

## A Research on the Exchange Rate Exposure of Firms Listed in Borsa Istanbul\*

Dilek Demirhan<sup>a</sup>

Aydanur Gacener Atıŝ<sup>b</sup>

**Abstract:** *The aim of this study is to estimate the extent of exchange rate exposure of textile and leather firms listed in Borsa Istanbul (BIST), and determine why some firms are exposed highly and the others are not. GARCH analysis was used to find the total exposure of these firms between 2005-2011. All the firms in the sample were exposed to foreign exchange exposure at least twice in the analysis period. Approximately 40% of firms in the sample were affected by the fluctuations in values of both US Dollar and Euro in each year between 2005-2011. For Dollar exposure, we found that there were no statistically significant differences between exposed and unexposed firms in terms of the share of foreign sales and foreign assets, currency position and firm size. However in terms of Euro exposure, the results of t-tests showed that firms that were exposed significantly to Euro have higher percentages of foreign sales over total sales, higher foreign assets over foreign liabilities and also higher foreign assets over foreign liabilities ratio.*

**Keywords:** Exchange rate exposure, currency risk, textile and leather industry, GARCH analysis

**JEL Classification:** F31, G00

### 1. Introduction

Fluctuations in foreign exchange rates are one of the important risk factors for firms especially which engage in international activities. Studies in finance literature that focused on testing the nature and causes of foreign exchange exposure have become widespread during the 1970s when the Bretton Woods system of fixed exchange rates unravelled (Bartram, et al., 2005). As the main objective of the firm should be to maximize the market value of shareholders' wealth, determination of the effects of foreign exchange rate fluctuations on firms' market values attracted great attention. Many of the earlier empirical studies have found a weak relationship between exchange rate fluctuations and firm value, but the findings of the more recent studies are mixed (Agyei-Ampomah & Mazouz, 2012). Especially after the recent financial crisis which started in 2007 in US, the risk factors which can influence the financial performance and the market value of the firms have become more important. Based on this fact, the aim of this study is to estimate the extent of exchange rate exposure of a sample of manufacturing firms listed in Borsa Istanbul(BIST) and determine the factors affecting their exchange rate exposure. Firms traded in BIST Textile and Leather Index (XTEKS) are included in the sample group because of the high level engagement of textile and leather industry in international activities. The share of textile, clothing and leather industries

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<sup>a</sup> Assist. Prof. Dr., Ege University, Department of Business Administration, Izmir, Turkiye, dilek.demirhan@ege.edu.tr

<sup>b</sup> Assist. Prof. Dr., Ege University, Department of Economics, Izmir, Turkiye, aydanur.gacener@ege.edu.tr

in Turkey's total exports is approximately 17% as of 2012. These industries are not only engaged in export activities they also engage in importing with 4% share in total imports (TSI, 2013). The firms operating in these industries also have importing activities because they use foreign raw materials and intermediate goods. Moreover textile and leather industries are among the strategic industries in Turkey, because textile industry has a share of more than % 10 in Gross Domestic Product and leather industry provides approximately %1 of the value added produced in manufacturing industry. These industries have a special role not only in Turkey but also in the whole world with the capacity of their designs which have power to determine the trends in fashion, and with the high technology used in manufacturing process (SGM, 2012). Therefore it would be interesting to find out the extent of exchange rate exposure of firms operating in this industry.

The stock market and financial data of XTEKS firms between 2005-2011 is used in the study. Firstly, GARCH analysis is used to document the exchange rate exposure of sample firms between these years. Jorion (1990)'s model, which regresses changes in exchange rates and market return against the stock returns, is widely used in the literature. However, as Agyei-Ampomah et al. (2012) suggest, the coefficient of the variable in Jorion(1990)'s model which represents the changes in exchange rates, measure the exposure over and above that of the market portfolio. So, in our study, orthogonalized market return is used in the Jorion (1990)'s model to measure the total exposure, following Agyei-Ampomah et al. (2012). After finding out the exposure of sample firms to changes in US Dollars and Euro, the firms are grouped according to their exposure. Then, t-tests are applied to see if there are significant differences between firms which have no exposure and which are significantly exposed, in terms of firm-specific characteristics such as size, share of foreign assets and foreign sales, and currency positions. As a result, we found that approximately 40% of firms in the sample were affected by the fluctuations in values of both US Dollar and Euro in each year between 2005-2011. For Dollar exposure, we found that there were no statistically significant differences between exposed and unexposed firms in terms of the share of foreign sales and foreign assets, currency position and firm size. However in terms of Euro exposure, the results of t-tests showed that firms that were exposed significantly to Euro have higher percentages of foreign sales over total sales, higher foreign assets over foreign liabilities and also higher foreign assets over foreign liabilities ratio.

