

THE IMPACT OF EXCHANGE RATE VOLATILITY ON INTERNATIONAL TRADE IN DEVELOPING COUNTRIES: EVIDENCE FROM TURKIYE

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ABSTRACT

Purpose- The purpose of this study is to examine how exchange rate volatility affects international trade in developing countries, particularly for Turkey.

Methodology- The study employs secondary monthly data from data providers like Turkish central bank (TCMB) and Turkish statistical institute (TUIK) website from 01.01.2018 to 31.12.2022 with 60 observations, samples used are exchange rate, consumer price index as independent variables and export as dependent variable. We employed GARCH model while analyzing in E-views 9.0 version in order to estimate the conditional volatility of the exchange rate and consumer price index on the trade volume

Findings- The analysis reveals export volume is influenced by a exchange rate volatility.

For portfolio managers and policymakers seeking to understand the patterns of global capital flows, these findings have significant implications.

Conclusion- based upon the analysis Findings it may be concluded that the CPI (Consumer Price Index) has a substantial impact on international trade by affecting the cost of production and prices of products and services. A country's trade balance may suffer as a result of high inflation, which can cause a decrease in exports and a rise in imports. On the other hand, low inflation might result in higher exports and lower imports for a nation, which will improve the country's trade balance.

Moreover, by affecting the relative pricing of goods and services across nations, the exchange rate has a considerable effect on international trade. A country's exports become more expensive while its imports get cheaper when its currency appreciates. This might result in a decrease in exports and an increase in imports, which is bad for the country's balance of trade.

In contrast, a country's exports become more reasonable priced while its imports become more expensive and when its currency appreciates. It causes an increase in exports and a drop in imports, which has a positive impact on the country's trade balance. Countries can use a variety of initiatives, including enacting laws to regulate currency fluctuations, employing exchange rate hedging techniques, and increasing exports through trade agreements, to manage the effect of currency rate on foreign trade. In order to increase the quality and value of their exports, countries can invest in enhancing their productivity and competitiveness, which can counteract the negative effects of currency changes.

Keywords: Exchange rate, consumer price index, international trade, volatility,

JEL Codes: M40, M41

1. INTRODUCTION

International trade mainly affects most developing countries' economies. However, importers and exporters can be adversely impacted by exchange rate volatility on international trade flows. Exchange rate volatility refers to the change in exchange rates over time that may be brought on by a number of variables, including changes in interest rates, political instability, and changes in global economic conditions. In this context, this study attempts to examine the impact of exchange rate volatility on international trade in developing nations. The study will use the empirical analysis (econometric techniques) to examine the relationship between exchange rate volatility and trade flows, using data from a sample of Turkey.

Overall, this research seeks to broaden the understanding of the impact of exchange rate volatility on international trade in developing countries, and to provide policy recommendations to help reduce the negative impact of currency rate variations on trade flows.

2. LITERATURE REVIEW

According to many researches, exchange rate changes can impact on international trade in emerging nations. Using quarterly data from 1996 to 2014 and the Autoregressive Distributed Lag (ARDL) to analyze the effect of exchange rate volatility of

Indian exports, Ghosh (2015) discovered that this volatility has a considerable negative impact on Indian exports in both the short and long terms.

In the same vein, Ahmed and Uddin's (2017) study investigated the impact of exchange rate volatility on Bangladesh's exports by using quarterly data from 1980 to 2015 with Autoregressive Distributed Lag (ARDL) approach and found that exchange rate volatility has a negative effect on Bangladesh's exports in both the short and long run.

In addition, Kaya's (2018) research on the effect of exchange rate volatility on Turkey's exports concluded that exchange rate volatility has a negative influence on Turkey's exports over the long and short terms. Using quarterly data spanning the years 2003 to 2017, with (ARDL) approach.

Likewise, Bahmani-Oskooee and Rhee's (1996) research evaluates the link between fluctuations in exchange rate and international trade using yearly data for 23 countries from 1975 to 1990. Their study suggested that exchange rate changes has an adverse effect on international trade in both the short and long run. However, that the impact of exchange rate volatility on trade is asymmetric, with negative shocks having a greater impact on trade than positive shocks.

