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RESEARCH ARTICLE

The Effects of Macroeconomic Indicators on Leveraged Forex Volume: Evidence from Turkey

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Abstract

In this study, the effects of macroeconomic indicators on leveraged forex volumes of financial intermediary institutions have been analyzed. The study covers the data for the period 2013Q1-2017Q2 of 16 financial intermediary institutions operating in Turkey. In the study in regards to macroeconomic indicators, BIST 100 Index revenues (BIST), consumer price index (CPI), consumer confidence index (CCI), average rate applied to deposits opened by banks (INT), gold prices (GOLD), money supply (M2), external trade export unit index (EUVI) and unemployment rate (UNEMP) have been used. In the study, the effects of macroeconomic indicators on leveraged forex volume have been examined through panel data analysis. As a result of the panel data analysis, it has been determined that the BIST, M2, EUVI and UNEMP variables have positive significant effects on leveraged forex volume and that the INT variable has negative significant effects on leveraged forex volume. In the study, the effects of CPI, CCI and GOLD variables on leveraged forex volume are statistically insignificant.

Keywords

Forex market • Leveraged forex volume • Macroeconomic indicators • Panel data analysis

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The Effects of Macroeconomic Indicators on Leveraged Forex Volume: Evidence from Turkey

Bretton Woods is the name of the international monetary system that ran from end of the World War II till the early 1970's. In fact, it was a set of the rules and institutions for the post-war international monetary system. In that system, the United States committed to sell (and buy) gold from $35 per ounce in transactions with other member countries**.** Moreover, every participating country also committed to fix a par value of exchange rate of its currency against the US dollar. The US dollar in this system served as a reserve currency in which all other participating countries kept their foreign exchange holdings. It was some sort of fixed exchange rate system. Starting from the late 1960's, many problems as well as strain were experienced in the system, and the US revoked the pledge to exchange dollar for gold at the fixed rate in 1971. The last move comes from other large countries abandoning the peg of their currencies to the US dollar in 1973, and the Bretton Woods System collapsed. After the collapse of the Bretton Woods System, especially large countries started to target the money supply while floating the exchange rates. Since the dollar is no longer pledged to gold, starting from the 1980s, international trade has increased with globalization in the World economy. With the increase in international trade, the significance of floating exchange rate has increased (Vigna and Casey, 2017).

Foreign exchange markets are decentralized markets in which the participants are generally separated from each other and the transactions take place via electronic media such as telephony or computer networks. In the foreign exchange market transactions can take place simultaneously at different prices in the market (Sarno and Taylor, 2002).

The forex market is the largest and most rapidly growing financial market in the world economy. In exchange transactions, investors simultaneously purchase one currency and sell the other. Accordingly, if an investor purchases euros and sells dollars, there must be a market player in the market who volunteers to carry out the opposite transactions. For this very reason, forex is a zero-sum game, and for every winning player, there is a loser. In the forex market, the possibility of ignoring risk is quite high due to over-optimistic market perception of investors and misleading market discourse. This is because, in this market, there is a leverage mechanism which makes it possible for investors to enter into transactions with much higher amounts than the resources they actually have, and this opportunity is one of the main reasons behind the risk in the forex market (Şendur, 2017). It is possible to invest in gold, oil, commodities, stock index, and CFD (Contract For Difference) as well as foreign currency in the forex market. However, in these markets the transactions take place in terms of bank money but not in cash payments. After the profit or loss, the net profit or loss is reflected in the investor's account and the results are recorded in terms of cash (Shilov and Semenov, 2011).

The increase in the use of different electronic application methods in foreign exchange markets provides algorithmic trading. Algorithmic trading is a term that captures any automated trading in which a computer algorithm determines the ordering strategy. For example, FX dealers use algorithms to automatically protect their stocks from risk. Hedge funds and arbitrage or other forms of trading are taken place via algorithms in the market (King and Rime, 2010). Forex trading, which investors can carry out by communicating with each other from long distance through computer networks, can occur in markets of different centers from all around the world. The most important markets include New York-USA, London-UK, Frankfurt-Germany, Tokyo-Japan, Geneva- Zürich-Switzerland, Singapore-Singapore, Hong Kong-China, and Paris-France (Doğukanlı, 2012). According to 2016 data, 36.9% of the daily forex trading volume is conducted in the UK, 19.5% in the US, 7.9% in Singapore, 6.7% in Hong Kong, 6.1% in Japan, and 22.9% in other countries (Ellialtıoğlu, 2017).

Both dealers and customers are the market participants in leveraged trading markets. The forex market involves such parties as banks and intermediary institutions, exporters and importers, multinational companies, international financial institutions and individual investors. In this market, investors take investment decisions using two traditional approaches, namely fundamental and technical analysis. In fundamental analysis, the state of the economy and macroeconomic indicators are evaluated to make estimations regarding the course the rates of foreign exchange that will follow. Technical analysis, on the other hand, is based on the concept that "history repeats itself." Accordingly, investors try to predict future price movements by examining changes in previous parities, trading volumes and supply and demand trends in the market.

