DO THE NEWS AFFECT THE EUR/ALL EXCHANGE RATE VOLATILITY?

Gentjan ÇERA*, Eda DOKLE**, Edmond ÇERA***

ABSTRACT

Since the early 1990s, Albania has adopted the flexible exchange rate regime. A vast empirical literature on exchange rate is focused on modeling its volatility. In contrast, this paper provides empirical analysis regarding the news impact on the EUR/ALL exchange rate volatility, using TGARCH model. We argue that the series has three important features of asset return proposed by the theory: unpredictability, fat tails and volatility clustering. The results show the existence and importance of news impact on exchange rate return.

Keywords: Albanian lek, EUR/ALL, news impact, TGARCH

JEL classification: F31, C58

1 INTRODUCTION

The exchange rate volatility has become increasingly important in developing countries because of its relevance both with the corporate decision making bodies and with the policymakers. While the former use it when evaluating their portfolios, the policymakers are focused more on the impact it has on the macro level. Exchange rate can be either fixed or floating. A fixed exchange rate is decided and not allowed to move, while the floating exchange rate is more volatile and may shift up or down depending on the economic shocks.

Albania switched from being a closed economy to an open one in the early 1990s. Although several economists argue whether the transition to an open economy has ended or not, it is important to have a close look at the two main positive transition steps undertaken in terms of exchange rate. Albania opted for the floating exchange rate regime since the first years of the transition process, because it had a limited amount of international reserves and was trying to keep away from any exchange rate misalignment that would be too costly for the small and fragile economy (Luci & Vika, 2011). Moreover, in 2009 the Bank of Albania decided to adopt the inflation targeting regime which has 'free floating exchange rate' listed as an important precondition.

The general study of exchange rate in Albania is important for several reasons. First, the financial sector is highly affected by the exchange rate because of the large part of loan portfolio being in foreign currency, which exposes the banking system towards a high currency risk. According to the data from the Bank of Albania, by the end of the 2014 first quarter, the loans in foreign currency amounted to 60.3% of the total loan portfolio in the country, while by the end of May 2014, the loans in euro amounted to 39.8% of the total portfolio in the country.

Second, international trade is highly affected by the exchange rate since Albania conducts most of its trade with other countries in euro. In this regard, Figure 1.1 shows the progress of GDP and total trade (measured as sum of exports and imports) starting from 2004 until 2013. In 2012, the total trade amounted to 52.95% of GDP, highlighting the importance of the exchange rate in the international trade. In addition, other central actors highly affected by the exchange rate risk are the 339 official exchange rate offices in Albaniawhich are interested to know a currency trend or a possible forecast.

*Faculty of Economy and Agribusiness, gcera@ubt.edu.almailto:gentjan.cera@gmail.com
** Institute of Economic Studies, Charles University in Prague edadokle@gmail.com
***Faculty of Economy, University of Tirana edmond.cera@gmail.com

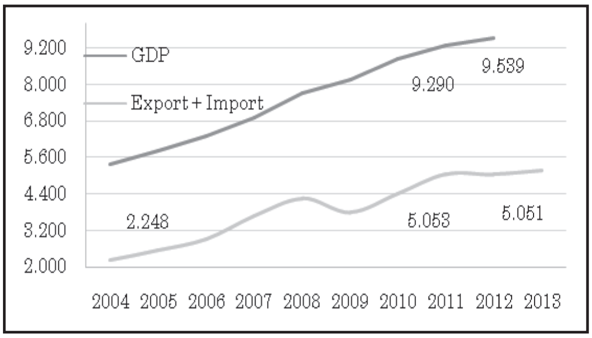


Figure 1.1. The international trade (export + import) and annual GDP trends (in millions, EUR)

The exchange trade between different currencies is performed in exchange rate markets where the rates between currencies are defined and trade is facilitated. However, the ALL (Albanian lek) exchange rate with other currencies does not follow the economic theory since the market equilibrium does not fully and significantly depend on the exchange rate (Hoda, 2012).

It is generally known that exchange rate affects the behavior of macroeconomic agents in the Albanian economy (Istrefi & Semi, 2009 and Vika & Luçi, 2011), but in our research we have not found any study focused on the news impact on the exchange rate volatility. Therefore we initiated a study on the possible predictability of the EUR/ALL exchange rate volatility and the importance of the news in exchange rate volatility. The focus on the EUR/ALL exchange rate was mainly due to the large trade Albania conducts with Eurozone countries and other countries using euro as a currency in their transactions. The main research questions this study aims to address are: Do the news affect the EUR/ALL exchange rate volatility? Which is the effect of bad news on it?

