İnsan ve Sosyal Bilimler Dergisi

Exchange Rate Shock and Its Impact on Import: The Case of Turkey

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ABSTRACT	ARTICLE INFO
Factors affecting foreign trade have always been an area of interest. Foreign exchange rates are a variable that comes to the fore due to other factors. In many applied studies, the effects of changes in exchange rates on imports and exports were examined. In many studies, although there are no supporting findings, explanatory and contributing results have been reached. In this study, the volatility of exchange rate was determined by using a new method, Markov Switching ARCH econometrics, and the effect of foreign exchange shocks was investigated. As a result of the regression, it was seen that the import value was affected by the risks caused by the uncertainty of exchange rate.	
Key Words: Exchange rate, import, export, foreign trade	

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Döviz Kuru Şoku ve İthalat Üzerindeki Etkisi: Türkiye Örneği

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ÖZET	MAKALE BİLGİSİ
Dış ticareti etkileyen faktörler daima araştırmacıların ilgisini çekmiştir. Diğer faktörlere kıyasla, döviz kurunun uluslararası ticaret üzerindeki etkileri ön planda kalan bir değişkendir. Bu nedenle, döviz kuru dalgalanmasının ihracat ve ithalat üzerindeki etkisi, çok sayıda ampirik çalışmanın araştırma konusu olmuştur. Birçoğunda tutarlı sonuçlar bulunamamasına rağmen, bulguların açıklanması ve katkıda bulunması sağlandı. Bu çalışmada, yeni bir ekonometrik yöntem olan Markov Switching ARCH tekniği kullanarak döviz kuru oynaklığı kanıtlanmaktadır. Bununla birlikte, ithalatın döviz kuru belirsizliğine yeniden yapılandırılmasının ardından, ithalat ve döviz kuru oynaklığının ters yönde ilişkili olduğu tespit edilmiştir.	

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Introduction

The effects of financial markets on real markets are not only in the domestic market but also in international markets. Nowadays, similar issues of applied studies in previous years are gaining importance. In addition to the development of new techniques, the intensification of foreign trade relations makes it necessary to examine the changes in these issues in more detail. The importation of a country primarily affects the domestic industry and causes a change in the whole economy. In addition to the imports of raw materials and semi-finished goods, especially as a result of changes in exchange rates, the changing preference of consumers to import goods from domestic goods leads to unexpected problems in the foreign trade balance and in the country's economy.

Therefore, the economy management and producers want to know the effects of the developments in domestic and foreign money markets on imports. When the effects of changes in exchange rates on imports are determined, the expected answers will emerge. Foreign exchange and export and import relations were the subject of many researches in the mid-1990s. Due to the theoretical results of a change in the exchange rate, the increase in exports is expected to have an impact on the decrease of imports. Some of the applied researches have reached the expectation and some of them have reached the opposite direction (Arize, vd, 1998: 1269).

We will also try to determine whether hedging and international financial techniques applied by importers are used in order to reduce the risks posed by exchange rate shock. In other words, if import does not react negatively to exchange rate uncertainty in exchange rate shock periods, we can say that international finance techniques are used. The aim of this study is to evaluate the effects of exchange rate shock rate on imports in Turkey. Our expectation is that the exchange rate volatility has an adverse effect on trade flows, because commercial options of firms are very limited in Turkey. In the first part of the study, there is an introduction, in the second section, there are researches about theoretical structure on the subject. In the third chapter, the model and data set was introduced and a new model was implemented. In the fourth chapter, the model has application. In the last section, the results are evaluated.

1. Theory and Previous Studies

Financial time series show non-linear properties. An important indicator of this feature is that the regimes show different dynamic structures. The financial predictions are inadequate with the linear models and they are not reliable. Recent evidence suggests that the volatility of financial assets is not stable, followed by a more stable period following a volatile period. An opportunity to measure change can be caught. In practice, financial models commonly define returns and volatility with linear models. However, there are many indications that non-linear models are more suitable (Franses, et al., 2006: 13).

