

FOREIGN EXCHANGE RATE SENSITIVITY AND STOCK PRICE : ESTIMATING ECONOMIC EXPOSURE OF TURKISH COMPANIES

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Abstract

Foreign exchange exposure of Turkish companies was examined in the study for a sample of 152 companies listed in İstanbul Stock Exchange. Two types of analysis were conducted. One is the measurement of economic exposure of Turkish companies with the slope of coefficient of the regression of stock returns on exchange rate by applying Adler and Simon (1986) model. The other model is Jorian's approach that market return is included. In the study we focus on individual firm value rather than a portfolio. Ordinary Least Squares Regression is used in estimation. Our findings reveal that 11.8 % of sample firms have a positive and significant economic exposure for the examined period. The proportion and mean exposure coefficient are high for exporter companies compare to non-exporter and overall sample. The results from the inclusion of market return to the model do not reveal significant difference in the economic exposure of the companies.

INTRODUCTION

Variability in exchange rate is a major source of macroeconomic uncertainty affecting firms. After the 1970's, the rapid expansion in international trade and adoption of floating exchange rate regimes by many countries led to increase exchange rate volatility. The firm's exposure to exchange rate risk increased.

In the literature three types of exposure under floating exchange rate regimes are identified; economic, translation and transaction. Translation and transaction exposures are accounting based and defined in terms of the book values of assets and liabilities denominated in foreign currency. Economic exposure is the sensitivity of company value to exchange rate movements. At the corporate level, changes in exchange rates affect the firm value, because future cash flows of the firm will change with exchange

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rate fluctuations. In other words, exchange rate changes have important implications for financial decision-making and for firm profitability.

Adler and Dumas (1984) show that even firms whose entire operations are domestic may be affected by exchange rates, if their input and output prices are influenced by currency movements.

It is widely believed that changing exchange rates affect the competitiveness of firms engaged in international competition. A falling home currency promotes the competitiveness of firms in home country by allowing them to undercut prices charged for goods manufactured abroad (Luehrman, 1991). Many simple partial equilibrium models (e.g. Shapiro) predict an increase in the value of the home country firm in response to a real drop in the value of the home currency. Economic theory suggests that under a floating exchange rate regime, exchange rate appreciation reduces the competitiveness of export markets; it has a negative effect on the domestic stock market. Conversely, if the country is import denominated, exchange rate appreciation may have positive affect on the stock market by lowerings input costs.

The estimation of exchange rate exposure is a relatively new area in international finance. After 1973, managers and economists become more concerned about the exchange rate fluctuations on firms. Also, for the past decade, researchers have been empirically investigating the exchange rate exposure of the firms. Following Adler & Dumas (1984) most of the research measures the exposure as the elasticity between change in firm value and exchange rate. Emprically, this exposure elasticicy is obtained from a regression of stock returns on an exchange rate change (Bodnar & Wong, 2000).

Turkey's exchange and trade system have been liberaliazed extensively since 1980's. Turkey now follows a floating exchange rate policy. In recent years Turkish economy has been suffered from economic crises. Volatility in foreign exchange rate and deviation from purchasing power parity became persistent in the economy. The

firms operating in Turkey are affected in many ways from these economic conditions. The firms have faced higher business risk and foreign exchange risk.

In this study, we aim to measure foreign exchange exposure of Turkish companies especially for last 3 years. We estimated the exchange rate sensitivity of equity returns of exporter and non-exporter companies by individual level.

This study is organized as follows: the first section is a literature review. The model, data and methodology are presented in the second section. Analysis results are interpreted in the third section. The last section presents conclusion.

LITERATURE REVIEW

In economic analysis it is suggested that firm value is related to exchange rate movements. Shapiro (1975) predicted an increase in the value of home country firm with a depreciation of home country currency. Adler and Dumas (1984) stated that even firms, which operate in domestic markets, might be affected by exchange rate movements.

Luetherman (1991) tested the hypothesis that an exogenous real home currency depreciation enhance the competitiveness of home country manufacturers vis a vis foreign competitor. His finding did not support that hypothesis. Firms did not benefit from a depreciation of the home country. On the contrary a significant decline in their market share of industry was found in a depreciation of the home currency.

Bodner and Gentry (1993) examined industry level exposures for three countries, Canada, Japan and USA. They revealed that some industries in all three countries had significant exposure.

Choi and Prasad 1995 developed a model and examined the exchange rate sensitivity of 409 US multinational firms. Their findings indicated that change in

exchange rate affected firm value. They found that 60 percent of firms had significant exchange rate exposure.

Domely and Sheehy (1996) found contemporaneous relation between the foreign exchange rate and the market value of large exporters in their study.

