modelling volatility in tourism returns

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Gönderim Tarihi: 21-Nis-2020 07:45PM (UTC+0300)
Gönderim Numarası: 1303743031
Dosya adı: modelling_volatility_in_tourism_returns_NoReferences.docx (54.13K)
Kelime sayısı: 5413
Karakter sayısı: 30530

VOLATILITY MODELLING FOR TOURISM SECTOR STOCKS IN BORSA İSTANBUL

Gülşah GENÇER ÇELİK[1]

ABSTRACT

This paper examines the volatility of the tourism sector in Borsa İstanbul in Turkey paying a special attention to the role of exchange rate exposure in the process. The GARCH, BJR (TARCH) and EGARCH models are employed to estimate the volatility in the stock returns of Turkish tourism firms using daily data from 02 January 2002 to 13 April 2020. The results suggest that: (i) compared to the GARCH and GJR model results, the EGARCH model provides valuable information on the volatility of returns in tourism sector and on the impact of exchange rate on stock returns; (ii) the impact of exchange rate risk on stock returns is significant and positive for 3 tourism firms and negative for 2 firms; (iii) the findings on volatility of stock returns indicate that the time dependent components of volatility is clearly more important than the time-independent component of volatility in predicting current volatility; (iv) the volatility of stock returns are highly persistent and the volatility at time t is more sensitive to past period volatility than past surprises in the market; (v) surprisingly, while there is no leverage effect, shocks have asymmetric effect on volatility implying that the impact of negative news do not outweigh positive news (or the impact of positive news on volatility is higher than the impact of negative news in the market).

Keywords: Turkish Tourism Industry; Volatility; Foreign Exchange Rate Risk; Stock Returns; ARMA, GARCH; GJR(TARCH); EGARCH Model

Jel Codes: G1, N2, C5

1. INTRODUCTION

Volatility is used to measure the dispersion of returns in the stock prices. The volatility of stock returns are affected by a large number of risk factors such as political instability, economic fundamentals, government budget deficits, economic policy changes, firm specific factors and so on. For tourism industry, exchange rate exposure can be considered as the most important risk factor that affect the stock return of tourism firms. For this reason, this study aims to investigate the volatility of the tourism firms' stock returns listed in Borsa İstanbul paying a special attention to the role of exchange rate exposure in the process. The subject matter is important for a number of reasons and of great interest to researchers on the subject, tourism firm managers, policy makers, and portfolio managers. For policy makers, being an important foreign exchange generating sector of the Turkish economy, the tourism sector plays a vital role in the balance of payments of economy. For managers, the subject is important because tourism sector is very sensitive to external shocks and especially the exchange rate shocks.

The impact of exchange rate exposure on stock returns might have a positive or negative effect. In this sense, we can identify four main channels through which exchange rate risk affects stock returns (Kasman et al., 2011; Olugbode et al. 2014): (1) According to the intertemporal capital asset pricing model and the Arbitrage Pricing Theory (APT), investors require additional compensation for bearing the risk of exchange rate changes and hence exchange rate sensitivities exert a significant impact on the common stocks of tourism firms; (2) Exchange rate exposure plays a vital role in the profitability of firms by influencing the value of a firm. Fluctuations in exchange rates can affect the value of the firm (Vardar et al., 2008; Kasman et al., 2011; Fauziah, Moeljadi and Ratnawati, 2015; Dornbusch and Fischer,1980), through influencing the cash flows of multinational firms, importers, exporters, and also purely domestic firms (Hyde, 2007; Lin,

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2012); (3) Maturity mismatch between the assets and liabilities of tourism firms and unexpected change in interest and exchange rates are considered as the key factors that lead to increase the risk exposure of the tourism firms; (4) the revenues, costs and profitability of tourism firms are directly influenced by the unexpected changes in exchange rates (Saunders and Yourougou, 1990). Depending on the net foreign positions of a firms' balance sheet, the unexpected movements in exchange rates can lead to gains or losses. For example, when foreign currency denominated liabilities exceed foreign currency denominated assets, the depreciation of the local currency may lead to damage in the firms' balance sheet and the deterioration of firms' equity may result in a decline in the tourism firms' stock return.

In recent years, it is often argued that volatility especially in financial markets have increased in line with financial globalization. Financial globalization intensifies volatility during the periods of high uncertainty, increases instability in a country facing external shocks and become a destabilizing factor in the economy (Çelik, 2019; Stiglitz, 2004; Cordella and Ospina Rojas, 2017; Kose et al., 2009; Umutlu et al., 2010). In particular, the higher volatility of Turkish Lira during crisis periods of 2008-2009 and 2013 has exerted an important effect on stock returns through increasing uncertainty, affecting exports, imports, foreign direct investment and portfolio investment decisions.

