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IMPACT OF MACROECONOMIC UNCERTAINTY ON FIRM PROFITABILITY: A CASE OF BIST NON-METALLIC MINERAL PRODUCTS SECTOR[1]

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ABSTRACT

Purpose- The aim of this study is to analyze the impact of macroeconomic uncertainty on Return on Assets (ROA) and Return on Operating Profits (ROAF) by employing panel data analysis within the sample of Borsa Istanbul Non-Metallic Mineral Products sector for the period of 2003:Q1-2016:Q4.

Methodology- Firstly; volatility levels of exchange rate, interest rate, inflation rate and growth rate were determined by Generalized Autoregressive Conditional Heteroscedasticity (GARCH) modelling. Then, the relationship between uncertainty and profitability were examined by panel data analysis.

Findings- Our findings revealed that growth volatility, exchange rate volatility, and interest volatility had a negative effect on both return on assets (ROA) and operating profit (ROAF).

Conclusion- Macroeconomic uncertainty has potential to affect the firm profitability through firm decision-making. The findings of this were consistent with relevant theoretical and empirical literature. In this regard, establishing and sustaining a stable macroeconomic environment is of great importance for firm profitability and in turn achieving a sustainable growth and lower unemployment rates.

Keywords: Macroeconomic uncertainty, firm profitability, non-metallic mineral products sector, Turkey, panel data analysis
JEL Codes: D81, G17, L25

1. INTRODUCTION

Both macro and micro uncertainty levels take form according to current economic conjuncture. The uncertainty level generally increases in the periods of economic recession and decreases under relatively better economic situations. The negative developments in general economic environment increase the volatility of micro or macroeconomic factors and in turn affect the firms' growth rates and profitability ratios negatively (Bloom, 2014: 155). Investments in production sector are generally affected from financing opportunities, exchange rate, growth rate, oil prices and capital cost to a great extent. In this regard, the raising volatility causes the firms to postpone or cancel the investment decisions. Thus; determining the uncertainty sources is of great significance in terms of providing stability in macroeconomic environment by considering all the factors that may affect profitability levels of production sector playing an important role on economic growth and employment.

A stable and foreseeable macroeconomic environment is an important component for the firms' production and investment decisions. Nonvolatile macroeconomic environment and developed financial markets pave the way for production and investment decisions by providing appropriate financing opportunities with the long-term regulatory business plans. On the other hand, the absence of macroeconomic stability causes the decreases in private investments due

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to high inflation rates and fiscal deficits (Mangla and Din, 2015, pp. 242-243). Macroeconomic variables such as foreign direct investments, money supply, interest and exchange rates affecting firms' performance and macroeconomic conditions may be controlled by monetary and fiscal policies. At this point; these macroeconomic policies are of great importance especially for production sector because this sector provides a huge amount of capital and is more affiliated with international markets (Odior, 2013: 363). Not only firm-specific factors such as capital structure, ownership structure and cash flows level but also macroeconomic uncertainty factors including inflation, interest and exchange rate volatility may be effective on the profitability of firms' investments by different channels such as demand and input market conditions, technological developments, competitive environment and financing opportunities. For instance; interest rate volatility has a great impact on firms' capital costs, financing conditions and investment opportunities. Because interest rate is considered as a discount rate in evaluating investment projects, unexpected increases or decreases as to interest rate make firms unwilling in taking investment decisions (Erdal, 2001, p. 27). Additionally; the increase on interest rates has a negative impact on firms' cost of borrowing and firms expose to liquidity risk. This situation causes firms to go bankruptcy because of inadequate cash flows as well (Zeitun et al., 2006: 2). On the other hand; the unexpected changes in the inflation rates are considered as one of the main factors causing macroeconomic uncertainty. High level of price volatility causes the loss of confidence in terms of investors and this perception affects firms' profitability negatively by decreasing the levels of investments. This study investigated the impact of macroeconomic uncertainty on the firms' profitability in operating Non-Metallic Mineral Products Sector quoted on Borsa Istanbul during the period 2003:Q1-2016:Q4 with panel data analysis. The study will contribute to the relevant literature by one of the early studies investigating the interaction between macroeconomic uncertainty and firm profitability in Turkey and also in the relevant literature. Furthermore, the findings of the study will be useful for macroeconomic policymakers. In the following part; theoretical and empirical literature review will be presented, and then the dataset and econometric methodology will be introduced. At the fourth part; the obtained results will be presented and the study will be completed with conclusion part.