In addition, using Autoregressive Distributed Lag (ARDL) approach with quarterly data from 1990 to 2009, Ali and Malik's (2011) investigated the interaction between exchange rate volatility and export performance in Pakistan and found that in both the short and long run effects of exchange rate volatility on exports are negative for Pakistan.

As part of the study of Osabuohien and Efobi's (2013), using Generalized Method of Moments (GMM), their study investigated on the impact of exchange rate volatility on the trade of Sub-Saharan African (SSA) countries using panel data from 1995 to 2010. They came up with the exchange rate volatility has a negative impact on trade in SSA countries in both the short and long run.

Furthermore, Lim and Mohd Ali's (2015) study investigates the influence of exchange rate swings on global commerce using quarterly data for a set of 20 countries from 1990 to 2013. By employing Fixed Effects and Random Effects models. The findings showed that volatility of exchange rate has a negative influence on global trade during the short and long run.

Indeed, Obida and Gambo's (2020) used Vector Error Correction Model (VECM) to evaluate impact of exchange rate volatility on trade flows in 10 sub-Saharan African countries using quarterly data from 2008 to 2018. The results of their study was that exchange rate volatility has a negative impact on trade flows in the short run but has a favorable impact in the long run.

Again, Glick and Rose's (2016) study provides a meta-analysis of the literature on the link between exchange rate volatility and international trade. The study synthesizes the findings of 33 empirical studies published between 1984 and 2014, which examine the effect of exchange rate volatility on trade. The results showed that exchange rate volatility has a negative impact on international trade. The effect is larger for imports than for exports, indicating that exchange rate volatility affects the willingness of firms to import more than their willingness to export.

In another hand, Akram and Hussain's (2020) study for the years 1991–201 explored the effects of currency rate volatility on export performance in six rising economies: Brazil, China, India, Malaysia, Mexico, and South Africa.

Exchange rate volatility has a detrimental effect on export performance in each of the six nations, according to the study's panel data analysis. China, India, and Mexico experience a bigger impact than the other three countries, proving that exchange rate volatility has a greater impact on these three countries' exports.

Also, Bacchetta and van Wincoop's (2017) study provides a comprehensive survey of the literature on the relationship between exchange rate volatility and international trade. The article covers theoretical and empirical research and explores the numerous ways that commerce might be affected by currency rate changes. According to the study, the most prevalent way that exchange rate volatility affects international trade is through its effect on price volatility. When currency rates are unstable, it is challenging for businesses to appropriately price their goods, which might lower demand for their products. Because it has an impact on businesses' investment, output, and trade financing decisions, exchange rate volatility can also have an impact on trade.

Moreover, Wang, Wu, and Zhou's (2020) study explores the effect of exchange rate volatility on China's exports using time-varying coefficient models and the generalized autoregressive, conditional heteroskedasticity (GARCH) model. The study used monthly data from 2000 to 2019 demonstrated that exchange rate fluctuation has a detrimental effect on China's exports.

However, the study also finds that the magnitude of this impact varies over time and depends on the level of exchange rate volatility. Specifically, the negative impact of exchange rate volatility on exports is stronger during periods of high changes than during periods of low fluctuations.

In addition, Goh and Wong (2019) carried out an empirical study on the impacts of exchange rate volatility on global commerce in the ASEAN-5 nations (Indonesia, Malaysia, the Philippines, Singapore, and Thailand) for the years 1995 to 2015. The study examined the effects of exchange rate volatility on the imports and exports of the ASEAN-5 countries using panel data for regression analysis. According to the findings, exchange rate volatility has a negative effect on both imports and exports, but as time goes on, it has an advantageous impact on exports. The study also reveals that less developed nations in the ASEAN-5 region are more affected by exchange rate volatility with regard to of trade.

In contrast, some studies have discovered that exchange rate volatility has no significant effect on international trade in emerging countries. For instance, Nguyen and Nguyen's (2017) study investigates the effect of exchange rate volatility on Vietnam's exports with quarterly data

from 2000 to 2015. They used the Autoregressive Distributed Lag (ARDL) and hypothesized that exchange rate volatility has a negative effect on Vietnam's exports in both the short and long run.

