COMMODITY PRICE VOLATILITY DURING AND AFTER THE ECONOMIC CRISIS – IMPLICATIONS FOR ROMANIA*

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Abstract

Under the impact of a wide range of forces, the prices of globally traded commodities often experience sudden and significant fluctuations, putting under uncertainty and risk the economic status of producers, consumers and traders from the private to the national level. Although commodity markets are notorious for their price volatility, the events the world economy experienced in recent years, particularly the global economic crisis, offered new connotations to this phenomenon. These price movements reverberated across internal markets all over the world, affecting their statuses. As Central Eastern European countries, due to the processes they have undergone in recent decades, manifest an increased responsiveness to external shocks, Romania experienced the international turmoil in a severe manner. This paper calculates and presents, by comparison, the food price volatility experienced at the international level and on the Romanian market during the years of the crisis and immediately after its appeasement.

Keywords: *commodity price volatility, economic crisis, Romanian market, GARCH.*

JEL classification: E30, E37, Q02

1. INTRODUCTION

The prices of globally traded commodities often experience sudden and significant fluctuations as a consequence of a wide range of forces and factors. Undoubtedly, the determinants of price volatility differ from one commodity to another, but in general, sudden price movements are the consequence of low elasticities of demand and supply in the short term (UNCTAD 2008, p. 39). Moreover, price changes tend to have sources that go beyond market fundamentals, adding to supply and demand shocks a large variety of factors, such as: the impacts of changing weather patterns, cycles in key markets, currency fluctuations, agreements or conflicts, trade policies, investments, and so on, an almost inexhaustible list if all of the linkages were to be considered.

The volatility of prices has increased over time, particularly since the 1970s; there were as many major price fluctuations between 1972 and 1999 as there were between 1899 and 1971 (Cashin and McDermott 2002, p. 15). However,

even though commodity markets were already notorious for their price volatility, the events that the world economy experienced during the 2000s deepened and offered new connotations to this phenomenon. In the first decade of this millennium, commodity markets experienced profound turbulence and high volatility, with prices reaching

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historical peaks only to crash dramatically some months later and soon restart their rise. Following a steady increase since 2002, induced by the relatively strong performance of the world economy, fast growth and structural changes in several emerging countries, and growing attention to the challenges of global warming and shrinking oil reserves (UNCTAD 2008, p. 19), the international markets for primary commodities reached their peaks in 2008. During this boom, volatility was amplified by the increasing linkages between commodity markets and financial ones. Price volatility, however, has been particularly severe since the emergence of the economic crisis at the global level. In September 2008, the global outlook had already dramatically deteriorated. Accordingly, the boom experienced in the previous years came to an end, followed by a sudden and intensive collapse, which very soon gave way to other consequent rises and falls in prices. Although the reasons for this instability were numerous, the global economic crisis, through a series of mechanisms, has been identified as having made a major impact on commodity price volatility during 2007-2011, as it brought both factors determining sudden pushes downward for prices (through financial restraints) and others determining sudden impulses upwards (through stimulus packages) (Pop 2011).

The price developments on international markets reverberated across internal markets all over the world, affecting their statuses. Because of the particular processes they had undergone in recent decades, Central and Eastern European (CEE) countries manifested an increased responsiveness to external shocks, while Romania experienced the international commodity markets turmoil in a particularly severe manner (Rovinaru, Rovinaru and Pop 2012). In order to illustrate this aspect, this paper presents by comparison the volatility experienced at the international level and on the Romanian market, concentrating the analysis exactly on the years of the crisis and offering a glimpse at the state registered immediately after its appeasement.

The remainder of the paper is structured as follows. The second section highlights the new perspectives offered by the global crisis regarding commodity price volatility, presenting a literature review supported by some empirical evidence meant to emphasize the mechanisms through which the crisis affected prices and intensified the commodity market's turmoil. The third section illustrates and compares the volatility experienced at the international level and the situation registered on the Romanian market, applying GARCH econometrical models to express the conditional variance on the two markets. Accordingly, this section offers a methodology description focused on the GARCH models and then an empirical illustration in which the econometric models are applied for analyzing the price series of food both on the Romanian market and on the international one. Further, in keeping with the results achieved, a comparison is offered between the conditional volatility on the Romanian and international markets as estimated from the models. Several conclusions finalize the paper in the fourth section.

