PAPER PREPARED FOR THE 123RD EAAE SEMINAR

PRICE VOLATILITY AND FARM INCOME STABILISATION MODELLING OUTCOMES AND ASSESSING MARKET AND POLICY-BASED RESPONSES

DUBLIN, FEBRUARY 23-24, 2012

Management of Volatility in the Grain Market

Guenther-Luebbers W.[1], Henke S.[1] and Theuvsen L.[1]

1 Georg-August-University, Göttingen, Germany

welf.guenther-luebbers@agr.uni-goettingen.de

Management of Volatility in the Grain Market

Guenther-Luebbers W., Henke S. and Theuvsen L.

Abstract

Food prices have steadily risen since the 1990s, and price were especially volatile in the years 2008 and 2010. This trend has also been reflected in the European grain market, which presents all European companies along the food value chain with new challenges. This paper focuses on the impacts of increased price volatility on the grain market. Furthermore, it describes and evaluates government interventions attempting to reduce this volatility. At the same time, it describes and assesses private management methods of dealing with price volatility. In this article, we provide an opportunity to understand how the European cereals market evolved to reach its present state and suggest future possible price assurance systems, such as insurance for the basic monetary security of cereal products for all of the parties involved.

Keywords: Management, Volatility, Grain Market.

JEL classification: Q 10, Q12, Q14, Q 17 and Q 18.

1. INTRODUCTION

The common agricultural policy (CAP) is one of the main pillars of the European integration process. Over time, divergent political objectives have led to changes in the legal framework for the European cereals market. In the early 1990s, the European cereals market was heavily regulated and virtually sealed off from the world market. Intervention mechanisms and protective tariffs held price volatility to a minimum until the widespread market liberalisation that began with the MacSharry reforms. Since that time, price volatility has increased considerably, as global factors, such as diminished returns, have begun to affect the European market. In Europe, price increases of almost 100% for wheat and even 200% for rice are no longer a rarity. This increase in price volatility has had a significant impact on those involved in the cereals market and requires tools for managing this instability. There has been massive change in the long-standing structures in the supply chains within a short period of time due to the strongly altered price volatility, greatly affecting the financial performance of individual companies. Hence, this paper deals with the relationship between policy changes and the price volatility in the European cereals market. Our main research interest lies in identifying and evaluating potential government and enterprise risk management instruments.

For this purpose, we first delve into the volatility of risk management. In this context, the determinants of price volatility of agricultural products are presented, and the meaning/importance of price volatility for food companies' risk management is described (section 2). The third section examines how the various changes in European agricultural policy have influenced price volatility. In the subsequent section, instruments dealing with volatility at the private and state level will be presented. The main results of the literature analysis regarding the management of volatility in the EU agricultural market are presented in the concluding section.

2. PRICE VOLATILITY IN RISK MANAGEMENT

Volatility is used to describe the intensity of the fluctuation of price/market quotations and can only be estimated using historical data analysis or ascertained as "implied volatility using optional prices". However, the variance in prices during a certain period of time is often used as a simple indicator for price volatility (Reinschmidt, 2006: 38-44). Statistically and mathematically, volatility is a standard deviation which is not only based on prices alone, but also on their relative changes, the so-called "returns" (Artavia et al., 2009: 59). Volatility can be characterised because of the regularities of individual variations, which are also subject to temporal clusters. Hence, it is possible that there is more or less volatility during certain periods of the year (Tsay 2002: 80).

Risk is generally defined as the risk of loss or by aggravating circumstances (Kromschröder et al., 1998: 1573). Literature often distinguishes between external risks (higher violence, political and technological uncertainties) and business risks, which all have to be taken into account for meaningful risk management (König, 2008: 12-13). Wiedemann (1998: 4-10) divides all relevant risks into two main groups: financial and business risks. Business risks include price risk, volume risk, risk behaviour and the risk of change, whereas financial risk usually affects a company's capital structure (Mußhoff et al., 2010: 322).

The price volatility of produced or purchased products entails a price risk for the company. The price risk is added to the market risks (Kern, 2008: 18-19). Thus, price volatility creates a risky situation for the company, which it tries to manage under the premise that a rational, utility-maximising decision-making process is present (Ossadnik et al., 2008: 321-323). In principle, risks can be accepted after an analysis and assessment of the specific risks a company is subject to; if the risk analysis shows a low potential loss or very low probability of occurrence, this risk can be controlled under certain circumstances. If current risks are considered too high with regard to potential losses or probabilities of occurrence, there are three options for risk management—avoidance, reduction, and shifting—which can be implemented after a comparative evaluation (Mußhoff et al., 2010: 324). Thus, there should be a customised risk management with preventive measures, roll-over, compensation and diversification in place, with the adopted control measures being continuously monitored and adjusted (Wolke, 2008: 1-10).

Agricultural markets are subject to particular uncertainties, since price developments depend not only on sales and production capabilities and demand, but also on the occurrence of exogenous factors. Supply may be particularly influenced by weather incidents or pests, as well as the prices of input factors, such as fertilisers. Demand is subject to many different influences, such as rising demand in emerging countries and growing production of renewable resources. Moreover, large inventories, which a few years ago could easily compensate for crop failures, have been exhausted, and this has led to an increase in the specific price volatility for agricultural products (Wessmann et al., 2008: 1-4). In recent years, globalisation and the progressive liberalisation of many market regulations have substantially increased the price volatility of raw materials, particularly for agricultural commodities. The elimination of market

restrictions, the reduction of inventories, currency fluctuations, and growing demand exacerbate this effect (Viechtl, 2008: 4).