Theoretical and empirical findings from previous studies and sources, firstly, foreign studies were given priority and then domestic studies were taken into consideration. Foreign and domestic researchers have examined the relationship between foreign exchange and foreign trade and especially export, and the effects of exchange shock on imports are not mentioned. The reasons for this may be that the countries have a great deal of exports and the fact that its position in the international arena is determined by the amount of exports made by the country. Input imports are mandatory for production in delevoping countries. It is clear that input costs, which affect direct production costs, will increase as a result of exchange shocks. Given this aspect of the issue, the uncertainty of the exchange rate becomes more important for imports (Baum, et al., 2009: 3).

Due to the effects of unexpected changes in the exchange rate on the profit, the trade volume is adversely affected (Choudhig, 2006: 3). Source Exchange risk may increase the risk of the importer. If the exchange rate volatility increases, the profit risk increases. As importers do not want to take risks and the increase in profit risk reduces the benefit of imports, it decreases the volume of international trade (Choudhig, 2006: 3).

According to the study conducted in thirteen countries with low income, the cointegration relationship and Johansen (1988) multi-equation process are used. The main consequence is that the volatility in the real exchange rate has increased, negatively affecting the export demand of these countries in the short and long term. High exchange rate volatility reduces trade by creating more risks in foreign trade (Arize, Osang, Slottje, 2000: 10).

Higher volatility increases the potential gain of trade. However, the more volatile exchange rate raises higher risk for international firms. This effect tends to reduce volume and production in international trade (Broll, Eckwert, 1999: 178).

If the country is more open to foreign trade, both money markets and total supply shocks produce smaller exchange rate movements. According to the research conducted in the data of 48 countries, it is clear that there is a difference in terms of influencing the importation of countries in terms of the volatility of real exchange rate according to the external openness differences in international trade (Hau, 2002: 615).

USA's imports from the UK, France, Germany, Japan and Canada are examined. It was found that US imports were not affected by the exchange rate volatility significantly. However, the relationship between exchange rate volatility and imports was negatively related and the importance of the relationship increased when the flexible exchange rate was applied according to the fixed exchange rate regime. (Koray, Lastrages, 1989: 710).

According to a study conducted in India, it is observed that the adaptation process of exchange rate volatility created in prices and amounts lasted two quarters in both exports and imports. In addition, while exporters should take advantage after devaluation, exporters take the price increases through pass-through and therefore the amount of exports does not increase. Exchange rate volatility affects imports in the direction of increase (Dhdakia, Saradhi, 2000: 4110).

Considering the studies conducted in Turkey, the existence of volatility using the TGARCH model and the relationship between VAR analysis and exchange rate volatility, export and import were investigated. According to this study, the effect of exchange rate volatility on imports between 1999:01-2007:01 period in Turkey were significant. In other words, exchange rate volatility affects imports (Türkyılmaz, Özer, Kutlu, 2007: 145).

According to a study conducted by the Central Bank in 1999, the exchange rate volatility in the analysis calculated with GARCH model between 1988:2-1997:2 period had an adverse effect on exports, but the effect on imports was not significant (Özbay, 1999: 14).

In a Study on Exchange rate uncertainty of Turkey conducted on the impact on exports and covering the years 1989-2002, it is seen that uncertainty of exchange rate affects export negatively (Öztürk, Acaravcı, 2006: 197). Another study included between 1995 and 2008 and found that the exchange rate volatility had a negative impact on exports both in the short term and in the long run (Köse, Ay, et al., 2008: 25).

In the study on the effects of exchange rate uncertainty on foreign capital investments, it was concluded that exchange rate volatility did not affect foreign investments (Dursun, Bozkurt, 2007: 1).

2. Objective

In this study, it is aimed to examine and test the effects of exchange rate shocks on foreign trade (especially imports).