2. NEW PERSPECTIVES OFFERED BY THE GLOBAL CRISIS REGARDING COMMODITY PRICE VOLATILITY

2.1. Literature Review and Empirical Evidences

Since the beginning of the 2000s, commodity markets at the global level have experienced profound turbulence and significant volatility. Starting from 2002, the international prices of all major commodity groups rose gradually in a boom that reached its peak at the middle of 2008, as the financial crisis that had just started to spread caused sharp commodity price declines (Rovinaru, Rovinaru and Pop

Figure 1. Commodity Price Indices (US Dollar Terms) Monthly Data: January 2000 – January 2012 (2005=100)
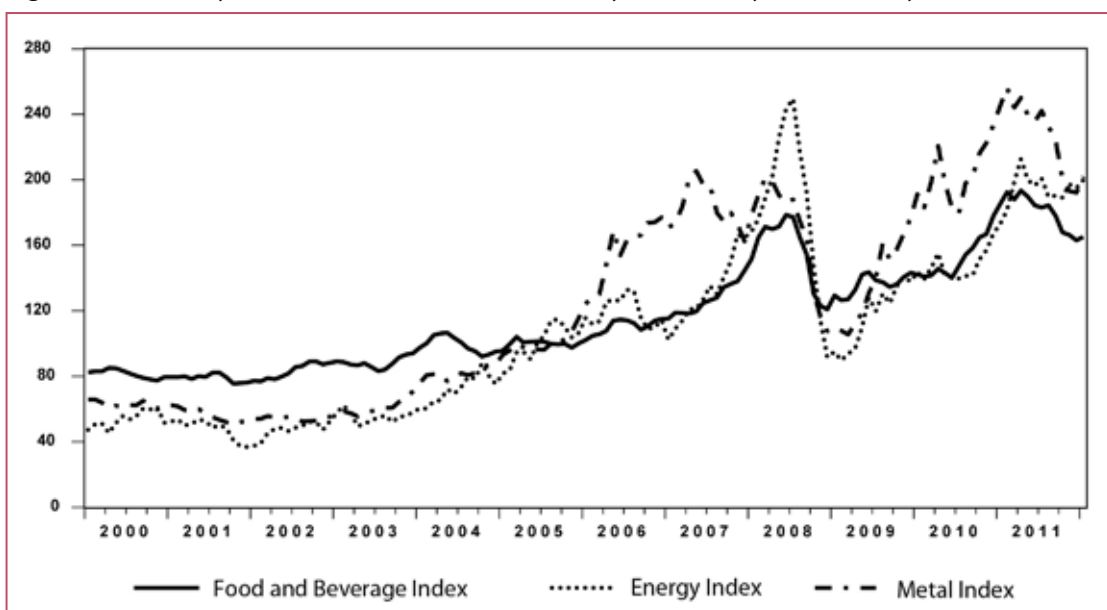
Source: Authors' illustration in Eviews 7.1 based on data released by IMF 2012.

2012). The graphs in Figure 1 illustrate these developments, as they present the trend of prices for some major commodity groups, emphasizing all the stages of the turmoil, including the blooming period experienced during the price boom, the collapse at the emergence of the crisis, and also the turning point and the restarting of the increase despite the ongoing global recession.

As calculations made using data released by the IMF (2012) show, fuel prices experienced drops of about 70%, metals prices by 50%, and even food and beverage prices, which are generally known to oscillate less under global cyclical conditions, also fell by about 30% (Rovinaru, Rovinaru and Pop, 2012). Even though the world economy was still in the realm of the crisis, the prices ceased falling by the beginning of 2009 and restarted their rise, continuing their rebound during 2010 as the global economy started to overcome the crisis. Increased demand from China, significant production cuts for metals and oil, and some weather-related factors in agricultural markets also contributed to higher prices. In spite of the recovery, even in 2011 prices continued to oscillate drastically, as the world economies continued to struggle with other turbulences, such as the sovereign debt crises.

As emphasized by the graphs in Figure 1, since the moment the economic crisis started to spread worldwide, the fluctuations on the commodity markets became more acute. An investigation of the recent literature regarding the commodity price shock of 2002-onward and the global economic crisis that troubled the world since 2008 led to the conclusion that there is a relationship of cross-determination between the two, each being regarded as both cause and effect for the other. Consequently, the subject "*commodity price shock – global economic crisis*" can be approached in both directions: the commodity price turmoil as a cause and aggravating factor of the crisis, and the global crisis, through its mechanisms, as a major determinant for the commodity price instability of recent years (Pop 2011). Regarding the first direction of approach, Gnan (2009), for example, offers support through explanations based on terms of trade deterioration in commodity-importing countries (which affected production and diminished private purchasing power and demand) and tightened monetary policies designed to avoid inflationary spreading, which contributed to the bursting of various asset price bubbles that had been accumulating since the beginning of 2000s, a fact that determined the global recession. Further, the price collapse of the second half of 2008 deteriorated the exporting countries' terms of trade, adding another adverse shock to the already decreased demand caused by the world recession, while, in the context of the negative global background, the gain in terms of trade for the importing countries did not provide much stimulus for investment and consumption, primarily contributing to an increase in private savings. As a result, high commodity price volatility may not only have caused the global crisis but may also have intensified its subsequent development (Gnan 2009, p. 22-23).

