The Effect of Exchange Rate Volatility upon Foreign Trade of Romanian Agricultural Products*

József Fogarasi†
Partium Christian University

Abstract

This paper takes a new empirical look at the long-standing question of the effect of exchange rate volatility on international trade flows of transition economies in Eastern Europe by studying the case of Romanian agricultural export to its export destination countries between 1999 and 2008. Based on a gravity model that controls for other factors likely to determine bilateral trade, the results show that nominal exchange rate volatility has had a significant negative effect on agricultural trade over this period. This negative effect of exchange rate volatility on agricultural exports can be reduced consistently by joining the country to the euro zone.

KEYWORDS: international trade, gravity model, exchange rate volatility, Romania

JEL CLASSIFICATION: F14, F31, Q17.

* This research was supported by a grant form the CERGE-EI Foundation under a program of the Global Development Network. All opinions expressed are those of the author and have not been endorsed by CERGE-EI or GDN.
† Correspondence address: Partium Christian University, Faculty of Economics, 27 Primariei, 410209 Oradea, Romania. Email: fogarasi@partium.ro

1. Introduction

There is a continuously growing literature dealing with the effects of the exchange rate uncertainty on international trade since the break down of Bretton Woods system of fixed exchange rates when both real and nominal exchange rates have fluctuated widely. Most of the studies are focused on estimating exchange rate volatility effects on international trade of developed countries, especially in U.S. as well as between developed and developing countries. This topic was neglected in Central and Eastern European Countries where major economic transformations have taken place in the process of implementing market economy mechanism.

The literature on agricultural transformation in Central and Eastern European Countries has focused on various aspects of transition, including land reform, farm restructuring, price and trade liberalization and etc. (see a comprehensive survey of Rozelle and Swinnen, 2004). However, until now macroeconomic aspects of agricultural transition, especially the study of exchange rate volatility on international trade were neglected.

In the present research we focus on the relationship between exchange rate volatility on Romanian agricultural trade, using a gravity model based on panel data. This issue is important in transition countries, because international trade with agricultural products and macroeconomic environment have been taken major changes in the last one and half decade. The short- and long-run impacts of monetary policy have been very important for the transition economies` agricultural sector due to the lack of farm policy credibility, where farm incomes are increasingly influenced by the foreign trade of agricultural products. Consequently the central question of the present research is how the exchange rate affects the agricultural trade in an Eastern European transition country.

The article is organized as follows. Section 2 surveys the theoretic and empirical contributions to the literature. In Section 3 the gravity model employed and some methodological aspects of examining volatility effects on international trade are presented. Data and the measurement of exchange rate volatility are presented in Section 4 and Section 5 respectively. Section 6 reports the findings of gravity equation estimations. The last section summarizes the results and draws some policy implications.

2. Literature review

The examination of the effect of exchange rate volatility on international trade has become effective after the abandonment of fix exchange rate regimes which has resulted a growing theoretical and empirical literature. A conventional method applied for these studies are the gravitational models.

2.1. Previous research

The widespread popular perception that greater exchange rate volatility reduces trade has helped motivate monetary unification in Europe (European Union Commission, 1990) and is strongly related to currency market intervention by central banks (Bayoumi and Eichengreen, 1998). However, the theoretical and empirical contributions to the literature fail to conclusively support this notion. A number of models have been advanced which find support for the negative hypothesis that volatility acts to the detriment of international trade. While other models supported the positive hypothesis that exchange rate volatility may lead to grater levels of trade (McKenzie, 1999). Then, inevitably, many empirical studies have failed to establish any significant link between measured exchange rate variability and the volume of trade.

One possible reason for such mixed results is the different time horizon of the analysis. One common argument is that exporters can easily ensure against short-run exchange rate fluctuations through financial markets, while it is much more difficult and expensive to hedge against long-term risk. Peree and Steinherr (1989), Obstfeld (1995), and Cho et al. (2002), presented evidences that longer-run changes in exchange rate seem to have more significant impacts on trade than do short-run exchange rate fluctuations that can be hedged at low cost. On the other hand Vianne and de Vries (1992) show that even if hedging instruments are available, short-run exchange rate volatility still affects trade because it increases the risk of premium in the forward market. Furthermore, Krugman (1989), Wei (1999), and Mundell (2000) argue that hedging is both imperfect and costly as a basis to avoid exchange rate risk, particularly in developing countries and for smaller firms more likely to face liquidity constrains. Pick (1990) analyzes the effects of exchange rate risk on U.S agricultural trade flows and he find that exchange rate risk is not a significant factor affecting bilateral agricultural trade from the United States to seven out of eight developed markets, but indicates that exchange rate risk adversely affects U.S. agricultural exports to some

developing countries. DeGrauwe (1988) illustrates how the relationship between exchange rate volatility, whether long run or short run, and trade flows is analytically indeterminate when one allows for sufficient flexibility in assumptions.