In the light of these discussions, this study models volatility of stock returns series of tourism firms in Turkey using ARMA-GARCH type models. The GARCH, GJR(or TARCH) and EGARCH models will be estimated using daily data of six tourism firms listed in Borsa İstanbul over the period of 2003-2020. The rest of this study is organized as follows. Section 2 reviews the relevant empirical literature on the relationship between stock returns of tourism firms and exchange rate. Section 3 provides the data subject to empirical analysis and introduces the empirical model employed in this study. Section 4 presents the findings obtained from estimating the GARCH, GJR(or TARCH) and EGARCH models. Section 5 concludes.

2. LITERATURE REVIEW

Over time, a vast amount of literature is accumulated on estimating of volatility in stock returns (Song, 1994; Mansur and Elyasiani, 1995; Flannery et al., 1997; Engle et al., 1990; Elyasiani and Mansur, 1998; Sehgal and Agrawal, 2017; Yamak et al., 2018; Çelik, 2019; Kasman et al., 2011; Olugbode et al., 2014, etc.). However, the number of empirical studies that investigate volatility in tourism sector is limited and most of these studies are undertaken at a sectoral level (Gokmenoglu and Hadood, 2019; Hsiao, 2017; Chang et al., 2013; Lee and Jang, 2010; Mohapatra, 2017).

Review of the empirical literature indicates that there are only few studies on the relationship between exchange rate exposure and stock return volatility in tourism industry, particularly at a firm level. Chang, et al., (2013) examines the size effects of volatility spillovers for firm performance and exchange rates in the Taiwan tourism industry using BEKK-AGARCH and VARMA-AGARCH models. The authors find that there are size effects on volatility spillovers from the exchange rate to firm performance and there is a negative correlation between exchange rate returns and stock returns.

In another study, Gokmenoglu and Hadood (2019) analyzed the volatility spillover between foreign exchange rate and tourism firm stock returns in China utilizing the BEKK-GARCH model. The results of the study indicate that there is bidirectional long-term spillover volatility between the variables under investigation. In their study for the US tourism firms, Obi, et. al., (2015) concluded that U.S. tourism firm stocks performance had only an adverse long-run association with expected risk proxied by S&P 500 implied volatility. Using the ARIMA model, Hsiao (2017) examines the effect of fourteen foreign currencies on twelve selected Taiwanese tourism firms' profitability. Results showed that return on assets (ROA) and return on equity (ROE) are differently and significantly affected by the exchange rate of Taiwanese currency against foreign currency fluctuations. By utilizing BEKK-AGARCH and GJR-AGARCH models, Chang et al. (2013) found out that there is a bidirectional size effect of long-term volatility spillovers between the

Taiwanese foreign exchange rate (against U.S. dollar and Chines Yuan) and large tourism firm stocks, while long-run volatility of small firms' stocks was only affected by Japanese long-term exchange rate volatility.

Review of the empirical studies related to Turkish tourism firms indicates that the empirical studies on the subject mainly aimed at measuring the financial performance of Turkish tourism companies with the help of financial ratios (Özçelik and Kandemir, 2015; Karadeniz and İskenderoğlu, 2011; Erdoğan, 2018; Güdük, 2018; Ergül, 2014).

Using a different methodology, Doğukanlı et al. (2010) investigated the exchange rate sensitivity of the main and sub-sector stock indices in the Borsa İstanbul in terms of Dollar and Euro currencies. They have used Johansen cointegration analysis. The results showed that there is a cointegration relationship between sectoral stock indices and exchange rates. Using a similar methodology, Soyaslan (2019) examined the relationship between exchange rate and BIST tourism stock index using cointegration analysis. She found out that there is a long-run cointegaration relationship between exchange rate and BIST tourism index.

In their study, Kutlu and Karakaya (2019) attempted to investigate the volatility of the Borsa Istanbul Tourism Index with the two-stage Markov Regime Change Autoregressive Conditionally Changing Variance model. The study was conducted between the periods of 02/05/2003 and 14/09/2018 in three periods, before the 2008 financial crisis, 2008 crisis and after the 2008 financial crisis. According to the results obtained with Markov Regime Change Autoregressive Conditional Variable Variance Model, Tourism index volatility could not return to the pre-crisis period. With the effect of the global crisis, the tourism index has volatility in all three periods and volatility in the post-crisis period is higher than in the pre-crisis period.

