

## PAPER DETAILS

TITLE: Do Indices Matter? The Influence of Exchange Volatility on Turkish Export Index (TIMEX)

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**Do Indices Matter? The Influence of Exchange Volatility on Turkish Export Index (TIMEX)**  
**Endeksler Önemli mi? Döviz Kuru Oynaklığının Türkiye İhracat Endeksi (TIMEX) Üzerindeki Etkisi**

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**Abstract**

*This study examines the effects of daily US dollar returns on the short-term spill of TEA (Turkish Exporters Assembly) export index (TIMEX) returns. The uniqueness of this empirical paper is investigating the influence of indices of that are specifically designed for exporting companies. First, we concluded that there is no asymmetric spread using the modified general autoregressive conditional heteroscedasticity (GARCH) (1,1)-M model. Then, the existence of asymmetric spread was investigated with GJR-GARCH (1,1)-M model and we obtained strong evidence that there is an asymmetric spread from dollar returns to TEA export index returns.*

**Keywords:** TIMEX, MV-GARCH, Volatility Spillover

**Öz**

*Bu çalışma günlük dolar getirilerinin, TİM ihracat endeksi (TIMEX) getirilerine kısa vadeli yayılma etkilerini incelemektedir. Bu ampirik araştırmayı benzerlerinden farklı kılan en belirgin özelliği sadece ihracat yapan şirketler için tasarlanan bir endekslerin etkisini araştırıyor olmasıdır. İlk olarak değiştirilmiş genel otoregresif koşullu değişen varyans (GARCH)(1,1)-M modeli kullanarak asimetrik bir yayılmanın olmadığı sonucuna vardık. Ardından asimetrik yayılmanın varlığı GJR-GARCH(1,1)-M modeli ile araştırılmış olup, dolar getirilerinden TİM ihracat endeksi getirilerine doğru asimetrik yayılmanın olduğuna dair güçlü kanıtlar elde ettik.*

**Anahtar Kelimeler:** TIMEX, MV-GARCH, Oynaklık Yayılımı

**Introduction**

The geographical discoveries that started in the 15th century, increased the business and transactions on the world trade flows with the Industrial Revolution after the 16th century, and these expectations has brought great increases in world trade and investment volume with technologic improvements and positive developments in transport infrastructure (Brezis, 1995).

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In the early 20th century, the phenomenon of globalization began to accelerate these trade volumes more with foreign trade policy instruments such as foreign exchange controls, customs duties and nontariff instruments. By this means, the gates of international trade have helped the build of an inclusive and open world economy (Chase, Kawano and Brewer; 2000). The acceleration of global trade agreements supported international trade flows and made the trade balance of the world economy responsive to exchange rate changes in the light of economic and social developments. The management of neoliberal policies in the world of the 21st century and the open macroeconomic policies of the countries made fundamental examination a necessity. This has made it necessary to examine it for basically two reasons (Swank, 2006; Hacker and Hatemi-J, 2004).

Firstly, policymakers often see trade balance as intertemporal trade, which is the best way to refer to time-based decision-making processes. This is how to model time preferences and how to determine the most appropriate level for this, and how to manage the conveyance of this concern. Because knowing how the change in exchange rates affects the trade balance in the long term, helps these policy makers to target the trade balance in that period.

The second is the fluctuations in trade equilibrium stemming from economic stability, in other words they want to foresee how they will affect their national income in the short term. Therefore, understanding how the exchange rate impacts the trade balance may help the policy makers targeting national income (Thirlwall, 2003). At this point, economists (Aghion et al., 2009) have long demonstrated that the short- and long-term effects of exchange rate represent a wide quite different. In addition, one of the reasons that these different effects may occur is that the amount or volume of trades usually pass slowly or reactively in order to adjust to exchange rate movements.

The volatility of these exchange rates, which shape the global trade volume, can basically change the amount of exports and imports, as well as show that the imbalance of payments can completely neutralize one side. For example, since the exchange rate against imports will increase import prices, the trade balance in local currencies can trigger a decrease or increase in domestic trade first in response to the depreciation (or devaluation) of the local currency (Gust, Leduc and Vigfusson, 2010). However, due to the relative cheapening of the local currency over time, more volumes of goods can be exported, resulting in less imports, at which point the foreign trade balance may experience a positive decomposition. However, as a result of the decrease in the value of the national currency against other currencies, purchasing power weakens (Haidar, 2011), and the price of imported goods has increased for the country that will make the purchase and therefore, it can be difficult to achieve a sustainable foreign trade-exchange relationship in the long term.