At the same time, the global crisis represented a major determinant for commodity price volatility in recent years. The mechanisms through which the crisis induced price instability are as follows:

– *shortages in credit availability and trade financing* that influenced market fundamentals;
– the deterioration of the global economic outlook and the lack of quick recovery perspectives that determined the *decrease of consumption and investments* and the increase of household savings rates, which further influenced the demand;
– the *invested capital on exchange markets*, which directly influenced volatility;
– the *depreciation of US currency*, in which most of the commodity prices are denominated;
– the *stimulus packages* introduced by some OECD countries and by some emerging economies, as a response to the crisis, which created supplementary pressure on the market fundamental.

The first three mechanisms listed above (*shortages in credit availability and trade financing, consumption* and *investment decreases*) can be regarded as typical reactions to an economic and financial recession. However, we consider the other two mechanisms (*U.S. dollar depreciation* and *stimulus packages*) to be those that offered new perspectives of analysis for price instability in the context of the crisis. Several theoretical and empirical analyses support this conclusion. For example, Lipsky (2008, p. 7) has shown that the depreciation of the U.S. dollar contributed approximately 20% to the increase of food prices. Moreover, if the U.S. dollar had maintained in recent years its level in 2002, oil prices would have been lower by 25 dollars per barrel and the price increase in other categories of goods would have been lower by 12%. Also, Pop (2011, p. 106-108) brings arguments to the fact that the 4000 billion Yuan (the equivalent of 586 billion USD) economic stimulus plan launched by China in November 2008 has been the major determinant for the end of the commodity price collapse and its consequent increase, despite the fact that the world was still in the midst of the global recession.

3. PRICE VOLATILITY DURING AND AFTER THE CRISIS: THE INTERNATIONAL AND ROMANIAN MARKETS

The significant turbulence of the international markets reverberated across internal markets all over the world, affecting their statuses. The CEE countries, due to the processes they had undergone in recent decades – post-communist transformations, market externalizations, globalization and European Union integration – manifest an increased responsiveness to external shocks. With the outburst of the global crisis, the vulnerability of these markets came once again to the front, as almost all of these states had accumulated major economic imbalances and had been experiencing sharp depressions (Rovinaru, Rovinaru and Pop 2012). Consequently, Romania experienced the global crisis and international market turmoil in a severe manner. In order to illustrate how the price instability on the world market reverberated across that of Romanian, we chose to model

the volatility of food prices on the two markets from January 2006 onwards in order to emphasize the moment of the crisis and its consequent effects.

3.1. Methodology

When estimating price volatility, a wide range of methods can be encountered in the economic literature, and which vary from rather simple ones, such as unconditional standard deviation or the coefficient of variation, to more complex ones, such as the ARCH model and its extensions. A series of limitations may be identified in the abovementioned simple approaches, causing an exaggeration of uncertainty and related price risk while computing volatility. These aspects are due to the fact that the unconditional standard deviation and the coefficient of variation do not distinguish between the predictable and unpredictable components of price series, intrinsically assuming that market participants behave in a naive way, not having the ability to detect regular features of the price process. Certain approaches are not founded on realistic considerations, as it is unrealistic to suppose that market participants do not have the experience of predicting seasonal behaviors, long-term tendencies or cyclical components in the prices of the commodities they deal with (Figiel and Hamulczuk 2010).

A common approach is represented by the Generalized Autoregressive Conditional Heteroscedasticity (GARCH) model (Bollerslev 1986), which has the merit of accounting for both the predictable and unpredictable components in the price process, while considering time varying conditional variances, and consequently, only the stochastic or unpredictable components when modeling volatility (Jordaan et al. 2007). According to Engle (2001), applications of the GARCH approaches are widespread in situations where the volatility of prices is a central issue, as relatively high volatility implies two problems: the autocorrelation of the residuals and heteroscedasticity. The latter refers to a situation in which the variances (σ_t^2) do not have a constant evolution in time, being conditioned, on the one hand, by its own lagged values (σ_{t-i}^2) and revealed by the GARCH-terms and, on the other hand by the lagged values of standardized errors with the aid of ARCH-term $\left(\dfrac{\varepsilon_{t-i}}{\sigma_{t-i}}\right)$ (Pop and Ban 2011, p. 515).