The rest of the paper is organized as follows. Section 2 reviews the existing literature about exchange rate exposure. Section 3 introduces the data, presents the methodology and discusses the empirical results. We conclude in Section 4 and discuss directions for future research.

## **2. Literature Review**

According to financial theory foreign exchange rate exposure is an important risk factor which can have a significant effect on firms' operations. As Prasad & Rajan (1995) state, fluctuations in exchange rates may affect future cash flows by altering the firm's economic and competitive conditions in the product and factor markets; change the domestic currency value of cash flows from foreign operations; and result in translation gains or losses when assets and liabilities of foreign subsidiaries are converted into domestic currency terms. Because of these factors a great body of research have focused on determining the extent of exchange rate exposure by analysing the effects of exchange rate movements on firm value. A seminal work in this research area was carried out by Aggarwal (1981) who showed that the values of the US Dollar and US stock prices were positively correlated. In another early

study Adler & Dumas (1984) have presented a single factor model to estimate foreign exchange rate exposure by estimating the elasticity of firm equity returns to exchange rate changes. Jorion (1990) developed an alternative specification to their model by explicitly controlling for market movements in his paper which he analyzed the foreign exchange exposure of U.S. multinationals, and found that the relationship between stock returns and exchange rates differed systematically across multinationals. He found a significant impact of foreign exchange rate risk on stock prices for only 5.2% of the analyzed 287 U.S. multinationals. The single factor model of Adler & Dumas (1984) and Jorion (1990)'s two-factor model were used extensively in empirical papers later in the literature. However the findings of these empirical studies about the effects of exchange rate fluctuations on firm value are controversial as discussed below.

Following earlier empirical studies mentioned above, Bodnar & Gentry (1993) examined industry-level exchange rate exposures for Canada, Japan, and the USA, and they concluded that some industries in all three countries displayed significant exchange rate exposures. In 1994 Amihud has found no significant relationship between exchange rate changes and stock returns of 32 US firms. In Japan, the study of He & K.Ng (1998) presented that only about 25% of their sample of 171 Japanese multinationals' stock returns experienced economically significant positive exposure effects for the analysis period. Griffin & Stulz (2001) tried to explore the effects of exchange rate shocks in explaining relative US industry performance and found a minimal effect of exchange rates and concluded that industry effects were more significant than exchange rate effects. In another study Allyannis & Ihrig (2001) analysed the sample of US manufacturing industry and their findings showed that only 4 of 18 industry groups were significantly exposed to exchange rate fluctuations. They argued that industry markup and competition played key roles in exposure and found that low markup U.S. industries have high exchange rate exposure. In contrast to earlier empirical work, Doidge, et al.(2006) showed that exchange rate movements can have an economically significant impact on firm value in their study which they used a database of non-financial firms from over 18 countries. In addition, Dominguez & Tesar (2006) determined that many publicly listed non-US firms from eight developed and emerging countries experienced significant currency exposure. In his study Bartram (2007) considered the effect of foreign exchange rates not only on stock returns but also on cash flows of the firm, and concluded that several firms were significantly exposed to at least one of the foreign exchange rates Canadian Dollar, Japanese Yen and Euro, and significant exposures were more frequent at longer horizons.