2 LITERATURE REVIEW

Different empirical studies on asset returns have noticed the presence of skewness, excess kurtosis and fat tails in distribution, which brings up the assumption that identical and independently distributed (i.d.d.) errors do not work properly for the asset returns (Longmore and Robinson, 2004). Therefore, three important issues are generally discussed: asymmetry, volatility clusters and leverage effect.

In their study, Engle and Ng (1993) examined the relationship between the "conditional variance of asset returns to exogenous shocks", named also 'news impact curve'. The results showed proof of asymmetry in stock returns. In 1963, Mandelbrot introduced the concept of volatility clustering referring to the idea that "large changes tend to be followed by large changesof either sign and small changes tend to be followed by small changes."

The leverage effects are largely known as the negative relationship between an asset price and its return. The term was first introduced by Black (1976) who tried to address the asymmetry found by Engle and Ng (1993). He argued that a fall in the stock prices originates from a decline in firm's equity, causing a direct increase in the leverage (debt to equity ratio) and signaling the riskiness of the firm. Also, he associated the increase level of risk with the presence of high volatility. This remark is generally accepted as a conclusion that negative shocks are followed by high volatility, while positive shocks are followed by low volatility. Moving away from the asset return case and focusing more on the exchange rate volatility, Longmore and Robinson (2004) noted that the magnitude of exchange rate volatility depends on whether the shock is positive or negative.

Observations of this type of times series has led to the use of the ARCH and GARCH models and their extensions. Mundaca (1991) used ARCH and GARCH models to examine the Norwegian currency basket and the NOK/USD exchange rate observed twice daily. She found out that the conditional variance was smaller for the basket than for the NOK/USD exchange rate and that these variances changed depending on the hour of the day the observation was taken. More importantly, she concluded that three series, out of four, were better fitted by GARCH. Chong, Chun and Ahmad (2002) used GARCH models and its modification to study the Malaysian Ringgit/Sterling exchange rate volatility for the period 1990-1997. The results show that the exchange rate volatility is persistent and the constant variance model is rejected. They highlight the fact that if using the random walk as a standard model, the GARCH models perform better when forecasting the volatility of the exchange rate. Later on, Insah (2013) studied the nature of the exchange rate volatility in Ghana using ARCH(1) and GARCH(1,1) models to measure volatility. The later was found to be the proper model for exchange rate volatility in Ghana.

To accommodate the leverage effects, new models started being used: TGARCH, EGARCH, and PARCH. Bala and Asemota (2003) studied the exchange rate volatility in Nigeria, applying GARCH models with exogenous break. Using monthly data on exchange rate returns for three foreign currencies (USD, EUR, and GBP), they compared results of different GARCH models, and concluded that better results were obtained with the application of the GARCH model with volatility breaks. When using the TGARCH model, they observed that the analysis of the two types of news showed that the news impact is asymmetric.

A study was conducted by Jithitikulchai (2005) on the exchange rate volatility of Baht/USD for the period between 1990 and 2005 based on weekly data. The author used TGARCH to account for the response of the series to good and bad news. The results show that the negative impact of the bad news is not significant although the direction seems coherent. However, he found out also that TGARCH modelled best the out of sample exchange rate volatility.
Regarding the case of Albania, Çera, Çera and Lito (2013) conducted a study on the value at risk for EUR/ALL exchange rate. They used GARCH(1,1) to analyze daily data of the exchange rate. The study addressed the main agents conducting economic activity in EUR and working in the Albanian economy. It is important to emphasize that it precedes our study.