Studies using the ARCH model and its extensions are commonly encountered in modeling stock market prices. With regard to commodity prices, notable models include those of Aradhyula and Holt (1988) which applied the GARCH method to modeling meat production, and Jordaan et al. (2007), which measured conditional volatilities for the prices of various crops traded on the SAFEX using the ARCH or GARCH approach. More recently, Figiel and Hamulczuk (2010) tested for conditional volatility by analyzing monthly wheat procurement prices in Poland. Regarding the Romanian market, this kind of approach in commodity price modeling has been applied by Pop and Ban (2011), who used EGARCH for modeling the price of wheat in order to estimate volatility and price risk, both on the Romanian and international markets. As part of a larger investigation

of price volatility on the Romanian market, an investigation which also includes the present paper, Rovinaru, Rovinaru and Pop (2012) estimated and compared the price volatility on the Romanian and international combustible markets, while Pop, Rovinaru and Rovinaru (2013) analyzed price volatility at a deeper level, investigating the cereal and sugar markets.

The general form of a GARCH (p,q) model includes two equations, one for the conditional mean and another for the conditional variance. The coefficients of ARCH-terms (α_i) reveal the volatility of previous periods of time and this volatility is measured with the aid of squared residuals from the equation of mean. The coefficients of GARCH-terms (β_j) show the persistence of past shocks on volatility. In our empirical analysis, we started from the basic GARCH (p,q) model, but during our research concluded that, for the analyzed price series, the asymmetrical GARCH models perform better compared to the symmetrical ones. This conclusion is also consistent with the findings of Pop and Ban (2011) and of Rovinaru, Rovinaru and Pop (2012). The symmetrical models assume that both the positive and negative innovations have a similar impact on volatility, while in reality it was demonstrated that for certain financial series, their volatility is significantly higher after negative shocks $(\varepsilon_t>0)$ compared to its level after positive ones $(\varepsilon_t<0)$. This effect is included in the extended model called EGARCH with the aid of an asymmetric coefficient, γ_i (Rovinaru, Rovinaru and Pop 2012). Similar to the methodology applied by Rovinaru, Rovinaru and Pop (2012) for studying combustible price volatility, in our paper we used the AR(k)-EGARCH(p,q) model, elaborated by Nelson (1991) with the following structure:

$$X_t = \pi_0 + \sum_{i=1}^{k} \pi_i \cdot X_{t-i} + \varepsilon_t \tag{1}$$

$$\log\!\left(\sigma_t^2\right) = \omega + \sum_{i=1}^{p} \alpha_i \cdot \left| \frac{\varepsilon_{t-i}}{\sigma_{t-i}} - E\!\left(\frac{\varepsilon_{t-i}}{\sigma_{t-i}}\right) \right| + \sum_{l=1}^{r} \gamma_l \cdot \frac{\varepsilon_{t-i}}{\sigma_{t-i}} + \sum_{j=1}^{q} \beta_j \cdot \log\!\left(\sigma_{t-j}^2\right) \tag{2}$$

where the residuals from (1), ε_t, follow a GED or a normal distribution and the $\log\!\left(\sigma_t^2\right)$ is the logarithm of conditional variances.

3.2. Empirical Results

The empirical investigation of the present paper is concentrated on the analysis of the price indices evolution for the Romanian food market, offered by the Romanian National Institute of Statistics (RNIS) and corresponding ones at the international level from the International Monetary Fund (IMF) Primary Commodity Prices database. We used monthly data between January 2006 and November 2011 in order to emphasize and analyze exactly the moment of the global crisis and its consequent effects immediately after its appeasement. We performed the analysis using *Eviews 7.1*.

Initially, a series of steps required by the statistical analysis of the time series were implemented. We eliminated the seasonal component of the two series using the multiplicative moving average method. From that point forward, we

operated with the logarithmic price ratios of the two series ($\ln(P_t/P_{t-1})$), due to their better statistical properties (Sironi and Marsella 1997, p. 159). The descriptive analysis of the food price return series, both on the Romanian and international markets, revealed that its volatility is not constant in time, indicating the presence of heteroscedasticity, making our data appropriate for GARCH modeling. In order to detect the serial autocorrelation, we analyzed the autocorrelation (ACF) and partial autocorrelation function (PACF) estimated for a number of lags varying from 12, 24 to 36, and the calculated Q-statistics indicated the presence of this phenomenon. Table 1 presents other descriptive statistics, showing mainly that the log returns of food prices do not follow a Gaussian distribution, since the skewness is different from zero and the kurtosis has a value larger than 3, as they should be for a Gaussian distribution. This aspect is also supported by the Jarque-Bera test.