Different from previous studies, Kandil, Göker and Uysal (2020) examined the effect of exchange rate and interest rate on equity profitability for 6 tourism companies listed in the BIST. In their analysis, the long-term effect of exchange rate and interest rate on equity profitability of firms was examined by Maki Cointegration test, and the direction and coefficient of the effect were determined by DOLS estimator. The findings show that both systematic risk factors have a negative effect on the profitability of the listed tourism companies.

The review of the empirical literature on volatility of tourism stock returns shows that almost all studies on the subject are carried out at aggregate level and they differ significantly in terms of methodology they employed. Furthermore, the empirical studies that aimed at estimating volatility using firm level data in tourism sector are very limited in number.

3. DATA AND METHODOLOGY

3.1. Data

To examine the the volatility spillover between foreign exchange rates and tourism stock returns in Turkey, this study employed the data obtained from the Finnet Data Delivery System and electronic data delivery system of Turkish Central Bank of Turkey. Stock prices for a sample of five Turkish tourism firms' stocks listed on the Borsa Istanbul (BIST) are collected and calculated from the Finnet Data Delivery System. It is daily data for the period 02.01.2002 to 13.04.2020 with 4593 observations. The tourism firms that their data analysed includes AYCES, MAALT, MARTI, METUR, PKENT and TEKTU. These firms are chosen due to data availability. Dolar Exchange rate of Turkish Lira obtained from the electronic data delivery system of Turkish Central Bank of Turkey of the sample period. Returns on exchange rates (ER_t) and tourism firms stock prices (R_t) are calculated by taking the first difference in log prices as

$$R_t = [ln(P_t) - ln(P_{t-1})] * 100$$

where P_t and P_{t-1} are daily closing prices at time t and t-1 respectively.

Tablo 1 presents the descriptive statistics for each of the five tourism firms' stocks and Dolar/Turkish Lira exchange rate returns (ER). While the mean returns for tourism firms' stock returns are positive ranging from a 0.0092 (METUR) to 0.0708 (MAALT), volatilities in stock returns for tourism firms ranges from 3.0314% to 3.7393. However, the volatility of Dolar exchange rate of domestic currency is relatively small with the standard deviation of 0.895% compared to volatilities in stock returns. Furthermore, the results in Table 1 shows that all series subject to empirical analysis have a highly skewed (skewed to left) and leptokurtic distribution rather than normal distribution. The null hypothesis of normality is rejected for all series by the Jarque–Bera normality test.

Table 1. Descriptive Statistics, 02/01/2002-13/04/2020

	AYCES	MAALT	MARTI	METUR	PKENT	TEKTU	ER
Mean	0.0627	0.0708	0.0172	0.0092	0.0695	0.0281	0.033
Median	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.017
Maximum	19.6115	18.2322	20.2524	20.1637	19.2372	19.8851	14.706
Minimum	-17.6456	-19.5567	-20.0671	-21.8002	-21.3093	-21.7065	-11.931
Std. Dev.	3.0314	3.2035	3.1348	3.4206	3.7393	3.5740	0.895
Skewness	0.5731	0.6756	0.3962	0.5570	0.8467	0.2815	1.123
Kurtosis	9.1135	9.6691	8.3008	10.2680	8.5221	8.2628	32.692
Jarque-Bera	7402.56	8859.22	5496.36	10028.94	6383.10	5359.92	169651.70
Probability	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.000
Sum	288	325	79	41	319	129	153
Sum Sq. Dev.	42189	47115	45115	52078	64193	58644	3675
N. of Observations	4592	4592	4592	4452	4592	4592	4592

3.2. Unit Root Test

For a time series data, it is important to test for the stationarity of the data since non-stationary regressors may invalidate most of the standard empirical results (Engle and Granger 1987; Enders, 2015). In this study we used the Augmented Dickey-Fuller (ADF) test and Phillips-Perron tests to determine the level of integration of the variables of interest (see Dickey and Fuller, 1981; Phillips-Perron, 1988). For each of the variables subject to empirical analysis, both ADF and PP statistics were calculated for the series including, no intercept and no trend, intercept, and intercept and trend in the underlying Phillip-Perron and Dickey-Fuller regressions. Table 2 presents the unit root test results. Inspection of the results Table 2 shows that the hypothesis of a unit root for all series are rejected at 1% level of significance indicating that the all series are stationary.

