the maize, soybean oil and wheat markets. Overall, therefore, there is weak evidence that index investment may have been responsible for raising commodity futures prices during the recent boom. Nevertheless, Gilbert stresses that it may be too simple to rule out the possibility that index-based investment may have affected prices in some markets and especially in the shorter term. More research in the operation of these markets is necessary in order to enable economists to provide policy prescriptions and advice.

Hernandez and Torero make an additional contribution to the debate on the role of futures markets during the recent price surge, focusing on the dynamic relationship between futures and spot market prices. Their evidence suggests that the markets are closely related with changes in futures prices leading those in spot markets. In theory, both futures and spot prices reflect the fundamental value of the same commodity. If instantaneous arbitrage were possible, prices in both futures and spot markets would be identical with changes taking place at the same time in line with the supply and demand fundamentals. Nevertheless, purchases and sales for physical delivery in the spot markets are subject to transaction costs. Contract and transport costs, cash constraints, as well as the need for storage for the physical commodity render spot prices slow in their response to new information. In contrast, futures market transactions can be implemented immediately by hedgers and speculators who react to new information with minor cash requirements.



The path and speed in which new information is filtered in the market and embedded in prices lies behind the notion of price discovery, which is the process by which supply, demand, storage and expectations determine the price for a commodity. Hernandez and Torero use this notion to investigate the relationship between prices in the spot and futures market in a number of food commodities between 1992 and 2009, thus including the period of the recent price surge. Most empirical studies of the price discovery mechanism support the hypothesis that changes in futures prices lead those in spot prices. However, this is not always the case and in a number of cases, changes in spot prices have triggered responses by futures market participants.

Hernandez and Torero utilize a battery of tests for Granger causality. They conduct linear as well as nonlinear Granger causality tests to uncover the causal links between spot and futures prices of maize, wheat and soybeans. They also extend their analysis to assessing causality between futures and spot prices volatility. Their results indicate that prices are discovered in the futures markets with futures prices causing spot prices, in the Granger sense. Although in some cases, the tests reveal bi-directional causality between futures and spot prices, in general, in most of the markets and periods analyzed, futures prices lead changes in spot prices more often than the reverse. Similar results are obtained in terms of price volatility. Again, price volatility is discovered in the futures markets in most cases.

The authors discuss these results in terms of policy implications and suggest that the evidence they provide underpins intervention in the futures markets. Excessive speculation in futures markets could, in principle, result in futures price increases and, through arbitrage opportunities, affect spot prices to levels that are not justified by supply and demand market fundamentals. Robles, Torero and von Braun (2009) test the hypothesis that speculation in futures markets does result in increasing futures prices by means of Granger causality tests. The article by Hernandez and Torero in this Review provides empirical evidence that futures prices lead spot prices. These findings support the case for intervention in the futures markets in times of significant volatility. This is the policy option proposed by von Braun and Torero (2008, 2009) to intervene in the futures markets in times of excessive price spikes in grains prices through a virtual reserve. The role of the virtual reserve would be to increase the supply of futures contracts sales progressively and reduce futures prices until speculators move out of the market as the incentives for further investments in on futures contracts disappear.

From the policy perspective, the article by Gilbert and that by Hernandez and Torero both call for increased attention on the futures markets. As the evidence is still scarce, both hint upon more research on the issue. First, although useful in exploring causal relationships, Granger causality tests are not sufficient in identifying the main drivers of price increases. There are 'identification' problems and more detailed models are necessary for accurately assessing causal effects, as the omission of relevant variables may result in wrong assessments. Second, more analysis may also necessary in order to explore the feasibility and effectiveness of direct interventions to alter the fundamentals of the futures markets. There are a number of questions to be answered related to the size of funds necessary for such intervention and an assessment of the likely reaction of market participants. This is important, as any attempt to publicly influence the prices in futures markets may quickly become expensive, but would also most likely lead to withdrawal of the agents who use the futures markets for hedging purposes.

## 4. THE ROLE OF FOOD RESERVES

Many countries attempted to alleviate domestic price increases through a combination of buffer stocks and trade policy. In Asia, large rice producing countries used both food

reserves and trade policy to stabilize grain prices and ensure food security. China, India and Indonesia managed to protect well over 2 billion consumers through food reserves and export restrictions. In Africa, maize producing and consuming countries, such as Kenya, Malawi and Zambia, also attempted to intervene through a similar mix of policies, but without success. The paper by Timmer and that by Jayne and Tschirley focus on food reserve management in these regions.