Further, we tested the non-stationarity of the time series, as they need to be stationary in order not to obtain spurious regressions. In Table 2 we showed the results of the ADF test at the national and international levels.

Table 1. Descriptive Statistics of Food Price Indices – Romanian and International Market, January 2006 – November 2011.

Measure	LN_FOOD_RO_SA	LN_FOOD_INT_SA
Mean	-0.000584	0.007426
Median	-0.000475	0.010280
Maximum	0.024999	0.070874
Minimum	-0.045279	-0.145514
Std. Dev.	0.010959	0.037388
Skewness	-0.774862	-0.865464
Kurtosis	6.109919	5.460199
Jarque-Bera	35.21361	26.39203
Probability	0.000000	0.008292

Source: Authors' calculations in Eviews 7.1.

Table 2. Testing the Non-Stationarity of Food Price Indices – Romanian and International Markets, January 2006 – November 2011.
Null Hypothesis: the series has a unit root

	t-Statistic	Prob.*		t-Statistic	Prob.*
LN_FOOD_RO_SA	-0.963848	0.7662	DLN_FOOD_RO_SA	-11.66081	0.0000
LN_FOOD_INT_SA	-0.215600	0.9332	DLN_FOOD_INT_SA	-10.25621	0.0000

*MacKinnon (1996) one-sided p-values.
Source: Authors' calculations in Eviews 7.1.

For the logarithmic series, the calculated value of the *t*-Statistic shows the series was not stationary. Thus, we constructed the first order differences that proved to be stationary.

Afterward, we estimated the models for each of the two variables, the conditional mean and conditional variance. Equations (1) and (2) were estimated using the maximum likelihood. Based on the information criterion minimization (especially Schwarz) and on the residual test, we chose the appropriate number of lags. When comparing the in-sample forecast with the real values, we noticed that the combined models ARIMA-EGARCH with a GED distribution perform better and produce more accurate estimates.

For the Romanian market, we determined that the most appropriate model took the following form (the z-Statistics and the probabilities are given in parentheses):

$$d \ln food_{Ro,t} = 0.529 \cdot d \ln food_{Ro,t-1} - 0.212 \cdot d \ln food_{Ro,t-2} + 0.123 \cdot d \ln food_{Ro,t-12} + \varepsilon_t$$

$$[17.18] \qquad [-36.04] \qquad [3.50] \qquad (3)$$
$$(0.000) \qquad (0.000) \qquad (0.005)$$

$$\log\left(\sigma_t^2\right) = -17.36 + 0.69 \cdot \left|\frac{\varepsilon_{t-1}}{\sigma_{t-1}}\right| - 0.38 \frac{\varepsilon_{t-1}}{\sigma_{t-1}} - 0.82 \cdot \log\left(\sigma_{t-1}^2\right)$$

$$[-11.0] \quad [1.70] \qquad [-1.44] \qquad [-4.83] \qquad (4)$$
$$(0.000) \quad (0.008) \qquad (0.001) \qquad (0.000)$$

For the international market, the appropriate model is:

$$d \ln food_{Int.,t} = -0.42 \cdot d \ln food_{Int,t-1} + 0.23 \cdot d \ln food_{Int,t-2} - 0.55 \cdot d \ln food_{Int,t-3} + \varepsilon_t$$

$$[-23.47] \qquad [5.85] \qquad [-12.96] \qquad (5)$$
$$(0.000) \qquad (0.000) \qquad (0.000)$$

$$\log\left(\sigma_t^2\right) = -7.02 + 2.60 \cdot \left|\frac{\varepsilon_{t-1}}{\sigma_{t-1}}\right| + 0.01 \cdot \frac{\varepsilon_{t-1}}{\sigma_{t-1}} - 0.33 \cdot \log\left(\sigma_{t-1}^2\right)$$

$$[-5.86] \quad [5.16] \qquad [0.11] \qquad [-1.51]$$
$$(0.000) \quad (0.000) \qquad (0.001) \qquad (0.01)$$

(6)

In our case, the most important are equations 4 and 6, which estimate the conditional variances as indicators for price volatility. Based on the estimated equations, we generated the series of conditional volatility in order to compare for the period January 2006 – November 2011 which of the two markets was more volatile. The results are given in Figure 2, the conditional volatility at the international and national levels.