2. LITERATURE REVIEW

There has been extensive empirical literature about the raising macroeconomic uncertainty resulting from the financial liberalization in both developed and developing countries as of 1980s. The empirical literature have indicated that the volatility in macroeconomic variables such as exchange rate, inflation rate, interest rate, oil prices and growth rate have affected the firm profitability to a great extent (e.g. see *Shapiro, 1974; Dumas, 1978; Aggarwal, 1981; Jorion, 1990; Baum et al., 2001; Demir, 2009; Sekmen, 2011;Savaş and Can, 2011*; *Anlas, 2012; Mutluay and Turaboğlu, 2013; Kemuma, 2015; Alibabaee and Khanmohammadi, 2016).* However, the relevant literature has generally focused on the relationship between several uncertainty factors and index returns not directly firm profitability (e.g. see Adjasi et al., 2008; Ozbay, 2009; Sariannidis, 2010; Savas and Can, 2011; Mlambo, 2013; Flota, 2014; Li et al., 2016). Only a few studies have researched the effect of macroeconomic uncertainty on firm profitability in both Turkey and all over the world (Demir, 2009; Mutluay and Turaboglu, 2013; Musa, 2014; Kemuma, 2015; Alibabaee and Khanmohammadi, 2016). In one of the studies, Shapiro (1974) and Dumas (1978) investigated the impact of exchange rate volatility on multinational firms' profitability and revealed that exchange rate volatility affected the firms' cash flow, profitability and market value negatively. In another study, Aggarwal (1981) researched the impact of monthly exchange rate changes on the value of the U.S. stock returns over the period of 1974-1978 and found a positive relationship between U.S stock returns and the currency value changes. Jorion (1990) examined the foreign exchange exposure of U.S. multinational firms and revealed that exchange rate volatility affected profit rates negatively and that the comovement between stock returns and the value of the dollar was found to be positively related to the percentage of foreign operations of U.S. multinationals.

Amihud (1994) analyzed the impact of exchange rate changes on the stock returns of 32 large-scale U.S. firms by using the monthly and quarterly data for the period of 1979-1988 and discovered that there was no significant relationship between exchange rate changes and stock returns. Baum et al. (2001) also examined the effects of permanent and transitory components of the exchange rate of multinational firms' profitability under imperfect information and concluded that the volatility of the permanent (transitory) component in the exchange rate leads to greater (lesser) variability in the profit rate levels. Adjasi et al. (2008) analyzed whether the volatility of macroeconomic variables such as exchange rate, monthly money supply, interest rate, and inflation rate and trade deficit affected Ghana Stock Exchange Index returns by using EGARCH method and revealed that there was a negative relationship between exchange rate volatility and stock returns and that the decrease in currency value made an increase (decrease) in long-term (short-term) stock returns. In another study, Demir (2009) investigated the impact of macroeconomic uncertainty and external shocks on the publicly traded manufacturing firms' profitability in the presence of multiple investment options in both real and financial sectors with semi-annual data from 1993 to 2003 by using panel data analysis and discovered that there was a statistically significant negative relationship between macroeconomic uncertainty and profitability. Sariannidis et al. (2010) aimed to determine whether macroeconomic factors had an effect on Dow Jones Sustainability Index and Dow Jones Wilshire REIT Index returns. Volatility of oil prices, ten year bond yields, exchange rate and non-farm employment rate were used as the macroeconomic uncertainty factors by using GARCH model in forecasting volatility. They reached that the volatility of oil

prices and exchange rate affected stock returns negatively and that ten year bond yields had a positive effect on U.S. stock exchange.