3. Limitations

The research is limited to the sample because the whole of the universe cannot be reached. The research is limited to the TCMB data set. In the data of the study, the series which were not purified from the monthly seasonal effects covering the period of 1991:5-2015:12 were used. All series were calculated as purged from price.

4. Methodology

The change in financial markets is an important indicator for real markets. Increasing uncertainty in financial markets is perceived as changing expectations in real markets and increasing risk. Determining the causes of volatility in financial markets and predicting these movements will facilitate the determination of the behavior and positions of financial markets, and will reduce the uncertainty and risk perception in the real sector to the lowest level.

Studies on the size of these movements with the downward and upward movements brought about the development of many techniques. Mandelbrot (1963) stated that volatility clusters were formed and the large-scale changes in the prices of assets traded in financial markets showed that small-volume changes were followed by small amount changes (Güloğlu, et al., 2007: 48).

Engle (1982) developed an Autoregressive Conditional Variance (ARCH) model and this model was developed by Bollerslev (1986) and generalized ARCH (GARCH) model was obtained in order to better understand this dynamic feature of financial markets and to predict the changing volatility over time. The GARCH model was derived from the conversion of the autoregressive ARCH model to an autoregressive moving average model.

5. SWARCH Model

In many studies on volatility, analyzes were made using ARCH or GARCH models. Most of the time such models predict higher volatility than they are and their predictive performance is quite low, Hamilton (1994) insists on this issue. Most of the researchers point to the structural change in the ARCH process. The high predicted resistance parameter for the whole sample shows big changes when working on the sub-samples.

In his study of the volatility of stocks returns on the New York stock exchange, Hamilton (1994) found that the Markov Transformed ARCH models, which consider the structural break in the ARCH process, foresee a lower resistance than the GARCH models. Therefore SWARCH technique to measure the rate of volatility in Turkey used in this study and the results were compared with results obtained from ARCH and GARCH art.

6. Data and Ampirical Findings

6.1. Data

In the data of the study, the series which were not purified from the monthly seasonal effects covering the period of 1991:5-2015:12 were used. All series were calculated as purged from price. The data are taken from the Central Bank of Turkey Electronic Data Distribution System. Logarithms of variables were taken for analysis. The abbreviation of the variables is as follows; imp = import, price = domestic price index, exchange rate = exchange rate (US dollar) and swarch = exchange rate volatility. When the logarithms of the variables were taken, "1" was introduced before all variables. The figure shows the logarithmic value of the exchange rate volatility.

Figure 1: Exchange Rate Volatility (lSwarch)