Figure 2. Food Price Volatility Monthly Data: January 2006–November 2011 (2005=100)

(a) Romanian Market
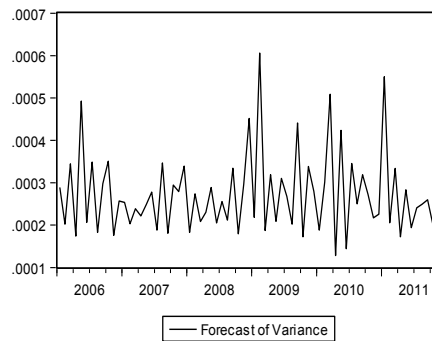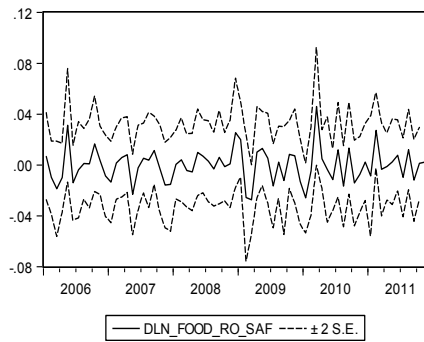
Forecast: DLN_FOOD_RO_SAF	
Actual:DLN_FOOD_RO_SA	
Forecast sample: 2006M01 2011M11	
Included observations: 71	
Root Mean Squared Error	0.017087
Mean Absolute Error	0.012385
Mean Abs. Percent Error	337.2103
Theil Inequality Coefficient	0.481088
Bias Proportion	0.000292
Variance Proportion	0.276763
Covariance Proportion	0.722946

(b) International Market
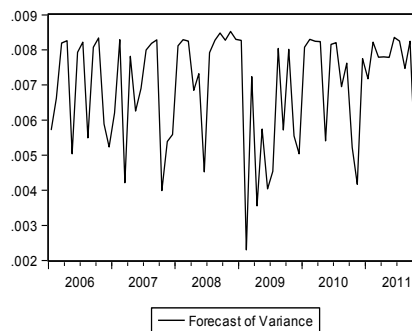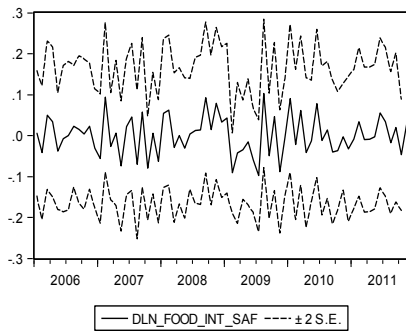
Forecast: DLN_FOOD_INT_SAF	
Actual: DLN_FOOD_INT_SA	
Forecast sample: 2006M01 2011M11	
Included observations: 71	
Root Mean Squared Error	0.081222
Mean Absolute Error	0.064858
Mean Abs. Percent Error	315.1455
Theil Inequality Coefficient	0.564789
Bias Proportion	0.000020
Variance Proportion	0.375176
Covariance Proportion	0.624804

(c) Merged Graphs – Romanian and International Market
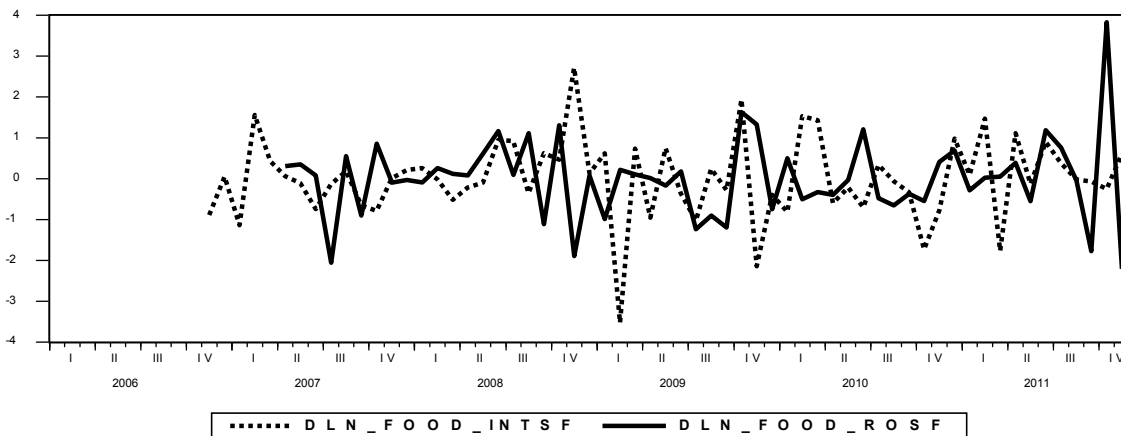
Source: Authors' calculations and illustrations in Eviews 7.1 based on data released by RNIS and IMF 2012.

Figure 2 illustrates that the estimated values of conditional variances show an increase of volatility between 2008 and 2011 on both food markets. After 2007–2008, the Romanian market appears to be more influenced by the situation than the international one, following the "peaks" generated by different world events, always one step behind. The main reason for this higher synchronization is most probably the fact that by joining the EU in 2007 and opening its markets, Romania became more receptive to international shocks. This finding is also consistent with that of Rovinaru, Rovinaru and Pop (2012) for the combustible market.