Sekmen (2011) examined the relationship between exchange rate volatility and U.S. firms' profitability by using Autoregressive Moving Average Model (ARMA) over the period of 1980-2008 and concluded that there was a negative relationship between exchange rate volatility and U.S. stock returns. In another study, Antonakakis et al. (2012) investigated whether political uncertainty index developed by Baker (2012) affects S&P 500 index returns by using monthly data during the period 1997-2012 with Dynamic Conditional Correlation model (DCC), and found that the increase in political uncertainty had a negative impact on stock returns. Furthermore, Flota (2014) assessed the impact of exchange rate changes on the stock returns of 71 non-financial publicly traded Mexican firms by using panel data analysis for the period of 1994-2003 and revealed that there was a statistically significant negative relationship between stock returns and exchange rate changes and that the effects found to be relatively higher in medium-scaled firms. Finally, Kemuma (2015) aimed to determine the relationship between macroeconomic uncertainty and the profitability of 49 insurance firms operating in Kenya by using linear regression model for the year of 2014. While net profit to total assets ratio was used as a profitability indicator; the volatility of exchange rate, inflation rate, growth rate, interest rate and employment rate were used as macroeconomic uncertainty factors. The empirical results showed that the volatility of exchange rate, growth rate and inflation rate had a negative impact on profitability and that there was a positive relationship between interest rate volatility and profitability.

3. DATA AND METHODOLOGY

This study investigated the impact of macroeconomic uncertainty on the firms' profitability in operating non-metallic mineral products sector quoted on Borsa Istanbul during the period 2003:Q1-2016Q4 with panel data analysis.

3.1. Data

Data set is consisted of 23 publicly traded cement firms in Turkey as disclosed Borsa Istanbul database online. The period analyzed is quarter and covers 2003:Q1-2016:Q4. The data as to dependent and control variables are obtained from the quarterly balance sheets, income tables and operating reports of the analyzed firms. In generating the required data set; the firms' going public dates and the period in which observation number is maximum were considered. While Return on assets (ROA) and Return on Operating Profits (ROAF) were used as the profitability indicators; the volatility of exchange rate, interest rate, inflation rate and Gross Domestic Product were considered as macroeconomic uncertainty indicators. The data as to independent variables were provided by the electronic data delivery system of Central Bank of the Republic of Turkey (CBRT) and 'Statistical Indicators' section of Turkish Statistical Institute. The quarterly data as to weighted average deposit interest rates of banks, the average of buying and selling rate and the value of volume index seasonally adjusted quarter on quarter were considered in determining the interest rate, exchange rate and growth rates. Additionally; current ratio and leverage ratio were used as the control variables in the study.

Table 1: Definition of the Variables

Type of Variable	Definition of Variables	Abbr.
Dependent Variable	Return on Assets (Net Profit/ Total Assets)	ROA
Dependent Variable	Return on Operating Profits (Operating Profit/Total Assets)	ROAF
Control Variable	Leverage Ratio (Total Debt/Total Assets)	KALD
Control Variable	Current Ratio [(Liquid Assets-Inventories)/Short-Term Liabilities)]	CO
Independent Variable	Exchange Rate	DKUR
Independent Variable	Interest Rate	FAIZ
Independent Variable	Consumer Price Index	TUFE
Independent Variable	Gross Domestic Product	GSYH

E-views 9.0 and State 14.0 software packages were used in the econometric analysis. The descriptive statistics and correlation matrix of the data set was presented in the Table 2 and Table 3. The mean and median of all the variables appeared to be not normally distributed. Jarque-Bera statistics also showed that all series were non-linear.

Table 2: Descriptive Statistics

Variable	ROA	ROAF	DKUR	FAIZ	TUFE	GSYH	CO	KALD
Mean	0.04092	0.03772	1.76221	17.2164	178.201	1.39642	3.27927	0.17121
Median	0.03954	0.03207	1.53608	15.89	172.846	1.9	2.23915	0.16491
Maximum	0.14126	0.18148	3.28092	45.39	288.893	5.5	10.9952	0.42116
Minimum	-0.04608	-0.05391	1.18801	8.39	96.3733	-5.4	0.99192	0.05517
Std. Error	0.03322	0.04214	0.52861	8.15105	56.448	2.34373	2.38751	0.08004
Skewness	0.21177	1.54323	1.34283	1.62578	0.32511	-0.90902	1.53508	0.84946