Other possible reason for such controversial results is the aggregation problem. The effects of exchange rate volatility on export may vary across sectors (McKenzie, 1999). This may occur because the level of competition, the price setting mechanism, the currency contracting, the use of hedging instruments, the economic scale of production units, openness to international trade, and the degree of homogeneity and storability of goods vary among sectors. The differences among sectors in exporters' access to financial instruments, currency contracting, production scale, storability, etc., may be partly pronounced in developing countries. This contrast is only accentuated by the fact that agriculture is typically a notably competitive sector with flexible pricing on relatively short-term contracts. Furthermore, agricultural products are relatively homogenous, and typically less storable than the exports in other sectors (Such, 1974). Therefore Bordo (1980) and Maskus (1986) argue that agricultural trade may be far more responsive to exchange rate changes than is trade of manufactured products.

Wang and Barett (2007) estimated the impact of the conditional mean and conditional variance of real exchange rates on Taiwan's exports by estimating innovative rational expectations based multivariate GARCH-M model using sector- and destination-specific monthly data. They found that agricultural trade flows are quite significantly negatively affected by high frequency exchange rate volatility that does not seem to impact other sectors significantly. Agriculture appears far more responsive to both expected exchange rates and to expected volatility in the exchange rate and less responsive to importer incomes, than do other sectors in Taiwan's economy. The same results were obtained by Cho et al. (2002) employing gravity models for ten developed country. They found that real exchange rate uncertainty has had negative effect on agricultural trade over the period between 1974 and 1995. Moreover, the negative impact of uncertainty on agricultural trade has been more significant compared to other sectors.

The available literature coping with the effect of exchange rate volatility on international trade, focusing on an individual trade commodity found also negative relationship. Sun et al. (2002) estimated the effect of exchange rate volatility on wheat trade worldwide employing a modified-type gravity model. They found that both measures of

short-term and long-term exchange rate volatility showed negative effects on world trade, while the long-effect was even larger. Yuan and Awokuse (2003) analyzed the exchange rate volatility and U.S. poultry export using gravity models with different volatility measures, and they found that exchange rate volatility has negative effect on trade in all the three static models and are statistically significant in two of them. A weak impact of exchange rate volatility on U.S. cotton export found Bajpai and Mohanty (2007) which could be attributed to the high exposure of the cotton and textile sector to the domestic and international policies.

2.2. Gravity Equation

A gravity model has been employed in this study, which have been extensively applied in international trade analysis. Classical gravity theory[1] states that the attraction force a_{ij} between two entities i and j is proportional to their respective masses m_i and m_j, usually proxied by GDP and/or population, and inversely proportional to the squared distance d_{ij}^{-2} between these entities. Therefore, this law can be formalized as:

$$a_{ij} = \gamma m_i m_j d_{ij}^{-2} \quad (1)$$

where γ - *is a constant proportionality factor.*

The using gravity approach to model international trade flows date back to Tinbergen (1962), Poyhonen (1963) and Linnemann (1966). Linnemann extended the classical gravity equation adding more variables and went further toward a theoretical justification in terms of Warlasian general equilibrium system. The theoretical aspects of gravity model for trade summarized in three main factors: the total potential supply (or exports) of a country to the world market, the total potential demand (or imports) of a country to the world market, and those factors that create a resistance to trade and thus affect the degree of trade intensity. These include ordinary tariff barriers and transport costs. The first and second factors are expected to be equal to one another if one disaggregates the international flow of capital, services or land transfers.

The basic form of the gravity model for examination of international trade following Matyas (1997; 1998) is:

$$EXP_{ij} = \alpha_0 GDP_i^{\alpha_1} GDP_j^{\alpha_2} POP_i^{\alpha_3} POP_j^{\alpha_4} DIST_{ij}^{-\alpha_5} XV_{it}^{-\alpha_6} TARIF_{it}^{-\alpha_7} D_n^{-\alpha_8} \quad (2)$$

[1] Carey (1871) observed the presence of gravitational force in social phenomena, stating that the force was direct ratio to mass and inverse to distance.

where, EXP_{ij} represents the trade flow between country i and j in the year t, α_0 is a constant, and $\alpha_1, \alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6, \alpha_7$ are coefficients, weighted geometric averages. GDP_i and GDP_j stand for domestic gross product per capita in country i and j, respectively. POP_i and POP_j represent population in country i and j, respectively, while DIS_{ij} expresses trade resistance due to geographic distance between countries i and j and D_n dummy variables to take into account qualitative resistance factors between country i and j. The equation can be augmented to include other factors that may create trade resistance, such as exchange rate volatility (XV_{ijt}) and bilateral trade tariffs ($TARIF_{ij}$).