3 METHODOLOGY AND THEORETICAL MODELS

3.1 Different models to measure risk

For a long time, econometricians were mainly studying how a variable would change in response to a change in another variable and the proper model to answer their questions was the least squares model. However, Engel (2001) argues that economists were faced with the challenge of forecasting the size of the error and finding a proper model that would allow them to answer questions about volatility. At a time when hetereoscedasticity was becoming a problem of least squares, it was Robert Engel who in 1982 introduced a new model called ARCH (Autoregressive Conditional Heteroscedasticity) which proposes a way to model heteroscedasticity.
The mathematical form of the ARCH model comes from the AR (Autoregressive) model which is presented as follows:

$$Y_t = a_0 + \sum_{i=1}^{d} a_i Y_{t-i} + \varepsilon_t \qquad (1)$$

To obtain the ARCH(q) model, Engel (1982) suggests expressing the variance (σ2)as a linear function of past squared innovations, where qdenotes the lag order.

$$\sigma_t^2 = \omega + \sum_{i=1}^{q} a_i \varepsilon_{t-i}^2 \qquad (2)$$

This model was largely used to describe possible volatility clustering where the sign of changes in price followed by other changes in price was unpredictable. Since in practice ARCH(q) models require a large number of lags and parameters, Bollerslev (1986) introduced a new model called GARCH. In these cases, the term ‘conditional variance’ is used to refer to the forecasted variance, which is based on past information. This model, in which pis the order of GARCH (lagged volatility) terms and qis the order of ARCH (lagged of squared error) terms, can be presented as follows:

$$\sigma_t^2 = \omega + \sum_{i=1}^{q} a_i \varepsilon_{t-i}^2 + \sum_{j=1}^{p} \beta_j \sigma_{t-j}^2 \quad (3)$$

Later on, the idea that asymmetric effect of shocks are independent was formulated with the introduction of the TARCH (Threshold Autoregressive Conditional Heteroscedasticity) model by Zakoïan (1994) and Glosten, Jaganathanand Runkle (1993) independently. The general specification of this model is as follows:

$$\sigma_t^2 = \omega + \sum_{i=1}^{q} a_i \varepsilon_{t-i}^2 + \sum_{j=1}^{p} \beta_j \sigma_{t-j}^2 + \sum_{k=1}^{r} \gamma_k \varepsilon_{t-k}^2 I_{t-k} \quad (4)$$

whereIt is a dummy variable taking value 1 for εt< 0 or 0 otherwise. This model introduces the concepts of good news (εt-i> 0) and bad news (εt-i< 0), which have different effects on the conditional variance. The good news effect is measured by aicoefficient while the bad news effect is measured by ai + γi because It = 1. In this case, if γi> 0, the bad news causes an increase in variance and has a leverage effect of order i, but if γi ≠ 0 the news impact is asymmetric. The 'news' concept refers to the information of past periods which affects the current period. Themodel can be written as TGARCH(r,p,q), where q, p and r are the orders of ARCH, GARCH and TGARCH terms. It is easily noticeable that GARCH model is a specific case of TARCH with an It equal to 0.

The ARCH family models include other models with specific restrictions like the IGARCH model which is estimated by removing the free constant and where the sum of coefficients a andβ is 1. By making other forms of restrictions we can obtain other ARCH models like: EGARCH, PARCH, CGARCH, GJARCH etc.

3.2 The data

The data employed consists of average daily data of the EUR/ALL exchange rate presented in the form of dynamic series over a time horizon between January 01, 2002 and July 10, 2014. The data is taken from the official webpage of the Bank of Albania where daily ALL exchange rates with other currencies are archived[1] . The total number of observations is 3,131.

The daily exchange rate return is defined as:

$$\Delta \ln(EUR / ALL_t) = \ln \frac{EUR / ALL_t}{EUR / ALL_{t-1}} \quad (5)$$

whereΔln(EUR/ALL)is the return on exchange rate, while EUR/ALLt is the exchange rate at time t, and EUR/ALLt-1 is the exchange rate at time t– 1.

Our empiric analysis is computed by using EViews7, a professional computer program for econometric analysis.

1 The Bank of Albania publishes the exchange rates four to five times a week.

4 FINDINGS

4.1 Descriptive statistics

Figure 2 shows time series plots of EUR/ALL exchange rate in the upper graph and the exchange rate return in the below graph. From the graphs in Figure 2, three periods stand out:

1) The first period between January 2002 and June2004, is characterized by an average exchange rate of 134. During this period the financial system was not fully consolidated and the Albanian economy was already showing signs of growth.

2) The second period lies between July 2004 and December 2008 and is noticeable for a stable exchange rate around 124. Continuing the revival of the first period, the economy was performing better with a growth of around 6%.The need of borrowers for funds and of banks for investing in profitable instruments was due to lack of previous opportunities to invest and generate substantial profits.

3) The last period starts in January 2009 and continues to nowadays. The graph shows a rapid increase of the exchange rate to an average of 138,which we believe to be also due to the global financial crisis and the sovereign debt crisis within the European Union.