Comparing the evolutions of volatility for the two food markets, we can affirm that in the midst of the crisis the food prices volatility was more accentuated on the international market than on the Romanian one. However, in the following period, in 2010 and especially in 2011, the volatility on the Romanian market become more acute than the international one, a sign of the fact that Romania is currently experiencing more severely the consequences of the crisis, and that it is highly affected by the turbulences in the euro aria and the sovereign debt crisis, while also facing a period of turmoil and internal problems that deepen the volatility context in comparison with the international market.

Analyzing the resulting equations for the Romanian market, we observed that the current volatility depends more on past shocks in the system than on past volatility. Thus, the current volatility context has its origins on the shocks and transformations to the Romanian market in general, and the food sector in particular, that were experienced in the recent period. Seven years after joining the European Union, the Romanian food sector is confronted with many difficulties whose effects are reflected in the performance and competitiveness of the sector. Compared to other EU Member States, Romania has significant agricultural potential. However, its organization, its excessive fragmentation of parcels which reduces productivity and discourages investments, combined with inadequate funding, are obstructing the achievement of the adequate level of performance necessary to cope with the increasing competitive pressures (RCC 2010, p. 31). Over the past two decades, this sector has experienced fluctuations in its development owing to structural changes such as privatization, the restitution of land after the communist period, and other external influences and transformations due to the processes of market liberalization and the need for alignment with the requirements of the European Community. All of these transformations had a major effect on the efficiency of the sector and its international competitiveness. Moreover, a significant part of the food products in Romania are imported, from meat to oils, vegetables, fruits, and also cereals in poor agricultural years. This shortcoming is due to the seasonality of agricultural production, which reaches its peak during the summer, and also to the lack of storage capacity and adequate means for the conservation of products. Indeed, the increase of imports of cheaper food products and the need for alignment with EU requirements, combined with the process of price convergence, are the main reasons why the world and European market evolutions in the sector are directly felt on

the Romanian market. The Romanian producers adapt with great difficulty to a market environment characterized by the high volatility of demand and prices, especially in the context of the recent economic turmoil. Before accession to the euro zone, it will be necessary for the agricultural system to reduce such volatilities as much as possible. Investments in this sector – through the absorption of EU funds, state funds schemes, banking products and other alternatives that the market economy offers – could contribute to increased productivity, better internal results and, in time, lower import levels.

Nevertheless, the volatility of prices remains a complex phenomenon we have to live with and which we can moderate only up to an extent. By adjusting market structures and specifying regulatory and fiscal policies we can try to limit it, but we will not remove it on the whole. Consequently, an alternative approach should consist in developing means to deal with the price risk and uncertainty that this volatile context creates. By implementing viable price risk management strategies – contractual, market-based, insurance schemes, etc. – the Romanian producers and consumers could attenuate the negative effects of price volatility, while concentrating on reducing the level of the imported volatility by strengthening internal capacities for production.

4. CONCLUSIONS

The global economic crisis, through a series of mechanisms, has been identified as having manifested a major impact on the price volatility of commodity markets during 2006-2011, as it brought factors manifesting both sudden pushes downward for prices followed by sudden impulses upwards. Initially increased partly due to "financialization" and reallocation of investments from the housing market, the collapse in commodity prices was intensified by the sharp contraction in demand in the developed and many emerging economies, which caused significant falls in the volume of international trade. The global crisis started as a financial crisis, and so also negatively affected the banking system, which stopped providing credit, leaving both producers and consumers without access to finance. The lack of credit at the height of the crisis caused a further contraction in commodity trade, and thus amplified the price collapse. Moreover, the instability of the U.S. dollar created additional pressure. However, the collapse, although major and sudden, did not persist for long, as commodity prices suddenly restarted their increase at the beginning of 2009. Credited with stimulating price recovery for most commodity groups, the stimulus packages introduced stimulated economic growth and rebuilt confidence in the financial markets. Although the commodity prices recovered temporarily after the crisis, the years 2010 and 2011 brought turbulence that again increased volatility.