Traditionally, the effect of the depreciation of the exchange rate on the trade balance of the country is handled under the Marshall-Lerner condition and within the structure called J curve. Marshall-Lerner condition and J curve were tested in many studies (Panda and Reddy, 2016). Bahmani-Oskooee and Rahta (2004) give a very good and extensive literature regarding the studies and the results obtained on this subject.

Theoretically, the real exchange rate (RER) is a major economic indicator of a country's international competitiveness, as it is an important determinant of exports and imports. In this regard, the Marshall-Lerner condition states that if the sum of the import and export elasticities at the exchange rate is over than one, the devaluation increases the trade balance (Hacker and Hatemi-J, 2004, Rose, 1990). After the emergence of this theory, various studies have been conducted in developed and developing countries in last 70 years. However, the current empirical literature, especially in developing countries, has not yet included a study of the relationship between the exchange rate and trade balance in favor of exports or the indices level of the largest exporters.

Looking at Turkey's economy which is considered as an emerging market economy, it has ended the traditional foreign trade policy stabilization program as of January 24, 1980 and has been embraced export-oriented economic development model and policy. Exports continue to increase as years of incentives for the development and deepening of the imports in this period was also the case in an open economy based on exports liberalization of foreign trade relations of the Turkey (Kirişçi and Kaptanoğlu, 2011).

As the foreign trade that captures great momentum since the beginning of the 2000s, Turkey's economy grew gradually in line with the stability and growth targets each year and has become competitive in the international economy. The volume of a foreign trade has reached \$ 157 billion from \$ 30 billion in 2002 to 2015 and has become an indispensable component of economic growth policy (Acemoglu and Ucer, 2015). Shown interest in the foreign trade policy of Turkey's economy, the acceleration of export volume and gaining a competitive structure in the international markets there are significant reasons for the gain. These; Undoubtedly, it is the result of the formation of many exporting companies to which the public offering is made and with the increase in the institutionalization level of these companies, the acquisition of national / international investors. Otherwise, foreign trade balance may decompose negatively as internationalization weakens in open economies.

Hence in this study, CBT USD / TL purchase price with the balance of foreign trade in particular literature, similar studies without Borsa Istanbul of the relationship of these variables (BIST) Turkey Exporters Assembly (TIM) Index (TIM Export Index - TIMEX) and the analysis of the impact of the volatility of the relationship is intended to be .

Related to this subject in the domestic and foreign literature (Gust, Leduc and Vigfusson, 2010; Chit, Rizov and Willenbockel, 2010; Li, Ma and Xu, 2015), the variables discussed are concentrated on real exchange rate, import price index and export price index. This study analyzes the relationship between the exchange rate and the TIM Export Index in addition to and different from other studies. The relationship between the specified variables in the study, is examined using volatility spread for Turkey's economy daily data of 2013:1-2018: 4 period.

### **Literature Review**

There are many studies examining the relationship between exchange rate volatility and export performance on a firm and industry or macro-economic level. What distinguishes this paper

from similar studies is that for the first time, it compares the exchange rate volatility with an export-oriented index which covers various sectors and firms. One of the groups most affected by the exchange rate fluctuations in an economy is the exporting companies. Therefore, the main purpose of this study is to examine the effects of fluctuations in exchange rates on indexes, which only include exporting firms, rather than general, regional or sectoral based indices. Recent studies after the year 2000 investigating the influence of exchange volatility on stock exchange indices are very scarce. Furthermore, there are almost no studies addressing the indices that are specifically designed for exporting companies.

Besides the gap in the literature, indices covering the top export companies are almost nonexistent. Common index series such as FTSE 100, FTSE 250, S&P 500 Index, Dow Jones Global Titans 50, Hang Seng Index, etc. are tracking the companies according to their weight in the indices and sector breakdown. We found out that there is no stock market sub-index especially listing exporting companies except Borsa Istanbul TIM Export Index (TIMEX) in Turkey. Accordingly, our literature review is constructed on relevant papers investigating the influence of exchange volatility on various stock exchange indices.