There was no legal regulation concerning the forex market in Turkey until 2011. Forex trading was carried out in over-the-counter markets. With the communiqué prepared by the Capital Markets Board (CMB) and put into effect in August 2011, CMB was authorized for forex trading in Turkey. Maximum leverage ratio in leveraged forex is specified as 1:100 in the respective communiqué. In January 2016, the CMB set maximum leverage ratio for transactions based on foreign currency and gold over US Dollar, Euro, and Turkish Lira as 1:50 and for transactions based on other assets than these as 1:25. Minimum initial margin is decided to be 20,000.00 TRY. In February 2017, leverage ratio was redetermined as 1:10 while initial margin was specified as 50,000.00 TRY with a new communiqué. The regulations made in January 2016 did not reduce the interest of investors in the forex market, and forex trading volume in 2016 showed a 21% increase from the previous year (Ellialtıoğlu, 2017). However, the regulations made in February 2017 prevented many investors from entering the forex market and led to a decrease in interest in the market. The trend in total forex trading volume involving the transactions which financial intermediaries carrying on business in Turkey conducted during the period of 2013:3-2017:6 are indicated in Figure 1.

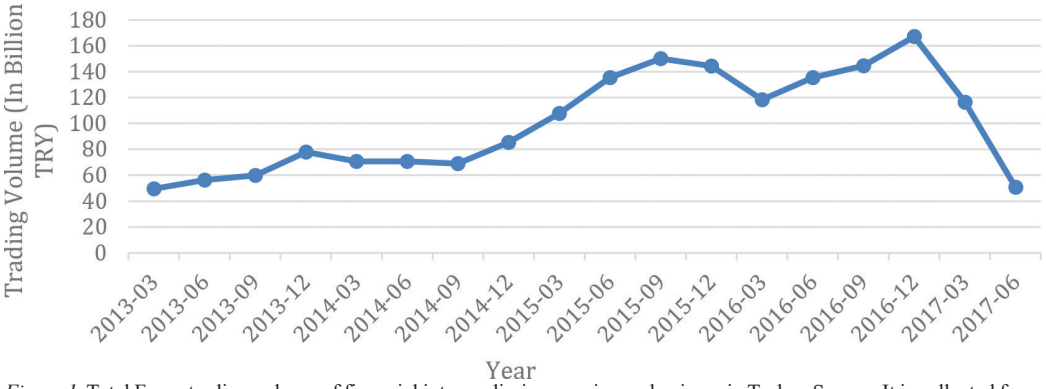

Figure 1. Total Forex trading volume of financial intermediaries carrying on business in Turkey Source: It is collected from the data of the Turkish Capital Markets Association

As pointed out in Figure 1, the total forex trading volume of financial intermediaries carrying on business in Turkey followed an upward trend by the last quarter of 2016, and it was on a significant decline in the first quarter of 2017. This situation came into prominence when the forex trading volume dropped below its value in the first quarter of 2013 in six months.

The total forex trading volume of financial intermediaries involved in this study is indicated in Figure 2.

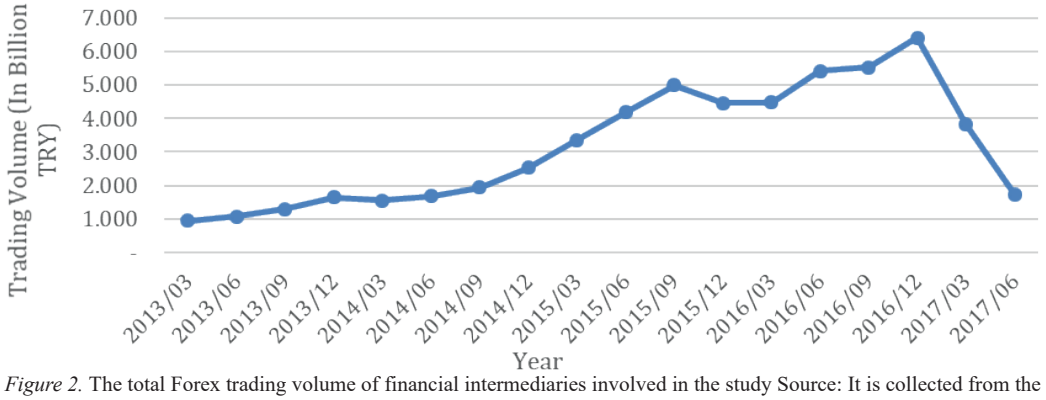

Figure 2. The total Forex trading volume of financial intermediaries involved in the study Source: It is collected from the data of the Turkish Capital Markets Association

As it is seen in Figure 2, the total forex trading volume of intermediary institutions involved in the study followed an upward trend by the last quarter of 2016, and it started to decline from the first quarter of 2017, in a similar way to Figure 1. It is possible to say that declines depicted in Figure 1 and Figure 2 starting from the first quarter of 2017 are consequences of regulations made by CMB in February 2017. Because in February 2017, leverage ratio was re-determined as 1:10 while the initial margin was specified as 50,000.00 TRY with a new communiqué.