Table 2. Unit Root Test Results

	ADF (τ)	ADF(τ_{μ})	ADF$(\tau_{\mu+t})$	PP(τ)	PP(τ_{μ})	PP$(\tau_{\mu+t})$
AYCES	-43.4855*	-43.4829*	-43.4665*	-65.0387*	-65.0332*	-65.0396*
MAALT	-64.1807*	-64.1752*	-64.1589*	-64.5020*	-64.4961*	-64.4944*
MARTI	-68.0646*	-68.0577*	-68.0707*	-68.0709*	-68.0641*	-68.0769*
METUR	-61.8159*	-61.8119*	-61.8226*	-62.1397*	-62.1348*	-62.1461*
PKENT	-51.6484*	-51.6447*	-51.6251*	-70.6785*	-70.6745*	-70.6315*
TEKTU	-66.0488*	-66.0437*	-66.0526*	-66.2695*	-66.2628*	-66.3024*
ER	-62.6675*	-62.7364*	-62.5932*	-62.5454*	-62.6106*	-62.5066*

Note: ADF and PP refer to the Augmented Dickey-Fuller (1981) and Phillips-Perron (1988) unit root tests. The lag lengths in the ADF and PP regressions are determined by the Schwarz Information Criteria (SIC). Asterisks (*,**,***) shows the 1%, 5%, and 10% the level of significance.

3.3. Empirical Model

To examine the volatility of the tourism sector in Borsa İstanbul in Turkey paying a special attention to the role of exchange rate exposure in the process, the GARCH-type (Generalized Autoregressive Conditional Heteroscedasticity) models are estimated. The reason for choosing the GARCH-type models is that volatility and changing variance are characterized as the nature of high frequency economic and financial time series. The GARCH-type models provide a relevant framework to model the presence of heteroscedasticity as a conditional variance. Since the GARCH models treat conditional heteroskedasticity as a variance to be modeled rather than as a problem to be corrected, the GARCH-type models can be used to estimate the relationship between exchange rate and stock returns of tourism firms as a conditional variance process. In empirical studies, the GARCH model (Bollerslev, 1986), the BJG (or TARCH) model (Glosten, Ravi, and Runkle, 1993), and the EGARCH model (Nelson, 1991) are widely used models in modeling the volatility in return series. Three GARCH models will be estimated in this paper, namely the GARCH, GJR (or TARCH), and EGARCH. The model specifications of these models can be briefly explained as follows. These models have two components, conditional mean and the conditional variance specifications.

3.3.1. Conditional mean specification

$$R_t = a_0 + a_1 R_{t-1} + a_2 R_{t-2} + \theta ER_t + u_t - \delta u_{t-1} \qquad (1)$$

$$u_t | I_{t-1} \sim N(0, h_t)$$

where R_t represents daily stock price returns and ER_t is percentage change in daily exchange rate at time t. u_t represents normally distributed error terms with mean zero and the conditional variance of h_t.

3.3.2. Conditional variance specification

The GARCH model (Bollerslev, 1986) treats the conditional variance as a function of its own lags as well as lagged shocks to stock price returns. The conditional variance equation for GARCH(1,1) model can be stated as (Enders, 2015):

$$h_t = \omega + \alpha u_{t-1}^2 + \beta h_{t-1} \qquad (2)$$

where h_t is the conditional variance, namely a one-period ahead estimate (or forecast) of the conditional variance based on past information, ω is a constant term, and u_{t-1}^2 measures the shocks in volatility. h_{t-1} is the forecasted variance from yesterday. To ensure that the conditional variance is positive, the parameter estimates should be as $\omega > 0, \alpha \geq 0, \beta \geq 0$. Furthermore, the necessary and sufficient condition that $\alpha + \beta < 1$ should hold for the existence of the second moment of u_t for GARCH(1,1).

The GARCH model is widely used model in practice since it is possible to model very complex conditional variance processes using only a fewer parameters. However, it does not incorporate the asymmetric volatility. In other words, the GARCH model enforces asymmetric response of volatility to positive and negative shocks of equal magnitude.

3.4. GJR-GARCH Model

The GJR or TARCH model develped by Glosten, Ravi & Runkle (1993) incorporate asymmetric volatility. The GJR model is an extension of the GARCH model with an additional term added to account for possible asymmetries. The advantages of the GJR model is that the asymmetric effects of positive and negative shocks are directly modeled, simpler to implement in practice and provides a better performance in forecasting volatility (Liu & Hung, 2010). The conditional variance of the GJR (or TARCH) model is given by:

$$h_t = \omega + \alpha u_{t-1}^2 + \beta h_{t-1} + \gamma u_{t-1}^2 D_{t-1} \qquad (3)$$

$$D_{t-1} = 1 \; if \; \varepsilon_{t-1} < 0$$

$$D_{t-1} = 0 \; if \; \varepsilon_{t-1} \geq 0$$

where h_t is the conditional forecasted variance, ω is the intercept for the variance, u_{t-1}^2 is the variance that depends on previous lag error terms, h_{t-1} is the forecasted variance from yesterday and D_{t-1} is a dummy variable that takes 1 for negative shocks and 0 zero for positive shocks. To make sure that the variance, $h_t > 0$, the sufficient conditions involve $\omega > 0, \alpha \geq 0, \beta \geq 0$, and $\alpha + \gamma \geq 0$.