Chou (2000) analyzed China for the rise and fall in the exchange rates. The main area of research was the record of China exports. The rate of exchange can be measured on the base of the conditional model. In order to measure the effect of models a policy for exchange rate was defined. The data for the analysis were collected from 1981 to 1994. Various categories were used to manage the data. Break analysis as carried out to measure significant for each variable. It was found from the study that ER has a detrimental effect on exports of the country. This can be justified with the use of ARDL model. Moreover, the uncertainty of trade can be applied to China owing to its policies for business (Chou, 2000).

In the period of floating exchange rates between 1974 and 1978, a study (Aggrawal, 2003) revealed that the stock exchange prices of NYSE, S&P 500, DC 500 indices and exchange rates showed a positive correlation.

Grambovas (2003) also made a significant contribution to the research field of volatility and equity markets were in regard to economics. The study conducted an empirical analysis for the exchange rate and targeted the financial markets of Europe as well as Greece and Hungary. The study used theoretical consideration for value and stable that the exchange rate has a direct effect on company operations (Grambovas, 2003). A long-run methodology was used for measuring the exchange rate. A multivariate methodology was used for the main area of research. It was found from the research that policymakers should emphasis on the exchange rate for business. It can help to attract investors and create a reform in the stock market (Grambovas, 2003).

An important element regarding import and export is investigated by Pritamani and Shome (2004). Its major focus was on the existing literature which raised the value for companies and macroeconomic variables. The study proposed a dual-purpose hypothesis (Pritamani and Shome, 2004). It was mentioned in the research paper that the domestic economy effects

corporate world. Company exports are based on demand. It was found from the study that negative exposures tend to decline the investment for companies. Univariate regression was used in the research paper. The study also found out insignificant results for stock markets and weighed portfolios. The authors focused on the portfolio choice for a company (Pritamani and Shome, 2004).

In an empirical study (Pan, Fok and Liu, 2007) covering seven East Asian countries, found that there is a casual relationship from exchange rates to stock prices except Malaysia. In opposite, another study (Zhao, 2010) using VAR and MGARCH models showed that there is no consistent long-run equilibrium association between real Renminbi rates (Chinese Yuan) and stock exchange prices.

Kasman and Vardar (2011) provided research for the ER and its impact on stock returns. The base represented information from Turkey. It was stated in the paper that interest and foreign exchange rates tend to impact on country trade based on an OLS model of the stock returns. The exchange rate was the major determinant of the stock return. The major evidence was based on variation in rate and exposure of new risk to the country (Kasman and Vardar, 2011). The findings of study were useful in practical sense and can provide a future incentive for potential investors.

Ya-qiong and Chuan-bao (2012) studied the impact of exchange rate fluctuation in China on the listed local corporations for the stock return. The study used panel data based on 2005 and evaluated the stock returns for the exchange risk (Ya-qiong and Chuan-bao, 2012). The companies involved were the Shanghai and Shenzhen stock exchange. It was found from the study that sample companies of China had strong exposure to foreign exchange and change in currency has the potential to damage companies' stock prices. It was also stated from research that the exchange rate has the potential to affect company value. It can be inferred from the research that if company size is larger it will directly affect the stock returns (Ya-qiong and Chuan-bao, 2012).

Mlambo and Maredza (2013) carried out research for the exchange rate volatility on the South African market. Johannesburg Stock Exchange was analyzed for the study. An empirical model was constructed for the whole variable and market performance was measured with the help of GARCH model. The data was collected from 2000 to 2010 and included number of observations for currency and stock volatility. The findings of the paper were supported by previous research. One of the main points was the correlation present between market and currency. It was also found that production and overdraft rates tend to put a negative effect on the market. The results for the study may be used for potential investments because less risk is found from the South African market (Mlambo and Maredza, 2013).

Khan and Ali (2015) also added a contribution to the exchange rate impacts on stock indices. The study was based on Pakistan an emerging country (Khan and Ali, 2015). It was stated that stock prices can be dependent on currency value. Moreover, the fluctuation of the UD Dollar

tends to decrease the modes of investment. The data for the study was based on eighteen years period. Granger causality was used to predict the relationship (Khan and Ali, 2015).

A similar study was made by Kennedy and Nourzad (2016). Research-based on the ER of the US Dollar and provide information about the market returns. The findings of the paper were supported by previous studies. Emerging countries tend to base US Dollars as an important mode for foreign currency (Kenedy and Nourzad, 2016). The authors used systematic approach for emerging countries. The recent change in currency tends to have declining effect on stock returns and can decrease the overall productivity for potential investors (Kenedy and Nourzad, 2016).