The forex market, the course of which is explained above is the subject of this study. It is, correspondingly, aimed to identify macroeconomic indicators having an impact on the forex volume of financial beneficiaries carrying on business in Turkey, by means of panel data analysis. The study is composed of three parts apart from the introduction and conclusion. The first part includes national and international literatures examining the effects of macroeconomic indicators on forex transactions. In the second part, the methodology followed is described. In the third and last part, the method adopted in the analysis is described and the findings obtained from the results of the analysis are interpreted.

Literature Review

Although there are many studies in the literature related to the forex market, studies investigating the relation with macroeconomic variables are very limited. Similar studies related to this subject are explained below in chronological order.

Egert and Kocenda (2014), who employed a high-frequency GARCH model in their studies, investigated the effects of the press news concerning macroeconomic variables and of the statements made by central banks on the forex market. They carried out their research using the data on the currencies of the Czech Republic, Hungary and Poland before 2008 financial crisis (2004-2007) and during the crisis (2008-2009). In conclusion, they observed that the forex markets react intuitively to the news on macroeconomic variables in both periods in accordance with exchange rate theories. Nevertheless, the sensitivity of the forex markets to verbal interventions of central banks was significant only during the crisis period.

Gao et al. (2014) based their study on the fact that fluctuations in exchange rates are reflected in the forex markets and that this situation results from fluctuations in crude oil prices in international markets. They also suggested an econometric model that can be used to prove this situation.

Köse et al. (2014), in their research studying the behaviors of Turkish forex investors, tried to set forth factors that investors should take into account so that they can pursue effective and rational investment processes. The result they obtained was that investors who want to carry out transactions in the forex market, which is considered to be relatively new in Turkey, should have accurate and sufficient knowledge, receive proper and efficient consultancy services, and know themselves well in terms of behaviors in order to be more effective in the investment decisions they make. Investors should understand really well the transaction requirements, the relationship between position, margin and profit/loss, and how this relationship can be affected by price changes, and they should plan their transactions and strategies in line with this information. Köse et al. (2014) also stated that the forex market is, by its nature, sensitive to political and economic developments and reacts to such developments with fast and high price movements and that this situation can cause volatility.

Accordingly, it is much healthier if the investors who carry out transactions in the forex markets are those who know that forex markets have high volatility and who can withstand dramatic changes in prices that could occur in a short span of time.

Geromichalos and Jung (2015), referring to forex market as the largest over-the-counter market in the world, aimed to observe how forex markets are affected by macroeconomic and microeconomic trends by creating an equilibrium model for forex markets based on recent developments in money markets. The results of their study showed that the forex market do not suffer any loss as a result of macroeconomic trends although it is critically affected by microeconomic trends.

Nathani et al. (2016) examined the relationship between the Indian forex market and macroeconomic indicators during the period of 1990-2010 by use of a multiple linear regression model. The result of the study, where they used macroeconomic indicators, namely, Gross Domestic Product (GDP) and inflation rates, as independent variables and the trends in exchange rates as dependent variables did not demonstrate any statistically significant relationship between GDP and inflation rates and the exchange rates.

As it may be seen, only a small number of studies have been conducted, and few macroeconomic variables have been used to determine the effects of macroeconomic variables on the forex market. For this reason, the studies on other financial markets, especially stock markets, have been examined in order to determine what macroeconomic variables should be used in the study, and a few of these studies are given below.

Mukherje and Naka (1995), found a positive relationship between industrial production index, consumer price index and interest rates, and stock market index in their study, while Moorkerjee and Yu (1997) determined that narrow and widespread money supply and foreign currency reserves are effective on the long-run equilibrium of stock markets, but there is no such relationship in exchange rates. Al-Sharkas (2004) used real economic activity (industrial production index), money supply (M2), inflation (CPI), and interest rate (Treasury Bills Interest Rate) as variables to study the effects of macroeconomic variables on the Amman stock market.

Methodology

The Aim and The Scope of The Study

The primary purpose of the study is to examine the relationship between the forex volumes of financial intermediaries providing services for forex transactions in Turkey and macroeconomic variables by use of panel data analysis. The study includes trimester data regarding various macroeconomic indicators and also 16 financial intermediaries who carried

on business in Turkey between the years of 2013-2017 and whose data can be accessed on a regular basis. The list of financial intermediaries whose data was used in the study is indicated in Table 1.

Table 1

Financial Intermediaries Involved in The Study

No	Firms
1	Anadolu Yatırım Menkul Kıymetler A.Ş.
2	Deniz Yatırım Menkul Kıymetler A.Ş.
3	Destek Menkul Değerler A.Ş.
4	Finans Yatırım Menkul Değerler A.Ş.
5	GCM Menkul Kıymetler A.Ş.
6	Gedik Yatırım Menkul Değerler A.Ş.
7	İntegral Menkul Değerler A.Ş.
8	İş Yatırım Menkul Değerler A.Ş.
9	Noor Capital Market Menkul Değerler A.Ş.
10	Oyak Yatırım Menkul Değerler A.Ş.
11	PhillipCapital Menkul Değerler A.Ş.
12	Saxo Capital Markets Menkul Değerler A.Ş.
13	Tera Yatırım Menkul Değerler A.Ş.
14	Turkish Yatırım A.Ş.
15	X Trade Brokers Menkul Değerler A.Ş.
16	Yapı Kredi Yatırım Menkul Değerler A.Ş.