The coefficients in Equation 3 provide rich interpretation related to volatility of returns. The γ parameter provides information about possible asymmetric effect in data: If $\gamma = 0$, there is no asymmetric volatility, If $\gamma > 0$ negative shocks will increase risk (volatility) more than positive shocks of the same magnitude, and If $\gamma < 0$, positive shocks increase the volatility more than negative shock. The total effect of a negative shock is equal to $(\alpha + \gamma)$ and a positive shock is equal to α. β captures the effects of persistence of shocks on volatility of returns.

3.5 EGARCH Specification Of The Conditional Variance

The EGARCH model developed by Nelson (1991) provides an alternative specification for the conditional variance. This specification has a number of important advantages (superior features) compared to GARCH and GJR conditional variance models. Because the logarithm of conditional volatility, $\ln(h_t)$, is modeled, the conditional variance is always be positive and there is no need to artificially impose non-negativity constraints on the model parameters. The condition that $|\beta| < 1$ is a sufficient condition for the existence of moments, for consistency and for asymptotic normality of the EGARCH(1,1) estimators (Chang et. al., 2014). The EGARCH variance equation can be written as:

$$\ln(h_t) = \omega + \alpha \left| \frac{u_{t-1}}{\sqrt{h_{t-1}}} \right| + \gamma \frac{u_{t-1}}{\sqrt{h_{t-1}}} + \beta \ln(h_{t-1}) \qquad (4)$$

where $\ln(h_t)$ represents the logarithm of conditional variance at time t, ω is the intercept for the variance, β is the coefficient for the logged GARCH term ($\ln(h_{t-1})$) indicating the persistence of shocks, γ is the scale of the asymmetric volatility. If $\gamma < 0$ and significant, it indicates the presence of leverage effect. The leverage effect refers to the negative correlation between an asset return and its volatility. In this sense, $\gamma < 0$ shows that bad news (or negative shocks) generate larger volatility than positive shocks. However, if γ is not significant, then there is no asymmetric volatility. If $\gamma > 0$ and significant, this means that positive shocks increase the volatility more than negative shocks. The coefficient $\alpha > 0$ represents the tendency of shocks to persist and shows the presence of volatility clustering. That is, volatility tends to rise when $\left|\frac{u_{t-1}}{\sqrt{h_{t-1}}}\right|$ is larger and vice versa.

4. FINDINGS OF THE STUDY

This section provides the empirical findings on the impact of exchange rate on Turkish tourism firms' stock returns obtained from estimating the GARH, TARCH and EGARCH models given in Equations 2, 3 and 4. As mentioned in section 3, the presence of heteroscedasticity or clustering of observations in error terms invalidates the standard econometric results. In such cases, the GARCH-type models provide a very useful framework to model volatility in the series. Before estimating the GARCH-type models, we first formulated and estimated the suitable ARMA model given in Equation 1 for the stock returns of tourism firms and then tested for the presence of clustering of error terms. Table 3 presents the findings on ARMA models. The type of ARMA models are determined by Scwarz Information Criteria. The results given in Table 3 shows that the exchange rate has a positive and significant effect on tourism firms' returns for only two firms out of six cases. The diagnostic statistics related to ARMA models indicate that while the null hypothesis of no autocorrelation is not rejected, Jarque-Berra statistics shows that normality hypothesis is rejected for all equations. More importantly, the results indicate that there are significant ARCH effects in errors for all equations.

Table 3. The Impact Of Exchange Rate On Tourism Firms' Stock Returns: The Estimation Results Of The ARMA Model

	AYCES	MAALT	MARTI	METUR	PKENT	TEKTU
a_0	0.0577 (0.0509)	0.0678 (0.0501)	0.0189 (0.0463)	0.0052 (0.0564)	0.0726 (0.0456)	0.0277 (0.0528)
θ	0.0988** (0.0506)	0.0576 (0.0540)	-0.0530 (0.0517)	0.1035*** (0.0587)	-0.0935 (0.0621)	0.0117 (0.0590)
a_1	0.0522* (0.0149)	0.0580* (0.0150)		-0.0455 (0.1930)	0.6791* (0.0984)	
a_2	0.0722* (0.0148)			-0.2715** (0.1293)		
δ_1				0.1248 (0.1902)	-0.7346* (0.0908)	
δ_2				0.3320* (0.1221)		
F-statistic	12.8584*	7.3239*	1.0499	8.6775*	8.7235	0.0393
χ^2_{JB}	6604.04*	8160.36*	5914.91*	8410.24*	7301.17*	5365.98*
$\chi^2_{auto}(7)$	11.3432	8.6167	2.6456	11.0643	9.1109	8.4813
SIC	5.0546	5.1682	5.1262	5.2959	5.4773	5.3887
ARCH(7)	450.94*	439.70*	278.53*	510.90*	513.77*	374.12*