Bahmani-Oskooee and Saha (2016) explored the area of the exchange rate and stock prices. The study was carried out on different types of macro variables. The study stated that the exchange rate can affect companies on the base of exports. Stock market prices can control the business direction. Authors used ARDL approach to model the data from countries such as Indonesia and Brazil (Bahmani-Oskooee and Saha, 2016). Two models were used in the study. One of the models includes bivariate approach while others focus on multivariate technique. It was found from the study that changes in variables were symmetry owing to the stock market and exchange rate (Bahmani-Oskooee and Saha, 2016).

Bagh, Azad, Razzak, Liaqat, and Knan (2017) conducted their research to analyze the influence of exchange rate volatility on PSX (Pakistan Stock Exchange). An explanatory study was carried over to measure the macroeconomic variables (Bagh et al., 2017). The exchange rates (ER) were measured as the independent factor while stock index was the main variable for the research. It was found from the paper that both of the variables have a correlation with stock market. The study also indicated that the association of independent and dependent variables can affect the desire of public for investment. It can also predict the growth rate of emerging economies (Bagh et al., 2017). The stock market index can be correlated with exchange rate. The research added to the market and its influence on stock index.

According to Ajayi and Mougoue (2018) their ECM model showed that stock price tends to act negatively for the currency (A.Ajayi and Mougoue, 2015). It was also found from the research that increases in stock price value tend to have a direct impact on currency. The study indicated that the domestic market has always provided room for investment and present value of asset tend to alleviate the exchange rate for a country (Avutswa, Oluoch and Olweny, 2018).

## **Method**

### **Moon and Yu's Approach for Volatility Spillover**

In this study, as well as symmetric and asymmetric GARCH models, the approaches developed based on the approach of Moon and Yu (2010), are used for the analysis of spillover effects. The most prominent feature of the method is that it allows for spillover and pass-through between the two markets (Moon and Yu, 2010)

In the first stage of the two-stage approach, the volatility of the market (LNDUSD), in other words, the GARCH (1,1) -M model of the external variable is estimated and the error term of

the model is obtained. In the second stage, the market where the volatility is spread (LNDTIMEX) is considered as the dependent variable, while the lags of the dependent variable (LNDTIMEX) and the independent variable (LNDUSD) is included in the mean equation. It is decided whether there is volatility propagation depending on whether the coefficient of the square of the errors in the predicted variance equation is significant or not. If the coefficient of error squares is significant, it is found that there is a volatility spread from the market in which the volatility emerges as a shock to the other market.

### Data Set and Empirical Evidence

In this study, the daily export data of TEA export index and Central Bank USD / TL purchase prices for the 31/1/2013 - 12/9/2018 (1411 observations) period were used. These data were obtained from CBRT-EDDS(Central Bank of the Republic of Turkey-Electronic Data Distribution System) and Borsa Istanbul Stock Exchange database. Daily time series representing the variables were calculated from the level series by the following formula.