Empirical analysis show that business actors are characterised by varying expectations concerning future price developments and perceived reasons for price volatility (Davier, Heyder and Theuvsen, 2010). Surveys have found that 93% of the companies in German-speaking countries consider the price volatility of raw materials to be significant, and 89% identify volatility as a clear influence on their cost structure. Of the companies surveyed, 62% have already incorporated volatility management in purchasing in their company's risk management department. However, at 66%, the strategy of risk rollover to the buyers is most popular (KPMG, 2007: 2-3). This strategy has the disadvantage that it creates a competitive advantage for competitors with more stable prices (Stelzer, 2007: 5) since, during periods of higher prices, the willingness of buyers to share price risks with their suppliers falls sharply.

3. EU AGRICULTURAL REFORMS WITH EFFECTS ON PRICE VOLATILITY

Beginning with the MacSharry Reform in 1992, EU political reforms concerning agriculture can be connected to a change in grain prices and their volatility. This paper seeks to analyse whether political changes were decisive in bringing about crucial changes in price volatility.

3.1 MacSharry Reform up to Health Check

In Fig. 1, a clear downward trend in the prices for quality wheat and brewing barley can be observed following the MacSharry Reform of 1992 and lasting until 2006. Before 1993, quality wheat sold at the rate of about €160/t. This can be explained by the fact that this was roughly the intervention price until the MacSharry Reform. After the MacSharry Reform, the intervention price was 33% lower, which resulted in prices immediately plunging to a lower level. The distribution of the 33% reduction over three years reveals that the price slid downward. The enormous oversupply of 40 M tonnes of grain in the EU (Urff, 1997: 26) could only result in lower prices. The intervention price had acted as a safety net within the EU, generally preventing prices from falling beyond that point. The grain price remained within the lower margin, i.e., at the intervention price, because of overproduction in the EU at that time (Henrichsmeyer et al., 1994: 548). It can be further ascertained that the price of quality wheat from 1997 to 2000 hovered around €120/t. This was the intervention price after the 33% decline. Smaller price peaks can be explained partly by the fact that ,from November to May, the intervention price was subsidised.

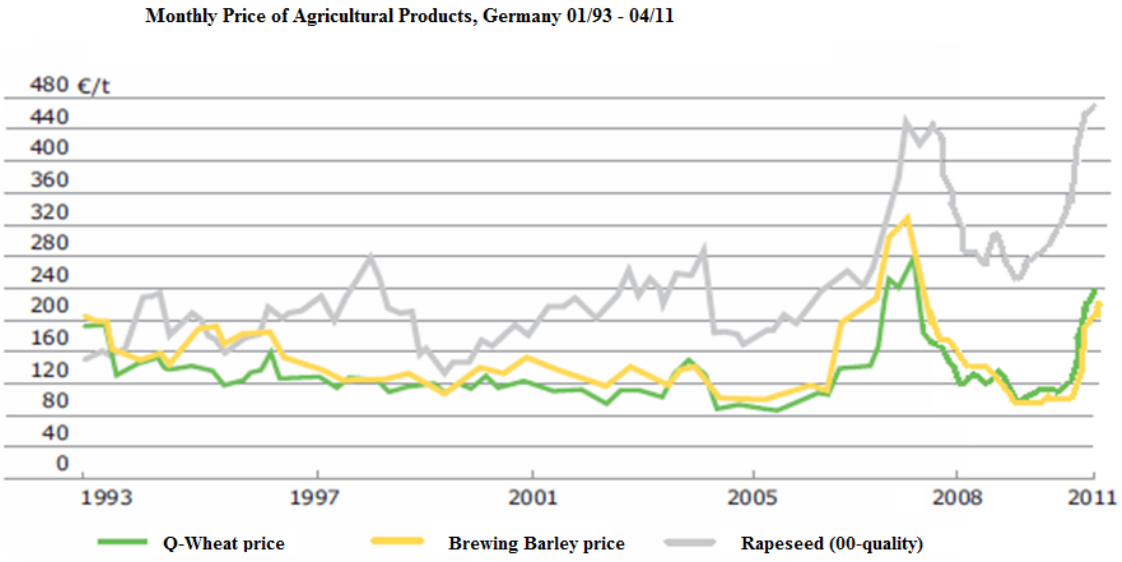
In 1996, there was a semblance of market mechanisms in the European grain market for the first time. The European price jump to €160/t was due to a faulty yield prognosis, a distortion of exchange rates within the European Union, a misjudgement of the processing industry for quality wheat and a subsequent supply shortage. Furthermore, the rest of the world had had two successive bad harvests, and the world market price for the first time had exceeded

the EU intervention price (Infodienst der Landwirtschaftsverwaltung Baden-Württemberg, 2009).

After 2001, there was a further decline in the price of quality wheat. From that time until 2004, the price levelled off at a new price intervention of €101.31/t. This was the rate decided on by Agenda 2000, which sought to gradually adjust the European grain price to the world market price. A further decline in prices through 2005 can be explained, on the one hand, by the fact that the monthly reports on the intervention price had decreased by 50%, and, on the other hand, by the fact that in 2004 Germany and Europe had an unusually good harvest (Infodienst der Landwirtschaftsverwaltung Baden-Württemberg, 2009).

The price increase between 2003 and 2004 is the result of two consecutively bad harvests in Europe in 2002 and 2003 due to bad weather conditions. Similar to the rest of the European Union, Germany experienced a 9% decrease in yield in comparison to the previous year and a 13% decrease in comparison with the mean of the years 1997-2002. Worldwide this year (2003) saw a 3.1% decrease in grain yields compared to the previous year. These lower yields and the ever-increasing interrelation between the European market and the world market allowed prices to rise temporarily to €155/t within the EU (Infodienst der Landwirtschaftsverwaltung Baden-Württemberg, 2009).