With regard to the Romanian situation in terms of food market price volatility, after 2007 Romania become more receptive to price signals from the international food market. Consequently, during the global crisis, its economy followed one step behind the international trend. However, in

recent years, 2010 and especially 2011, the volatility on the Romanian market became more acute than the international one. These findings are in accordance with those provided by Rovinaru, Rovinaru and Pop (2012) and Pop, Rovinaru and Rovinaru (2013) for the combustible market and, from the agricultural perspective, for cereal and sugar markets. These findings come as proof of the fact that Romania is currently experiencing more severely the consequences and aftermath of the crisis, while also highly affected by turbulence in the euro area and the sovereign debt crisis; moreover, it is also facing a period of turbulence and internal problems that deepen the volatility context in comparison with the international market. The current volatility context has its origins in the shocks and transformations to the Romanian market in general, and the food sector in particular, that were experienced during the recent period, transformations that had a major effect on the efficiency of the sector and its international competitiveness. Despite Romania's significant agricultural potential, its low productivity levels and inadequate funding are obstructing the achievement of an adequate level of performance necessary to cope with increasing competitive pressures. The increase of imports of cheaper food products and the need for alignment with EU requirements, combined with the process of price convergence, are the main reasons why the world and European market evolutions in the sector are directly felt on the Romanian market. Consequently, Romania's current volatility context is a mixture of imported volatility and internal instability and the lack of maturity of its market structures. As price volatility represents a very complex phenomenon that can be moderated only up to an extent by adjusting market structures and specifying regulatory and fiscal policies, Romania should concentrate on strengthening its internal potential for production in order to reduce the level of imported volatility, while also dealing with the problem through price risk management strategies.

REFERENCES

Aradhyula, S.V. and Holt, M. T., 1988. GARCH time-series models: an application to retail livestock prices. Western Journal of Agricultural Economics, 13: 365-374.

Bollerslev, T. 1986. Generalised autoregressive conditional heteroskedasticity. Journal of Econometrics, 51: 307–327.

Cashin, P. and McDermott, C. J. 2002. The Long-Run Behavior of Commodity prices: Small Trends and Big Variability, IMF Staff Papers, 49(2): 175–199.

Engle, R. 2001. GARCH 101: the use of ARCH/GARCH models in applied econometrics, Journal of Economic Perspectives, 15(4): 157–168.

Figiel, S. and Hamulczuk, M. 2010. Measuring price risk in commodity markets, Olsztyn Economic Journal, 5(2): 380-394.

Gnan, E. 2009. Energy, Commodity and Food Price Volatility: What Policy Responses?, CESifo Forum 1/2009.

International Monetary Fund (IMF). 2012. Primary Commodity Prices Database.

Jordaan, H., Grové, B., Jooste, A., and Alemu, Z.G. 2007. Measuring the price volatility of certain field crops in South Africa using the ARCH/GARCH approach, Agrekon, 46(3): 306-322.

Lipsky, J.P. 2008. Commodity prices and global inflation, Council on Foreign Relations, New York (May 8).

Nelson, D.B. 1991. Conditional Heteroskedasticity in Asset Returns: A New Approach, Econometrica, 59(2): 347-370.

Pop, L.N. 2011. Key Factors Influencing Commodity Prices: The Impact of the Recent Global Economic and Financial Crisis, Virgil Madgearu Review of Economic Studies and Research, 4(1): 97-110.

Pop, L.N. and Ban, I.M. 2011. Comparative Approach of Measuring Price Risk on Romanian and International Wheat Markets, World Academy of Science, Engineering and Technology, Special Journal Issue 77 (May): 512-517.

Pop L.N., Rovinaru F., and Rovinaru M. 2013. Assessing the Price Risk on the Romanian Agricultural Market: Analyses and Implications, Interdisciplinary Management Research IX: 469-479, Opatija: J.J. Strossmayer University Osijek, Hochschule Pforyheim University, Croatia.

Pop, L.N., Rovinaru, M., and Rovinaru, F. 2013. The Challenges of the Sugar Market: An Assessment from the Price Volatility Perspective and Its Implications for Romania, Elsevier Procedia Economics and Finance, 5: 605-614.

Romanian Competition Council (RCC) 2010. The Challenges of the Single Market and Competition in Sensitive Sectors. Available at: http://www.consiliulconcurentei.ro/_uploads/docs/items/id6479/the_challenges_of_the_single_market_and.pdf

Romanian National Institute of Statistics (RNIS), 2012, Tempo Online Database.

Rovinaru, F., Rovinaru, M, Pop, L.N. 2012. Comparative Analysis of the International and Romanian Market from the Price Volatility and Risk Perspective, Interdisciplinary Management Research VIII: 487-497, Opatija: J.J. Strossmayer University Osijek, Hochschule Pforyheim University, Croatia.

Sironi, A. and Marsella, M. 1997. La misurazione e la gestione dei rischi di mercato: Modelli, strumenti e politiche, Bologna: Il Mulino.

UNCTAD 2008. Trade and Development Report, Chapter II, Commodity Price Hikes and Instability, New York and Geneva.