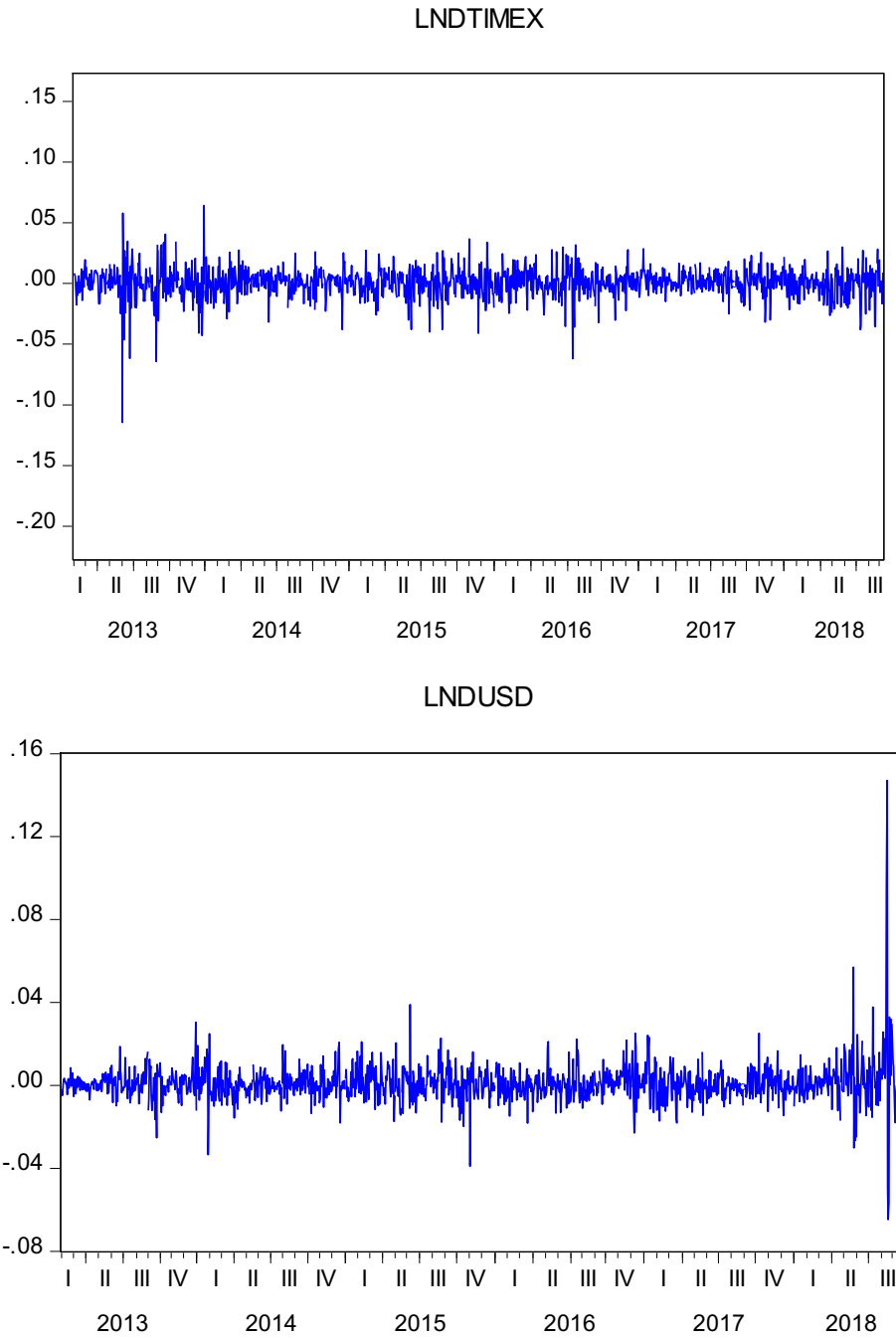
$$R_t = \ln \left( \frac{P_t}{P_{t-1}} \right)$$

The variables used in the analysis and their definitions are given in Table 1.

**Table 1. Used Variables and Definitions**

| Variables | Definition                                     |
|-----------|------------------------------------------------|
| TIMEX     | TEA Exportation index                          |
| USD       | Central Bank USD/TL exchange                   |
| LNDTIMEX  | Logged-Difference TEA exportation index        |
| LNDUSD    | Logged-Difference Central Bank USD/TL exchange |

In Figure 1, the characteristics of the financial time series and the graphs in the course of the variable variables over time are presented.



**Figure 1. LNDTIMEX and LNDUSD Graphs**

When the figures are examined, it is seen that the volatilities are generally followed by one another, high volatility is followed by high volatility and low volatility is followed by low volatility. This phenomenon, known as the clustering, is one of the most important features of financial time series. The most important result of these features is time varying variance.

The fact that financial time series have weak stability (Table 3) does not mean that these series are also strong stable. Strong stability usually requires assumptions about the distribution characteristics of the series. These assumptions are the distribution characteristics of the series which are determined based on the third(skewness) and fourth(kurtosis) moments of the series.

The test used for the validity of this assumption is the Jarque-Bera normality test (Tong, 1990; Brockwell and Davis, 1987).

**Table 2. Descriptive Statistics belonging to Profit Series**

|              | <b>LNDTIMEX</b> | <b>LNDUSD</b> |
|--------------|-----------------|---------------|
| Mean         | 0.000537.       | 0.000922.     |
| Median       | 0.001228.       | 0.000359.     |
| Maximum      | 0.064124.       | 0.147066.     |
| Minimum      | 0.114368.       | 0.064757.     |
| Std. Dev.    | 0.012095.       | 0.009259.     |
| Skewness     | 0.966017.       | 3.315331.     |
| Kurtosis     | 11.48843.       | 58.74885.     |
|              |                 |               |
| Jarque-Bera  | 4452.438.       | 185174.1.     |
| Probability  | 0.000000.       | 0.000000.     |
|              |                 |               |
| Sum          | 0.756745.       | 1.300037.     |
| Sum Sq. Dev. | 0.206109.       | 0.120805.     |
|              |                 |               |
| Observations | 1410            | 1410          |

