The Effects of Currency Futures Trading on Turkish Currency Market

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Abstract

In this article, the impact of the introduction of currency futures trading on the volatility of the underlying currency market for Turkey is studied. Analyzing the data, following results are obtained. First, the results suggest that the introduction of futures trading has decreased the volatility of Turkish currency market. Second, the results show that futures trading increases the speed at which information is impounded into spot market prices. Third, the asymmetric responses of volatility to the arrival of news have increased after the introduction of futures trading.

Key Words: Currency Futures Trading, Turkish Derivatives Exchange, GARCH

JEL Classification: C12, C22, G10, G14

Özet – Vadeli Döviz Ticaretinin Türk Döviz Piyasasına Etkileri

Bu makelede, Türkiye'de vadeli döviz ticareti işlemlerinin başlamasının döviz piyasasının oynaklığını nasıl etkilediği incelenmiştir. Yapılan analizler sonucunda aşağıdaki sonuçlar elde edilmiştir. Bir, vadeli döviz ticareti işlemlerinin başlaması döviz piyasasının oynaklığını azaltmıştır. lki, sonuçlar vadeli döviz ticaretinin, piyasadaki yeni haberlerin spot döviz piyasasına geçiş hızını artırdığını göstermektedir. Üç, vadeli döviz ticareti işlemlerinin başlaması, oynaklığın yeni haberlere verdiği asimetrik tepkileri yükseltmiştir.

Anahtar Kelimeler: Vadeli Döviz Ticareti, Vadeli Opsiyon Borsası, GARCH

JEL Sınıflaması: C12, C22, G10, G14

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1. Introduction

Futures have been rendered as financial products of increased importance in recent years. Although trading stock index futures started in February 1982 in the US and soon followed by other developed countries, it is a relatively recent phenomenon in emerging markets. After the introduction of futures trading, there has been concern about the impact of futures on underlying spot market. Specifically, the economic literature intensified the debate on the negative or positive impact of futures trading on the underlying market volatility. There are two different arguments. The first argument is that futures market increases market volatility since it attracts uninformed traders because of their degree of leverage and the lower level of information of futures traders with respect to cash market traders is likely to increase the volatility. Furthermore, futures market promotes speculation with the consequence of a boost in volatility. The opposite argument is that futures market reduces spot market volatility since futures market plays an important role of price discovery, increases market depth and enhances efficiency. Moreover, futures market provides the hedging opportunities to the market participants and so it reduces the risk and stabilizes the market.

Lee and Ohk (1992) argue that the effect of the futures in index on the volatility of the spot market differs from country to country, not only because of the different structure of these markets but mainly due to the different macroeconomic conditions prevailing in each country. Although there are empirical studies for different countries with mixed results, most of them focus on developed countries. There are a few empirical researches on emerging markets. This paper contributes in the literature by studying the ongoing debate about the impact of futures trading on the volatility of the underlying spot market from an emerging country perspective.

In this paper, I examine the effect of the introduction of currency futures trading into Turkish currency market. To analyze the relationship between the futures trading and the volatility, the Generalized Autoregressive Conditional Heteroskedastic (GARCH) family of statistical techniques is utilized. GARCH models are used since they capture one of the well-known empirical regularities of returns, the volatility clustering and because of this they are the econometric techniques employed in most of previous studies. This paper tries to determine

whether the introduction of futures market affect the volatility of underlying spot market positively or negatively. Moreover, the study tries to find out how futures market influences underlying spot market in terms of transmission of information into stock prices. Furthermore, the change in asymmetric responses to information is investigated using the model proposed in Glosten, Jagannathan and Runkle (1989) (GJR) that captures the asymmetric response of conditional volatility to information.

The remainder of the paper is organized as follows. The next section presents a brief review of the theoretical literature and of the main results of previous empirical studies. Section 3 gives details about the Turkish Derivatives Exchange, the data set and the methodology used. Section 4 shows the empirical results of this study. Section 5 concludes the paper.