Figure 1. Grain and rapeseed price development in Germany, 1993-2011



Source: Authors' illustration of Artavia et al., 2009: 56; indications acc. to ZMP, AMI market economy for grain and oilseeds

In 2006 an enormous increase in the cost of crude oil and natural resources began. As a result of this boom, the prices for agricultural commodities also skyrocketed. In addition, throughout the entire European Union an extremely bad harvest resulted in yields being reduced by as much as 20%. The intervention price, which remained at the same level—€101.31/t—after the Midterm Review, had no relevance in this scenario. The market mechanisms that had

increasingly asserted themselves over the Midterm Review in the European politics of the grain market now came into effect. The factors which led to this interaction were more or less the same in Europe as in the rest of the world. Agriculture was no longer limited to food production but could also shift to the production of bioenergy and other renewable resources. Since that time, biomass production has been strongly encouraged and subsidised by EU and national legislation. This has created intense competition between food and bioenergy production. Therefore, the agricultural resources were suddenly coupled to the price of crude oil via their energy value and thus reacted, albeit latently, in the same manner: with a rapid price increase, peaking at €280/t in early 2008 (Wright, 2009: III-IV).

Another type of grain worthy of consideration is brewing barley. The relatively parallel development of the prices for wheat and for brewing barley can be explained by the fact that the price for brewing barley is indirectly set by the price of wheat. Minimal differences in prices occur due to local market conditions, smaller field size in brewing barley production and differing marketing strategies. Farmers' ability to shift between fodder and brewing barley production also plays a role.

The price for brewing barley always remained slightly above that for wheat between 1993 and 2006, i.e., from the Midterm Review until shortly before the Health Check. In order to make the cultivation of brewing barley attractive and competitive, the price level is usually contractually set at a rate above that of barley for fodder and above that for wheat. In this way, the supply of national malting plants is secured. However, the sliding reduction in price resulting from the reduction of the wheat intervention price can also be observed here, so that the 1993 price of €200/t dropped to roughly €110/t in 2005. Small peaks in the price of €20 to €30/t can be observed in Fig. 1 for this period and reflect the fact that the brewing barley market is very small and readily assessable in contrast to the wheat market. Variations in yield due to metrological effects are hard to absorb because there is no large storage keeping in this branch. If yields are lower than anticipated or if the required quality cannot be attained, the market reacts very quickly and prices rise substantially. Just as the price of wheat shot up due to various circumstances in 2007/2008, the price of brewing barley followed this trend. In the phase of increasing prices, brewing barley had a head start in comparison to wheat; however, after the peak price phase ended, its price also fell back to its 2006 level as a result of the economic crisis.

Fig. 1 shows the differences in producers' prices. The prices for wheat and brewing barley were not volatile from the beginning of the 1990s until 2002. During this period, there were no large deviations in price in either direction. This was different after the first price jump around 2003/2004, when, for a short time, the wheat price increased about 50% from its usual €100/t to €150/t. The price later returned to the intervention price. The volatility of the wheat and brewing barley markets recovered in the following years. For the two years from 2006 to 2008, the price of wheat fluctuated between €90/t and €280/t—a fluctuation range of €190/t. Brewing barley experienced even more drastic fluctuations within this time period. Within one year, its price rose to €330/t, an increase of €220/t. Thus, for both products, the price tripled

within a year and after that year returned to its former price range. Compared to earlier years, this represents much greater price volatility.

In Table 1, Artavia et al. (2009) have calculated the various volatilities for brewing barley, quality wheat and rapeseed using data for German commodities for three periods: 1993-2000 Period 1 (P1), 2001-2004 Period 2 (P2) and 2005-2008 Period 3 (P3). These periods correspond roughly to the various EU agricultural policy reforms. The first period reflects the time immediately following the MacSharry Reform, the second the impact of Agenda 2000 and the Midterm Review, and the third the effects of the Luxemburg Enactments. Table 1 illustrates the different volatilities. The range of the monthly volatilities runs from 2.98% to 6.62% and of the annual volatilities from 10.34% up to 22.92%.

Monthly Volatility

In its monthly volatility, P1 definitely reflects the market situation for the three commodities under consideration. Brewing barley, which is traded according to contractual agreements, showed the lowest volatility, followed by wheat at 3.81%. Rapeseed had the highest volatility at 4.27% since it was already affected by the fluctuations of the global market in P1. P2 exhibited the same distribution of volatility among the three commodities—brewing barley with the lowest and rapeseed with the highest volatility—however, between wheat and rapeseed there was only a 0.02% difference. For P3, however, this changed.

Table 1: Historical and EWMA Volatility of German Grain and Rapeseed Prices

	Total 01/93 - 12/08		Period 1 01/93 - 12/00	Period 2 01/01 - 12/04	Period 3 01/05 - 12/08
in %	historical	EWMA*	historical		
monthly volatility					
Q-wheat	4.89	7.96	3.81	4.92	**6.62**
brewing barley	4.02	6.95	2.98	3.08	**6.16**
rapeseed 00-quality	4.56	6.28	4.27	4.94	4.81
annualised volatility					
Q-wheat	16.95	27.58	13.2	17.03	**22.92**
brewing barley	13.92	24.08	10.34	10.68	**21.34**
rapeseed 00-quality	15.81	21.74	14.8	17.12	16.68

* Exponentially Weighted Moving Average, Lambda = 0.94; Levene-test for significant difference (95% level):
underlined = significant difference when compared to previous period; bold = significant difference compared to P1

Source: Author's illustration of Artavia et al., 2009: 60

The volatility of wheat and brewing barley prices doubled in comparison to their P1 value, whereas the volatility of the rapeseed price remained almost constant or rose only slightly, by 0.5%. The historical monthly volatility is calculated for the entire period of 1993 to 2008 by determining the means of the values of the individual periods according to their relative length of time in years. A surprising result is that the historical price volatility of wheat is greater than

that of rapeseed. This can be explained by the fact that the volatility of wheat prices was much higher than that for rapeseed in P3.