Kurtosis	4.80661	6.51916	3.78609	5.62733	1.93987	3.65783	4.38744	3.66652
JB Statistics	8.03417	51.1252	18.2716	40.7762	3.60885	8.72196	26.4855	7.77151
Probability	0.01801	0.00000	0.00108	0.00000	0.16456	0.01276	0.00002	0.02053

3.2. Econometric Model and Method

Volatility forecasting is generally used in hedging risk, managing efficient portfolios and measuring uncertainty levels by considering a number of factors. These models are classified into four main groups: Historical Volatility Models, ARCH Class Conditional Volatility Models, Implied Volatility Models and Stochastic Volatility Model Forecasts (Poon and Granger, 2003: 506). Volatility may be separated into two components such as predicted and unpredicted. The predicted component in financial time series is conditional variance and this function of risk premium is predicted by ARCH class volatility models. In this study; we aimed to determine the exchange rate, interest rate, inflation rate and growth rate volatility by using ARCH class volatility models (Pagan and Schwert, 1990: 267). First, the ARCH effect is tested after making time series stationary in these volatility models and then, volatility model is generated. Volatility levels of exchange rate, interest rate, inflation rate and growth rates were determined by Generalized Autoregressive Conditional Heteroscedasticity (GARCH) modeling. After determining the volatility levels, the following two models were used to analyze the effect of macroeconomic uncertainty factors on firm profitability by using panel data analysis method:

Model I: $ROA_{it} = \beta_{it} + \beta_1 DKUR\_OY_{it} + \beta_2 FAIZ\_OY_{it} + \beta_3 TUFE\_OY_{it} + \beta_4 GSYH\_OY_{it} + \beta_5 FCO_{it} + \beta_6 FKALD_{it} + \varepsilon_{it}$

Model II: $ROAF_{it} = \beta_{it} + \beta_1 DKUR\_OY_{it} + \beta_2 FAIZ\_OY_{it} + \beta_3 TUFE\_OY_{it} + \beta_4 GSYH\_OY_{it} + \beta_5 FCO_{it} + \beta_6 FKALD_{it} + \varepsilon_{it}$

- β_{it}*: Constant term*
- ε_{it} *: Error term*
- *i: Each firm for i*
- *t: time*

Panel data refers to the pooling of observations on cross-sections of households, countries, firms, etc. over several time periods. The use of panel data provides practitioners to control for heterogeneity. Also panels give more informative data, more variability and less collinearity among the variables and are useful in identifying and measuring effects that are simply not observed in a pure cross-section or pure time-series data (Baltagi, 2014: 1-8). In this study, the effect of macroeconomic uncertainty proxied by growth volatility, inflation volatility, exchange rate volatility, and interest volatility was analyzed by panel data analysis. The cross-sectional dependence among the series and homogeneity of the slope coefficients were analyzed by Breusch and Pagan (1980) Lagrange Multiplier (LM) test and Pesaran and Yamagata (2008) adjusted delta tilde test. Then the stationary of the variables was examined with panel unit root test of Hadri and Kurozumi (2012) considering the existence of cross-sectional dependence and homogeneity. Random Effects Model (REM) was selected in the light of pretests of Breusch-Pagan (1980), Chow (1960) and Hausman (1978) tests. Finally, two models were estimated and robustness checks were conducted.

4. FINDINGS AND DISCUSSIONS

Firstly; the volatility levels of exchange rate, interest rate, inflation rate and growth rate were determined by using GARCH model. Then, panel data models were analyzed for investigating the relationship between macroeconomic uncertainty and profitability. The correlation matrix was presented in Table 3. The results showed that there was a positive relationship between interest rate uncertainty, growth rate uncertainty, current ratio and firms' profitability performance variables Return on Assets (ROA) and Return on Operating Profits (ROAF). Additionally; there was a negative relationship between exchange rate uncertainty, leverage ratio and dependent variables. The low levels of correlation coefficients among the variables increases the reliability of the generated models.