Note: Coefficients refer to the estimates of the following ARMA model: $R_t = a_0 + a_1 R_{t-1} + a_2 R_{t-2} + \theta ER_t + u_t - \delta_1 u_{t-1} + \delta_2 u_{t-2}$
F-Statistic represents overall significance test. SIC, χ^2_{JB}, $\chi^2_{auto}(7)$, ARCH(7) stand for the Schwarz information criterion, Jarque-Berra normality test, Breusch-Godfrey Serial Correlation LM Test, ARCH test, respectively.

Numbers in parentheses indicate standard errors *, **,*** indicate the significance level at 1%, 5% and 10% respectively.

Having found that volatility clustering in error terms are important, the GARCH-type models which handle volatility are estimated to determine the impact of exchange rate on stock returns of tourism firms. As mentioned above, three different GARCH-type models are estimated. The estimation results obtained from the GARCH model given in Equation 2 is presented in Table 4. The examination of Table 4 shows that the coefficient of exchange rate risk variable is significant for only three tourism firms out of six. The exchange rate changes have a positive and significant effect on stock returns for only one firm. This indicates that an increase in exchange rate contributes positively to earnings of tourism firms causing their stock prices to rise. Interestingly, the exchange rate risk has a negative and significant effect on stock returns of 2 firms implying that these firms suffer significant losses from depreciation of Turkish lira.

The estimation results related to conditional variance equation are given in Table 4. The results indicate that non-negativity condition, the covariance stationarity and stability conditions are satisfied since the ω, α, and β coefficients are positive and $\alpha + \beta < 1$. The results also shows that the time-independent component of volatility (ω) is positive and statistically significant for all tourism firms indicating that volatility is important integral part of return generating process in tourism industry. The coefficients on the time-dependent ARCH (α) and GARCH (β) components of volatility are positive significant for all cases. These findings provide important insight about the sources and the timing of volatility of tourism stock returns. First, the short-run persistence of shocks (new surprises) to returns (ARCH effect, α) parameter is smaller than the long-run persistence of a previous period's forecast variance (GARCH effect, β). Second, the value of α and β parameters are very close to unity suggests that shocks to the tourism stock returns at time t have highly persistent effects implying that shocks to volatility dissipates slowly.

Table 4. The GARCH Model Estimates of Tourism Stock Returns Model

	AYCES	MAALT	MARTI	METUR	PKENT	TEKTU
Coefficient	**Mean Equation**					
a_0	0.0440 (0.0339)	0.0228 (0.0417)	0.0133 (0.0374)	0.0017 (0.0402)	-0.0395 (0.0335)	0.0221 (0.0467)
θ	0.1206* (0.0383)	0.0622 (0.0471)	-0.0931** (0.0455)	0.0341 (0.0395)	-0.0702*** (0.0412)	0.0436 (0.0461)
a_1		0.0521* (0.0162)	-0.0617* (0.0164)		0.5232* (0.0947)	
δ					-0.6247* (0.0868)	
Coefficient	**Variance Equation**					
ω	1.0044* (0.0404)	0.4378* (0.0173)	0.7862* (0.0574)	1.2393* (0.0562)	1.7614* (0.0684)	0.4469* (0.0281)
α	0.2745* (0.0116)	0.1243* 80.0055)	0.1443* (0.0091)	0.2410* (0.0119)	0.3201* (0.0136)	0.0941* (0.0046)
β	0.6497* (0.0103)	0.8410* (0.0048)	0.7798* (0.0117)	0.6782* (0.0107)	0.6013* (0.0110)	0.8739* (0.0046)

Note: Coefficients refer to the estimates of the mean and variance equations of the following ARMA-GARCH(1,1) model: Mean Equation: $R_t = a_0 + a_1 R_{t-1} + a_2 R_{t-2} + \theta ER_t + u_t - \delta u_{t-1}$; Variance Equation: $h_t = \omega + \alpha u_{t-1}^2 + \beta h_{t-1}$.
Numbers in parentheses indicate standard errors *, **,*** indicate the significance level at 1%, 5% and 10% respectively