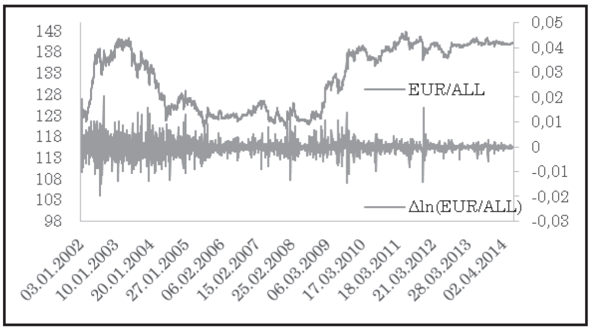


Figure 4.1. EUR/ALL (LHS axis) and Δln(EUR/ALL) (RHS axis) for January 2002 to July 10, 2014

The second graph in Figure 4.1 shows the EUR/ALL exchange rate return which is centered on the zero value along the entire time horizon under study, despite the fact that the exchange rate sometimes increased and in other times decreased. It can be noticed that the degree of return is continuously changing, taking both high and low values. This effect is measured by the ARCH family models, known also as volatility clustering. The two graphs are shown together to present an important statement that when the exchange rate falls, the volatility of exchange rate return is higher. Taking a look at the graph, the period between 2003 and 2005 confirms this statement, which we will analyze in the next section. Also, we can observe the idea of asymmetric volatility described by Nelson with his EGARCH model (Engel, 2004) stating that volatility tends to increase when the markets are in decline.These graphs give a first hint of a possible presence and effect of the bad news in the exchange rate in the EUR/ALL exchange rate volatility, which we will discuss in the following section.

Returns are almost unpredictable, they have surprisingly large numbers of extreme values, and both the extremes and quiet periods are clustered in time. These features, for which the ARCH models were designed, are often described as unpredictability, fat tails, and volatility clustering. Engel's (2004, 407) important remark on the topic remains the following: 'When the volatility is high, it is likely to remain high, and when it is low, it is likely to remain low.'

To check whether the return of the EUR/ALL exchange rate has the three features mentioned above, we observeTable 4.1andTable 4.2, which present several statistical data. The last two columns of Table 1 show results on the exchange ratereturn. However, the second column in the Table takes into consideration the whole period, while the third column shows results for the period until January 19, 2010.

Table 4.1. Descriptive statistics of EUR/ALL and Δln(EUR/ALL)

Series	EUR/ALL	Δln(EUR/ALL)	
Sample	All	All	Until Jan. 19, 2010
Mean	132.114	4.15E-5	5.69E-5
Std. Dev.	7.3591	0.0028	0.0033
Skewness	-0.1780	0.2756	0.2557
Kurtosis	1.3180	10.0362	7.2171

The mean is almost zero in both columns, but slightly higher in the first one with data from the full period included in the study. Standard deviation and skewness are different in both cases. The most interesting feature is the kurtosis which measures the magnitude of the extremes. If returns are normally distributed, then the kurtosis should be three. The kurtosis of the Δln(EUR/ALL) for the sample "until January 19, 2010" is 7.2, while for the full sample it is about 10. As a result, the distribution of the exchange rate EUR/ALL return has fat tails.

The unpredictability of the EUR/ALL exchange rate returns can be shown by observing the sign of the exchange return in Figure 4.1. The graph confirms that the return sometimes moves up, causing for a positive sign, and other times down, changing to a negative sign. However, the moment when this change happens cannot be defined, proving the unpredictability of the EUR/ALL exchange rate return.

Thevolatility clustering can be concisely observed by looking at autocorrelation results. Volatility clustering will show up as significant autocorrelations in squared or absolute returns (Engel, 2004). Table 4.2 presents the autocorrelation coefficients for the series of squared returns which are significant above the 99% level, indicating a clear evidence of volatility clustering in this series.

Table 4.2. Autocorrelations of EUR/ALL squared returns

Lag	AC	Q-Stat.	Prob.
1	0.265	220.59	0.000
2	0.224	377.71	0.000
3	0.141	440.26	0.000
4	0.154	514.33	0.000
5	0.087	538.29	0.000
6	0.112	577.52	0.000
7	0.083	599.36	0.000
8	0.145	665.10	0.000
9	0.102	697.65	0.000
10	0.155	773.59	0.000
11	0.092	800.07	0.000
12	0.092	826.71	0.000

The above analysis showed that the EUR/ALL exchange rate has three features of the series presented by the theory: unpredictability, fat tails and volatility clustering.