3. Empirical Specification of Gravity Equation

Because I tested the effects of exchange rate volatility on Romanian (i) export to the selected most important export destination countries (j), and not combined bilateral trade between exporter and importer, I does not included in the econometric model of gravity equation the gravity mass independent variables (GDP_i, POP_i) as they are constant in any combination of export destination countries. I log-linearize equation (2) to arrive at the estimating equation (3):

$$\ln EXP_{ij} = \alpha_0 + \alpha_1 \ln GDP_j + \alpha_2 \ln POP_j + \alpha_3 \ln DIST_{ij} + \alpha_4 \ln XV_{ij} + \alpha_5 TARIF_{ij} + \alpha_6 D_{1,BORij} + \alpha_7 D_{2,EU} + \alpha_7 D_{3,CEFTA} + \varepsilon_{ij} \quad (3)$$

where ε_{ij} is an error term assumed statistically independent from the rest of the regressors, with conditional mean of 0. Because estimating a panel data on Romanian agricultural export, equation (3) above acquires a time dimension as presented in equation (4) below:

$$\ln EXP_{ijt} = \alpha_0 + \alpha_1 \ln GDP_{jt} + \alpha_2 \ln POP_{jt} + \alpha_3 \ln DIST_{ij} + \alpha_4 \ln XV_{ijt} + \alpha_5 TARIF_{ijt} + \alpha_6 D_{1,BORij} + \alpha_7 D_{2,EU} + \alpha_8 D_{3,CEFTA} + \tau_t + \eta_{ijt} \quad (4)$$

where τ_t's are full set of year dummies, and η_{ijt} is the error term. Additional factors may enhance or resist export are also typically included in equation (4). The most common are dummies for common border, common language, and regional trade agreements (RTA). In equation were included a dummy for common border, $D_{1,BORij}$ with value 1 when country j shares common border with country I and 0 afterwards, and dummies $D_{2,EU}$, $D_{3,CEFTA}$ for

regional trade agreements. Romania signed a preferential trade agreement with the European Union in 1993 which become effective in 1995. $D_{2,EU}$ with value 1 when the country j is member of EU and *CEFTA* with value 1 when country j is member of Central European Free Trade Agreement (CEFTA) states; and afterwards 0.

Table 1. Country List

Export destination economies from Romania		
Australia	Germany	Panama
Austria	Greece	Poland
Azerbaijan	Hungary	Portugal
Belarus	India	Russia
Belgium	Israel	Saudi Arabia
Bosnia and Herzegovina	Italy	Slovakia
Bulgaria	Japan	Slovenia
Canada	Jordan	South Africa
China	Latvia	Spain
Croatia	Lebanon	Sri Lanka
Cyprus	Libyan Arab Jamahiriya	Sweden
Czech Republic	Luxemburg	Switzerland
Denmark	Macedonia	Syrian Arab Republic
Egypt	Malta	Turkey
Estonia	Moldova	Ukraine
Finland	Morocco	United Arab Emirates
France	Netherlands	United Kingdom
Georgia	Norway	United States