2. Literature Review

On the theoretical front, two opposing arguments exist in the literature about the impact of the introduction of futures trading into the underlying spot markets. The first group of researchers supports the argument that futures trading increase the volatility of the underlying market and so destabilize the market. According to Cox (1976), the main cause of destabilization of the underlying spot market is the presence of uninformed traders in the derivatives market. Finglewski (1981) supports the same argument by stating that a lower level of information of futures participants compared to that of cash market traders results in increased spot market volatility. By explaining that futures markets attract uninformed traders as a consequence of their high degree of leverage, Stein (1987) points out the same argument that the activity of those traders reduces the information content of prices and increases cash market volatility. In this view, increase in the volatility of spot markets is a result of high degree of leverage and the presence of speculative uninformed traders in the futures markets.

The second group of researchers presents arguments in favor of the idea that futures trading have a beneficial effect on the underlying spot market by decreasing its volatility. Powers (1970) claims that futures trading improves the market depth and informativeness. Danthine (1978) shows in his model that futures trading increases market depth and decreases spot market volatility. Bray (1981) and Kyle (1985) came up with alternative models asserting that futures

trading lowers the volatility of the underlying cash market. Stoll and Whaley (1988) claims that futures trading enhances market efficiency. Furthermore, future markets are an important means of price discovery in spot markets as stated by Schwarz and Laatsch (1991). The theoretical debate about how futures trading affect underlying cash markets remains rather inconclusive since the proposed logical arguments both support and reject the proposition of futures markets having a destabilizing effect on spot markets. Therefore, the issue of whether and how futures markets affect underlying spot markets stays an empirical issue. Nevertheless, empirical literature presents also mixed results.

Although many empirical studies have examined to figure out whether futures markets stabilize or not spot markets, the results are still different from each other. Some researches alleged that the introduction of futures trading increases the volatility of the spot market. Finglewski (1981) investigated the impact of Government National Mortgage Association (GNMA) futures on the price volatility of the GNMA spot market and concludes that the future market has led to increased volatility of the underlying market. Clifton (1985) observed an increase of volatility in the currency spot market after the introduction of futures by using data from Chicago's International Monetary Market. Lee and Ohk (1992) examined the effect of introducing index futures trading on stock market volatility in Australia, Hong Kong, Japan, the UK and the US using daily index data for periods of approximately 4 years spanning the introduction of index futures trading. They observed that the stock market volatility increased significantly after the listing of stock index futures in Japan, the UK and the US. Yet, the stock market volatility decreased in Hong Kong and the futures trading did not influence the stock market in Australia. Antoniou and Holmes (1995) suggested an increased volatility following the introduction of the FTSE100 index futures contract for the London Stock Exchange. Chatrath *et al.* (1996) studied the impact of the introduction of futures trading on the volatility in the spot rates of the British Pound, Canadian Dollar, Japanese Yen, Swiss Franc and the Deutsche Mark. They find that currency futures trading has a significant positive impact on the volatility in the exchange rate changes.

On the contrary, some empirical studies provide evidence that the introduction of futures trading on stock index decreased the volatility of the underlying market.

Edwards (1988a,b) found a decreased stock market volatility for the S&P500 after the introduction of the stock index futures contract. Shastri *et al.* (1996) find that the volatility of exchange rates decreases following the introduction of foreign currency options. Antoniou *et al.* (1998) studied the impact of the introduction of futures trading in the volatility of six stock markets worldwide. (Germany, Japan, Spain, Switzerland, the U.K and the U.S) They observed that the introduction of futures trading had a statistically significant negative effect on the volatility of the spot market in Germany and Switzerland. In the remaining countries the futures trading did not influence the volatility of the stock market significantly. Moreover, the authors showed that the asymmetric responses decreased for Germany, Japan, Switzerland, the U.K and the U.S and it is only increased for Spain. They explained this result by the absence of well-established financial markets in Spain. Jochum and Kodres (1998) find that the introduction of futures on currencies decreases the spot market volatility for the Mexican Peso and has statistically insignificant effects on the spot market volatility of the Brazilian Real and Hungarian Forint. Bologna and Cavallo (2002) researched on the MIB30 index in the Italian stock market and found that the introduction of stock index futures had led to diminished stock market volatility. Finally, Drimbetas *et al.* (2007) investigated the impact of the introduction of futures trading on stock index into the Greek stock market and showed that the introduction of derivatives had induced a reduction of the conditional volatility of the underlying market.