4.2 Evidence of news impact

The econometric modeling procedure of different time series requires the need to perform a stationarity test before moving ahead with the analysis. We use the Dickey-Fuller test to address the unit root of the series and results are presented in Table 4.3 for both EUR/ALL and Δln(EUR/ALL) series. They confirm that the EUR/ALL exchange rate is non-stationary at level while its first difference becomes stationary and highly significant. However, the EUR/ALL exchange rate return is stationary at level and we do not need to first differentiate the data.

Table 4.3. Unit root test for EUR/ALL and Δln(EUR/ALL) (Augmented Dickey-Fuller test)

	Series in	Lag length	t-Statistic	Prob.
EUR/ALL	Level	3	-1.43727	0.5654
	1st difference	2	-35.3055	0.0000
Δln(EUR/ALL)	Level	2	-35.2924	0.0000

Note: Null Hypothesis: Series has a unit root;
Exogenous: Constant; Automatic lag length - based on SIC.

The next step of our analysis is to evaluate the news impact on the EUR/ALL exchange rate volatility through estimating two models: TGARCH(1,1,1) and TGARCH(1,1,2). The results in Table 4.4 show that apart from γ, all other coefficients are positive and significant inTGARCH(1,1,1). In this case, the ARCH test suggests the usage of other lag orders in order to exclude all the possible ARCH effects.

For this reason, we went further to estimate the TGARCH(1,1,2) model with two lags in the error term which implies two a coefficients. Adding an additional lag to the error term improves the quality of the model in general, making all the coefficients significant. The γ coefficient is significant at 99% level and strengthens the idea that news is important in the exchange ratereturn, implying that news is asymmetric. The positive sign shows that bad news increases the variance and has a leverage effect in the proper order. We can conclude that the second model is better than the first one for two reasons. First, the ARCH test shows that this model does not have ARCH effects in it, and second, it reflects a lower AIC statistics and higher log likelihood.

Table 4.4. Results for TGARCH(1,1,1) and TGARCH (1,1,2) models

	TGARCH(1,1,1)		TGARCH(1,1,2)	
	Coef.	Prob.	Coef.	Prob.
ω	5.9E-8	0.0000	2.9E-8	0.0000
α_1	0.2982	0.0000	0.4205	0.0000
α_2	–	–	-0.2842	0.0000
β	0.7478	0.0000	0.8690	0.0000
γ	0.0239	0.1926	0.0261	0.0082
Akaike info criterion (AIC)	-9.5902		-9.60604	
Log likelihood	15,012.67		15,038.46	
Durbin-Watson stat	1.8763		1.8763	
ARCH effect: Chi-sq.(lag=1)	4.9300	0.0264	0.0515	0.8204
Convergence achieved after	12 iterations		18 iterations	

Note: Dependent variable: Δln(EUR/ALL); Sample (adjusted): 2 – 3,131; Method: ML - ARCH (Marquardt) - Normal distribution.

Apart from the existence of the two types of news, the general literature on threshold GARCH discusses the different weights in the ARCH family models (Engel, 2004). The TGARCH(1,1,2) can be written as:

$$\sigma_t^2 = \omega + \alpha_1\varepsilon_{t-1}^2 + \alpha_2\varepsilon_{t-2}^2 + \beta\sigma_{t-1}^2 + \gamma\varepsilon_{t-1}^2 I_{t-1} \quad (6)$$

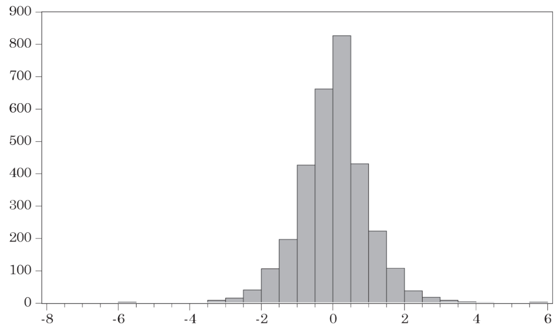
Bala and Asemota (2003) explain that these weights are calculated on the long run average, previous forecast, symmetric news and negative news. The weights presented in this model are: (1 – a1 – a2– β – γ/2, β, a1 + a2) and γ/2. When estimated in our model, the weights of exchange rate returns are: −0.01835, 0.869, 0.1363 and 0.01305. In the TGARCH model, 'good news' and 'bad news' have different effects on conditional variance. The impact of 'good news' is measured by (a1 + a2), while the impact of 'bad news' by (γ +a1 + a2). For the EUR/ALL exchange rate return, good news has an impact of 0.1363 while bad news has an impact of 0.1624. These values prove that good news and bad news do not have the same impact on the exchange rate returns, confirming the asymmetry of the news impact on our series.