Table 3: Correlation Matrix

1.Model	**ROA**	**CO**	**DKUR_OY**	**FAIZ_OY**	**GSYH_OY**	**KALD**	**TUFE_OY**
ROA	1						
CO	0.25391	1					
DKUR_OY	-0.07299	0.01043	1				
FAIZ_OY	0.06132	-0.05605	-0.49283	1			
GSYH_OY	0.056091	-0.01889	0.06857	-0.02252	1		
KALD	-0.29501	-0.57629	0.04783	0.11665	0.02118	1	
TUFE_OY	-0.05841	-0.03797	0.61350	-0.55303	0.09169	-0.2937	1
2. Model	**ROAF**	**CO**	**DKUR_OY**	**FAIZ_OY**	**GSYH_OY**	**KALD**	**TUFE_OY**
ROAF	1						
CO	0.13785	1					

DKUR_OY	-0.03950	0.01043	1				
FAIZ_OY	0.02715	-0.05605	-0.49283	1			
GSYH_OY	0.04652	-0.01889	0.06857	-0.02252	1		
KALD	-0.05966	-0.57629	0.04783	0.11665	0.02118	1	
TUFE_OY	-0.01821	-0.03797	0.61350	-0.55303	0.09169	-0.2937	1

4.1. Homogeneity and Cross-Section Dependency Test Results

First, the homogeneity of the slope coefficients were analyzed by delta tilde and adjusted delta tilde tests of Pesaranand Yamagata (2008), because it will be determinative in choosing the further econometric tests and the test results were presented in Table 4. The null hypotheses were rejected because the probability values of the calculated tests are less than %5 and we concluded that slope coefficients were heterogeneous.

Table 4: Pesaran and Yamagata (2008) Homogeneity Test Results

	Test Statistics	**Probability (p)**
$\tilde{\Delta}$	12.673	0.006*
$\tilde{\Delta}_{adj}$	9.528	0.002*

*significant at 5%

Breusch-Pagan (1980) LM test was used in order to determine whether there is cross-section dependency and the obtained findings were presented in Table 5. The obtained findings showed the presence of cross-section dependency because the probability values are less than 5%.

Table 5- CD_{LM1} Test Results

Variables		**Value**
ROA	t statistics	6.934
	probability	0.000*
ROAF	t statistics	5.832
	probability	0.000*
CO	t statistics	4.099
	probability	0.021*
KALD	t statistics	9.435
	probability	0.002*
KUR_OY	t statistics	7.391
	probability	0.000*
FAİZ_OY	t statistics	5.628
	probability	0.017*
TÜFE_OY	t statistics	9.372
	probability	0.000*
GSYİH_OY	t statistics	4.023
	probability	0.008*

*significant at 5%

4.2. Panel Unit Root Test Results

Hadri and Kurozumi (2012) second generation panel unit root test was used to examine the integration levels of the variables considering the cross-section dependency among the cross-section units. The test results indicated that ROA, ROAF, CO and KALD were I(1) and the rest were I(0).

Table 6: HadriandKurozumi (2012) Panel Unit Root Test Results

Level			
Variables		**Statistics**	**p**
ROA	Z_A^{SPC}	5.953	0.000
	Z_A^{LA}	5.041	0.002
ROAF	Z_A^{SPC}	8.552	0.001
	Z_A^{LA}	8.127	0.000

CO	Z_A^{SPC}	5.329	0.007
	Z_A^{LA}	4.336	0.002
KALD	Z_A^{SPC}	7.112	0.000
	Z_A^{LA}	7.523	0.000
KUR_OY	Z_A^{SPC}	6.835	0.129
	Z_A^{LA}	4.067	0.124
FAIZ_OY	Z_A^{SPC}	0.982	0.097
	Z_A^{LA}	0.884	0.092
TUFE_OY	Z_A^{SPC}	0.672	0.174
	Z_A^{LA}	0.551	0.165
GSYH_OY	Z_A^{SPC}	1.098	0.083
	Z_A^{LA}	1.237	0.094
First Level Differences			
Variables		**Statistics**	**p**
ROA	Z_A^{SPC}	0.763	0.001
	Z_A^{LA}	0.709	0.000
ROAF	Z_A^{SPC}	1.562	0.002
	Z_A^{LA}	1.438	0.008
CO	Z_A^{SPC}	0.997	0.000
	Z_A^{LA}	0.901	0.002
KALD	Z_A^{SPC}	1.178	0.006
	Z_A^{LA}	1.066	0.000