4. Data

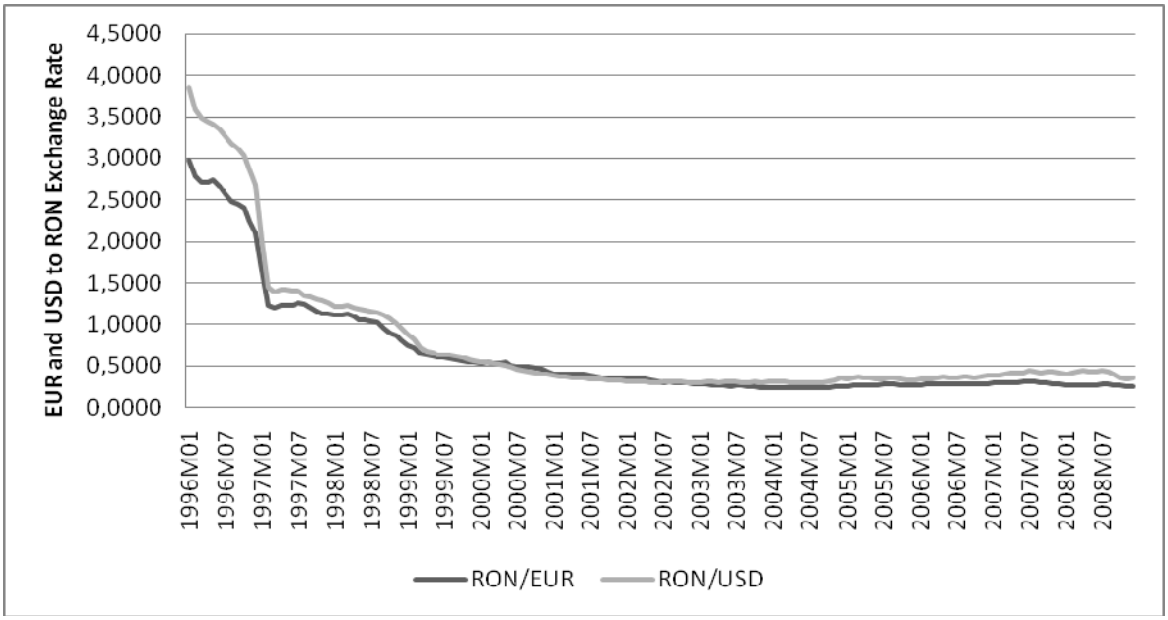
Economic theory would suggest that the income level of the domestic country should contribute to the determination of a country's export, and since the marginal propensity to import with respect to income is positive, as well as the expected sign of a nation's trading partner's income should also be positive. The domestic and export destination countries' income is considered GDP collected from World Economic Outlook Database as well as the number of inhabitants (POP) in these countries, while export destination countries' distance from exporter (i) country is obtained from Pennsylvania State University World Tables. The value of GDP per capita were collected in national currencies and converted to euro at the yearly average exchange rate. The export data of Romanian agricultural products are also expressed in Euros and come from EUROSTAT database; are included fifty-four export destination countries were Romania exported agricultural products in every year of the period analyzed from 1999 to 2008 (see table 1).

Table 2. Summary Statistics

Variable	Mean	St. Dev.	Min	Max
EXP_{ijt}	13,601,936	34,363,609	649	343,616,596
GDP_{it}	3,314	1,620	1,503	6,377
GDP_{jt}	14,833	14,520	301	76,811
POP_{it}	21,857,880	338,015	21,546,873	22,457,994
POP_{jt}	71,017,279	223,860,214	388,000	1,318,309,724
$DIST_{ij}$	2,699	2,963	299	15,242
XV_{ijt}	0.0331	0.0207	0.0128	0.1740
$TARIF_{ij}$	8.659	9.354	0	105

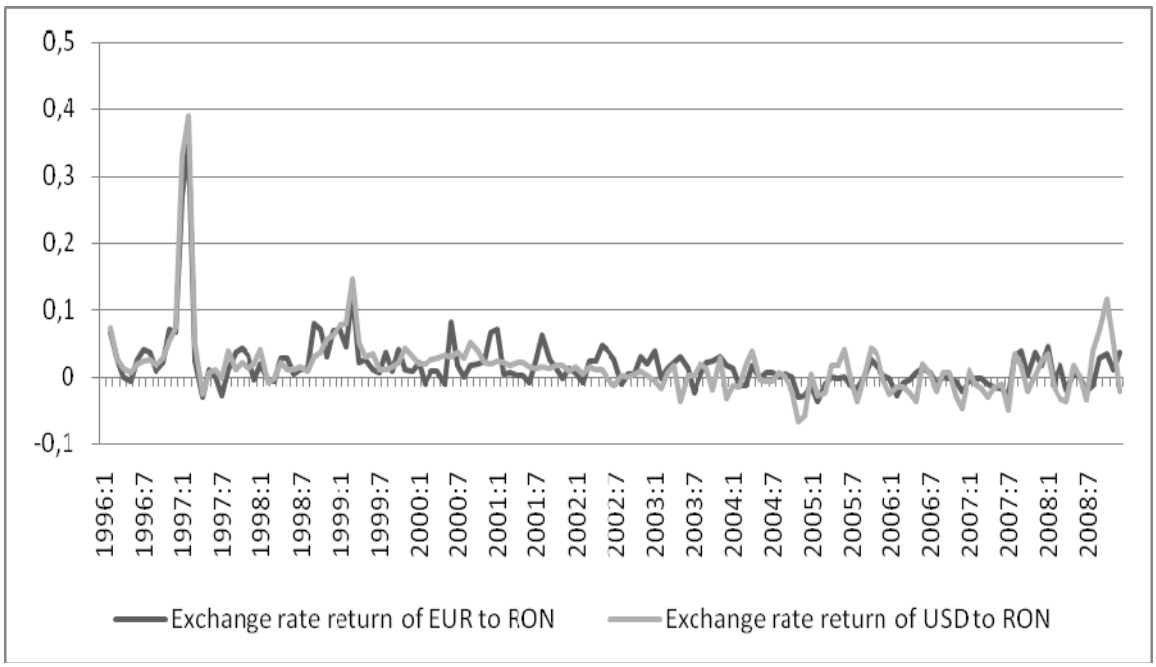
Table 2 presents summary statistics of the variables used in the estimation of exchange rate volatility on Romanian agricultural exports for the period of 1999 to 2009. Note, that GDP per capita in Romania (i) is only 22% of the average of its export destination countries (j) and the variable POP_{it} is 31% of average variable POP_{jt}. The rows labeled XV_{ijt} represents the summary statistics for the exchange rate volatility estimated based on Standard Deviation (St. Dev.) of monthly nominal exchange rates, which I define in the next section. The monthly average nominal exchange rate series and returns[2] of EUR and USD to RON variability on the analyzed period are presented on Figure 1 and Figure 2 respectively.