3. Data and Methodology

Although TURKDEX was founded in 2003, the formal trading in futures contracts began in February 2005. Analysis is undertaken with the use of data for the period 3 years prior to through 3 years after the introduction of futures trading. Thus, the data ranges from February 2002 through February 2008 in which there are 1511 total observations. The data is obtained from Central Bank of the Republic of Turkey and shows the-end-of-the-day currency value. The currency basket is calculated as the 0.5 *(Euro/TL) + 0.5 *(USD/TL). The daily value of Chicago Board Options Exchange Market Volatility Index (VIX) is used to isolate the impact on the underlying currency volatility arising from factors in the market other than the introduction of derivatives. VIX data is obtained from Bloomberg.

The results were obtained on the basis of R_t, which is the rate of return R in period t, computed in the logarithmic first difference, R_t=ln (p_t/p_{t-1}) *100 where p_t is the value of currency basket at the end of period t.

The GARCH framework is used in order to investigate the impact of currency futures trading on the volatility of the Turkish currency. The GARCH model has been developed by Bollerslev (1986) from the Autoregressive Conditional Heteroskedastic Models (ARCH) model previously introduced by Engle (1982). In ARCH, the changing variance is included into estimation in order to obtain more efficient results. It is assumed that the error term of the return equation has a normal distribution with zero mean and time varying conditional variance of h_t ($\varepsilon_t \sim N(0,h_t)$) and so the forecast variance of return equation varies systemically over time. In this model, the conditional variance, h_t, relies on the past squared residuals and is calculated as $h_t = V_{cons} + \sum_{i=1}^{m} Va_i \ \varepsilon_{t-i}^2$. In GARCH, h_t depends on not only lagged values of ε_t^2 but also lagged values of h_t. ($h_t = V_{cons} + \sum_{i=1}^{m} Va_i \ \varepsilon_{t-i}^2 + \sum_{j=1}^{n} Vg_j \ h_{t-j}$) One of the most appealing features of the GARCH framework, which explains why this model is so widely used in financial literature, is that it captures one of the well-known empirical regularities of asset returns, the volatility clustering. Therefore, following Holmes (1996), a GARCH representation would seem to be an appropriate means by which to capture market-wide price volatility. GARCH (1,1) model has been extensively used in the literature since it is the most convenient way to represent conditional variance for financial time series. Thus, the following model is exercised for the analysis:

$$R_t = \beta_1 R_{t-1} + \beta_2 \, VIX_t + \varepsilon_t \qquad (1)$$

$$\varepsilon_t \sim N(0,h_t) \qquad (2)$$

$$h_t = \alpha_0 + \alpha_1 \ \varepsilon_{t-1}^2 + \ \alpha_2 \, h_{t-1} + \gamma \, D_F \qquad (3)$$

where R_t is the daily return on the currency basket, R_{t-1} is a proxy for the mean of R_t conditional on past information and VIX_t is the variable reflecting indirectly the international systematic factors. As regards the conditional variance Equation 3, it has been augmented with the dummy variable D_F which takes value 0 for the pre-futures period and 1 for the post-futures period. This dummy allows us to determine the negative or positive impact of the introduction of futures trading.

Moreover, it is known that if an asset has high volatility, then risk averse investors will require higher expected return to hold that asset and so the omission of h_t from the conditional mean equation might potentially cause bias. In order to avoid this, GARCH in mean, GARCH-M, model is proposed. GARCH-M (1,1) is employed for checking the results of GARCH (1,1). In GARCH-M (1,1), the equation 1 becomes:

$$R_t = \beta_1 R_{t-1} + \beta_2 VIX_t + \theta h_t + \varepsilon_t \quad (4)$$

Furthermore, in the GARCH model, news is assumed to have an equal effect irrespective of sign. If news has an asymmetric effect on volatility, then the GARCH model will be misspecified and subsequent inferences based on this model may be misleading. Thus, it is extended to allow for asymmetric effects. The GJR model is proposed in Glosten, Jagannathan and Runkle (1989) and it is an asymmetric model. The GJR model is less sensitive to outliers and higher likelihood than EGARCH model according to Engle and Ng (1993) and so it is chosen for the analyses in order to obtain asymmetric responses of volatility to news. In the GJR model the asymmetric response of conditional volatility to information is captured by including, along with the standard GARCH variables, squared values of ε_{t-1} when the sign on ε_{t-1} is negative. Thus the equation 3 becomes:

$$h_t = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 h_{t-1} + \tau D_{t-1} \varepsilon_{t-1}^2 + \gamma D_F \quad (5)$$

where D_{t-1} =1 if $\varepsilon_{t-1}<0$, D_{t-1} =0 otherwise.