Miller & Reuer (1998) conducted a study on the implications of differences in strategy and industry structure for firms' economic exposures to foreign exchange rate movements. According to their results, 13-17 % of US manufacturing firms exposed for foreign exchange rate movements. Also they indicated that foreign direct investment reduces economic exposure to foreign exchange rate movements.

Glaum, Brunner and Himmet (2000) examined the economic exposure of German corporations to change in DM/US dollar exchange rate. They found that German firms are significantly exposed to changes in DM/US dollar rate.

Several studies focused on the some companies and they demonstrated that exporter firms' stock values are more sensitive to change in foreign exchange rates (Mao and Kao, 1990; Bortov and Bodnar, 1992).

In the most of the studies foreign exchange exposure was measured by regression analysis by using stock returns. Adler and Simon (1986) measured economic exposure as the slope of stock return on exchange rate change. Jorion's (1990) model was established by adding the return of the market to control for market movements. As Jorion, Booth and Rotenberg (1990) and Bodnar and Gentry (1993) examined economic exposure with market return, Miller and Reuner (2000) estimated economic exposure by multivariate modelling approach. They applied three-currency model, also add some specified macroeconomic variables such overall stock market return and interest rates. Flanney and James (1984) and Sweeney and Warga (1986) also used interest rates in their models. Doneely and Sheehy (1996) formed a portfolio with 39 companies, and examined the relationship between abnormal return on exporting firms portfolio and

return on sterling. Khoo (1994) estimated mining companies' economic exposure by using exchange rates, interest rates and price of oil.

MODEL

Economic Exposure Measurement

In order to measure Turkish firms' economic exposure we followed Adler & Simon (1986) model. We measure economic exposure as the slope coefficient from a regression of stock returns on exchange rates.

$$R_{it} = \alpha_i + \beta_i e_t + e_{it} \quad (1)$$

α_i = constant term

R_{it} = Stock return for firm i.

e_t = Percentage change in exchange rate

The coefficient β_i represents the sensitivity of a company i's stock returns to exchange rate movements. In the model exchange rate quotation is direct quotation for Turkey. In other words it is shown as TL per one unit of the foreign currency. Positive value of β_i means that a depreciation of TL corresponds to an increase in the value of firm i.

In the study, we applied another model as Jorion' approach. Jorian introduced another macroeconomic variable market return to control for market movements. To control for the 'common macroeconomic' influences on total exposure elasticities; most empirical studies include the return to a market portfolio with the exchange rate variable in their empirical models (Bodnar & Wong, 2000).

$$R_{it} = \alpha_i + \beta_{1i} e_t + \beta_{2i} R_{mt} + e_{it} \quad (2)$$

α_i = constant term

R_{it} = Stock return for firm i.

e_t = Percentage change in exchange rate

R_{mt} = Market return

Ordinary least squares regression was used to estimate models. Exchange rate movements can be measured in nominal or real terms. Real movements are defined as nominal movements adjusted for price level changes across countries. In some studies (Khoo, 1994; Bodnar and Wong, 2000), since real and nominal exchange rates are highly correlated both or one of them are used. Also in some studies trade weighed foreign exchange rate used. The exchange rate used in the study is real effective exchange rate, which is calculated by the Turkish Central Bank, we did not prefer nominal interest rate due to the presence of high inflation in Turkish economy. The market index we employ is ISE 100 company index.

In both model, we focused on individual firm value. Choi ve Prasad (1995) state that examining exchange rate risk on aggregate level, on portfolio or market index, may not reveal the true exchange risk sensitivity of firm value. They claim that a firm level study is necessary to understand whether and why individual firms display varying sensitivity to exchange risk. We followed their approach in our analysis.

DATA

In order to examine Turkish firms economic exposure, we constructed a sample. Sample firms stocks are publicly traded in Istanbul Stock Exchange (ISE) market. Only medium and big sized 152 firms are included. We used monthly data to estimate exchange rate sensitivity of the equity for the period from January 2000 to October 2002. Sample firms' economic exposure was examined in two steps. First, all sample firms' stock returns regressed on exchange rate change and market return. In the second step, firms examined according to one specific character, which is export volume. The firms divided into two; exporter and non-exporter firms. We identified firms as an exporter firm, if their foreign sales level is at least 20% of total sales in 2000. Individual stock returns for firms and ISE market return data were collected from ISE sources.

RESULTS

In following the results of the Turkish Companies exchange rate sensitivity are reported. In the study we applied two models. Ordinary least squares regression was

used to estimate both models. Exchange rate sensitivity of firm value is measured by using stock return. First we regressed real effective exchange rate change on all sample value. Then sample was divided into two groups as exporters and non-exporter companies and exchange rate sensitivity of each group was examined.