Figure 1. Nominal Exchange Rate Series of EUR and USD to RON



[2] The rate of return of exchange rate is calculated: $(e_m - e_{m-1}) / e_{m-1}$, where e_m represents monthly average nominal exchange rate.

Figure 2. Exchange Rate Return of EUR and USD to RON



5. Measuring Exchange Rate Volatility

A variety of measures of exchange rate volatility have been used in the literature. Usually, the measures used have been some variant on the standard deviation of the difference in annual or quarterly or monthly exchange rates, for example, the standard deviation of the percentage change in the exchange rate or the standard deviation of the first differences in the logarithmic exchange rate. In this article, in order to capture ex ante exchange rate uncertainty, the later measure is used. I construct the measure of exchange rate volatility based on monthly average nominal exchange rates of the period of 1996 to 2008 for every studied year from previous three years to year t. The measurement of exchange rate volatility is based on *nominal* bilateral exchange rates several studies highlighted that nominal and real exchange rate series generate nearly identical empirical results (McKenzie and Brooks, 199; McKenzie, 1999; Quian and Varanges, 1994).

A moving standard deviation of the first differences in the monthly nominal exchange rate over the prior forty eight month (m) of the year t and prior three years (t`)[3] is applied for estimating exchange rate volatility for year t:

[3] t` represents the period based on monthly data of the year s' t-3, t-2, t-1 and t.

$$XV_{ijt} = \sqrt{\frac{\sum_{m=1}^{48}\left(x_{ij,m} - \bar{x}_{ij,t`}\right)^2}{48}} \quad (5)$$

where $x_{ij,m}$ = ln $e_{ij,m}$ – ln $e_{ij,m-1}$, ln $e_{ij,m}$ is the log of the monthly nominal exchange rate (e) between countries i and j at the time (month) m, and $\bar{x}_{ij,m} = \sum_{m=1}^{48} x_{ij,m} / 48$ is the mean of $x_{ij,m}$ over the forty-eight month of year t and previous three years.

The volatility of Romanian new leu (RON) to the export destination countries national currencies calculated with the above equation is decreasing between 1999 and 2008 (see appendix 1).

6. Results

One advantage of using panel data is that unobservable cross-sectional effects can be accounted. However, there are some econometric issues that need to be addressed when estimating gravity equation (4). First, nonspherical error terms resulting from heteroskedasticity and autocorrelation across panel sets are anticipated in the dataset. In case of trade between two smaller countries or between a smaller country and a larger country is likely to be more volatile compared to trade between two large countries and heteroskedasticity may occur in this case (Frankel, 1997). Autocorrelation within panels may be present, partly reflecting sunk cost effects (Roberts and Tybout, 1997). To address these problems are applied the heteroskedastic corrected standard errors (Prais-Winsten) approach, that controls for heteroskedasticity, and panel specific AR(1) is applied to control autocorrelation (Beck and Katz, 1995; 1996).

In table 3, the results from the gravity model of equation (4) using the moving standard deviation as a volatility measure, are presented. After excluding outliers from the sample of fifty-four countries the estimations are based on forty-eight export destination countries.[4] The coefficient on XV_{ijt} is negative and significant at 5% level. This implies that the exchange rate volatility has negative effect on Romanian agri-food exports: increasing volatility by 10% results 5% decreases of agri-food exports. The negative effect of exchange rate volatility on agricultural trade is consistent with the findings of Cho et al (2002) and Kandilov (2008).

[4] Excluded outliers export destination countries are Australia, China, India, Luxemburg, Norway and Panama. In case of these countries the share of Romanian agri-food exports is very low.