In Table 2, basic descriptive statistics of the variables are presented. According to the Jarque-Bera normal distribution test in the chart, the null hypothesis that the variables are normally distributed is rejected. Thus, it is seen that both variables are not normally distributed. This result also provides information that the series are not strong stable. In addition, LNDTIMEX series has left crooked and thick tail, whereas LNDUSD has a crooked and leptokurtic (vertical) structure. Therefore, the variables discussed have basic financial time series characteristics.

ADF unit root test was used to test whether the variables discussed in Table 3 have weak stasis characteristics.

**Table 3. Unit Root Test Results**

Null Hypothesis: LNDTIMEX has a unit root

Exogenous: None

Lag Length: 0 (Automatic - based on SIC, maxlag=23)

|                                        | t-Statistic | Prob.* |
|----------------------------------------|-------------|--------|
| Augmented Dickey-Fuller test statistic | -38.00822   | 0.0000 |
| Test critical values: 1% level         | -2.566604   |        |
| 5% level                               | -1.941048   |        |
| 10% level                              | -1.616548   |        |

\*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNDUSD has a unit root

Exogenous: None

Lag Length: 2 (Automatic - based on SIC, maxlag=23)

|                                        | t-Statistic | Prob.* |
|----------------------------------------|-------------|--------|
| Augmented Dickey-Fuller test statistic | -24.06475   | 0.0000 |
| Test critical values: 1% level         | -2.566607   |        |
| 5% level                               | -1.941049   |        |
| 10% level                              | -1.616548   |        |

\*MacKinnon (1996) one-sided p-values.

According to the results of ADF unit root test, LNDUSD and LNDUSD variables were found to be stationary in mean since the test statistics of were more negative than the critical values of 1% significance level.

The ARCH-LM test was used to determine whether the series in question exhibited variance characteristics over time before the volatility analysis of the studied series. For this purpose, lag lengths of ARMA structures concerning the series were determined first. AIC information criterion was used to determine lag lengths. The maximum lag length is determined as 12 ARMA for LNDUSD (10,7) and ARMA for LNDTIMEX (11,12) using the Automatic Arima Selection” algorithm in the Add-ins extension of E-views 10 package program. The ARCH-LM heteroscedasticity test results applied to the error terms of these lag lengths are given in Table 4.

**Table 4. ARCH-LM Heteroscedasticity Test Results**

|           | F-Statistic | Prospect | N*R <sup>2</sup> | Prospect |
|-----------|-------------|----------|------------------|----------|
| LNDTIME X | 35.06272.   | 0.0000.  | 34.25883.        | 0.0000.  |
| LNDUSD    | 711.3307.   | 0.0000.  | 473.1390.        | 0.0000.  |

According to the results of the varying ARCH-LM variance test statistics, null hypotheses that the series were constant variance for both return series were rejected and it was concluded that the series had variance property according to time. Eviews 10 were used in order to obtain analytical findings.

After reaching the results that the series representing the variables have varying variance properties, the volatility and causality analysis of the market where the volatility is spread (LNDTIMEX) was made. In the analysis of the volatility in the market, parameter estimations were made by using symmetrical AR (1) -GARCH (1,1) -M and asymmetric AR (1) -GJR-GARCH (1,1) -M techniques. Thus, while investigating the variance stability of the time series on the one hand, whether there was a volatility spread from the market in which the shock occurred to the other market was determined with variance causality test.