With help of the EWMA volatility, more currently observed values with a stronger weighting can be added to the results, whereas observations that lie further in the past lose exponentially on weight. This contrasts to the historical volatility, which gives equal weight to all observations (Wuensche, 2007: 1). The differences in Table 1 between the historical volatility and the EWMA volatility suggest that the volatility of wheat and brewing barley has increased over time.

Annualised Volatility

The calculated values for the annualised volatility likewise confirm that the above described changes in the European CAP have exerted a great influence on volatility. The constantly increasing opening of the market after 1992 reflects the calculated volatility of the different periods. The significance and ranking of the volatilities among the three commodities observed are the same as for the monthly volatilities.

Whether the effects of the combined EU agricultural reforms from MacSharry up until the Health Check have resulted in price volatilities in other member states of the EU similar to those in Germany needs further research. Volatilities in various European member states are more or less the same, differing from one another by only about 2% to 3%. France and Italy are exceptions, however. Their wheat as well as brewing barley volatilities lie approx.. 10 percentage points below the volatilities of other EU member states (Artavia et al., 2009: 63). The reasons for this difference are still unclear. Not only France's main region of cultivation, the Paris Basin, but also Northern Italy and the Po Valley are known for their extremely high and reliable yields. Therefore, it can be assumed that these countries are net exporters of bread-making quality wheat and, even in years of reduced harvests, have to rely very little, if at all, on imports.

3.2 Health Check 2008 and the Future

The Health Check was signed into law on November 20, 2008, by the EU Ministers of Agriculture. This again promoted the further liberalisation of the EU grain markets. The global price development is transferred one-to-one to the European grain market. The wheat price fell in Europe to almost €120/t until 2009/2010. The German brewing barley price even fell below €100/t for a short period of time. One reason for this enormous decrease in prices was the second good global grain harvest in a row in 2009. The global wheat storehouses were again filled to capacity, and production was greater than global consumption. The intervention price for quality wheat after the Health Check remained at €101.31/t, but intervention was limited to only 3 mill. tons. The rest had to be traded at the open competitive bidding price. This safety net for wheat in the form of the existing intervention price protected the wheat price from falling even further. After a slight recovery in the wheat price before the 2010 harvest, the price skyrocketed by 100% afterwards until January 2011. This represents completely abnormal market behaviour directly after the harvest in that the prices did not react to the high supply of

new grain with a drop in prices, but rather with an enormous increase. This behaviour was due to bad weather, which brought lower yields and worse quality than anticipated. Russia experienced not only an extended drought, but also large fires in fields and forests, which destroyed a considerable portion of the harvest. Reports of export embargos of wheat from Russia and possibly also the Ukraine drove up the price as well (Djuric et al., 2010: 3-14).

The price development of brewing barley in Germany is representative of its price development in Europe in general and broadly parallels the wheat market. However, brewing barley which is unable to meet the quality standards can only be sold as fodder, just as in the case of lower grade wheat. After the Health Check, in which the amount of intervention for brewing barley was lowered to zero for an indefinite period of time, the price for fodder barley sank for the first time below the intervention price of €90-€92/t after the harvest of 2009. Since it is not possible for European farmers to produce barley at this price, Copa/Cogeca, the European farmer union, asked the EU to reinstate the intervention for barley in order to shore up the brewing barley price (Raiffeisen, 2009). After the resumption of the brewing barley intervention in autumn 2009, the price settled back to the intervention level, where it remained until its rapid rise after the harvest of 2010, which was influenced by the same factors as the wheat price.

Considering the wheat and brewing barley prices, one notes the enormous volatility of prices after the Health Check through the end of 2010. Within two years' time, the prices fluctuated within a range of approx. €100/t; in other words, the prices increased by about 100%. It is difficult to calculate the volatility for this short period; however, one could adopt the values found in Table 2 for P3 for this time period. Although they were calculated solely with German data, the figures can be applied to the entire EU since the grain market was further liberalised after the Health Check, further reducing differences among EU member states.

4. MANAGEMENT OF VOLATILITY

4.1 Management of Volatility in the Private Sector

In order to manage volatility in private sector companies, there are internal measures such as the diversification of revenue sources, which can be used mainly by producers, as well as external management tools available (Mußhoff et al., 2010: 327). External instruments range from strategic alliances to vertical integrations (Wessmann et al., 2008: 4), but also include bilateral agreements, such as pre- or supply contracts as well as purchasing strategies in the cash market (Mußhoff et al., 2010: 328-329). In addition to these instruments, either future cash flow (cash flow hedge) from the commodities business or the monetary value can be set in a contract, and the condition of available raw materials (fair value hedge) can be secured through the use of derivatives. In this case, the cash flow hedge is currently more important than the fair value hedge. Companies should select company-specific risk-hedging instruments only after a comprehensive risk assessment. Thus, the entire strategy is manifested in a management mechanism and adapted to changing circumstances (KPMG, 2007: 26-27).

4.1.1 Strategies in the Cash Market and Bilateral Contracts

The fundamental difference between cash and futures markets lies in the difference in time between the conclusion and the fulfilment of the contract. Terms in a contract on the cash market are to be met immediately after conclusion of a contract where an agreement for future business is included (Walter, 2009: 58). Agents in the cash market can manage volatility through buying or selling strategies. The precondition for the use of such strategies is a careful analysis of the specific volatility (Wilson, 1984: 29-32).