Table 3. Exchange Rate Volatility and Exports

Variable	lnEXP_{ijt}.
lnGDP_{jt}	0.322***
lnPOP_{jt}	0.717***
ln$DIST_{ij}$	-1.482***
ln XV_{ijt}	-0.531**
TARIF	0.000
$D_{1,BOR}$	-0.527
$D_{2,EU}$	-0.280
$D_{3,CEFTA}$	-0.193
const	10.746***
R^2	0.9714
N	480
rho	-0.298

Note: The single (*), double (**), or triple (***) asterisk denote significance at the 10%, 5%, and 1% levels, respectively.

The mass variables of gravity model lnGDP_{jt} and lnPOP_{jt} have the expected positive sign and are significant at the 1% level in both cases of exchange rate volatility estimations. This imply that higher value of GDP per capita of 10% in export destination country (j) increase export by 3%, as well as 10% increase of population (j) result 7% of import increasing from Romania of agri-food products.

The classical trade resistance variable of gravity equation ln$DIST_{ij}$ has the expected negative sign and is significant at 1% level: 10% of distance increasing results 15% decreases of export to these export destination countries. However the quantitative (TARIF) and qualitative ($D_{2,EU}$ and $D_{3,CEFTA}$) trade resistance variables are not significant.

6. Summary

In this article I have studied whether exchange rate volatility has negatively affected Romanian agricultural export. I constructed a balanced panel of Romanian agri-food export to 54 export destination countries for the period 1999-2008. This gave a fairly large panel dataset to which I could apply the gravity model specification, which has numerous advantages over cross-sectional studies that have typically been used to highlight the impact of exchange rate volatility on bilateral trade flows. Exchange rate volatility is captured by a moving standard deviation of the first differences in the exchange rate over the forty-eight month nominal average exchange rate of year t and prior three years. The volatility of new Romanian leu to national currencies is decreasing during the analyzed period.

The estimations of gravity equation indicate that the signs of significant parameters are according to our expectations. The signs of parameters for the variables of population and income (GDP) of export destination countries are positive, while distance is negative. As well as exchange rate volatility has negative effects on Romanian agri-food export.

The policy implications of adverse effect of exchange rate volatility on Romanian agi-food trade are connected to the process of joining to euro zone and to the attitude of trading firms with agri-food products. As the exchange rate volatility has negative effect on trade with Romanian agr-food products, the agricultural holdings and firms operating in food industry are interested in the speeding up process of joining Romania to the euro zone, introducing euro as earlier as possible. At the same time trading firms with Romanian agri-food products should cover their risks which arise from currency volatility using the opportunities offered by the forward and future markets, which have also been developing intensively in Romania in the last period.

Overall, the results presented make a contribution to our understanding of the connection between exchange rate movements and international trade in case of transition economies. The results are consistent with the findings of Cho et al. (2002), Wang and Barett (2007), and Kandilov (2008) and extend their findings of negative effect of exchange rate volatility on export to transition economies.

References

Beck, S. L. and J. N. Katz (1995): What to Do (and Not to Do) with Times-Series Cross Section Data. American Political Science Review, 89(3): 634-647.

Beck, S. L. and J. N. Katz (1996): Nuisance vs. Substance: Specifying and Estimating Time-Series-Cross Section Models. Political Analysis, 6(1): 1-36.

Bajpai, S. and S. Mohanty (2007): Impacts of Exchange Rate Volatility on the U.S. Cotton Export. Southern Agricultural Economics Association Annual Meeting 2007, Dallas, TE.

Bayoumi, T. and B. Eichengreen (1998): Exchange Rate Volatility and Intervention: Implications of the Theory of Optimum Currency Areas. *Journal of International Economics*, 45, pp. 191-209.

Bordo, M. D. (1980): The Effect of Monetary Change on Relative Commodity Prices and the Role of Long-Term Contracts. *Journal of Political Economy*, 61, pp. 1088-1109.

Carey, H. C. (1871): Principles of Social Science. J. B. Lippincott&Co.. Philadelphia.

Cho, G., I.M. Sheldon and S. McCoriston (2002): Exchange Rate Uncertainty and Agricultural Trade. *American Journal of Agricultural Economics*, 84(4), pp. 931-942.

DeGrauwe, P. (1988): Exchange Rate Variability and the Slowdown in Growth of International Trade. *IMF Staff Papers*, 35, pp. 63-84.

European Union Commission (1990): One Market, One Money. *European Economy*, 44, p. 341.

Engle, R. (1982): Autoregressive Conditional Heteroskedasticity with Estimates of the Variance of U.K. Inflation. *Econometrica*, 50: 987-1008.