The Data Set and Methods of the Study

The data set of the study is composed of forex trading volumes of 16 financial intermediaries carrying on business in Turkey and provide services for forex transactions, based on their income statements during the period of 2013Q1-2017Q2, and 8 macroeconomic indicators concerning Turkey's economy. In line with the purpose of the study, leveraged forex trading volume which is the forex volume, of intermediaries, is used as the dependent variable. The independent variables, on the other hand, are 8 macroeconomic indicators representing different aspects of the country's economy. In determination of independent variables, since there were not any studies with similar content, the studies conducted using macroeconomic indicators affecting financial markets in general were taken into consideration. Even though it was desired to add more macroeconomic indicators as independent variables, this had to be avoided due to high correlation observed between some macroeconomic indicators and the possibility of encountering the problem of multicollinearity. Therefore, the number of macroeconomic indicators was kept limited, and indicators that could cause multicollinearity were not included in the study. Financial tables regarding intermediaries are collected from the Turkish Capital Markets Association (www.tspb.org.tr). BIST 100 Index yields, one of the macroeconomic indicators, were obtained from FINNET (Financial Network Information News Network - www.finnet.com.tr) and

other macroeconomic indicators were obtained from EDDS (Electronic Data Distribution System, Central Bank of the Republic of Turkey) (https://evds2.tcmb.gov.tr/). Descriptions regarding dependent and independent variables used in the study are indicated in Table 2.

Table 2

Dependent and Independent Variables Used in the Study

	Variable	Code
Dependent Variable	Leveraged Forex Trading Volume	FOREX
Independent Variables	BIST 100 Index Yields	BIST
	Consumer Price Index	CPI
	Consumer Confidence Index	CCI
	Weighted Average Interest Rate Charged by Banks on Deposits	INT
	Gold Prices	GOLD
	Money Supply (M2)	M2
	Foreign Trade Export Unit Value Index	EUVI
	Unemployment Rate	UNEMP

The dependent variable (FOREX) is the leveraged forex trading volumes for firms and includes leveraged forex trading volumes for both customers and liquidity providers. The FOREX variable in this study includes leveraged transactions of the Turkish Lira against foreign currencies such as USD/TRY and EUR/TRY. When the data set of the study was formed, all variables apart form BIST were included in the data set after their rates of change were calculated in percent compared to the previous periods. The BIST variable was used after the calculation of the logarithmic change of BIST Index closing prices compared to the previous period. The data set created within the scope of the study is a panel data set that is composed of 16 firms (cross-section) and 18 periods (time-series). Panel data is a type of data set created by combining both cross-sectional and time series data (Tatoğlu 2013). This data set has plenty of advantages compared to pure cross-sectional and time series data by providing the opportunity of using more informative data, providing stronger control over individual heterogeneity, having a higher degree of freedom between variables, and exhibiting less multicollinearity. Despite all these advantages it offers, panel data also includes such disadvantages and limitations as having a more challenging process of data collection and design and the probability of encountering measurement failures arising from ambiguous and unclear questions or omission (Baltagi 2013). In addition, the short-time dimension and the high cross-section dimension are addressed in micro panel data. The panel data model created within the scope of the study is as follows:

$$FOREX_{it} = \beta_{0it} + \beta_{1it}BIST_{it} + \beta_{2it}CPI_{it} + \beta_{3it}CCI_{it} + \beta_{4it}INT_{it} + \beta_{5it}GOLD_{it} + \beta_{6it}M2_{it} + \beta_{7it}EUVI_{it} + \beta_{8it}UNEMP_{it} + \varepsilon_{it} \quad (1)$$

In the model, $FOREX_{it}$ represents the leveraged forex volumes of firms; β_0 is the constant variable; β_n is the trend coefficients of variables while the *i* and *t* subscripts represent the values that variables contain for each firm and period.

In panel data analysis, models that can be applied according to interpersonal (section, firm) effects, time effects and simultaneous unit and time effects are categorized as the Fixed Effects Model, Random Effects Model and Pooled Model. In order to decide between the fixed effects or the random effects model, the Hausman Test could be used. The Hausman Test simply assesses whether the unique errors (μi) are correlated with the explanatory variables.

There are various assumptions that need to be tested in panel data analysis before estimation. These assumptions are the nonexistence of multicollinearity which means high correlation between independent variables, stationary series meaning nonexistence of unit roots in the series, nonexistence of autocorrelation (serial-correlation) briefly meaning the relationship between error terms, and the nonexistence of heteroscedasticity (Ün 2015).