LSWARCH
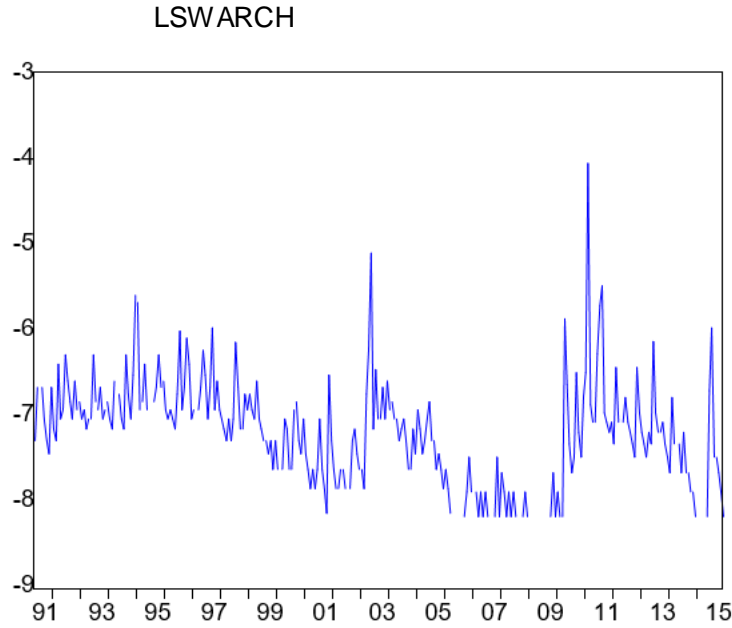
6.2. Stationary Analysis

Variables are assumed to be static in models discussed in the time series econometrics approach, that is, the average and variance is assumed to change with time (Sevüktekin and Nargeleçekenler, 2005: 37). False regression problem is encountered when the series is not stable. The logarithms of the variables were taken first. Stability tests are performed to determine if the series is stationary. The most common ADF test (Akaike, 1973: 255) is used for stationary tests. Another stationary test was conducted by the Phillips-Perron test (1988) and the Kwiatkowski-Phillips-Schimidt-Shin test (1992). As shown in Table 1 below, the ADF and PP test results reject the hypothesis that the series contains unit root for the fixed-term and/or trend model at the level of 1% significance, and accept the stability hypothesis in the KPSS test. Looking at the test results, we can say that the series is stable in the period examined.

Table 1: ADF, PP, KPSS Test Results[1]

Extended Dickey-Fuller (ADF) Test			
LDK	"Fixed and No Trend"	"Fixed Term"	"Fixed and Trendy"
ΔLn(ITH)	-3.76***	-5.57***	-5.61***
ΔLn(Exchange Rate)	-8.14***	-10.42***	-10.58***
ΔLn(Price)	-1,42	-8.52***	-8.63***

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[1] Statistics are significant at 1% level.

ΔLn(SWARCH)	-14.41***	-14.39***	-14.37***
Philips Peron(PP) Test			
LDK	"Fixed and No Trend"	"Fixed Term"	"Fixed and Trendy"
ΔLn(IMP)	-31.82***	-39.56***	-40.17***
ΔLn(Exchange Rate)	-8.59***	-10.32***	-10.69***
ΔLn(Price)	-3,99	-9.03***	-9.12***
Ln(SWARCH)	-0,007	-8.76***	-9.65***
Kwiatkowski-Philips-Schimdt-Shin(KPSS)Test			
LDK	"Fixed Term"	"Fixed and Trendy"	
ΔLn(IMP)	0.11***	0.05***	
ΔLn(Exchange Rate)	0.54***	0.34***	
ΔLn(Price)	0.49***	0,42	
ΔLn(SWARCH)	0.04***	0.03***	

6.3. SWATCH's Prediction results

The SWARCH model was estimated using the maximum likelihood method. In this study, the number of cases (N = 2) was taken. The first case (st = 1) was called low volatility, (st =2) was called high volatility. The SWATCH (1,1) model was estimated under the assumption of t distribution. Estimation results are as follows:

$$Y_t = 0{,}0179 + 0{,}956\, Y_{t-1} + e_t$$
$$(0{,}005)(0{,}012)$$

$$h_t^2 = 0{,}00024 + 0{,}326\tilde{e}_{t-1}^2 - 1{,}8 * 10^{-12}\tilde{e}_{t-2}^2$$
$$(9{,}6 * 10^{-5})(0{,}182)(0{,}536)$$

$$g_1 = 1, g_2 = 4{,}04, L = 684{,}54$$
$$(2{,}79)$$

According to these results, it was estimated at g2 =4.04. This value shows that the variance in the high volatility (st = 2) is approximately four times higher than in the low volatility. The ergodic possibilities for each case using the transition probabilities are as follows;

$$Prob(s_t = 1) = 0,48$$
$$Prob(s_t = 2) = 0,51$$

The first value (0,48) indicates the probability of any observation in the sample period (st = 1) at any time, and the second value (0,51) at any time during the sample period in the case of high volatility of any observation (st = 2).