Frankel, J. A. (1997): Regional Trading Blocs in the World Economic System. Institute for International Economics, Washington D.C.

Kandilov, I.T. (2008): The Effects of Exchange Rate Volatility on Agricultural Trade. *American Journal of Agricultural Economics*, 90(4): 1028-1043.

Krugman, P. (1989): Exchange Rate Instability. The Lionel Robbins Lectures, Cambridge, MIT Press.

Linnemann, H. (1966): An Econometric Study of International Trade Flows. New-Holland Publishing Company, Amsterdam.

Maskus, K. E. (1986): Exchange Rate Risk and U.S. Trade. A Sectoral Analysis. *Economic Review*, Federal Reserve Bank of Kansas City, 3, pp. 16-28.

Matyas, L. (1997): Proper Econometric Specification of the Gravity Model. *The World Economy*, 20, pp. 363-369.

Matyas, L. (1998): The Gravity Model: Some Econometric Considerations. *The World Economy*, 21, pp. 397-401.

McKenzie, M. D. (1999): The Impact of Exchange Rate Volatility in International Trade Flows. *Journal of Economic Surveys*, 13(1), pp. 71-106.

McKenzie, M. D. and R. Brooks (1997): The Impact of Exchange Rate Volatility on German –U.S. Trade Flows. *Journal of International Financial Markets, Institutions, and Money*, 7, pp. 73-87.

Mundell, R. A. (2000): Currency Areas, Exchange Rate Systems, and International Monetary Reform. *Journal of Applied Economics*, 3, pp. 217-256.

Obstfeld, M. (1995): International Currency Experience: New Lessons and Lessons Relearned. *Brookings Papers on Economic Activity*, 1, pp. 119-196.

Peree, E. and A. Steinherr (1989): Exchange Rate Uncertainty and Foreign Trade. *European Economic Review*, 33, pp. 1241-1264.

Pick, D. H. (1990): Exchange Rate Risk and U.S. Agricultural Trade Flows. *American Journal of Agricultural Economics*, 72(Aug), pp. 694-700.

Poyhonen, P. (1963): A Tentative Model for Volume in Trade Between Countries. *Weltwirshaftschaftliches Arhiv*, 90, 91-113.

Quian, Y. and P. Varangis (1994): Does Exchange Rate Volatility Hinder Export Growth? *Empirical Economics*, 19, pp. 371-396.

Robert,s, M.. and J. Tybout (1997): The Decision to Export in Columbia: An Empirical Model of Entry with Sunk Costs. *American Economic Review*, 87(4): 545-563

Rozelle, S. and J. Swinnen (2004): Success and Failure of Reform: Insights from the Transition Economics. *Journal of Economic Literature*, 42(2), pp. 404-456.

Schuh, G. E. (1974): The Exchange Rate and U.S. *Agriculture. American Journal of Agricultural Economics*, 56, pp. 1-13.

Sun, C., M. Kim, W. Koo, G. Cho, and H. Jin (2002): The Effect of Exchange Rate Volatility on Wheat Trade Worldwide. Selected paper for 2002 Annual Meeting of AAEA, Long Beach, CA.

Tinbergen, J. (1962): Shaping the World Economy. Twentieth Century Fund, New York.

Vianne, J. M. and C. G. de Vries (1992): International Trade and Exchange Rate Volatility. *European Economic Review*, 36, pp. 1311-1321.

Wang, K. L. and C. B. Barett (2007): Estimating the Effects of Exchange Rate Volatility on Export Volumes. *Journal of Agricultural and Resource Economics*, 32(2), pp. 225-255.

Wei, S. J. (1999): Currency Hedging and Goods Trade. *European Economic Review*, 43, pp. 1371-1394.

Yuan, Y. and T. O. Awokuse (2003): Exchange Rate Volatility and U.S. Poultry Exports: Evidence from Panel Data. Selected paper for 2003 Annual Meeting of AAEA, Montreal, Canada.