It is possible to refer to two basic approaches in panel data analysis in compliance with the structure of the data set. Panels with long cross-section and short-time dimensions are called micro panels. Panels with short or medium cross-section and large-time dimensions are called macro panels. In studies conducted with macro panels, the stationarity assumption should be provided in time series. In studies conducted with micro panels, the stationarity assumption does not have to be provided since the time dimension is short (Baltagi 2013). The panel data model created within the scope of the study is composed of a time-series of 18 periods and a cross-section dimension of 16 firms. Therefore, the macro panel data analysis approach was adopted, and the stationarity of variables and cross-sectional dependence were taken into consideration.

Analysis and Findings

The problem of multicollinearity, one of the assumptions that needs to be tested in panel data analysis before estimation, is one of the unwanted situations in regression analyses and represents high correlation between independent variables. 'p' stands for the correlation coefficient, and in the models including independent variables with $p>0.75$ or $p<-0.75$, it is likely to encounter the problem of multicollinearity. In the determination of whether there is any variable that could lead to the problem of multicollinearity in the model, the methods of Correlation Analysis and Variance Inflation Factor-VIF were applied. In the event that the VIF value is equal to 4 or greater than 4, a significant problem of multicollinearity in regard to the dependent variable included in the respective regression model can be referred to. The limit value, which is accepted as 4 in this study, is considered to be 5 or 10 by some researchers. Results of correlation analysis regarding the variables are indicated in Table 3.

Table 3

Results of Correlation Analysis Regarding the Variables and VIF Values

Results of Correlation Analysis								
Variables	**BIST**	**CPI**	**CCI**	**INT**	**GOLD**	**M2**	**EUVI**	**UNEMP**
BIST	1							
CPI	-0.19752	1						
CCI	-0.01232	0.017079	1					
INT	0.118364	0.118077	-0.24659	1				
GOLD	-0.16801	0.335135	-0.40392	0.383133	1			
M2	0.236272	-0.16512	-0.71896	0.363356	0.183178	1		
EUVI	0.021248	-0.09828	0.168433	-0.00513	-0.20984	-0.09353	1	
UNEMP	-0.33341	-0.17631	-0.17184	0.062312	0.135928	0.163219	-0.44305	1

VIF Values		
Variables	**R^2**	**VIF Value**
BIST	0.329	1.490312966
CPI	0.271	1.371742112
CCI	0.618	2.617801047
INT	0.288	1.404494382
GOLD	0.399	1.663893511
M2	0.635	2.739726027
EUVI	0.296	1.420454545
UNEMP	0.423	1.733102253

Note: VIF values are calculated for each independent variable with the formula: 1/(1- R2) using R2 values which are obtained from the estimations of regression models where independent variables are included in turn in a way that when one of these are dependent, the rest of variables are independent.

According to the results of the correlation analysis and VIF values regarding the variables indicated in Table 3, it is identified that there is no correlation higher than 75% or lower than -75% among the variables included in the model, and that there is not any variable with VIF value higher than 4. In this respect, it is possible to infer from the results of the correlation analysis and VIF values regarding the variables that the problem of multicollinearity will not be encountered in the model created as part of the study.

The series for each variable should be stationary in regression models where time series are adopted. Even though, in stationary series, there are shocks in the course of time, the values can go back to average; in other words, despite fluctuations in the long term, the average is maintained. In order to be able to decide on the type of unit root test to be applied, it should be investigated whether there is a cross-sectional dependence in the panel data set and if the panel is homogeneous or not. In this study, cross-sectional dependence was examined by use of the CDlm test developed by Breusch and Pagan and the CD test suggested

by Pesaran while homogeneity was examined by use of Delta and Delta adj. (adjusted) tests set forth by Pesaran and Yagamata. The results of cross-sectional dependence and homogeneity tests are indicated in Table 4.

Table 4

The Results of Cross-Sectional Dependence and Homogeneity Tests

	Tests	Statistic	Probability
Cross-sectional Dependence Tests	Breusch-Pagan CDlm	2082.297	0.0000
	Pesaran CD	35.75142	0.0000
Homogeneity Tests	Delta	-2.758	0.9970
	Delta adj.	-3.021	0.9990

Null Hypothesis
H0: No Cross-Section Dependency
H0: Homogeneity

As indicated in Table 4, the probability value reached with regard to both the Breusch and Pagan CDlm test and the Pesaran CD test was 0.0000<0.05. The results of both tests point out the existence of the problem of cross-sectional dependence in the model. When the results of Delta and Delta adj. tests set forth by Pesaran and Yagamata were analyzed, the probability values for both tests were observed to be over the critical level of 0.05. The results of the tests imply that panel data sets created in both tests were homogeneous. The bootstrap panel unit root test developed by Smith et al. (2004) which is a unit root test that pays regard to cross-sectional dependence (second generation) and that can be applied in homogeneous panels, was adopted in testing stationarity in series by taking into consideration the results of the cross-sectional dependence and homogeneity tests. The results of the panel unit root test are indicated in Table 5.