Most economists are unconvinced that food price stabilization measures can be successful and inexpensive. In the context of rice in Asia, Timmer argues for the contrary. His article builds a case for the benefits of stabilizing staple food prices. In Asia, rice accounts for half the income of farm households and between 25–40 percent of consumption expenditures. In the absence of stabilization, price surges can cause famine for the poor who cannot afford higher food costs. Price stabilization also benefits producers as a second-best solution to missing credit markets. Instead of subsidizing credit, governments, by stabilizing rice prices, reduce the risk to which farmers are exposed and thus promote investment.

However, Timmer suggests that there are additional, and perhaps more important benefits. As rice accounts for a large share of expenditures, price fluctuations affect the demand of other goods and services in the economy. These effects are all the more significant as the demand for rice is inelastic relative to that of other goods. Therefore, rice price stabilization brings about macroeconomic stability for investment and growth. For example, in Indonesia rice price stabilization shapes the country's approach towards food security. However, these price policies also consider dynamic and economy-wide issues, such as the distributional consequences for farmers and consumers.

Price stabilization places significant demands for logistical and operational capacity, access to financial resources and strong analytical skills. Timmer puts emphasis on these by providing an account of BULOG, Indonesia's price stabilization agency. Stabilizing domestic prices requires buffer stock operations in conjunction with trade policy. BULOG, and other price stabilization agencies in Asia, implement such policies to keep rice prices within a certain band sometimes with complex financial operations, going through periods characterized by food crises or self-sufficiency. The stabilization mechanism relies heavily on trade policy to maintain the desired balance between production, consumption and stock changes. However, such fine tuning through trade is against the World Trade Organization rules.

Timmer's discussion of the recent price surge reveals that domestic stabilization policies can have a significant international impact. India, China, Indonesia and Viet Nam stabilized their domestic rice prices during the 2007–08 food crisis by using export bans, or very restrictive controls and buffer stocks. Although successful, these policies had also a significant impact on the world market. In 2008, the decision of India and Viet Nam, the world's second and third largest rice exporters, to ban exports of rice resulted in a 43 percent increase in the price of rice between October and February of the same year. Timmer discounts this impact. The international market of rice is quite thin, with most important producing and consuming countries stabilizing their domestic markets. He stresses that in terms of aggregate global welfare, the use of buffer stocks and export bans in these large countries may be both an effective and an efficient way to cope with food crises, even after considering the effects on increased world price volatility.

The relevant World Trade Organization (WTO) provisions essentially permit export prohibitions or restrictions on basic foodstuffs to relieve domestic critical shortages of foodstuffs. Export taxation was never disallowed, unlike import tariffs. This asymmetry in the WTO disciplines applying to imports and exports has been pointed out during the current negotiations on agriculture and several countries proposed stronger rules in this

area. However, there is resistance on these issues from other WTO members and it is unlikely that stronger disciplines on export restrictions would materialise under the Doha Development Round. In the case of rice, although export restrictions stabilized domestic prices in many large countries, they created substantial uncertainty in the market especially because governments announced the export bans without clarifying their duration. More predictable and less discretionary policies would convey clearer information and render panic and hoarding less likely, resulting in less uncertainty.

Jayne and Tschirley focus on the experience of East and Southern African countries, where marketing board operations are still a central characteristic of the food economies, in spite of the perception that markets in the region have been liberalized. Like rice in Asia, white maize is the main food staple in East and Southern Africa and as the authors stress, the cornerstone of a 'social contract' binding governments to promote the welfare of smallholders and ensure cheap food for the urban population. Marketing board operations, such as domestic procurement, food releases and import programmes, in conjunction with trade policy are the instruments the government uses to satisfy the terms of this social contract.

The presence of the government in the market, trading along the private sector, has given rise to a dual marketing system in which the environment is shaped by both frequent and unpredictable changes in policies. In the East and Southern Africa region marketing boards are often the single most important player in the market and their power over maize prices affects market participants. Largely unexpected changes in marketing boards' operations and trade policy result in increased risk and losses for other market participants, thus hindering the development of efficient private markets.