More recently Aggarwal & Harper (2010) have argued that domestic companies also face significant foreign exchange exposure like multinational firms, and documented that on average domestic company foreign exchange exposure was not significantly different from the exposures faced by multinational firms. Aysun & Guldi (2011) offered a different approach and estimated exchange rate exposure nonparametrically. They compared the results obtained using a linear approach with those from nonlinear and nonparametric models and found that considerable proportion of the firms who did not have linear exposure were exposed significantly when nonlinear or nonparametric models were used. In another recent study it was argued that the relation between stock returns and exchange rate exposure should be examined conditional on the realization of the exchange rate change while the unconditional relation is likely insignificant on average. They tested this argument for a large sample of non-financial firms from 37 countries. They did not find an unconditional relation between stock returns and ex-ante exposure suggesting the lack of a

relation between exposure and expected return, but documented a conditional relation that was a direct function of the realization of the exchange rate factor. Their results suggested that exchange rate exposures mattered for realized returns (Bartram & Bodnar, 2012). In UK, Agyei-Ampomah & Mazouz (2012) studied the sensitivity of foreign exchange exposure, and its determinants to the different estimation methods by using 269 firms' data, and showed that the foreign exchange exposure of individual firms were highly sensitive to the estimation methods. The exposure extents of the firms in the sample were changing according to the methods used. They also indicated that small firms and firms with low growth opportunities tended to be more exposed to exchange rate movements. A re-examination about the exchange rate movements and firm value was made by Chaieb & Mazzotta (2013) who used a quarterly data of US firms over the period 1973–2005 to measure industry level exposure and its dynamics. Considering the joint evidence from the cross-section of firms they found statistically significant and sizable unconditional exposure in most industries.

The exchange rate exposures of firms operating in Turkey were also investigated by different researchers. For example Kiyamaz (2003) analyzed the foreign exchange exposure of firms in a highly inflationary environment during the period of 1991-1998 for a sample of 109 firms traded on Borsa Istanbul (Formerly named Istanbul Stock Exchange- ISE) According to his findings Turkish firms were highly exposed to foreign exchange risks, and the degree of exposure was more pronounced for textile, machinery, chemical, and financial industries. He also concluded that firms who were engaged in exporting and importing activities tended to have the highest exposure to exchange rate risk. In addition he considered the effect of 1994 crisis on exchange rate exposure and found that post-crisis exposures tend to be lower than those of the pre-crisis period. In another study on ISE firms Solakoglu (2005) utilized capital market approach to identify exchange rate exposure for Turkish firms between 2001 and 2003. Results of his study indicated that the size of the firm and the share of export revenue in total revenue had a negative effect on the exposure level. The exchange rate exposures of textile firms traded in ISE were investigated by Cukur & Topuz (2005) and majority of them were found to be negatively influenced by the fluctuations in foreign exchange rates. The results of their study indicated a serious exchange rate risk for the firms in textile industry which are also in line with our findings. In a more recent study by Dogukanli, et al.(2010) the dollar and euro exchange rate exposures of industrial stock indices for the period of January 1999-June 2009 in Istanbul Stock Exchange were investigated. They found long-run relationship among these indices and exchange rates and concluded that exchange rate exposure differed among the industries.

Firms in financial industry in Turkey were also taken as a sample in foreign exchange exposure research in Turkey. Kasman, et al.(2011) examined the effects of interest rate and foreign exchange rate changes on Turkish banks' stock returns and their results suggested that interest rate and exchange rate changes had a negative and significant impact on the conditional bank stock return. They found that interest rate and exchange rate volatility were a major determinant in the conditional bank stock return volatility which suggested that variation in interest and exchange rate risk can explain the observable bank characteristics that are relevant for interested parties who want to manage their risk exposure and oversee changes in exposure

### **3. Method**

The objective of this paper is to investigate the exchange rate exposure of textile and leather firms traded in BIST and after finding the extent of their exposure it is aimed to find

out the reason of why some firms were exposed more and the others were not. 22 firms traded under BIST Textile and Leather Index (XTEKS) were selected as a sample; however the stock market and financial data of only 17 firms out of these 22 firms were available for the period 2005-2011. Therefore 4 firms that have no sufficient data for this whole period are eliminated from the sample. Stock market and financial statements' data for these firms were taken from Borsa Istanbul statistical database, and www.kap.gov.tr website.