Below, two sales strategies based on cereals marketing are presented: Through storing a cereal and subsequently selling it, one can earn a higher price than the harvest price through speculation. However, there is also a risk of speculation losses due to investments in storage facilities and the health maintenance of the stock, as well as negative price developments. A sales variant with a lower speculative factor represents continuous marketing in partial quantities throughout the entire marketing year. In this case, the farmer can fall back on a cooperative marketing pool, which gathers the total harvest and merchandises it over a defined period of time (Utz, 2008: 8-10).

Likewise, through the use of purchasing strategies, buyers also have the opportunity to profit from price volatility, especially when the agricultural commodities market is characterised by short-term contract options and daily prices. Based on an earlier assessment of volatility, one can determine a purchasing price barrier after taking the current available inventory into consideration, which normally corresponds to the average price; the higher the inventory, the lower this barrier is, and vice versa. Ideally, when using this model at lower prices under the purchasing price barrier, purchasing is carried out and inventory expanded. In other words, this stock causes so-called speculative storage, which can later be tapped in periods of higher prices (Reiner et al. 2005:118-122).

Another means of protecting against volatile prices is bilateral agreements, also known as pre- or supply contracts. Here, the two parties agree on conditions some time before the execution of the business agreement. Such agreements may be binding for both parties and may include an unconditional futures transaction, or unilateral executive rights, also known as a conditional futures transaction or conditional futures options. The agreed terms of such a contract are binding, and a violation of the commitments regarding purchasing or distribution results in mandatory compensation of the business partner. In a conditional futures transaction, an asymmetric distribution of risks results in the business partner who issues the options receiving appropriate compensation (Mußhoff et al., 2010: 327-328).

4.1.2 Management of Volatility with the Help of Derivatives

In the literature, there are many definitions of the term *derivative*. Typically, *derivative* denotes an agreement to be fulfilled in the future, to be met without significant initial costs between at least two parties, at the value agreed upon at the time the contract is signed (Barckow et al., 2002: 2). Four basic types can be identified: futures, forwards, options and

OTC-options. Furthermore, it is possible to fundamentally separate these basic types into conditional and unconditional derivatives. Conditional futures transactions, or options, give one party the right to exercise the option at any time. However, there is no obligation to do so. In contrast, unconditional futures transactions, i.e., futures or forwards, imply a two-sided obligation to carry out the transaction at the scheduled time (Rieger, 2009: 20).

A third classification can be conducted on the basis of the marketplace: futures traded in a stock exchange and outside it—so-called over-the-counter (OTC) trades. Futures in the stock market are standardised products and, through an intermediary clearing house, offer higher transaction security (Rieger, 2009: 20). When managing price volatility in raw material markets, 73% of the products are OTC, a majority of which are forwards. OTC solutions offer companies many benefits, such as liquidity and more exact product specifications, thus eliminating basic risks (KPMG, 2007: 21).

However, forwards and OTC options are individual agreements between two parties which create substantial risk for the other contracting party. In addition, trade is more difficult due to the lack of standardisation, which enables higher flexibility in the contracts, thus reducing market liquidity (Geyer et al., 2007: 146-147). When futures and options are traded in an exchange market, the stock exchange acts as a mediator between the parties. The price is determined in the stock market through supply and demand, and transactions are confirmed there. Nevertheless, the parties have no direct business relationships with each other, but conduct each transaction with the so-called clearing house. The clearing house advocates for the risk of default, i.e., when a party cannot close its position or cannot fulfil its obligations. This is accomplished through the collection of collateral (margins) from the contracting parties. Value adjustments are known as variation margins, and shield the parties from contraction risk since losses are covered by the clearing house (Geyer et al., 2007: 148).

The intervention of the clearing house for risk mitigation and standardised products are not only particularly interesting for producers who need protection against volatile prices, but also for speculators. Speculation can significantly increase market efficiency because speculators increase the number of purchases and sales and, thus, trading liquidity. Hence, the chances of finding a business partner increase. In addition, speculators increase the permanent valuation of the market, along with market efficiency (Rieger, 2009: 19). However, on the OTC market, due to the lack of margins, the liquidity of the company improves thorugh accepting the contraction risk. Moreover, this improved, higher liquidity due to non-standardised product specifications leads to reduced overall market liquidity (Peihwang et al., 1997: 166-178).

A futures transaction must involve either a resource per se or a price index for commodities. A futures transaction involving an agricultural commodity may be completed either on the market (as a futures on the commodity futures exchange) or off the market (as a forward). However, the special conditions for transport and storage capacities limit the pool of potential market players, which leads to an almost exclusively agricultural sector (Geyer et al., 2007: 188-190). The OTC market has a similar structure but provides, as already mentioned, a higher flexibility in the contract design (Peihwang et al., 1997: 166-178).

When trading futures or forward contracts on indices which reflect the price of the commodity, there is a great difference in that, in this specific index, the value of the good traded on the cash market does not exist. Consequently, no physical goods are delivered; only cash payments (cash settlements), i.e., the difference between the current value of the good and the rate agreed on the date of maturity, take place. By securing a price for a specific commodity index, future cash flows for the purchase or sale of commodities can also be protected since the actual purchase on the cash market—although subject to price volatility—neutralises the cash flow fluctuations through gains or losses from the maturing futures at that time (Geyer et al., 2007: 149-153).

The buyer of an option acquires the right to an agreed amount of a particular commodity at an agreed purchase or sale price. The buyer of the option deals with the so-called option writer, who is required to carry out the transaction upon payment of an options premium. The due date of the option differs, depending on the type of option; American options can be exercised at any time, European options only on the due date, and Bermuda options on many pre-determined dates.