Table 5

The Results of Unit Root Test Regarding Variables

	T-bar Values				WS Values			
	Constant		Constant-Trend		Constant		Constant-Trend	
	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
FOREX	-4.190	0.000***	-4.372	0.000***	-3.376	0.000***	-3.857	0.000***
D(BIST)	-6.325	0.000***	-6.705	0.001***	-3.280	0.001***	-3.417	0.031**
CPI	-5.981	0.000***	-6.093	0.000***	-6.438	0.000***	-6.799	0.000***
D(CCI)	-3.517	0.017**	-3.214	0.089*	-4.322	0.000***	-4.327	0.000***
INT	-3.703	0.000***	-3.185	0.049**	-4.273	0.000***	-3.853	0.000***
D(GOLD)	-5.566	0.001***	-5.516	0.004***	-3.430	0.003***	-2.969	0.033**
M2	-4.051	0.009***	-3.806	0.029**	-4.293	0.002***	-4.556	0.005***
D(EUVI)	-4.014	0.004***	-4.325	0.014**	-4.502	0.001***	-5.028	0.003***
UNEMP	-5.084	0.001***	-4.806	0.004***	-5.079	0.001***	-4.943	0.002***

Note 1: The maximum lag length in tests was determined as 3, and optimal lag length was identified using the approach of general-to-specific. Probability values were obtained from 5000 bootstrap distributions. "D" letter in the Table indicates that series related to variables are at the first level of difference. ***, ** and * indicate significance levels of 1%, 5% and 10%, respectively.
Note 2: H0: Unit Root

It is seen in Table 5 that FOREX, CPI, INT, M2 and UNEMP are stationary at level while BIST, CCI, GOLD, and EUVI are stationary at their first differences. It can be expressed that if the variables that are stationary at level and those that are stationary at their first differences are interpreted together, the probability values of all the variables are significant at levels of 1%, 5% and 10%. The level that variables are stationary was taken into consideration when the panel regression analysis was carried out, and they were added to the model at the level where they were stationary.

For the data set, whether the fixed effect or the random effect models are appropriate is examined by running a Hausman Test. Moreover, by use of an F Test it, was investigated whether the fixed effects were observed in cross-section, in time, or in both dimensions. Whether the relevant differences exist in cross-section dimension was investigated with an F-Group Fixed Effects Test while the time dimension was investigated with F-Time Fixed Effects Test, and with an F Two-way Fixed Effects Test in terms of both dimensions. Breusch-Pagan LM test was adopted to examine the problem of heteroscedasticity which is a problem to be tested before proceeding with panel regression analysis. On the other hand, the Baltagi and Li LM test and Born and Breitung LM test were adopted to investigate if there was a problem of autocorrelation in the models, which means the relationship between error terms. The results regarding the F, heteroscedasticity and autocorrelation tests are given in Table 6.

Table 6

Results of Hausman Test, F-Test, Heteroscedasticity and Autocorrelation Tests

	Tests	**Statistic**	**Probability**
Hausman Test		25.59785	0.000000
F-Tests	F-Group Fixed Effects	2.732069	0.000356
	F-Time Fixed Effects	0.637520	0.842621
	F Two-way Fixed Effects	1.778908	0.008201
Heteroscedasticity Test	LMh_Fixed Effects	1080.343	0.000000
Autocorrelation Tests	LMp-Statistic	0.000656	0.979571
	LMp*-Statistic	1.001504	0.316947

Null Hypothesis
H0: No correlation between explanatory variables and μi (E(X'μ)=0)
H0: No fixed effects (F test)
H0: No heteroscedasticity (LM test for heteroscedasticity)
H0: No autocorrelation (LM test for autocorrelation)

The results of the Hausman Test are given in Table 6. The probability value of the test indicates that the fixed effects model is an appropriate model for the data set. The results of the Hausman Test also points out that the within estimator is consistent and should be used in the model. The results of the F-Test specified in Table 6 suggest that the probability value of F-Group Fixed Effects is 0.000356<0.05 while the probability value of F-Time Fixed Effects is 0.842621>0.05. In that case, it is possible to specify that F-Group Fixed Effects exist in the

model but F-Time Fixed Effects do not exist. According to the Heteroscedasticity Test, since the probability value of LM Fixed Effects was obtained as 0.0000<0.05, this model suffers from the problem of heteroscedasticity. When the results of the autocorrelation tests are examined, it is seen that the probability value for the Baltagi and Li LMp test is 0.979571>0.05, and the probability value for the Born and Breitung (2016) LMp* test, which is an improved version of the former LMp test, is 0.316947>0.05. Thus, the results of both autocorrelation tests suggest that this model does not suffer from the problem of autocorrelation. When making estimations in panel regression analyses, one of the methods adopted in resolving problems such as heteroscedasticity and autocorrelation is the White Period Coefficient Covariance method (Korkmaz et al. 2010). In this study, the problem of heteroscedasticity encountered when making estimations in the panel regression model was aimed to be resolved by correcting standard errors by use of the White Period Coefficient Covariance method. The results of panel data analysis are indicated in Table 7.