To find out the exchange rate exposure of firms, Jorion (1990)'s model is widely used in the literature. In this model changes in exchange rates and market return are regressed against the stock returns as follows:

$$R_{it} = \beta_{i0} + \beta_{im}R_{mt} + \beta_{is}S_t + \varepsilon_{it} \quad (1)$$

$R_{it}$  represents the return on stock  $i$  at time  $t$ , and  $R_{mt}$  is the market return at time  $t$ .  $S_t$  is the percentage change in the value of a single currency or basket of currencies;  $\beta_{i0}$  is a constant that varies across firms;  $\beta_{im}$  estimates stock  $i$ 's market-wide exposure;  $\beta_{is}$  is the estimate of the foreign exchange exposure;  $\varepsilon_{it}$  is the residual error with a zero mean and a constant variance. However, as Agyei-Ampomah et al. (2012) suggested, the coefficient of the variable in Jorion(1990)'s above model,  $\beta_{is}$ , which represents the changes in exchange rates, measure the exposure over and above that of the market portfolio. So, in our study, orthogonalized market return is used in the Jorion(1990)'s model to measure the total exposure, following Agyei-Ampomah et al. (2012). To find the orthogonalized market return firstly  $S_t$ , the percentage change in the value of a single currency, should be regressed against  $R_{mt}$ , the market return at time  $t$ , as in the following equation:

$$R_{mt} = \vartheta_m S_t + \tau_{mt} \quad (2)$$

$\tau_{mt}$  in above equation(2) is the orthogonalized market return which is not correlated with the exchange rate movements. Therefore this variable is used in the Jorion(1990)'s model instead of  $R_{mt}$  as follows:

$$R_{it} = \alpha_{i0} + \alpha_{im}\tau_{mt} + \alpha_{is}S_t + \varepsilon_{it} \quad (3)$$

In equation (3)  $\alpha_{is}$  represents the foreign exchange rate exposure of firm  $i$ . In our model US Dollar and Euro currencies against Turkish Lira (TL) are used as proxies for exchange rate, since majority of the foreign currency transactions in Turkey are in these two currencies. Daily values of US Dollar and Euro against TL were taken from Turkish Central Bank's statistical data base for years between 2005-2012.

First of all, equation (2) is used for regressing the daily changes in US Dollar and Euro against  $R_{mt}$  in separate equations and the orthogonalized market returns for each year is determined for US Dollar and Euro. The return of BIST-100 index is used to represent  $R_{mt}$ . In solving equation (2) OLS is used firstly, and Langrage Multipler (LM) test for autoregressive conditional heteroskedasticity (ARCH) is applied to see if there exist any ARCH effects. For all years the findings of ARCH-LM tests revealed that ARCH effect exists, therefore the appropriate ARCH-GARCH models that were determined according to AIC (Akaike Information Criteria) and SIC (Schwartz Information Criteria) criteria are used for each year.<sup>1</sup>

Afterwards, these orthogonalized market returns are used in equation (3) together with the changes in related currency rate to be able find out exposure coefficient,  $\alpha_{is}$ . Weekly returns are calculated on a daily basis for each firm in the sample and used in equation (3) as

<sup>1</sup>Results of ARCH-LM, AIC and SIC tests are available upon request.

dependent variable for each year. Finally,  $\alpha$ s were determined for two different currencies in different models for each firm in the sample.

#### 4. Findings

As a result of the estimation of equation (3), coefficients of relevant exchange rate fluctuations were calculated. In estimation of these equations for each firm and year, first of all OLS was used again, and ARCH-LM tests were applied to uncover any ARCH effects afterwards. In all estimations for all firms, ARCH-LM tests revealed that strong ARCH effects existed, thus appropriate ARCH-GARCH models that were determined according to AIC (Akaike Information Criteria) and SIC (Schwartz Information Criteria) were used for each firm at each year.<sup>2</sup>

According to Table1, it seems that more firms are exposed to changes in US Dollar compared to Euro, because out of 126 observations (18 firms for 7 years) 107 observations have a significant US Dollar coefficient and 92 have a significant Euro coefficient. In 89 observations the coefficients of both US Dollar and Euro are significantly important at 5% level. Moreover, there is not any firm which has not been influenced at all from exchange rate changes during this period. These findings are parallel to findings of previous studies by Kiyamaz (2003) and Cukur & Topuz (2005) who found significant rate of exposure for textile firms listed in ISE.