4. Empirical Results

The currency basket, 0.5*(Euro/TL) + 0.5*(USD/TL), is used to examine the effect of the currency futures on the volatility of the Turkish currency market.

Figure 1 : The time series graph of R_t

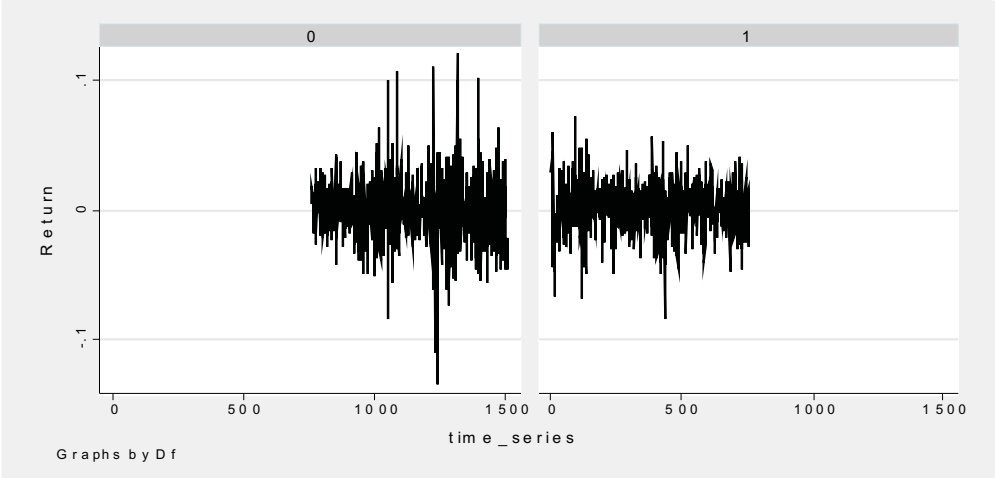

Figure 1 shows the time series graph of R_t. It is segmented by the dummy variable D_F which takes value 0 for the pre-futures period and 1 for the post-futures period.

Table 1: Return Index GARCH

β_0	β_1	β_2	α_0	α_1	α_2	γ
Whole						
Period						
	-0.004	-0.002*	-3.877**	0.233**	0.771**	-0.517*
	(0.028)	(0.001)	(0.191)	(0.023)	(0.017)	(0.239)
Pre-						
Futures						
	0.026	-0.001	0.024**	0.201**	0.779**	
	(0.039)	(0.001)	(0.006)	(0.031)	(0.027)	
Post-						
Futures						
	-0.033	-0.002*	0.010**	0.266**	0.762**	
	(0.041)	(0.001)	(0.003)	(0.034)	(0.022)	

Note: Standard errors are reported under the coefficients, ** and * indicate the level of significance at the 1% and 5% level, respectively.

Table 1 shows the GARCH(1,1) results of the Return Index for the whole period, the pre-futures period and the post-futures period. The measure of the effect due to introduction of currency futures is shown by the γ coefficient in the whole period. This coefficient is negative and statistically significant and so it can be said that the introduction of futures trading has a negative impact on the level

of price volatility of the underlying stock market. This result suggests that futures trading has led to decreased volatility.

Antoniou and Holmes (1995) observed that α_1 could be interpreted as a 'news' and α_2 could be defined as 'old news'. More specifically, α_1 relates to the impact of yesterday's currency price changes on currency price changes today and the higher value of α_1 implies that recent news has a greater impact on price changes. The value of α_1 has increased from 0.201 to 0.266 from the pre-futures to the post-futures period. This increase suggests that the information is being impounded in currency prices more quickly due to introduction of futures trading. On the other side, α_2 is the coefficient on the lagged variance term and as such is picking up the impact of currency price changes relating to days prior to the previous day and thus to news which arrived before yesterday. The value of α_2 has decreased from 0.779 to 0.762 from the pre-futures to the post-futures period. This can be explained by observing that the increased rate of information flow reduces the uncertainty about previous news. In other words, in the presence of currency futures trading, 'old news' play a smaller role in determining the volatility of the market. This argument seems to confirm the expectation of increased market efficiency as a consequence of the activity in currency futures.