Table 5 presents the estimates obtained from GJR (TARCH) model of tourism returns given in Equations 1 and 3. Examination of the mean equation shows that the impact of exchange rate risk on stock returns are exactly the same as the findings of the GARCH model. In this sense, the GARCH and GJR models provide similar results. In terms of volatility of stocks, however, as mentioned above, the GARCH model implicitly assumes that the effects of negative and positive shocks have symmetric and same effects on conditional variance (volatility) of stock returns. However, the empirical studies indicate that negative shocks (bad news or shocks that cause stock prices to decline) have greater effect on conditional volatility than positive innovations (good news or shocks that lead stock prices to rise) of the same magnitude. In this sense, the GJR model provides further information about the importance of asymmetric effects of shocks in addition to the ARCH and GARCH effects of the GARCH model. act of negative and positive shocks to stock return. The examination of Table 5 shows that ARCH and GARCH parameters are positive and significant for all tourism firms' returns. This indicates that the volatility is changing by time and the impact of positive past surprises ($\alpha's$) and past volatility ($\beta's$) have highly persistent effect on current volatility (current conditional variance) of returns as in the GARCH model in Table 4. More importantly, although its magnitude is small, the parameter, γ, which represents possible asymmetric effect in data, is negative and significant and negative for only 3 out of 6 tourism firms. Since the total effect of a negative shock is equal to $(\alpha + \gamma)$ and a positive shock is equal to α, as mentioned above, the negative, γ, parameter indicate that positive shocks increase the volatility of returns more than negative shocks of the same magnitude. β captures the effects of persistence of shocks on volatility of returns.

Table 5. The GJR (TARCH) Model of Tourism Stock Returns Model

	AYCES	MAALT	MARTI	METUR	PKENT	TEKTU
Coefficient	**Mean Equation**					
a_0	0.0438 (0.0378)	0.0318 (0.0433)	0.0167 (0.0389)	0.0188 (0.0454)	-0.0155 (0.0368)	0.0259 (0.0478)
θ	0.1206* (0.0384)	0.0635 (0.0472)	-0.0928** (0.0455)	0.0358 (0.0392)	-0.0725*** (0.0405)	0.0446 (0.0460)
a_1		0.0526* (0.0161)	-0.0613* (0.0165)		0.5190* (0.0944)	
δ					-0.6226* (0.0862)	
Coefficient	**Variance Equation**					
ω	1.0044* (0.0405)	0.4196* (0.0169)	0.7671* (0.0560)	1.2381* (0.0561)	1.7419* (0.0668)	0.4334* (0.0271)
α	0.2743* (0.0146)	0.1309* (0.0079)	0.1456* (0.0102)	0.2648* (0.0160)	0.3596* (0.0179)	0.0958* (0.0058)
γ	0.0005 (0.0192)	-0.0225* (0.0087)	-0.0085 (0.0118)	-0.0488* (0.0172)	-0.0979* (0.0230)	-0.0067 (0.0072)
β	0.6497* (0.0103)	0.8462* (0.0048)	0.7842* (0.0114)	0.6782* (0.0108)	0.6059* (0.0106)	0.8764* (0.0044)

Note: Coefficients refer to the estimates of the mean and variance equations of the following ARMA-GARCH(1,1) model: Mean Equation: $= a_0 + a_1 R_{t-1} + a_2 R_{t-2} + \theta ER_t + u_t - \delta u_{t-1}$; Variance Equation: $h_t = \omega + \alpha u_{t-1}^2 + \beta h_{t-1} + \gamma u_{t-1}^2 D_{t-1}$. Numbers in parentheses indicate standard errors. *, **,*** indicate the significance level at 1%, 5% and 10% respectively

Table 6 present estimation results of the EGARCH model of the stock returns of tourism firms given in Equations 1 and 4. The mean equation given in Table 6 suggests that the exchange rate risk variable exerts a significant impact on stock returns of 5 tourism firms out of 6 firms. The sign of the exchange rate risk coefficients are significant and positive in 3 cases and significant and negative in 2 cases. Compared to the GARCH and GJR model results, the EGARCH model performs better in the estimation of exchange rate stock return relationship. Evaluation of the estimates of the variance equations in Table 6 provides a number of important information about the volatility of stock returns. First the results show that the coefficient that represents the time independent component of volatility (ω) is small in magnitude, positive and statistically significant in only three cases. However, the ARCH and GARCH components, α and β respectively, are large and significant in all cases. These findings imply that the time dependent components of volatility are more important than the time-independent component of volatility. Second, the significant and positive ARCH coefficient, α, imply the presence of volatility clustering and of the tendency of shocks to persist. The GARCH coefficients ($\beta's$) are positive, significant and less than one for tourism firms. This suggests that the volatility in tourism stock returns are very persistent meaning that the volatility remains high and will dissipate very slowly over time. The results in Table 6 shows that the coefficients, γ, which represents the asymmetric and leverage effects of shocks to current volatility, are positive and significant in five out of six cases. The positive and significant γ coefficient suggests that there is no leverage effect and that only asymmetric effects exist implying that the impact of positive news on current volatility is larger than negative news of the same magnitude.