After the volatility values are found, the regression results obtained by taking the exchange rate, price and volatility values as independent variable and dependent variable are as follows.

$$lith = 3,262 + 1,089 \, 1price - 0,882 \, 1exchange \, rate - 0,035 \, 1Swarch$$
$$(0,037) \quad (0,05) \quad\quad (0,051) \quad\quad (0,0174)$$
$$R^2 = 0,95 \quad \tilde{R}^2 = 0,95 \quad F = 2035 \quad DW = 0,94$$
$$BG(3) = 90,55$$

According to Durbin-Watson test, autocorrelation is observed in regression. We also applied the Breusch-Godfrey LM (BG) test to ensure autocorrelation (Vogelvang, 2005: 117). According to the BG test performed with three delays, we had to accept the null hypothesis that there is no autocorrelation. In order to eliminate autocorrelation, the first and second delays of the import dependent variable were regressed to the equation. The results of this regression are as follows.

$$lith = 0,8383 + 0,439 \, 1price - 0,361 \, 1exchange \, rate - 0,0091Swarch + $$
$$(0,620) \quad\quad (0,069) \quad (0,0617) \quad\quad (0,0145)$$
$$0,403li \, th(-1) + 0,219li \, th(-2)$$
$$(0,056) \quad\quad (0,056)$$
$$R^2 = 0,96 \quad\quad \tilde{R}^2 = 0,96 \quad\quad F = 1811 \quad\quad Dw = 2,07$$
$$BG(3) = 10,27$$

Breusch-Godfrey LM (BG) test, according to the five percent after the delay is considered to be an empty hypothesis that autocorrelation.

According to the predicted regression results, the signs of the variables affecting the imports are as expected. Domestic price increases and imports are directly proportional. Imports also increase as domestic prices increase. The most important variable affecting imports is the domestic price level. As the exchange rate increases, imports are downside. Likewise, exchange rate volatility is reversed. Volatility, that is, imports decrease as exchange rate risk increases.

Result and Recommendations

Knowing the variables affecting foreign trade will facilitate the selection of policy instruments and the correct way to be followed. The most important part of the balance of

payments is the import and export transactions. Foreign trade items, which alone provide external balance, affect the real sector as well as money markets.

Today, due to the effect of the international financial markets on the exchange rate balance, it is the most important factor that ensures the healthy structuring of the export and import balance in a country. In other words, while the exchange rate is in balance, foreign trade remains stable, otherwise stability is deteriorating.

After the exchange rate volatility was found, domestic prices and exchange rates were taken as the independent variables of the regression. According to the regression analysis coefficients were significant, and the parameter markers were in the direction expected. According to regression results; While the import value moves in the same direction with domestic prices, it moves in the opposite direction with the exchange rate volatility and exchange rate. As exchange rate volatility increases, imports are declining and it is an important variable that determines imports. The higher the foreign exchange markets in Turkey, the lower the import rate. The importance of stable foreign exchange markets is significant in terms of stability of imports. The most important variables determining the import value are; exchange rate and exchange rate volatility. A very small risk formation in the foreign exchange markets is reflected in the foreign trade and imports decrease. Therefore, if the countries are not faced with a risk arising from international markets, they try to keep domestic foreign exchange markets as balanced as possible.

The effect of import on exchange rates is quite high when we regress the exchange rate with imports without taking volatility values. Changes in the money markets are among the factors that affect the import values. The balance of money markets and imports will thus ensure that foreign trade is in balance. Any domestic and external negative development that does not activate the exchange rate will directly affect the real sector. In this regard, importers could not avoid foreign exchange risk in Turkey, therefore, it is said that much affected by exchange rate volatility.

While we had the same results with many studies, we could not reach the same results with some studies. However, the fact that the newly developed techniques support previous research increases the confidence in the results. Achieving the results stated by the theory is important for the effectiveness of the policies. The choice of appropriate policy instruments has been the basis for the success of an economy in recent years, when global impacts and instability have increased.

Due to the negative effects of the 2008 global financial crisis, extreme fluctuations in exchange rates, the sudden changes in the price of an important commodity such as oil, and the political transformations such as the Arab Spring, the global economy has many risks in itself.

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