At the end, Halicioglu's (2016) study investigated the impact of exchange rate changes on Turkey's exports using quarterly data from 2002 to 2015. The study employs the Autoregressive Distributed Lag (ARDL) approach to cointegration analysis to investigate the long run and short-run relationships between exchange rate volatility and exports. The results suggest that exchange rate volatility has a negative impact on Turkey's exports in both the short and long run. Also, the effect of exchange rate fluctuation on exports is nonlinear, with high volatility having a more detrimental effect than low volatility.

3. DATA AND METHODOLOGY

This study's goal is to determine how currency rate fluctuations impacts foreign trade for Turkish case. For this purpose, the econometric approach adopted in this study is based the generalized autoregressive conditional heteroskedasticity (GARCH) model to estimate exchange rate volatility. We use data from 01-01-2018 up to 31-12-2022 period and the research object is exchange rate, consumer price index as independent variables and export as dependent variable. Data collected from Turkish central bank's web site and analyzing used E-views 9.0 version.

3.1. Hypothesis

H 0= Exchange rate affects trade

H 1= Exchange rate does not affect trade

H 3 = Consumer price index (cpi) affects trade

H 4 = Consumer price index (cpi) does not affect trade

Table 1: Variables

DATA		SOURCE
<i>Trade (Export) – (Tx)</i>	Dependent variable	Turkish Central Bank
<i>Exchange Rate (Fx)</i>	Independent variable	Turkish Central Bank
<i>Consumer Price index (CPI)</i>	Independent variable	Turkish Statistical Institute

The dependent and independent variables used in this research are showed in Table 1. Exchange rate and consumer price index are used as independent variables, and trade volume as a dependent variable. The data have been collected from the website of the Turkish Central Bank (TCMB) and Turkish Statistical Institute (TUIK) between January 1, 2018, and December 31, 2022 (monthly data).

Exchange rate: is the price at which one currency converted into another. It is a key component of international trade, investment, and financial transactions since it illustrates the worth of one currency in comparison to another. For our study, secondary data are collected from central bank of republic of Turkey.

Consumer price index: is a measurement of the average change in prices paid by consumers for a variety of products and services over time. By gathering pricing information for a representative sample of products and services that households frequently buy, the CPI is determined as a weighted average of these price changes, which are tracked over time for these items' prices.

Volume of Trade: The total value or quantity of goods and services that a country export.

3.2. Econometric Model

For this study, we judged the following econometric model suitable

$$Tx = \alpha + \beta_1 Fx + \beta_2 Cpi + \epsilon_1$$

Whereas:

Tx : Trade (Export) of Turkey
 $\beta_1 Fx$: Exchange rate (Usd/TL)
 $\beta_2 Cpi$: Inflation rate of Turkey
 α : Alpha
 ϵ_1 : error

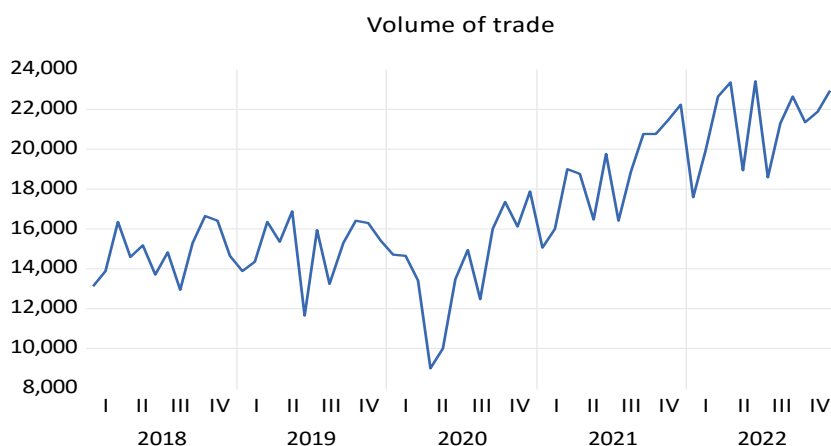
Figure 1: Volume of trade (Export) of Turkey from 2018 to 2022

Figure 1 shows the monthly volume of export made by Turkey during the period of 2018 and 2022. The volume of Turkey's exports has raised in recent years. Many factors can be the reasons of this increase like economic expansion. In fact, The Turkish economy has expanded recently. This has increased both domestically and internationally the demand for Turkish products and services. We can take into account the globalization; Turkish companies now find it simpler to export their products and services abroad. In addition, Turkey has recently signed a number of free trade agreements, which have reduced tariffs on goods exchange between Turkey and other nations.