Table 4.5 shows correlogram of standardized residuals and correlogram of squared standardized residuals for TGARCH(1,1,2) model. The results of the squared standardized residuals correlogram (performed until the 12 lag) show once again the absence of ARCH effect in the model. Moreover, since the coefficient of standardized residuals autocorrelation are significant while the coefficients for the autocorrelation of the standardized squared residuals are not significant, it proves that TGARCH(1,1,2) was properly chosen.

Table 4.5. Correlogram of standardized residuals and correlogram of standardized residuals squared for TGARCH(1,1,2) model

	Correlogram of standardized residuals				Correlogram of standardized residuals squared			
Lag	AC	PAC	Q-Stat	Prob.	AC	PAC	Q-Stat	Prob.
1	0.165	0.165	85.071	0.000	-0.004	-0.004	0.052	0.820
2	0.037	0.010	89.445	0.000	0.002	0.002	0.066	0.968
3	-0.025	-0.033	91.361	0.000	0.008	0.009	0.291	0.962
4	0.010	0.020	91.705	0.000	-0.014	-0.014	0.893	0.926
5	0.017	0.014	92.629	0.000	-0.022	-0.022	2.372	0.796
6	-0.014	-0.022	93.288	0.000	0.002	0.002	2.385	0.881
7	-0.029	-0.024	95.975	0.000	-0.026	-0.026	4.552	0.714
8	-0.025	-0.014	97.878	0.000	-0.013	-0.013	5.067	0.750
9	0.037	0.045	102.20	0.000	-0.007	-0.008	5.221	0.815
10	0.023	0.009	103.80	0.000	-0.004	-0.004	5.267	0.873
11	-0.002	-0.010	103.81	0.000	-0.013	-0.013	5.793	0.887
12	-0.040	-0.036	108.73	0.000	-0.014	-0.016	6.422	0.893

Figure 4.2 illustrates the distribution of the error term in the TGARCH(1,1,2) model. Although a first look at the graph may suggest that the distribution of the error term is normal, based on the previously discussed features of distribution (skewness, kurtosis and probability of Jarque-Bera statistic) we conclude that the error term in this model is not normally distributed.



Series: Standardized Residuals
Sample 2 3131
Observations 3130

Mean	0.016720
Median	0.034068
Maximum	5.681568
Minimum	-7.654804
Std. Dev.	1.001961
Skewness	-0.215203
Kurtosis	7.567525
Jarque-Bera	2744.949
Probability	0.000000

Figure 4.2. Histogram of the error term distribution of the TGARCH (1,1,2) model

5 CONCLUSION AND FURTHER RESEARCH

The importance of studying exchange rate has increased significantly with the continuous process of globalization affecting the entire world. Despite the considerable amount of studies on the issue of analyzing the source of exchange rate volatility and modeling it, several challenges arise constantly. The lack of other studies on the predictability of EUR/ALL exchange rate and the news impact on exchange rate volatility, with a specific focus on Albania, was the main drive of this research. Following a previous study conducted by Çera et al. (2013) to assess the value at risk of the EUR/ALL exchange rate, this paper focuses mainly on the news impact.

The results of descriptive statistics show that the EUR/ALL exchange rate return series is unpredictable, has fat tails and confirms volatility clustering. Our empiric analysis proves the existence of news impact on EUR/ALL exchange rate volatility and provides actual values for the good news and bad news. More importantly, the bad news has a considerable impact on the EUR/ALL exchange rate volatility, confirming previous researches.

A possible topic for further research on the issue remains the study of news impact of the ALL exchange rate with other foreign currencies, allowing for comparison of empirical results between different time frequencies: daily, weekly, and monthly. Another interesting idea for further research would be the study of the return of a portfolio composed by different currencies, while minimizing the level of exchange rate risk of ALL with other currencies.

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