Apendix 1. Exchange rate volatility of national currencies to Romanian new leu (%)

RON	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
AUD	6,50	6,53	3,61	3,29	2,45	2,74	2,60	2,51	2,30	2,26
AZN	6,39	6,29	2,52	2,53	1,60	2,02	2,35	2,58	2,65	3,14
BGN	17,40	14,75	2,81	2,57	2,08	1,98	1,84	1,65	1,61	1,89
BYR	10,12	10,30	9,11	8,20	4,22	2,20	2,48	2,43	3,88	4,15
CAD	6,44	6,34	2,79	2,75	1,70	2,24	2,48	2,72	2,71	2,71
CHF	5,63	5,58	2,95	2,56	2,15	2,05	1,96	1,76	1,92	2,62
CNY	6,23	6,11	2,32	2,35	1,67	2,07	2,26	2,45	2,54	3,11
CZK	6,25	6,28	2,77	2,72	2,55	2,32	2,22	1,66	1,92	2,16
DKK	5,73	5,73	2,85	2,60	2,12	2,00	1,87	1,67	1,62	1,90
EEK	5,71	5,71	2,84	2,60	2,13	2,01	1,87	1,66	1,63	1,89
EGP	6,22	6,16	2,88	2,88	3,67	3,63	3,76	3,84	2,72	3,28
EUR	***5,69***	***5,70***	***2,80***	***2,60***	***2,13***	***2,01***	***1,87***	***1,66***	***1,63***	***1,89***
GBP	6,05	5,95	2,57	2,44	1,61	1,71	1,87	1,83	1,73	2,03
GEL	7,13	7,05	4,08	3,70	1,79	2,15	2,46	2,72	2,84	3,28
HRK	5,61	5,61	2,51	2,42	2,12	1,99	1,94	1,67	1,66	1,86
HUF	5,91	5,92	2,71	2,52	2,41	2,28	2,15	2,05	1,87	2,15
ILN	6,59	6,38	3,11	3,12	2,25	2,27	2,26	2,23	2,51	3,08
INR	6,54	6,38	2,59	2,37	1,45	1,99	2,16	2,43	2,45	2,56
JPY	6,27	6,26	4,00	3,30	2,42	2,43	2,41	2,29	2,64	4,22
LBP	6,29	6,14	2,44	2,49	1,71	2,10	2,35	2,55	2,59	3,24
LKR	6,31	6,25	2,73	2,51	1,72	2,21	2,57	2,81	2,92	3,39
LVL	5,87	5,76	2,37	2,22	1,28	1,64	1,70	1,65	1,80	1,88
LYD	6,58	6,48	3,52	10,56	10,24	10,12	10,11	2,94	2,57	3,20
MAD	5,74	5,66	2,50	2,30	1,67	1,78	1,68	1,59	1,67	1,93
MDL	8,31	8,21	5,55	3,25	1,86	2,48	2,73	2,91	3,02	2,77
MKD	5,69	5,70	2,80	2,60	2,13	2,01	1,87	1,66	1,63	1,89
NOK	6,26	6,23	2,78	2,69	2,31	2,47	2,53	2,23	2,11	2,06
PLN	5,97	5,92	2,81	2,81	2,59	2,35	2,13	2,01	2,15	2,23
RUB	12,89	12,78	11,23	2,34	1,78	1,63	1,84	1,99	2,00	2,25
SEK	5,55	5,60	2,86	2,71	2,07	2,04	2,07	1,86	1,66	1,78
SKK	5,88	5,95	2,47	3,00	3,40	3,18	3,19	2,46	1,61	1,92
TRY	5,91	5,79	5,59	5,99	6,07	6,25	3,86	3,70	3,48	3,74
UAH	8,27	8,21	5,27	2,88	1,93	2,11	2,40	2,60	2,67	4,96
USD	***6,23***	***6,11***	***2,32***	***2,36***	***1,67***	***2,07***	***2,30***	***2,50***	***2,57***	***3,20***
ZAR	7,55	7,37	4,66	4,30	4,09	4,48	3,74	3,68	3,52	3,62

RON – New Romanian leu, AUD – Australian dollar, AZN - Azerbaijanian manat, BGN – Bulgarian lev, BYR – Belarusian rouble, CAD – Canadian dollar, CHF – Swiss franc, CNY – Chinese yuan renminbi, CZK – Czech koruna, DKK – Danish krone, EEK – Estonian kroon, EGP – Egyptian pounds, EUR – Euro: Countries from Euro Zone and Bosnia and Herzegovina, GBP – Pound sterling, GEL – Georgian lari, HRK – Croatian kuna, HUF – Hungarian forint, ILN – Israeli new sheqalim, INR – Indian rupee, JPY – Japanese yen, LBP – Libanonian pounds, LKR – Sri Lanka rupee, LVL – Latvian lats, LYD – Lybian dinar, MAD - Moroccan Diram, MDL – Moldavian leu, MKD – Makedonian dinar, NOK – Norvwegian krone, PLN – Polish zloty, RUB – Russian rouble, SEK – Swedish krona, SKK – Slovakian koruna, TRY – New Turkush lira, UAH – Ucraine hrivnya, USD – US dollar: US, Jordan, Panama, Saudi Arabia, Syria, United Arab Emirates; ZAR – South African rand.