Apart from the high level of exposure, results demonstrate that effects of exchange rate movements on firm values are negative most of the time. According to Table 1, only 2 of the 107 significant (at %5) US Dollar coefficients and 4 of 92 significant (at %5) Euro coefficients are positive. This is an interesting finding because of the high export volume of textile industry even if they also engage in importing activities. Total export amount of the firms in the sample during 2005-2011 is 6 billion TL. We could not reach the import amounts of the sample firms during 2005 and 2006, but total import value of the firms between 2007-2011 is approximately 3 billion TL. Even if most of the firms in the sample have higher export volumes than import volumes, nearly all the significant coefficients are negative. This shows that textile industry really face a serious exchange rate risk that should be managed efficiently. However most of the firms in the sample do not use hedging instruments to manage their exchange rate risk. Only 3 of the firms in the sample use derivative instruments for hedging, two of which do it in a consistent basis during the whole analysis period. However, it is also interesting to find out that these two firms are among 7 firms which have significant exposure in all years.

During the analysis period a global financial crisis, which has been considered as a second great depression after 1929, crashed out in US during 2007, and started to affect the other countries in the world especially after the collapse of Lehman Brothers in September 2008. Therefore it would be appropriate to investigate the possible effects of this crisis on exchange rate exposures of sample firms in the study. To analyze this influence, two sample independent t-tests are applied to 89 observations that have both significant Dollar and significant Euro exposures, and the results are given in Table 2.

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<sup>2</sup>Results of ARCH-LM, AIC and SIC tests are available upon request.