Note: *Optimum lag length is determined with Schwarz information criteria.*

4.3. Panel Data Analysis

There are a variety of different models for panel data such as pooled regression, fixed effects, random effects and random parameters as stated in Baltagi (2005). In this study; some statistical tests were made in order to decide between two possible forecasting models. Chow test is used in order to determine the mutual meaning of firms specific and time specific effects and Hausman test is used whether there is a random effect. The Chow, Breusch-Pagan (BP) and Hausman test results are presented in Table-7 and the random effects model was chosen for the analysis in the light of test results.

Table 7: Panel Data Forecasting Method Selection Test Results

Dependent Variable: ROA			**Dependent Variable: ROAF**		
Test	**p value**	**Decision**	**Test**	**p value**	**Decision**
Chow(F test)	0.012	H_1 accept	Chow(F test)	0.001	H_1 accept
BP(χ^2 test)	0.002	H_1 accept	BP(χ^2 test)	0.019	H_1 accept
Cross-section random		0.128	Cross-section random		0.157
Period random		0.041	Period random		0.121
Cross-section and period random		0.129	Cross-section and period random		0.273

The panel data models were analyzed by considering random effects model and the findings were presented in Table 8.The estimated coefficients showed that all the independent variables except inflation uncertainty had a statistically significant negative effect on firm profitability. While exchange rate volatility had the lowest impact on profitability, growth rate volatility had the highest impact when compared with other macroeconomic uncertainty factors. As for the control variables; the findings showed that leverage ratio affected profitability negatively and current ratio affected profitability positively(Goddard, 2005; Salawu and Awolowo, 2009; Akinlo and Asaolu, 2012; Aygun, 2012;Ozmenvd., 2012; Uluyol et al., 2014; Ahmad et al., 2015; Dogan and Topal, 2016; Demirci, 2017). Inflation uncertainty may be effective on firms' performance especially in terms of the income and tax structures. For instance; the volatility levels of firms' sales increase as well as their costs in an uncertain macroeconomic environment and this situation causes the challenge of income instability (Hatzinikolaou et al., 2002: 46-47). The relevant literature also shows that there is a negative relationship

between inflation uncertainty and profitability (Huizinga, 1993; Beaudry, 2001; Fountas et al., 2006; Caglayan, 2015). On the other hand, economic efficiency decreases in the presence of inflation volatility because relative price movements lose their information transfer edge. Thus this situation causes growth rates to be affected negatively. As for this study; it has been seen that inflation volatility (TUFE_OY) has no impact on firm profitability. The fact that inflation rates in Turkey are relatively low and stabile in the analysis period may be proposed as a reason of this situation.

After the collapse of the Bretton Woods system, the exchange rate volatility has showed increase in comparison with the fixed exchange rate system. Exchange rate volatility may affect profitability negatively by way of reversing financial planning, earning levels, market share and balance sheet structures. The so-called negative relationship is supported by both theoretical and empirical studies (Shapiro, 1974; Dumas, 1978; Jorion, 1990; Amihud, 1994; Bartov and Bodnar, 1994; Baum et al., 2001; Demir, 2009; Kemuma, 2016). Also in this study; the similar results have been obtained and the findings have showed that exchange rate volatility has a negative impact on profitability to some extent. Why this effect level is low may be resulted from the cement sector. Because domestic raw materials are used in production process to a large extent, it is possible to say that there is a protection mechanism within cement sector. Additionally growth rate volatility affects firms' profitability negatively by way of reversing firms' future manufacturing planning. In this study; it has been seen that 1% percent of increase in growth volatility (GSYH_OY) cause ROA to %34 and ROAF to %28 decrease. Interest rate volatility has also a negative impact on firm profitability by reversing firms' financing decisions. Some studies made as to relationship between interest rate volatility and profitability have shown that interest rate affects profitability negatively and in this study, the similar findings have obtained as to interest rate volatility (Amariati, 2013; Hajileeand Nasser, 2017).