**Table 5. AR(1)-GARCH (1,1)-M Model: Symmetrical Spreading Effect from LNDUSD to LNDTIMEX**

| PARAMETERS         |    | NORMAL DISTRIBUTION |          | GED Reasoning    |                 |
|--------------------|----|---------------------|----------|------------------|-----------------|
| Mean Equation      |    |                     |          |                  |                 |
|                    |    | Parameters          | Prospect | Parameters       | Prospect        |
| $\alpha$           |    | 0.0002              | 0.7363.  | 0.0006.          | 0.3055.         |
| $\beta$            |    | 6.2631              | 0.1903.  | 5.9586.          | 0.1614.         |
| $\delta$           |    | 0.0224.             | 0.4808.  | 0.0306           | 0.2454.         |
| $\lambda$          |    | 0.0186.             | 0.6124.  | 0.0084.          | 0.7971.         |
| Variance Equation  |    |                     |          |                  |                 |
| A                  |    | 0.0000.             | 0.0000.  | 0.0000.          | 0.0009.         |
| B                  |    | 0.7677.             | 0.0000.  | 0.7880.          | 0.0000.         |
| C                  |    | 0.1445.             | 0.0000.  | 0.1193.          | 0.0001.         |
| D                  |    | 0.0089.             | 0.3502.  | 0.0130.          | 0.4106.         |
|                    |    |                     |          | GED DF(1.220274) | GED Prob(0.000) |
| Hypothesis Tests   |    |                     |          |                  |                 |
| AIC                |    | 6.0924.             |          | 6.1941.          |                 |
| BIC                |    | 6.0625.             |          | 6.1606.          |                 |
| LB(Q Prob)         | 5  | 0.3160.             |          | 0.3560.          |                 |
|                    | 10 | 0.0880.             |          | 0.0840.          |                 |
|                    | 20 | 0.4460.             |          | 0.4430.          |                 |
|                    | 50 | 0.3020.             |          | 0.3260.          |                 |
| LB(Q2 Prob)        | 5  | 0.4180.             |          | 0.3920.          |                 |
|                    | 10 | 0.7680.             |          | 0.7700.          |                 |
|                    | 20 | 0.6320.             |          | 0.6830.          |                 |
|                    | 50 | 1.0000.             |          | 1.0000.          |                 |
| ARCH(1)-LM(F Prob) |    |                     | 0.5500.  | 0.6744.          |                 |

#### Benchmark Model GARCH(1-1)-M

$$LNDUSD_t = \alpha + \beta h_t + \varepsilon_t$$

$$h_t = a + bh_{t-1} + c\varepsilon_{t-1}^2$$

#### Symmetrical Spillover Test Model: AR(1)-GARCH(1,1)-M

$$LNDTIMEX_t = \alpha + \beta h_t + \delta LNDTIMEX_{t-1} + \lambda LNDUSD_{t-1} + \varepsilon_t$$

$$h_t = a + bh_{t-1} + c\varepsilon_{t-1}^2 + dU_{t-1}^2$$

Here,  $U_{t-1}$ ; means the error term square obtained from the benchmark model applied to the dollar. LB (Q) and LB (Q2) show Ljung-Box Q and Ljung-Box Q2 test statistics, which show

whether autocorrelation is present in the model, respectively. The F-test is the ARCH-LM test statistic which shows whether there is a variance in the model. The null hypotheses of both tests indicate that there is no autocorrelation and varying variance, respectively.

In Table 5, the estimation results of the symmetrical AR (1) -GARCH (1,1) -M model are presented.

In this study, in order to take into account the effect of volatility on condition, GARCH-M model, where conditional variance takes place as an explanatory variable in conditional mean, is preferred. Thus, the impact of a risk due to the shock in dollar prices on the export index of TEA can be analyzed. In addition, the volatility model was estimated according to the GED distribution in order to reveal the asymmetric effects on the series depending on the distribution characteristic.

When the AR (1) -GARCH (1,1)-M estimation results in the chart are examined, it is seen that variance parameters meet the positivity condition. On the other hand, if the coefficient of GED distribution is less than 2, it means that the series has thick tail characteristics. Therefore, this is an information about the distribution may show asymmetric effects depending on the tail characteristic.

The coefficient of the circle of the error term was found to be meaningless. This provides information that there is no symmetrical volatility spread from dollar (LNDUSD) to TEA Export Index.

When the diagnostic statistics for the consistency of the predicted results were examined, the probability values of Q and Q2 statistics showing whether there was autocorrelation or F statistics showing whether there was a variance or not were found to be insignificant at 5% significance level. This result means that the models do not carry autocorrelation and changing variance and therefore they fulfill the requirements for interpretation of the model results.