**Table 1: Exchange Rate Exposure for Individual Firms in Sample (2005-2011)**

<i>Firm</i>	<i>Period</i>	<i>Dollarbeta</i>	<i>Eurobeta</i>	<i>Firm</i>	<i>Period</i>	<i>Dollarbeta</i>	<i>Eurobeta</i>
Akın	2005	-0,84951***	-0,48663***	Altınyıldız	2005	-0,84383***	-0,84383***
Akın	2006	-0,80284***	-0,63335***	Altınyıldız	2006	-0,09465	-0,00464
Akın	2007	-0,45939***	-0,43361***	Altınyıldız	2007	-0,34118	-0,40779*
Akın	2008	-0,92280***	-0,67734***	Altınyıldız	2008	-0,24271***	-0,47709***
Akın	2009	-0,68757***	-0,61199***	Altınyıldız	2009	-0,39287***	-0,39287***
Akın	2010	-0,36837***	-0,54407***	Altınyıldız	2010	0,39837***	-0,03086
Akın	2011	-0,73982***	-0,48753***	Altınyıldız	2011	-0,60765***	-0,04778
Arsan	2005	-0,19318*	-0,10207	Birlik	2005	0,17083	-0,08154
Arsan	2006	0,00000*	0,00008	Birlik	2006	-0,35816***	-0,35213***
Arsan	2007	-0,04811	-0,52762***	Birlik	2007	-0,02232	-0,11269
Arsan	2008	-0,18513**	-0,09861	Birlik	2008	-0,85726***	-0,68829***
Arsan	2009	-0,29182*	-0,19497	Birlik	2009	-0,56460***	-0,72927*
Arsan	2010	-0,71436***	0,23103	Birlik	2010	-0,31894*	-0,12567
Arsan	2011	-1,30387***	-0,82395***	Birlik	2011	-1,12970***	-0,57008***
Bişaş	2005	-0,00046	-0,52268**	Bossa	2005	-0,29520**	-0,56687***
Bişaş	2006	-0,99229***	-0,46867***	Bossa	2006	-0,65644***	-0,67979***
Bişaş	2007	-0,07623	0,263	Bossa	2007	-1,06612***	-0,86712***
Bişaş	2008	-0,48599***	-0,45916***	Bossa	2008	-0,44690***	-0,55686*
Bişaş	2009	0,08768	-1,04162***	Bossa	2009	0,35302***	0,24273**
Bişaş	2010	-0,69026***	-0,26383	Bossa	2010	-0,59401***	-0,19319***
Bişaş	2011	-0,88178***	0,33945***	Bossa	2011	-1,02614***	-0,46480***
Derimod	2005	-0,64486***	-0,92897***	Desa	2005	-0,60242***	-0,92410***
Derimod	2006	-1,48282***	-1,04059***	Desa	2006	-1,02992***	-0,88205***
Derimod	2007	-1,18040***	-1,11051***	Desa	2007	-0,87948***	-0,87849***
Derimod	2008	-1,08718***	-0,85141***	Desa	2008	-0,83176***	-0,70309***
Derimod	2009	-0,18418**	-0,06095	Desa	2009	-0,93649***	-0,90391***
Derimod	2010	-0,52524**	0,2833	Desa	2010	-1,33607***	-0,45020***
Derimod	2011	-0,95056***	-0,88549***	Desa	2011	-1,16352***	-0,80959***
İdaş	2005	-1,10654***	-1,19999***	Karsu	2005	-0,64463***	-0,67192***
İdaş	2006	-1,87209***	-1,59271***	Karsu	2006	-1,42821***	-1,31609***
İdaş	2007	-0,21120*	-0,11918	Karsu	2007	-0,94374***	-1,10746***
İdaş	2008	-1,39954***	-1,15258***	Karsu	2008	-0,74619***	-0,55566***
İdaş	2009	-0,32059**	0,01489	Karsu	2009	-0,66306***	-0,66306***
İdaş	2010	-0,53729***	-0,03738	Karsu	2010	-0,71499***	-0,18954
İdaş	2011	-1,06524***	-0,51633***	Karsu	2011	-0,13934	-0,0235
Kordsa	2005	-0,66470***	-0,99133***	Lüks	2005	-0,31705**	-0,28344***
Kordsa	2006	-1,39772***	-1,42469***	Lüks	2006	-0,65840***	-0,60035***
Kordsa	2007	-1,16522***	-0,64401***	Lüks	2007	-0,70467***	-0,74642***
Kordsa	2008	-0,74019***	-0,63741***	Lüks	2008	-0,62852***	-0,79233***
Kordsa	2009	-0,56860***	-0,53300***	Lüks	2009	-0,04993	0,01032
Kordsa	2010	-0,55940***	-0,39789***	Lüks	2010	-0,79788***	-0,05804
Kordsa	2011	-1,03216***	-0,63977***	Lüks	2011	-1,01599***	-0,39884***
Mensa	2005	-1,15519**	-2,95562***	Menderes	2005	-0,86589***	-1,15131***
Mensa	2006	-0,50363***	-0,52570*	Menderes	2006	-1,30450***	-0,02756
Mensa	2007	-0,65929***	-0,58195**	Menderes	2007	-1,09599***	-0,51794***
Mensa	2008	-0,98001***	-0,41047***	Menderes	2008	-0,97984***	-0,59158***
Mensa	2009	-0,13998	0,27383	Menderes	2009	-0,09927	-0,16628
Mensa	2010	-0,65968*	-1,46852***	Menderes	2010	-1,04034***	-0,11064
Mensa	2011	-1,19152***	-0,74095***	Menderes	2011	-1,48555***	-0,93184***
Söktaş	2005	-0,73756***	-1,00645***	Sönmez	2005	-0,79884***	-0,84862***
Söktaş	2006	-1,47323***	-1,09824***	Sönmez	2006	-1,40949***	-1,13905***
Söktaş	2007	0,00781	-0,24246	Sönmez	2007	-1,08128***	-1,08758***
Söktaş	2008	-0,63089***	-0,49962***	Sönmez	2008	-0,80396***	-0,69926***
Söktaş	2009	-0,69148***	-1,08030***	Sönmez	2009	-0,23636	0,13572
Söktaş	2010	-0,31538	-0,62849***	Sönmez	2010	-0,67141***	-0,36019***
Söktaş	2011	-0,36577**	-0,36494***	Sönmez	2011	-1,08712***	0,34326*
Yataş	2005	-1,01082***	-1,23813***	Yünsa	2005	-0,36290***	-0,51482***
Yataş	2006	-0,01507***	0,90900***	Yünsa	2006	-0,84617***	-0,74208***
Yataş	2007	-0,97600***	-0,98822***	Yünsa	2007	-0,53407***	0,15650**
Yataş	2008	-0,81415***	-0,52013***	Yünsa	2008	-0,59099***	-0,35502***