Table 7

The Results of Panel Data Analysis Regarding the Model

Dependent Variable: FOREX
Method: Panel EGLS (Cross-section weights)
Period (Adjusted): 2013Q2 2017Q2
Number of Periods Included: 17
Number of Unit (Firms) Included: 16
Number of Total Observation in Panel: 272
Linear estimation after one-step weighting matrix
White cross-section standard errors & covariance (no d.f. correction)

Variables	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
BIST	0.094529	0.039016	2.422852	0.0161**
CPI	5.967013	4.271858	1.396819	0.1637
CCI	0.302284	0.340688	0.887273	0.3758
INT	-0.093003	0.042723	-2.176859	0.0304**
GOLD	0.522560	0.507337	1.030006	0.3040
M2	0.575748	0.189883	3.032123	0.0027***
EUVI	0.518240	0.254371	2.037340	0.0427**
UNEMP	0.207011	0.089071	2.324113	0.0209**
C	-0.195317	0.132307	-1.476242	0.1411
Weighted Statistics				
R-Square	0.183152	Average of Dependent Variables		0.160632
Adjusted R-Square	0.107396	Dependent Variable Standard Deviation		0.839054
S.E. of regression	0.798923	The Sum of Squared Residuals		158,2929
F-Statistic	2.417656	Durbin-Watson Statistic		2.152935
P-Value (F-Statistic)	0.000464			

*** and ** indicate significance levels of 1% and 5% respectively.

According to the statistics indicated in Table 7, the model is a significant model with a significance level of 1% (P-Value 0.000464<0.01). The R^2 value of the model was obtained

as 18.31%. Accordingly, it can be said that independent variables included in this model can explain the changes in the dependent variable by 18.31%. When the results of the panel data analysis regarding the model are considered as a whole, it is possible to say that there is a statistically significant relationship between macroeconomic variables and the forex trading volumes.

When the results of panel data analysis are examined in terms of variables, it is observed that the M2 variable has a statistically significant relationship with FOREX variable at a level of 1% while the BIST, INT, EUVI, and UNEMP variables have it at a significance level of 5%. The results of the analysis suggest that there is no statistically significant relationship identified between the values of CPI, CCI, and GOLD and FOREX variable. The results assert that a one-unit increase in BIST 100 Index yields, in money supply, in export unit value index and in unemployment rate leads to a 0.0945, 0.5757, 0.5182 and 0.2070 unit increase in forex trading volumes respectively. On the other hand, a one-unit increase in the weighted average interest rate charged by banks on deposits leads to a 0.0930 unit decrease in forex trading volumes of financial intermediaries.

Conclusion

The forex market is the largest and most rapidly growing financial market in the world. Forex transactions are conducted when investors simultaneously purchase one currency and sell the other. As of 2016, with respect to the forex transactions executed in markets from different centers of the world, 36.9% of the daily forex trading volume is conducted in the UK, 19.5% in the US, 7.9% in Singapore, 6.7% in Hong Kong, 6.1% in Japan and 22.9% in other countries (Ellialtıoğlu 2017). The total forex trading volume of intermediary institutions carrying on business in Turkey followed an upward trend by the last quarter of 2016, and it was on a significant decline in the first quarter of 2017. It can be said that, the main reason for this decline is the legal regulations on the leverage ratio and initial margin used in forex transactions in February 2017.

This study aims to identify the effects of macroeconomic indicators on the forex volume through the method of panel data analysis by use of the 2013Q1-2017Q2 period data of 16 financial intermediaries carrying on business in Turkey. As for macroeconomic indicators, the study includes BIST 100 Index yields (BIST), consumer price index (CPI), consumer confidence index (CCI), average interest rate charged by banks on deposits (INT), gold prices (GOLD), money supply (M2), foreign trade export unit index (EUVI), and unemployment rate (UNEMP).

The results of the analysis performed imply that there are statistically significant relationships between BIST, INT, M2 and UNEMP variables and the forex trading volumes of financial intermediaries. The relationship between the weighted average interest rate

charged by banks on deposits and the forex trading volumes are negative while the relationship between the forex trading volumes and the other macroeconomic variables are positive. There is no statistically significant relationship between the CPI, CCI, and GOLD and the FOREX variable.

In this study, it has been determined that changes in macroeconomic indicators cause significant changes in forex trading volumes of financial intermediaries in Turkey. The results of the study are important for the managers of financial intermediaries and forex market investors to direct their investments in the face of the changes in macroeconomic indicators. The contribution of this study lies in analyzing the effects of firm-specific and investor behavior-specific factors in the forex market on the forex trading volume. For future studies doing similar research by using not only TRY-based but also other hard currency-based cost of funds as explanatory variables would be valuable.

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References

Al-Sharkas A. (2004). The dynamic relationship between macroeconomic factors and the jordanian stock market. *International Journal of Applied Econometrics and Quantitative Studies, 1*(1), 97-114.

Altan M. ve Güzel, F. (2015). Forex piyasasının Türkiye'deki durumu ve Türkiye finans piyasalarına etkileri. *Selçuk Üniversitesi Sosyal Bilimler Dergisi, 33*, 203-214.

Baltagi, B. H. (2013). *Econometric analysis of panel data.* Fifth Edition. Chichester: Jhon Wiley&Sons Ltd.