Table 2: Return Index GARCH-M

β_0	β_1	β_2	α_0	α_1	α_2	θ	γ
Whole							
Period							
	-0.033	-0.007**	-3.883**	0.238**	0.765**	0.234**	-0.499*
	(0.027)	(0.001)	(0.191)	(0.023)	(0.015)	(0.044)	(0.235)
Pre-							
Futures							
	0.003	-0.006**	0.022**	0.202**	0.781**	0.215**	
	(0.039)	(0.002)	(0.005)	(0.030)	(0.024)	(0.074)	
Post-							
Futures							
	-0.068	-0.008**	0.013**	0.275**	0.745**	0.246*	
	(0.042)	(0.002)	(0.004)	(0.035)	(0.021)	(0.055)	

Note: Standard errors are reported under the coefficients, ** and * indicate the level of significance at the 1% and 5% level, respectively.

Table 2 shows the GARCH-in-mean, GARCH-M, results of the Return Index. Similar to GARCH results, the γ coefficient is negative and statistically significant at 5% level. The value of α_1 coefficient has increased from 0.202 to 0.275 from the pre-futures period to the post-futures period. In contrast, the value of α_2 coefficient, reflecting the impact of "old news", has fallen in the post-futures period.

Table 3: Return Index GJR

β_0	β_1	β_2	α_0	α_1	α_2	τ	γ
Whole							
Period							
	0.008	-0.003**	-4.110**	0.365**	0.754**	-0.271**	-1.277**
	(0.038)	(0.001)	(0.210)	(0.039)	(0.014)	(0.039)	(0.372)
Pre-							
Futures							
	0.025	-0.001	0.020**	0.272**	0.786**	-0.122*	
	(0.040)	(0.001)	(0.006)	(0.049)	(0.028)	(0.050)	
Post-							
Futures							
	0.019	-0.005**	0.003*	0.406**	0.736**	-0.437**	
	(0.032)	(0.001)	(0.001)	(0.065)	(0.015)	(0.067)	

Note: Standard errors are reported under the coefficients, ** and * indicate the level of significance at the 1% and 5% level, respectively.

In Table 3, the results of the GJR model of Return Index. In the GARCH model, news is assumed to have an equal effect irrespective of sign. If news has an asymmetric effect on volatility, then the GARCH model will be misspecified and subsequent inferences based on this model may be misleading. Thus, it is extended to allow for asymmetric effects. The GJR model is proposed in Glosten, Jagannathan and Runkle (1989) and it is an asymmetric model. The GJR model is less sensitive to outliers and higher likelihood than EGARCH model according to Engle and Ng (1993) and so it is chosen for the analyses. Similar to the GARCH and GARCH-M results, the γ coefficient is negative and statistically significant at 1% level. The value of γ coefficient is higher than the value of it in both the GARCH and GARCH-M results. The τ coefficient shows the asymmetric response of

volatility to news. This absolute value of asymmetric response has increased from the pre-futures period to the post-futures period.

5. Conclusion

The impact of futures trading on the volatility of the underlying spot market is investigated by many authors for different countries in the literature. There are studies claiming futures market increases spot market volatility as a result of destabilizing effects of future trading associated with speculation. In contrary, some authors argue that futures market reduces spot market volatility since futures market plays an important role of price discovery, increases market depth and enhances efficiency. I examine the impact of currency futures trading on the volatility of the Turkish currency market.

This paper analyzes whether currency futures trading has increased or decreased spot market volatility by considering the issue of volatility, information speed and asymmetries. First, the results suggest that the introduction of futures trading has decreased the volatility of underlying spot market. Second, the results show that futures trading increases the speed at which information is impounded into spot market prices. Third, the asymmetric responses of volatility to the arrival of news for Turkish currency market have increased after the introduction of futures trading.

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