Jayne and Tschirley examine the interactions between the government and private traders using tools of economic analysis and also drawing from political science and sociology. The government's objective is seen as remaining in power by maximizing votes, while traders aim at maximizing profits. Actions by one party will affect the other. For example, a decision by the government to import food and proceed in subsidized sales can erode the value of private traders' stocks. In a similar manner, traders' non-competitive behaviour can impede the government from ensuring cheap food.

In addition, the relationship between governments and traders is shaped by uncertainty on what the other will do, giving rise to a credible commitment problem. For example, the government may announce the importation of food, but traders are not certain that this will be carried out. They are also not certain that, in the event imports arrive, the government will allow them to purchase. As a result they prefer to remain inactive. This can have significant negative consequences in times of crises and the authors discuss the two cases of Kenya and Malawi in order to illustrate the impact of governments and traders' interaction during the recent price surge.

The authors provide a classification of competing visions for staple market development. On one end of the spectrum they place the current practice of discretionary market intervention, while at the opposite end the government provides only public goods and does not intervene in the market. An intermediate solution consists of a rules-based state intervention. This involves the provision of credible information on public import programs and changes in import tariffs in a timely manner in order to avoid private sector disruptions and ensure the availability of food. In addition, it requires the establishment of clear and transparent rules for the intervention of governments in the market. Once more, predictable and non-discretionary intervention can reduce the fragility of some markets in East and Southern Africa and reduce volatility.

## 5. INSTRUMENTS TO ASSURE IMPORT SUPPLIES

During the last two decades, the agricultural trade position of developing countries, on aggregate, has changed from net exporting to net importing. This attribute increases their vulnerability during food price surges. High food prices can have significant impacts on importing countries and a direct adverse effect on food security. A major problem many net food importing developing countries face is that of major trade finance constraints which can prevent both public institutions and private traders from importing the required amount of food. In his paper, Sarris examines a number of issues related to food import management and discusses three specific mechanisms which can facilitate imports.

The first mechanism aims at reducing the unpredictability of food import bills by hedging in the futures markets. High food bills may result in major repercussions on the whole economy, worsening the current account balance, aggravating foreign exchange constraints and reducing the country's import choices. Should importing countries use the futures markets and hedge, the unpredictability of their food bills and the risk these countries are exposed to, will be reduced. Sarris uses simulations to assess the potential reduction in unpredictability through hedging with futures contracts and options. His findings suggest that the reduction in unpredictability is significant. The analysis also indicates that the reductions in the unpredictability of food import bills during the recent price surge, if importing countries had hedged by using futures or options, would have been substantial. This has important implications for food import management, as well as for the development of commodity exchanges in the developing world.

A facility to assist net food importing developing countries to meet the cost of excess food import bills is Sarris' second proposal. The Food Import Financing Facility (FIFF), put forward in this paper, is in accordance with the Marakkesh Decision to maintain usual levels of imports in the face of price shocks. The design of the FIFF is based on existing practices of international trade and finance, involving the international community as provider of conditional guarantees, rather than finance. Sarris provides an analysis of the Facility's basic functions and structure. FIFF is designed to operate as a guarantee fund enabling commercial banks to extend new credit to food importers in times of need. It would benefit itself from guarantees by a number of donor countries in order to make up its operational fund. Another central aspect of the design is that the FIFF would not finance the whole import bill of a country, but only the excess part. The mechanisms by which credit would be extended are also discussed. For example, trigger conditions based on specific food import bill indicators would prompt importing countries to seek finance.

Since the Marakkech Decision, very little has been pursued in the WTO on such facilities or similar alternatives, perhaps due to the low food price period that ensued. However, in retrospect, a functional international food import financing programme would have provided some relief to the affected countries during the recent period of soaring food prices, had it been in place.

The third mechanism Sarris proposes is that of an International Grain Clearing Arrangement to assure the supply of food imports. This attempts to reduce the risk of reneging on a delivery contract between private agents in different countries. This risk is not related to the unpredictability of food import bills, as in the first mechanism, but to that underlying import supplies. Sarris notes that although contracts in commodity exchanges are enforced, there is no international contract enforcement institution to ensure that physical delivery takes place. The way to enforce contracts in the international market would be to establish linkages between commodity exchanges around the world so that guarantees could be provided that physical supplies are available to execute the international contracts.