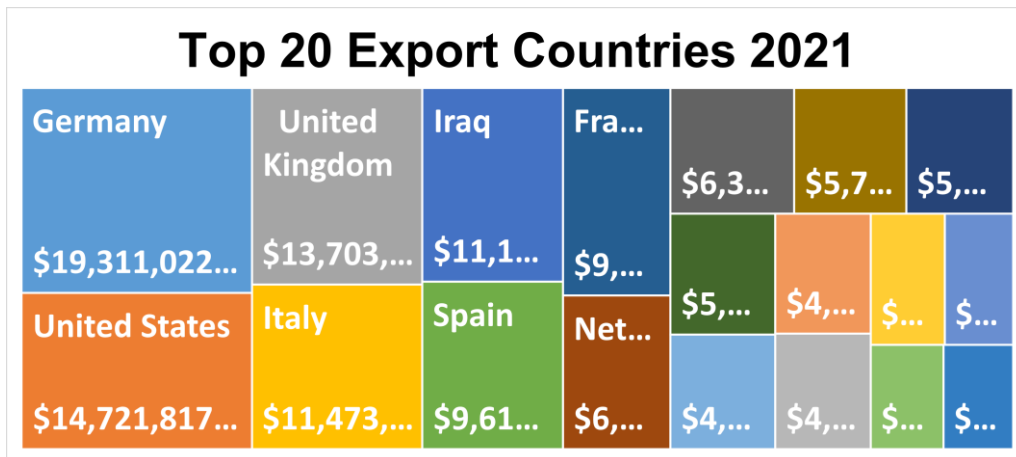
Table 2: Top 10 Exported Goods By Turkey In 2021

Rank	Products	Export (\$)	Export (%)
1	Motor Vehicles & Parts	\$25,022,288,148	11.10%
2	Industrial Machinery	\$20,774,979,518	9.22%
3	Iron & Steel	\$17,063,291,082	7.58%
4	Electrical Machinery	\$12,011,249,987	5.33%
5	Precious Stones & Metals	\$10,964,701,702	4.87%
6	Apparel: Knit	\$10,781,471,794	4.79%
7	Plastics	\$10,015,156,865	4.45%
8	Iron & Steel Articles	\$8,801,582,599	3.91%
9	Oil & Mineral Fuels	\$8,506,563,580	3.78%
10	Apparel: Non Knit	\$7,513,606,778	3.34%

Machinery and transport equipment including road vehicles, electrical machinery, apparatus, and appliances are the major items of Turkey's exports. A significant portion of manufactured commodities, such as textile yarn, fabrics, made-to-order items, iron, steel and metal manufacturing are also exported.

The miscellaneous produced goods, garments and clothing accessories have a high rate in the export report. We must consider fruits and vegetables because Turkey places higher value on food and live animals. The volume containing gold also includes non-monetary chemicals and related goods.

Table 3: Top 20 Exported Country in 2021



Above all, Germany, the UK, the UAE, Iraq, and the US, as well as Italy, France, and Spain, were Turkey's primary export trading partners.

Figure 2: Monthly exchange rate (usd) of Turkey from 2018 to 2022

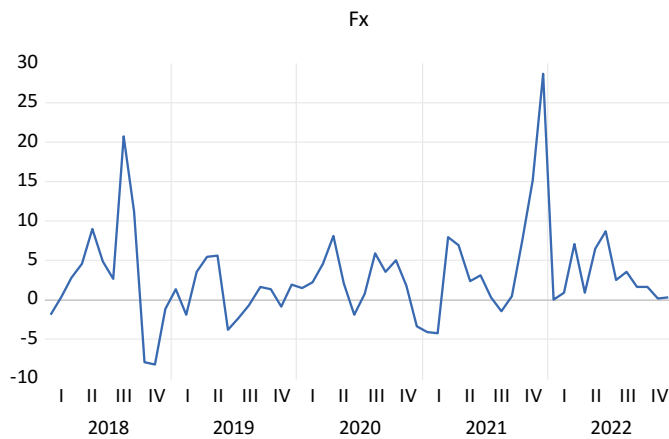


Figure 2 shows the monthly exchange rate of TL and Usd during the period of 2018 and 2022. There are various causes for the Turkish lira's depreciation. First, Turkey's high inflation has increased the cost of Turkish goods and services for international consumers, which has decreased exports and foreign exchange revenues. Second, political instability has deterred international investors from making investments in Turkey, resulting in a decline in inflows of foreign currency. Finally yet importantly, by keeping interest rates low, the Turkish central bank has decreased demand for US dollars by making it more appealing for domestic depositors to hold liras. These elements work together to lower the value of the Turkish lira.