In the second model, market return has been included. In Model 2, we orthogonalized the market return. The orthogonalization eliminates spurious of possible multicollinearity problem, “the situation in which two or more independent variables are very highly correlated” (Bris and Koskien, 1995; Mansfield, Allen, Doherty and Weigelt, 2002, p. 178).

In the study we also analysed lagged response of stock prices to exchange rate change. We regressed stock returns against lagged exchange rate change and we could not find significant difference in the exchange rate sensitivity than we did not present lagged results.

In Table 1, the results of the first model are summarized. Mean exposure coefficient, standard deviation, minimum and maximum coefficient values and number and percent of firms with significant exposure are presented in three groups as; all firms, exporters and non-exporters. In the sample 152 companies are included while 86 companies are exporter, 66 companies are non-exporter. For overall sample, the exposure measure ranges from -.195 to .710, with the mean exposure coefficient of .168. Exporter firms' exposure range from -.145 to .555, mean exposure coefficient is .194. For non-exporter firms, exposure coefficient ranges from -.195 to .710, but their exposure coefficient is smaller (.136) than exporters and overall sample's coefficient. In other words exporter companies have the highest exposure coefficient. In Table 1, it is indicated that 18 companies (11.8%) have significant exposure. It is seen that exporters and non-exporters have different exposure pattern in the sample. In exporters 16 companies (18%) are exposed to movements in exchange rate, but in non-exporter only 2 companies (3%) are exposed significantly. All exposed companies' β coefficients are positive. This result reveals that the firms with significant exchange risk sensitivity

appreciate from a decrease in the value of TL. Especially the decrease in the value of the TL makes exporters more price competitive.

Table1- Foreign Exchange Exposure of Turkish Companies

$$\text{Model: } R_{it} = \alpha_i + \beta_i e_t + e_{it}$$

	All Firms	Exporters	Non-Exporters
Sample Size	152	86	66
Mean Exposure Coefficient	,168	,194	,136
Standard Deviation	,143	,147	,132
Minimum	-,195	-,145	-,195
Maximum	,710	,555	,710
Significant Exposure			
Number of Firms	18	16	2
Percent of Total	11.8 %	18.6 %	3%
Significant at 5 percent			
Number of Firms	11	9	3 %
Percent of Total	7 %	10.5 %	
Significant at 10 percent			
Number of Firms	7	7	0
Percent of Total	4.6 %	% 8.1	0

Table 2- Foreign Exchange Exposure of Turkish Companies

$$\text{Model: } R_{it} = \alpha_i + \beta_{1i} e_t + \beta_{2i} R_{mt} + e_{it}$$

	All Firms	Exporters	Non-Exporters
Sample Size	152	86	66
Mean Exposure Coefficient	,076	,112	,036
Standard Deviation	,143	,158	,106
Minimum	-,195	-,145	-,195
Maximum	.710	.555	.710
Significant Exposure			
Number of Firms	18	17	1
Percent of Total	11.8 %	19.8%	1.5 %
Significant at 5 percent			
Number of Firms	15	14	1
Percent of Total	9,9 %	16.2 %	1.5 %
Significant at 10 percent			
Number of Firms	3	3	0
Percent of Total	1.9 %	3.4 %	0

In Table 2, the result of Model 2, which includes the market return is presented. In that analysis, although all sample's, exporters' and non-exporters' mean exposure coefficients are smaller than Model 1, there is no considerable change in the number of exposed firms.

CONCLUSION

Foreign Exchange exposure of Turkish companies was investigated in this study. Two types of analysis were conducted. The first was that economic exposure of Turkish firms was measured as the slope coefficient of the regression of stock returns on exchange rates. In the following analysis we included market return to the model for the aim of controlling market movements. Both models developed for these analyses were focused on individual firm value and were estimated by ordinary least squares regression. As an exchange rate, real effective exchange rate was used. The application of this study is to listed non-banking sector companies in İstanbul Stock Exchange market. We measured exporter and non-exporter companies' exchange rate sensitivity.

Findings reveal that exposure of all firms ranges from -.195 to .710 and its mean exposure is .168. Exporter companies' mean exposure coefficient is higher than non-exposure companies'. Also the number of the exposed companies in exporter is higher. While sixteen of exporter companies are exposed significantly but only two of non-exporter companies have significant exposure coefficient. These results indicate that exposure pattern of exporter and non-exporter companies are different. Furthermore all significant β coefficients have positive sign. This means that a depreciation of TL leads to an increase in the value of exporter firms.

The application of Model 2, included market return, did not alter the proportion of exposed firms. Similar with the findings of the first model, the number of the exposed companies is the same (18 companies in 152) and exporters' mean exposure coefficient is higher than all firms' and non-exporters'.

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