#### **Asymmetrical Spreading Test: Model:AR(1)-GJR-GARCH(1,1)-M**

$$LNDTIMEX_t = \alpha + \beta h_t + \delta LNDTIMEX_{t-1} + \lambda LNDUSD_{t-1} + \varepsilon_t$$

$$h_t = a + bh_{t-1} + c\varepsilon_{t-1}^2 + dU_{t-1}^2 + kS_{t-1}U_{t-1}^2$$

$$S_t = \begin{cases} 1 & U_t \leq 0 \\ 0 & \text{diğer} \end{cases}$$

Whether the upward or downward movement of the price of the dollar has an effect on the export index, the presence of an asymmetric spread, will be examined by testing the significance of the added dummy variable. Here, the residues estimated from the basic model are dummy variables that take a value of 1 if it is less than zero, and 0 in other cases. In other words, if the dollar has fallen, it has a value of 1 and if it has risen, it has a value of 0.

**Table 6. AR(1)-GJR-GARCH (1,1)-M Model Asymmetrical Spreading Effect from LNDUSD to LNDTIMEX**

| Mean Equation      |    |            |          |
|--------------------|----|------------|----------|
|                    |    | Parameters | Prospect |
| $\alpha$           |    | 1.39E-05   | 0.9828.  |
| $\beta$            |    | 7.094.436  | 0.1397.  |
| $\delta$           |    | 0.023130.  | 0.4641.  |
| $\lambda$          |    | 0.027229.  | 0.4975.  |
| Variance Equation  |    |            |          |
| a                  |    | 1.47E-05   | 0.0000.  |
| b                  |    | 0.324780.  | 0.0000.  |
| c                  |    | 0.132821.  | 0.0000.  |
| d                  |    | 0.032763.  | 0.0148.  |
| k                  |    | 0.129361.  | 0.0000.  |
|                    |    |            |          |
|                    |    |            |          |
|                    |    |            |          |
| Hypothesis Tests   |    |            |          |
| AIC                |    | -6,09822   |          |
| BIC                |    | -6,06467   |          |
| LB(Q Prob)         | 5  | 0.303.     |          |
|                    | 10 | 0.091.     |          |
|                    | 20 | 0.442.     |          |
|                    | 50 | 0.313.     |          |
| LB(Q2 Prob)        | 5  | 0.460.     |          |
|                    | 10 | 0.785.     |          |
|                    | 20 | 0.631.     |          |
|                    | 50 | 1.000.     |          |
| ARCH(1)-LM(F Prob) |    | 0.5807.    |          |

When the diagnostic statistics for the consistency of the predicted results were examined, the probability values of Q and Q2 statistics showing whether there was autocorrelation or F statistics showing whether there was a variance or not were found to be insignificant at 5% significance level. This result means that the models do not carry autocorrelation and changing variance and therefore they fulfill the requirements for interpretation of the model results.

## Results

In this article the daily dollar returns of in Turkey, TEA export index returns to (TIMEX) January 31, 2013 - With data between September 12 2018 dates were looking at short-term spillover effects and general autoregressive conditional heteroskedasticity (GARCH) (1,1) -M model using an asymmetric spread. However, when the presence of asymmetric spread is examined with GJR-GARCH (1,1) -M model, strong evidence is obtained that there is an asymmetric spread from dollar returns to TEA export index returns.

When the existence of diffusion is estimated by using the analysis method developed based on the approach of Moon & Yu (2010), the models in this study do not carry autocorrelation and

varying variance, indicating that it constitutes the necessary conditions for interpreting the model results. The fact that the parameters (k and d) are significant results in an asymmetric spread from the dollar market towards the TIM export index. While negative shocks in the dollar market (the fall in dollar return) reduce the index volatility, the increase in the dollar's return increases the volatility.

Therefore, dollar return to show an asymmetric spillover effect on the TIMEX can be explained by two situations in Turkey. The bullish market formed by the dollar creates price fluctuations as a result of the shift of investors in the stock market, as well as the investors prefer to maintain their position in the exchange rate market (loss-aversion theory). The other is that although the exchange rate increase puts pressure on the index, the volatility decreases due to the volatility in the stock market when the value of TL increases due to the activity of shares and the upward movements of industrial companies with high foreign exchange position.

The volatile structure exhibited by financial markets, regardless of the reason, primarily affects the investor's investment decision. Nowadays, the floating exchange rate regime, especially in developing countries such as Turkey, without creating a risk that exchange rate without departing markedly from economic fundamentals or the extreme volatility of financial stability must be sustainable.

This is an important exchange rate policy. The study contributes to the literature as it is one of the first studies to reveal the relationship between two important market indicators. In addition to this, the testing of the relationship in this study will continue to be an important component for both the investor and future studies as it guides the TIMEX market investors.

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