Simpler options are called warrants, which are not traded on the stock exchange but issued by companies. In principle, they are identical to options. The market for warrants is used almost only by private buyers. Warrants give the buyers maximum flexibility; however, due to the obligatory options premium, they also incur the highest costs, which also substantially increases premiums at all levels and leads to particularly high price volatility (Walter, 2009: 59-60).

4.1.3 Management of Volatility with the Help of Company Cooperation or Vertical Integration

Vertical integration or cooperation can be withstood through the use of vertical integration steps, where the market-pricing of the products lies between two stages of the value chain (Jansen, 2008: 196). The main purpose of such vertical cooperation or integration rests in the hedging of supply or sales to almost arbitrary stages, but with predictable, determinable exchange prices for goods (Teusler, 2008: 17). This total value chain optimisation is accepted and followed by the companies involved in order to increase their own profits (Koch, 2006: 13), or to improve their strategic position (Teusler, 2008: 1).

Partnerships are voluntary alliances of independent companies on a contracual basis for the joint management of tasks. They are used to achieve a common goal which could not be better achieved individually (Jansen, 2008: 177). Cooperation has various characteristics, such as cooperation-direction, number of partners, geographical distance, and duration. Cooperation can be vertical (between different levels in the value chain) or horizontal (collaboration within one level of the value chain). With regard to the number of cooperating partners, there can be bilateral (two partners), trilateral (three partners) or other forms of networks (more than three partners). The complexity of the necessary agreements increases with each additional partner since a variety of coordination and information measures need to be created and maintained.

Geographical distances can be categorised as local (distance between the companies is less than 50 km), regional (50-100 km), national or international. With regard to duration, a distinction between temporary and permanent agreements can be made; the latter can be grouped into short, medium and long-term cooperation. Another important factor is the frequency of contact, which entails one-time, sporadic, periodic or permanent contacts (Teusler, 2008: 17-21).

Cooperation can be divided into different phases. The first is the initiation phase, in which a company looks for a partner. This is followed by the formation phase, in which the necessary inter-company agreements are made and the cooperation activities begin. The implementation of the cooperation is called the management phase. During this phase, the agreed coordination, investments and measures for stabilisation are carried out. Although the basic agreements have been fulfilled, adjustments may be made at any time in order to realise the desired potential. The last phase of a cooperation is the termination phase. The date of termination can be agreed upon during the formation phase or result from subsequent developments in the partnership. No matter what the reason for termination, a fixed termination process should be set, and the cooperation dissolved in accordance with contractually agreed measures in order to avoid an uncontrolled dissolution of the cooperative (Teusler, 2008: 23-28).

A classic vertical integration is the acquisition of an upstream or downstream value chain by a company (Grossman et al., 1986: 692-693). An upstream or downstream value chain step is equivalent to an acquisition. In relation to the management of volatility, this strategy is pursued for the same goals as cooperation. However, in a classical vertical integration, a higher predictability can be achieved, because the behaviour and the demands of a cooperative partner no longer need to be considered (Koch, 2006: 14-17).

4.2 Governmental Management of Volatility

The CAP's ability to manage the heightened volatility of the governmental level are limited by multiple agreements with the WTO (World Trade Organisation). For instance, the contractual "Agreements on Agriculture" (AoA) allow no further direct influence on the market when it is production-related. The CAP is therefore forced to use other instruments to stabilise agricultural markets and thus ensure an income for farmers in the future. The European Agricultural Commission is currently working on new instruments to be utilised in the coming years (European Commission, 2008). Several suggestions have been made for stabilisation of the markets and management of increased volatility, especially in light of the Common Agricultural Policy (CAP) after 2013. A main starting point for the CAP is the improvement of market efficiency. This includes the development of market information systems in the context of public and private cooperative efforts to share important information as well as the development and stabilisation of private storage keeping. In addition, the commodity markets as well as the futures markets must receive financial support and development from the EU. Likewise, regional commerce needs to be undergirded with a safety net to keep the wheat price from falling too low. The intervention of 3 mill tons of wheat will be a continuing public policy

(BLE, 2010). Finally, the CAP could gain importance by introducing and giving subsidies to insurances from the second pillar. These insurances have less to do with insuring a certain income level for the farmers, but more with cases of crop failure and the effects of severe weather. Existing insurance systems, such as for hail damage, should be expanded to include coverage for other types of abnormal weather. Insurance for crop failure which is not contingent on particular weather conditions and which is substantially supported by the possibility of modulation should also be instituted (Rudloff, 2009). National aid in case of emergency and catastrophe are also being discussed as a way to secure the income of farmers. This includes, for instance, national tax breaks for the year in question, help for liquidity and low bridging loans.

The support of research and technology should be included in the CAP's catalogue of measures for future stabilisation and volatility reduction of the grain markets (Artavia et al., 2009: 81).

It is easy to see that the CAP needs to actively counter both the instability and the increasing risk to income on the agricultural market. Future agricultural markets must first increase and develop their efficiency and transparency, and, second, a definite income must be ensured for European producers, not, as in the past, by supporting and protecting production, but by developing instruments and opportunities for absorbing and dealing with rising volatility in future.

Furthermore, nongovernmental organisations (NGOs) and scientific institutes have designed models to limit the volatility of grain markets. A particularly interesting model for the global storage keeping of grain was developed by IFPRI in cooperation with the World Bank. In reaction to the food crisis, IFPRI wanted to show how the global grain price could be held within a certain price range. This model would hinder the development of peaks and dips in prices, which would then bring back trust and stability in the grain market and thus prevent the development of further starvation. It is based on three pillars that are established and managed parallel to, but independent of one another. These include an independent emergency reserve, a globally organised and managed reserve, and a virtual reserve.