Table 8: Panel Data Analysis Results

Dependent Variable: FROA				
Variables	**Coefficient**	**Standard Error**	**t-statistics**	**Probability**
FKALD	-0.04739	0.006835	-6.932382	0.0000*
FCO	0.082625	0.016674	4.955211	0.0000*
DKUR_OY	-0.01848	0.005563	-3.321744	0.0009*
FAIZ_OY	-0.03959	0.006738	-5.875562	0.0000*
TUFE_OY	-0.00034	0.000225	-1.526043	0.1272
GSYH_OY	-0.34075	0.005256	-64.83296	0.0000*
Constant	1.611371	0.15332	10.50988	0.0000*
R-square	0.6625	**Total Error Square**		1.1679
F-statistics	56.982*	**Durbin-Watson statistics**		2.756
Dependent Variable: FROAF				
Variables	**Coefficient**	**Standard Error**	**t-statistics**	**Probability**
FKALD	-0.04821	0.015331	-3.144646	0.0017*
FCO	0.052567	0.007228	7.2726895	0.0000*
DKUR_OY	-0.02574	0.007906	-3.256369	0.0012*
FAIZ_OY	-0.04821	0.009229	-5.224057	0.0000*
TUFE_OY	-0.0002	0.000191	-1.068543	0.2855
GSYIH_OY	-0.28367	0.121126	-2.341966	0.0193*
Constant	4.437068	0.424791	10.44529	0.0000*
R-square	0.6829	**Total Error Square**		2.8534
F-statistics	78.023*	**Durbin-Watson statistics**		2.3213

*significant at 5%

As is the case with all-time series, autocorrelation is also an important problem for panel data analysis. One of the basic assumptions of regression analyses is that there is no relationship between same errors for the different observations. The presence of autocorrelation was tested by Wooldridge test (2002) and the results were presented in Table 9. The null hypotheses were accepted for both two models in the light of test results, and we concluded that there was no autocorrelation problem between the error terms in the models.

Table 9: Wooldridge Autocorrelation Test Results

Dependent Value: FROA		**Dependent Value: FROAF**	
F value	Probability	F value	Probability
564.081	0.172	526.752	0.152

Greene (2003) heteroscedasticity test was used in order to check whether the residuals of regression have changing variance. For both two models; null hypothesis meaning that the residuals of regression don't have a changing variance was accepted. Thus, it is possible to say that the obtained findings from the panel data analysis provide the reliability conditions.

Table 10: Greene Heteroscedasticity Test Results

Dependent Value: FROA		**Dependent Value: FROAF**	
Chi-square	P	Chi-square	p
672.827	0.103	598.552	0.128

5. CONCLUSION

A number of countries, especially developing countries, have passed from the fixed exchange rate system to the floating exchange rate system after the collapse of the Bretton Woods system. However, the globally integration of financial markets has occurred as a result of financial liberalization since 1980s and the frequency and intensity of the financial crises have increased relatively when compared with the past. Furthermore, countries have been more aware towards international economic and social changes. As a result of these developments; providing and sustaining global and domestic macroeconomic stability have become an important factor in firms' decision-making process. In this study; the effect of macroeconomic uncertainty represented by the volatility of different macroeconomic variables on the profitability of the firms listed on Borsa Istanbul Non-Metallic Mineral Products sector was analyzed for the period of 2003:Q1-2016:Q4 with panel data analysis. In the first stage of econometric analysis; the volatility levels of exchange rate, interest rate, inflation rate and growth rate have been forecasted by GARCH model. Then, the relationship between macroeconomic uncertainty and profitability has been examined by using panel data analysis. The estimated coefficients indicated that the volatility of all the macroeconomic variables except inflation rate affect profitability negatively. The findings have also showed that growth volatility/exchange rate volatility had the highest/lowest impact on profitability. In this regard, establishing and sustaining a stable macroeconomic environment is of great importance for firm profitability and in turn achieving a sustainable growth and lower unemployment rates.

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