It is important to note that Turkish economy has suffered a number of negative effects as a result of the Turkish Lira's depreciation. It has increased the cost of importing goods and services for Turkish firms, which has raised consumer costs. Additionally, because Turkish enterprises' products are now more expensive, it is now harder for them to compete with those of other countries.

Figure 3: Monthly Consumer price index of Turkey from 2018 to 2022

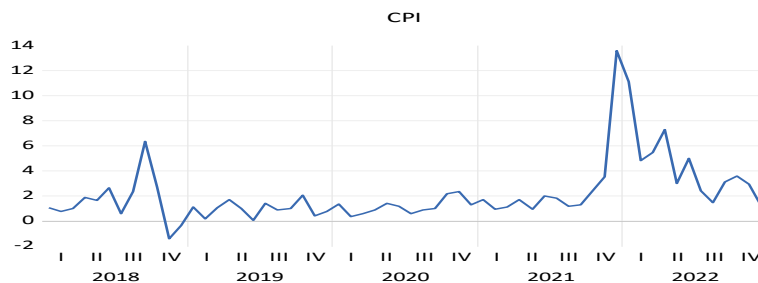


Figure 3 shows the monthly consumer price index of Turkey during the period of 2018 and 2022. We can noticed that the consumer price index (CPI) has been rising gradually. Several factors have contributed to the CPI's rise. First, inflation, which is a general rise in prices, have caused by many factors, including a rise in the money supply, increased demand, and a decline in supply. In addition, Turkey's economic expansion has generated increased demand for products and services, pushing prices upward. Last but not least, the cost of imports has increased as a result of the Turkish lira's decline versus US dollar.

Stationarity test

Unit Root Test using Augmented Dickey-Fuller Method

Two first steps are taken before applying the GARCH models to assess the volatility of currency rates. Data stationarity needs to be verified first. For this, we frequently apply the common Augmented Dickey Fuller (ADF) tests.

Table 2 : ADF-Fuller test for trade volume

Null hypothesis : Trade volume has a unit root

Variable	T-statistic	Prob
Trade volume	-1.419791	0.5665

In order to check the stationary test for volume of trade, we used ADF test model. The results in Table 2 show that exchange rate is not significant because prob-value is 0.5665, which is more than 0.05 . As the volume of trade is non-stationary, difference should been taken in order to run unit root test.

Table 3 ADF-Fuller test for Dtrade

Null hypothesis : DTrade volume has a unit root

Variable	T-statistic	Prob
DTrade	-12.20	0.0000

The results in Table 3 show that trade volume is significant now significant at level and intercept. The p-value is 0.0000, which is less than 0.05. At 1% level, volume of Trade (DTrade) \rightarrow I (0) is stationary at level and Intercept

Table 4 : Automatic ARIMA forecasting

Selected variable DTRADE

Number of estimated ARMA model	25
Number of non-converged estimations	0
Selected ARMA model	(0,1) 2 (0,0)

The results in Table 4 show the selected ARMA results, which is (0.1). The ARIMA model shows that zero is autoregressive component and one moving average component.