**Table 2: Results of t-tests comparing exchange rate coefficients before and after the crisis**

Variable	Group	N	Mean	Std.Dev.	Pr (T < t)	Pr( T  >  t )	Pr(T > t)
\$ exp.beta	Pre-crisis	40	-.8468754	.3649752	0.1372	0.2743	0.8628
	Post-crisis	31	-.8006819	.3783794			
€exp.beta	Pre-crisis	40	-.8538755	.5497283	0.0074	0.0148	0.9926
	Post-crisis	31	-.5897329	.3331547			

As the recent financial crisis started to have a widespread effect in 2008, years between 2005-2007 is named as pre-crisis period, 2008 is excluded from the analysis and years between 2009-2011 is named as post crisis period. As Table 2 demonstrates there is no significant difference between the US Dollar exposure before and after the crisis. However, Euro exposure seems to drop significantly after the crisis period. This finding is consistent with the findings of Kiyamaz (2003) who also reported a decrease in exchange rate exposure after 1994 crisis. This decrease resulted probably because of the important effects of recent financial crisis on most of the European countries which are key trade partners of firms in the sample.

After looking at the effects of recent financial crisis on exchange rate exposures of textile and leather firms, the observations are splitted into two, as the ones with no exchange rate exposure and the ones with significant exchange rate exposure. By this way we can see the differences between these observations in terms of important firm-specific factors which are accepted as determinants of exchange rate exposure in the literature. To be able to demonstrate if there are any statistically significant differences between these two groups t-tests were applied for US Dollar and Euro seperately.

**Table 3: The results of t-tests for US Dollar exposure**

Variable	Group	N	Mean	Std.Dev.	Pr (T < t)	Pr( T  >  t )	Pr(T > t)
Foreign Sales/Total Sales	No Exposure	19	.4583174	.812082	0.7462	0.5077	0.2538
	Sig.exposure	107	.3309539	.3039244			
Foreign Assets/Total Assets	No Exposure	19	.0842882	.0813387	0.1201	0.2402	0.8799
	Sig.exposure	107	.1175082	.2166988			
Foreign Assets/Foreign Liabilities	No Exposure	19	.3695838	.5319767	0.1058	0.2116	0.8942
	Sig.exposure	107	.5700691	1.038142			
Size (Log of Assets)	No Exposure	19	18.52105	1.005542	0.1268	0.2535	0.8732
	Sig.exposure	107	18.8182	1.11401			

Table 3 summarizes the findings of t-tests for US Dollar exposure. We investigated if the share of foreign sales, share of foreign assets in total assets, ratio of foreign assets relative to foreign liabilities and size of the firms differ significantly between two groups, that have a significant exchange rate exposure and that have not. As a result we can conclude that there are not any significant differences between these two groups in terms of aforementioned variables, suggesting that US Dollar exposure is not related to these firm-specific factors. But, in the case of Euro we can observe statistically significant differences of these factors between two groups : exposed & unexposed.