Born, B. and Breitung, J. (2016). Testing for serial correlation in fixed-effects panel data models. *Econometric Reviews, 35(7)*, 1290-1316.

Broto, C. (2013). The effectiveness of forex interventions in four Latin American countries.*Emerging Markets Review 17.* 224-240

Doğukanlı, H. (2012). *Uluslararası finans*. Üçüncü Baskı. Adana: Karahan Yayınları.

Égert, B. and Kočenda, E. (2014). The impact of macro news and central bank communication on emerging European forex markets. *Economic Saystems, 38,* 73-88.

Ellialtıoğlu, N. (2017). *Foreks piyasaları ve Türkiye'de yasal düzenlemeler sonrası uygulama değişikliklerinin analizi*. Yayımlanmamış yüksek lisans tezi. Başken Üniversitesi, Ankara.

Financial Information News Network, http://www.finnet2000.com/F2000Plus, [Erişim Tarihi: 18 Kasım 2017].

Gao, X., An, H., Fang, W. and Sun, X. (2014). The transmission of fluctuant patterns of the forex burden based on international crude oil prices. *Energy, 73,*380-386.

Geromichales A. and Jung K.M. (2015). An over-the-counter approach to the forex market. *MPRA paper.* No.64402

King, M. and Rime.D. (2010). The $4 trillion question: what explains FX growth since the 2007 survey?. *BIS Quarterly Review,* December.

Korkmaz, T., Yıldız, B. ve Gökbulut, R. İ. (2010). FVFM'nin İMKB ulusal 100 endeksindeki geçerliliğinin panel veri analizi ile test edilmesi. *İstanbul Üniversitesi İşletme Fakültesi Dergisi, 39(1),* 95-105.

Köse, Y., Atik, M. and Yılmaz, B. (2014). Foreks işlemlerin davranışsal açıdan incelenmesi: Türk foreks yatırımcıları üzerinde bir araştırma. *Muhasebe Bilim Dünyası Dergisi, 6(4),* 1-14.

Kumar S. (2006). Forecasting volatility-evidence from Indian Stock and Forex Markets. *IIMK/WPS/08/FIN/2006/06*

Moorkerje, R. and Yu, Q. (1997). Macroeconomic variables and stock prices in a small open economy: The case of Singapore, *Pacific-Basin Finance Journal*, 5(3), 377-388.

Mukherjee T. K. and Naka A. (1995). Dynamic relations between macroeconomic variables and the Japanese Stock Market: an application of a vector error correction model. *Journal of Financial Research*, *18*(2), 223-237.

Nathani, N., Bhatnagar, V., Singh, P., Sharma, U., Tiwari, S., Khan, H., Maurya, A., Navratan., Narang, K. and Agarwal, N. (2016). Macroeconomic factors affecting foreign Exchange market in India. S.S. Bhakar ve G. Mathur (eds.). A Systematic Guide from Research to Manuscript. (ss. 67-76). New Delhi (India): Bharti Publications.

Özmen, N. C. (2011). *Uluslararası finansal piyasaların gelişimi ve bir örnek olarak forex piyasalarının İncelenmesi.* Yayımlanmamış yüksek lisans tezi, Marmara Üniversitesi, İstanbul.

Sarno, L. and Taylor, M. P. (2002). *The economics of exchange rates.* Cambridge: Cambridge University Press.

Shilov, B. N. and Semenov, S. V. (2011). *Forex bilmeniz gereken herşey (Çev. Anıl Abbak).* İstanbul: Scala Yayıncılık**.**

Smith, L. V., Leybourne, S., Kim, T. H. and Newbold, P. (2004). More powerful panel data unit root tests with application to mean reversion in real exchange rates. *Journal of Applied Econometrics, 19,* 147-170.

Şendur, Y. (2017). Forex piyasasında riskler. *İktisadi İdari ve Siyasal Araştırmalar Dergisi, 2*(2), 23-28.

Şendur, Y. and Cihangir, M. (2014). Forex piyasasının kendine has özellikleri ve forex piyasasının pay piyasaları ve futures piyasalarıyla karşılaştırılması. *The Journal of Academic Social Science Studies, 28,* 537-557.

Tatoğlu, F. Y. (2013). *Panel veri ekonometrisi: Stata uygulamalı*. İstanbul: Beta Basım.

Türkiye Cumhuriyeti Merkez Bankası, Elektronik Veri Dağıtım Sistemi https://evds2.tcmb.gov.tr/index.php?/evds/serieMarket, [Erişim Tarihi: 18 Kasım 2017].

Türkiye Sermaye Piyasaları Birliği, https://www.tspb.org.tr/veriler/, [Erişim Tarihi: 18 Kasım 2017].

Ün, T. (2015). *Stata ile panel veri analizi*. S. Güriş (eds.) Stata ile panel veri modelleri. (ss. 39-80). İstanbul: Der Kitabevi.

Vigna P. and Casey M.J. (2017). *Kripto para çağı-Bitcoin ve dijital paranın küresel ekonomik sisteme meydan okuması (Çev. Ali Atav).* Ankara: Buzdağı Yayınevi.