Table 5 : ADF test for FX

Null hypothesis : FX has a unit root

Variable	T-statistic	Prob
FX	-5.2082	0.0001

In order to check the stationary test for exchange rate, we used ADF test model. The results in Table 5 show that exchange rate is significant at level and intercept. The p-value is 0.0001, which is less than 0.05. At 1% level, Exchange rate (FX) \rightarrow I(0) is stationary at level and Intercept

Table 6 : ADF test for CPI

Null hypothesis : CPI has a unit root

Variable	T-statistic	Prob
CPI	-3.60	0.0085

In order to check the stationary test for consumer price, we used ADF test model. The results in Table 6 show that consumer price is significant at level and intercept. The p-value is 0.0007, which is less than 0.05. At 1% level; Consumer price index (CPI) \rightarrow I(0) is stationary at level and Intercept

Table 7 : Mean equation

Variable	Coefficient	Std error	Z-statistic	Prob
C	199.6965	2.767812	72.14960	0,0000
MA(1)	-0.738883	0.072689	-10.16502	0,0000
Variance equation				
C	146005.1	267515.6	0.545782	0.5852
RESID (-1) ²	-0.193703	0.079918	-2.423765	0.0154
GARCH (-1)	1.154073	0.113582	10.16068	0.000

According the moving average from ARMA model, for estimating GARCH, We used MA (1) and this estimation give us the results in Table 7. It is evident that mean and variance equation are all significant because they are less than 0.05. As mean and variance for the volatility trade are all significant, now, we will find out if CPI and FX affect the DTRADE.

4. FINDINGS

Using the MA(1), DTrade as dependant variable, FX and CPI as independent variables. We estimated the GARCH MODEL as above. Based on The *Table 8*, the results are as follow,

RESID (-1)²: P-value is **0.7795**. The value is greater than 0.05, it indicates that the lagged squared residual term is not statistically significant.

GARCH (-1): P-value is **0.000**. The value is less than 0.05, providing strong evidence to reject the null hypothesis. Therefore, the GARCH term is statistically significant at the 5% significance level.

FX: P-value is **0.0284**, which is less than 0.05. Therefore, we can say that FX is statistically significant.

CPI: P-value is 0.9981, which is greater than 0.05. Therefore, CPI is not statistically significant.

Here, we can see that exchange rate is significant with p-value of 0.0284 while the consumer price index P-value is 0.9981. Therefore, we can say that exchange rate increases the volatility of trade volume of Turkey.

Table 8 : Garch model

Variable	Coefficient	Std error	Z-statistic	Prob
C	101.3148	61.91275	1.636412	0,1018
MA(1)	-0.735460	0.075468	-9.745312	0,0000
Variance equation				
C	703744.7	399736.9	1.760519	0.0783
RESID (-1) ²	-0.021678	0.077449	-0.279906	0.7795
GARCH (-1)	0.631956	2.83E+10	10.16068	0.000
FX	265026.2	120919.5	2.191758	0.0284
CPI	923.2606	384213.8	0.002403	0.9981
Rsquared	0.291477			
Adjusted Rsquared	0.279047			

Interpretations

The Effect of exchange rate

H0 = exchange rate affects trade ; ACCEPTED Based on the results, the prob-value of exchange rate is 0, 0284 which is less than 0, 05 significance level.

That means exchange rate is significant and increase the volatility of trade in long run.

H 1= Exchange rate does not affect trade ; REJECTED

***The Effect of consumer price index**

H3= Cpi does not affect trade : REJECTED Based on the results, the prob-value of cpi is 0,9981 which is more than 0, 05 significance level. That means Cpi is not significant and does not affect trade in long run.

H 4 = Consumer price index (cpi) does affect trade; ACCEPTED

5. CONCLUSION

In summary, the CPI (Consumer Price Index) has a substantial impact on international trade by affecting the cost of production and prices of products and services. A country's trade balance may suffer as a result of high inflation, which can cause a decrease in exports and a rise in imports. On the other hand, low inflation might result in higher exports and lower imports for a nation, which will improve the country's trade balance.

Moreover, by affecting the relative pricing of goods and services across nations, the exchange rate has a considerable effect on international trade. A country's exports become more expensive while its imports get cheaper when its currency appreciates. This might result in a decrease in exports and an increase in imports, which is bad for the country's balance of trade.

In contrast, a country's exports become more reasonable priced while its imports become more expensive and when its currency appreciates. It causes an increase in exports and a drop in imports, which has a positive impact on the country's trade balance. Countries can use a variety of initiatives, including enacting laws to regulate currency fluctuations, employing exchange rate hedging techniques, and increasing exports through trade agreements, to manage the effect of currency rate on foreign trade. In order to increase the quality and value of their exports, countries can invest in enhancing their productivity and competitiveness, which can counteract the negative effects of currency changes.

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