A number of aspects of such an institution are discussed by the author. These include the ownership, the risks of defaults, the link with physical reserves and financing. Indicative estimates of the size of the institution suggest that it would not weigh heavily on the market and hence would not influence the fundamentals of supply and demand in global import trade. Its objective would be to facilitate trade and hence assure that there is enough physical grain to execute normal commercial contracts.

## 6. CONCLUDING REMARKS

Volatile prices have significant negative effects on developing countries. Price surges induce substantial income risks and can be particularly detrimental to developing countries' welfare and growth prospects.

This issue of the Commodity Market Review enquires into the determinants of food price movements and examines a number of policy options. The papers contribute towards analysing the empirical behaviour of food prices during the recent price surge and provide a systematic examination on a number of issues. The main drivers of agricultural price volatility are discussed. The role of speculators in the food futures markets and the effect of national food reserve and trade policy responses are examined, illustrating the implications for developing countries. Most of these issues are controversial, but at the same time raise a variety of important policy questions. Should food price volatility increase, concerted effort at the international level will be necessary in order to shield low income food importing developing countries from the negative effects of sudden and unpredictable increases.

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# The nature and determinants of volatility in agricultural prices: An empirical study from 1962–2008

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## 1. INTRODUCTION

There is now considerable empirical evidence that the volatility in agricultural prices has changed over the recent decade (FAO, 2008). Increasing volatility is a concern for agricultural producers and for other agents along the food chain. Price volatility can have a long run impact on the incomes of many producers and the trading positions of countries, and can make planning production more difficult. Arguably, higher volatility results in an overall welfare loss (Aizeman and Pinto, 2005),<sup>2</sup> though there may be some who benefit from higher volatility. Moreover, adequate mechanisms to reduce or manage risk to producers do not exist in many markets and/or countries. Therefore, an understanding of the nature of volatility is required in order to mitigate its effects, particularly in developing countries, and further empirical work is needed to enhance our current knowledge. In view of this need, the work described in this chapter, seeks to study the volatility of a wide range of agricultural prices.

Importantly, when studying volatility, the primary aim is not to describe the trajectory of the series itself, nor to describe the determinants of directional movements of the series, but rather to describe the determinants of the absolute or squared changes in the agricultural prices.<sup>3</sup> We approach this problem from two directions: First, by directly taking a measure of the volatility of the series and regressing it against a set of variables such as stocks, or past volatility. Second, by modelling the behaviour of the series,<sup>4</sup> while examining whether the variances of the shocks that drive the evolution of prices can be explained by past volatility and other key variables.

More specifically, we employ two econometric methods to explore the nature and causes of volatility in agricultural price commodities over time. The first decomposes each of the price series into components. Volatility for each of these components is then examined. Using this approach we ask whether volatility in each price series is predictable, and whether the volatility of a given price is dependent on stocks, yields, export concentration and the volatility of other prices including oil prices, exchange rates and interest rates. This first approach will be used to analyse monthly prices.<sup>5</sup> The second approach uses a panel regression approach where volatility is explained by a number of key variables. This second approach will be used for annual data, since the available annual series are relatively short.

On a methodological level, the work here differs from previous work in this area due to its treatment of the variation in the volatility of both trends and cyclical components (should a series contain both) of the series. Previous work has tended to focus on either one or the other. Alternatively, work that has used a decomposed approach has not employed the same decomposition as the one employed here. Importantly, in contrast to many other approaches, the framework used to analyse the monthly data requires no prior decision about whether the series contain trends.

The report proceeds as follows. Section 2 gives a quick review of some background issues regarding volatility. This report does not discuss the consequences of volatility. Its aim is limited to conducting an empirical study into the nature and causes of volatility, and to explore whether these have evolved over the past few decades. To this purpose,

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<sup>2</sup> For a coverage of the literature relating the relationship between welfare, growth and volatility, readers are again referred the Aizeman and Pinto, 2005, page 14 for a number of classic references on this topic.

<sup>3</sup> In order to model volatility, it may be necessary to model the trajectory of the series. However, this is a necessary step rather than an aim in itself.

<sup>4</sup> This is done using a 'state space form' which is outlined in a technical appendix.

<sup>5</sup> Data of varying frequencies is not used for theoretical reasons, but due to the data availability. These were provided by FAO.