Table 6. The EGARCH Representation Of Tourism Stock Returns Model

	AYCES	MAALT	MARTI	METUR	PKENT	TEKTU
Coefficient	**Mean Equation**					
a_0	0.0631** (0.0312)	0.0366 (0.0354)	0.0043 (0.0347)	-0.0199 (0.0359)	-0.0737 (0.0267)	0.0257 (0.0443)
θ	0.1089* (0.0382)	0.0718*** (0.0424)	-0.1096* (0.0390)	0.0816 (0.0352)	-0.0549*** (0.0336)	0.0410 (0.0451)
a_1		0.0379** (0.0151)	-0.0676* (0.0158)	-0.0403 (0.0160)	0.5040* (0.0681)	
δ					-0.6237* (0.0591)	
Coefficient	**Variance Equation**					
ω	0.0002 (0.0068)	0.0444* (0.0056)	0.0024 (0.0103)	0.0136 (0.0101)	0.0862* (0.0141)	0.0348* (0.0072)
α	0.4273* (0.0124)	0.3073* (0.0104)	0.2769* (0.0117)	0.3958* (0.0135)	0.4869* (0.0137)	0.2093* (0.0077)
γ	0.0169*** (0.0087)	0.0259* (0.0064)	0.0170* (0.0068)	0.0324* (0.0080)	0.0516* (0.0098)	0.0070 (0.0051)
β	0.8537* (0.0054)	0.9237* (0.0029)	0.9080* (0.0062)	0.8740* (0.0054)	0.8278* (0.0071)	0.9545* (0.0030)

Note: Coefficients refer to the estimates of the mean and variance equations of the following ARMA-GARCH(1,1) model: Mean Equation: $R_t = a_0 + a_1 R_{t-1} + a_2 R_{t-2} + \theta ER_t + u_t - \delta u_{t-1}$; Variance Equation: $\ln(h_t) = \omega + \alpha \left|\frac{u_{t-1}}{\sqrt{h_{t-1}}}\right| + \gamma \frac{u_{t-1}}{\sqrt{h_{t-1}}} + \beta \ln(h_{t-1})$. Numbers in parentheses indicate standard errors. *, **,*** indicate the significance level at 1%, 5% and 10% respectively.

It should also be noted that the statistical inferences carried out above about the tourism stock return models are valid inferences since the stock return series subject to empirical analysis satisfy the non-negativity, stability and stationarity conditions. As seen from Tables 4, 5, and 6, the stationarity conditions of $\alpha + \beta < 1$ and $|\beta| < 1$ for the EGARCH model, and a non-negativity condition of $\alpha > 0$ *and* $\beta > 0$ for the GARCH and GJR models, are satisfied. These sufficient conditions make sure that the Quasi-Maximum Likelihood Estimators (QMLE) are consistent and asymptotically normal (Chang et al., 2014; McAleer et al., 2007).

5. Conclusion

This study examined the impact of exchange rate risk on stock returns for Turkish tourism firms listed in Borsa İstanbul. To cope with the time varying properties of volatility, the ARMA model of tourism stock returns are estimated with the GARCH, GJR(or TGARCH) and EARCH variance specifications. The estimation results showed that the EGARCH model delivered valuable information on the impact of exchange rate risk on stock returns of tourism firms by handling volatility in stock return series properly. The results indicate that the effect of an increase in exchange rate risk differ among tourism firms significantly. While the impact of exchange rate risk on stock returns of tourism firms is positive and significant for 3 cases, it is negative and significant for 2 firms. The empirical findings on volatility of stock returns obtained from variance equation indicates that the time dependent components of volatility is clearly more important than the time-independent component of volatility in predicting current volatility in all models. Furthermore, the results suggest that the volatility of stock returns are highly persistent and the volatility at time t is more sensitive to past period volatility than past surprises in the market. Surprisingly, the sign of the γ coefficient, which shows the asymmetry of shocks on volatility, is negative in the GJR model and positive in the EGARCH model suggesting that the impact of negative news do not outweigh positive news or that the impact of positive news on volatility is higher than the impact of negative news in the market. This suggest that while positive innovations like a market boom rises volatility of returns, negative innovations like market stagnation leads to a decline in volatility. This rather surprising finding requires further analysis on stock returns of Turkish tourism firms.

modelling volatility in tourism returns

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