The independent emergency reserve should comprise about 5% of the current food aid in grain, which is set aside by larger grain producers in decentralised locations. It would be financed by a certain number of countries that are unified in a new organisation or club. The stockpiled supplies would only be used for the prevention of starvation and would be managed and supervised by the United Nations' World Food Programme (Braun et al., 2009[b]: 2).

The reserves would be globally organised and stockpiled by each member state. It would exist independently of the supplies set aside by farmers, traders and processing companies. These reserves would be centrally coordinated by a "high-level technical commission" and would only be used when it was necessary to intervene in the cash market (Braun et al., 2009[b]: 2).

The virtual reserve is not a grain reserve in a physical sense, but rather an agreement among the members to reserve a set amount of currency in order to intervene in the grain futures market. The agreed-upon amount would not be constantly available in a fund, but would take

the form of capital that members had committed to make available when necessary. As with the national reserves, this virtual capital would be under the direction of the "high-level technical commission". When a pre-determined price is exceeded, a certain number of short sales will be transacted at the current price during a certain time period on the futures market so that the prices on the spot and futures market will return to a level within the pre-determined price range. This model is based on the deliberation that the sole knowledge of the existence of such an instrument for market regulation should hold the markets within the desired price corridor and keep speculators out of the grain market (Braun et al., 2009[a]: 2).

Another new model for the storage and price stabilisation of grain was developed with regard to the dynamics of the oil markets, where the constellations of the supply and demand issues show definite parallels. This model was designed and calculated by Rudloff and Wieck in cooperation with the German Institute for International Politics and Safety. Similar to the role of OPEC in the oil market, the grain market would found a cartel of suppliers in which all larger grain producing and exporting states are represented (Rudloff et al., 2009: 1).

As seen in the oil market dynamics, the buyer would have reserve assets. This aspect of the model can only be transferred to a limited extent because the countries which are most likely to need these reserves are unable to invest their own capital. This lack of capital has to be made available within the scope of foreign aid (Rudloff et al., 2009: 4).

As discussed above, the coordination of the suppliers in a cartel must encompass all major producers. However, such a cooperation is difficult to realise because the grain producing and trading states are, of course, more interested in obtaining a high rather than a low price. For this reason, such a plan could be achieved only by arguing that a fundamental level of staple food must be globally assured. In order to meet this guarantee, not only must all of the influential partners mentioned participate in the process, but stockpiling must also take place in order for a constant volume of grain to be available at short notice throughout the annual grain production cycle (Newbery et al., 1985: 197).

The supplier cartel seems especially promising because a high concentration of suppliers dominates and thus the desired pricing effect can be achieved with a relatively small volume (Rudloff et al., 2009: 3).

5. SUMMARY

After the inception of the MacSharry Reform in 1992, the volatility of the European grain market amplified, and it can be expected to continue to increase, affecting the long-term values of the global grain market. Besides other important determinants of volatility, it is clear that the CAP has played an important role in influencing the volatility of European grain prices in the past. Direct political influence on the volatility of grain prices will decrease in future because the European grain market can no longer be viewed as an isolated "island" in the global agricultural market, but must be recognised as a component in it.

This price volatility poses a great challenge for risk management on the part of European grain producers, and, therefore, developing a form of security for times of increased volatility is

imperative. However, the complexity of the insurance instruments for private entities frequently make it difficult for family-run farms to use them effectively. Thus, such private hedging instruments are better suited to producers in the rest of the supply chain. To a large extent, the once well-functioning intervention price mechanism can no longer be applied due to international agreements. In order for European governments to be able to continue to secure the future income of agricultural businesses, a safety net to prevent prices from falling lower than a certain level and specific insurance options in case of crop failure and bad weather must be established.

Two conclusions can be derived from the above observations. Firstly, private and governmental instruments must be implemented which hamper price volatility along the entire supply chain, keeping it within an acceptable range. Secondly, it is increasingly obvious that all parties involved need to have tools in place for securing income in times of rising volatility which will, at the same time, indirectly hedge against volatility.

REFERENCES

Artavia, M., Deppermann, A., Filler, G., Grethe, H., Häger, A., Kirschke, D. and Odening, M. (2009) Ertrags- und Preisinstabilitäten auf Agrarmärkte in Deutschland und der EU: Betriebswirtschaftliche und agrarpolitische Implikation. *Schriftenreihe der Rentenbank* Band 26: 53-88.

Barckow, A. and Beike, R. (2002). *Risk-Management mit Finanzderivaten: Steuerung von Zins- und Währungsrisiken*. Munich: Oldenbourg.

Braun, J. von, Lin, J. and Torero, M. (2009(a)). Eliminating Drastic Food Price Spikes: A Three Pronged Approach for Reserves. IFPRI note for discussion, International Food Policy Research Institute (IFPRI). Washington DC: IFPRI.

Braun, J. von and Torero, M. (2009(b)). Implementing Physical and Virtual Food Reserves to Protect the Poor and Prevent Market Failure. IFPRI policy Brief 10, International Food Policy Research Institute (IFPRI). Washington DC: IFPRI.

Davier, Z. von, Heyder, M. and Theuvsen, L. (2010). Media Analysis on Volatile Markets' Dynamics and Adaptive Behavior for the Agri-Food System. *International Journal on Food System Dynamics* 1 (3): 212-223.

Djuric, I., Glauben, t., Götz, L., Perekhozhuk, O. (2010). Nahrungsmittelkrise & Transformation: Staatliches Krisenmanagement und Marktreaktionen östlicher „Getreidenationen".In Loy, j.-P. and Müller, A.E., *Agrar- und Ernährungsmärkte nach dem Boom*, Schriften der Gesellschaft für Wirtschafts- und Sozialwissenschaften des Landbaues e.V., Band 45

Europäische Kommission (2008). *CAP Health Check: Impact Assessment Note No. 8*, Annex D; Subject: Risk and Crisis management, Brüssel.