Table 4 shows the results of t-tests which examines these differences and we can see that firms which have significant Euro exposure have higher percentage of foreign sales over total sales. Moreover firms which are exposed significantly to fluctuations in Euro have higher

foreign assets over total assets ratio. We also found a statistically significance difference between two groups in terms of the ratio of foreign assets over foreign liabilities. Significantly exposed firms seem to have higher foreign assets over foreign liabilities ratio. According to these findings firms with higher foreign sales and higher foreign assets, are exposed more to the fluctuations in Euro, while there are no statistically significant differences between firms in terms of US Dollar exposure.

**Table 4: The results of t-tests for Euro exposure**

Variable	Group	N	Mean	Std.Dev.	Pr (T < t)	Pr( T  >  t )	Pr(T > t)
Foreign Sales/Total Sales	No Exposure	34	.2600278	.3310793	0.0479	0.0959	0.9521
	Sig.exposure	92	.3834691	.4438594			
Foreign Assets/Total Assets	No Exposure	34	.0653991	.0676264	0.0087	0.0174	0.9913
	Sig.exposure	92	.1299053	.2311049			
Foreign Assets/Foreign Liabilities	No Exposure	34	.2407106	.2181028	0.0006	0.0012	0.9994
	Sig.exposure	92	.6512666	1.12132			
Size (Log of Assets)	No Exposure	34	18.67162	1.053258	0.2597	0.5193	0.7403
	Sig.exposure	92	18.811	1.119663			

## 5. Conclusion

Foreign exchange rates are important macroeconomic factors which are monitored by many parties in an economy. Fluctuations in the values of important currencies, for example in US Dollar and Euro for Turkey, can cause crucial problems especially for firms that are engaged in international activities. The exchange rate exposure of the firms listed in textile and leather index of BIST are the focus of this study because of the strategic importance of the sector and the wide range of the firms' international activities in this sector. It was aimed to determine the extent of exchange rate exposures of these firms by investigating the effects of changes in US Dollar and Euro on their stock returns. In this respect orthogonalized market return was used in the Jorion(1990)'s model to measure the total exchange rate exposure, following Agyei-Ampomah et al. (2012), so that total exposure for each firm in the industry was estimated during the years 2005 to 2011.

This study indicated that 18 of the firms in textile and leather index of ISE are exposed seriously to changes in US Dollar and Euro. The results revealed significantly important negative coefficients for these two currencies in the vast majority of observations. The effects of the recent financial crisis on these firms' foreign exchange exposures were also investigated and the findings of the t-tests conducted for this purpose showed that exposure to Euro has decreased in the post-crisis period, despite the fact that there was no statistically significant differences between US Dollar exposure before the crisis and US Dollar exposure after the crisis. Previously (Kiymaz, 2003) has also demonstrated a decrease in exchange rate exposure of Turkish firms after 1994 crisis and concluded that this could be because of the increased conciousness of the sample firms about hedging themselves against exchange rate fluctuations because of the crisis.

To be able to find out the reasons of why some firms are exposed highly and while others are not, observations were divided into two groups: ones with no exposure and ones with significant exposure. For US Dollar exposure, we found that there were no statistically significant differences between exposed and unexposed firms in terms of the share of foreign sales and foreign assets, currency position and firm size. This finding suggest that US Dollar exposure of this sample firms did not resulted from these firm-specific factors investigated here. However in terms of Euro exposure, the results of t-tests showed that firms that were

exposed significantly to Euro have higher percentages of foreign sales over total sales, higher foreign assets over foreign liabilities and also higher foreign assets over foreign liabilities ratio.

As a result, the vulnerability of listed textile and leather firms in Turkey to exchange rate fluctuations and the factors affecting this vulnerability were displayed in the study. Although there are studies about exchange rate exposures of BIST firms (Kıymaz, 2003; Solakoğlu, 2005; Doğukanlı et al., 2010), the time frame of the analyses in our study was wider and more recent. Moreover, it would be possible to see the effects of the recent financial crisis on the exchange rate exposure of textile and leather firms. Even if the global financial crisis seemed to have no negative effects on exchange rate exposures of sample firms, the vast majority of the firms in the sample have negative exchange rate coefficients which are statistically significant for both US Dollar and Euro. In this context, it becomes important for the firms operating in textile and leather industry to manage these risks efficiently to be able to protect their firm values.

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