Geyer, C. and Uttner, V. (2007). *Praxishandbuch Börsentermingeschäfte*. Wiesbaden: Gabler.

Grossman, S. J. and Hart, O. D. (1986). The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration. *The Journal of Political Economy* 94: 691-719.

Henrichsmeyer, W. and Witzke, H. P. (1994). *Agrarpolitik Band 2, Bewertung und Willensbildung*. Stuttgart Hohenheim: UTB.

Infodienst der Landwirtschaftsverwaltung Baden-Württemberg (2009). www.landwirtschaft-bw.info/servlet/PB/show/1201672/Wirtschaftsjahr%202002_03.pdf

Infodienst der Landwirtschaftsverwaltung Baden-Württemberg (2009). www.landwirtschaft-bw.info/servlet/PB/show/1201682/Wirtschaftsjahr%201995_96.pdf

Jansen, S. (2008). *Mergers & Acquisitions Unternehmensakquisitionen und -kooperationen. Eine strategische, organisatorische und kapitalmarkttheoretische Einführung*. Wiesbaden: Gabler.

Kern, M. (2008). *Kapitalmarktorientierter Kreditrisikotransfe*r. Wiesbaden: Gabler.

Koch, W. (2006). *Zur Wertschöpfungstiefe von Unternehmen: Die strategische Logik der Integration*. Wiesbaden: Deutscher Universitätsverlag.

König, R. (2008). *Management betrieblicher Risiken bei produzierenden Unternehmen*. Dissertation Uni Köln.

KPMG. (2007). *Energie- und Rohstoffpreise: Risiken und deren Absicherung*. Zürich: KPMG.

Kromschröder, B. and Lück, W. (1998). Grundsätze risikoorientierter Unternehmensüberwachung. *Der Betrieb* 32: 1573-1576.

Mußhoff, O. and Hirschauer, N. (2010). *Modernes Agrarmanagement*. Munich: Vahlen.

Newbery, D. M.G. and Stiglitz, J. (1985). *The Theory of Commodity Price Stabilisation, A Study in the Economics of Risk.* Oxford: Oxford University Press.

Ossadnik, W. and Lange, O. (2008). Risikomanagement international agierender Unternehmen. In Funk W. and Rossmanith J., *Internationale Rechnungslegung und Internationales Controlling*. Wiesbaden: Gabler, 319-342.

Peihwang, W., Poon, P. and Zee, S. (1997). The Effect of Option Listing on Bid-Ask Spreads, Price Volatility, and Trading Activity of the Underlying OTC Stocks. *Review of Quantitative Finance and Accounting* 2: 165-180.

Reiner, G. and Jammernegg, W. (2005). Bewertung unterschiedlicher Beschaffungsstrategien für Risk-Hedging Supply Chains unter Berücksichtigung intermodaler Transportprozesse. In Günther, H., Mattfeld, D. and Suhl, L., *Supply Chain Management und Logistik*. Heidelberg: Physika, 115-134.

Reinschmidt, T. (2006). *Dynamische Steuerung von Portfoliorisiken*. Wiesbaden: Deutscher Universitätsverlag.

Rieger, M. (2009). *Optionen, Derivate und strukturierte Produkte: Ein Praxisbuch*. Stuttgart: Schäffer-Poeschel.

Rudloff, B. (2009). *Volatile Agrarpreise, Das Stabilisierungspotential aktueller EU-Reformen,* SWP-Studie, Berlin: SWP.

Rudloff, B. and Wieck, C.,(2009). *Getreide als strategischer Rohstoff, Herausforderungen für den G8-Gipfel*. SWP-Aktuell 17, Berlin: SWP.

Stelzer, A. (22. 2 2007). *Das Preisrisiko eliminieren*. Produktion 8: 5.

Teusler, N. (2008). *Strategische Stabilitätsfaktoren in Unternehmenskooperationen*. Wiesbaden: Gabler.

Urff, W. von (1997). *Zur Weiterentwicklung der EU Agrarpolitik, Synopse und Bewertung von Reformvorschlägen*. Konrad-Adenauer-Stiftung, Interne Studie Nr.150/1997, Sankt Augustin: Konrad-Adenauer-Stiftung.

Utz, F. (2008). *Stellung des Getreideerfassungshandels in der Wertschöpfungskette für landwirtschaftliches Getreide*. Landinfo 3: 7-10.

Viechtl, E. (2008). http://www.lfl.bayern.de/ipz/pflanzenbauforschung/32936/vortr_07_viechtl.pdf

Walter, L. (2009). *Derivatisierung, Computerisierung und Wettbewerb: Die Entwicklung der Deutschen Terminbörse DTB/Eurex zwischen 1990 und 2001 im Kontext der europäischen Terminbörsen*. Wiesbaden: Gabler.

Wessmann, P., Kara, G. and Liebig, D. (2008). *Steuerung von Einkaufsrisiken in volatilen Agrarmärkten*. Düsseldorf: A.T. Kearney GmbH.

Wiedemann, A. (1998). *Die Passivseite als Erfolgsquelle: Zinsmanagement in Unternehmen: Erfolgsmessung und Risikosteuerung.* Wiesbaden: Gabler.

Wilson, W. W. (1984). Hedonic Prices in the Malting Barley Market. *Western Journal of Agricultural Economics* 2: 29-40.

Wolke, T. (2008). *Risikomanagement*. Munich: Oldenbourg.

Wright, B. (2009). International Grain Reserves and Other Instruments to Address Volatility in Grain Markets. *Policy Research Working Paper* 5028, The World Bank. Washington DC:

www.raiffeisen.com/news/artikel/30213269