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**Foreign Ownership and Exchange Rate Risks: Evidence from Korean Stock Returns**

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**Abstract**

In this paper, we estimate several measures of firm’s ‘exposure to exchange rate risks’ --hereafter ‘F/X exposure’--, and analyze how these exposures are affected by different firm characteristics including foreign ownership. By using the foreign ownership and stock return data on 571 Korean firms from 2000 to 2006, we find that foreign ownership is an important factor affecting the F/X exposures. In particular, during a month of home currency depreciation, stock returns of firms with a higher ownership experience a greater negative shock, but during a month of increased exchange rate volatility, it is the firms with a lower ownership that receive a greater negative shock. Overall, various firm characteristics are found to affect the F/X exposures in different directions, weakening the significance of them. This finding helps explain the previously documented weak association between exchange rates and stock returns.

**I. Introduction**

Suppose a firm’s main source of income is exports. If the local currency is expected to depreciate, the firm’s exports will gain price competitiveness, and the operating income is likely to increase. Would this seemingly good news automatically bring about a rise in the share price? The answer may not necessarily be affirmative, especially from a foreign investor’s perspective. This is because the expected depreciation of the local currency will result in a depreciation of the ‘home’ currency value of his/her stock holdings. Therefore, the foreign investors may well sell off their shareholdings, and the share price may not respond positively to the depreciation of the local currency. The traditional research on F/X exposure has largely been ignoring the effects of the foreign ownership, and this study attempts to fill the void.

Since Adler and Dumas (1984) defined a firm’s F/X exposure as the correlation of the value of an asset or liability to the changes in exchange rates, the empirical research on F/X exposure has largely been on measurement of the exposure itself and the contributing factors. The first such attempt is Jorion (1990). He develops a model to measure F/X exposure by estimating the ‘currency beta’: a slope coefficient of stock returns against the exchange rate changes. In essence, this model attempts to estimate the ‘net’ economic exposure on stock returns after all the effects of currency risks on the assets and liabilities including the effects of hedging activities are taken into account. Jorion (1990) finds that even though the currency beta varies across the U.S. multinational firms depending on their level of foreign activities, for most of the firms, it is statistically insignificant. The latter finding has been received as somewhat puzzling and triggered a host of further investigation. For example, Bartov and Bodner (1994) corroborate this weak association between the U.S. stock returns and the exchange rates, and argue that the weak association may arise from mispricing. In addition, Chow, Lee and Solt (1997) find that the weak association is mainly over short-horizons, since the interest rate effects and the cash-flow effects of F/X exposures are offsetting over short horizons. Using Japanese data, He and Ng (1998) find that a slightly larger proportion[[1]](#footnote-2) of sample firms experience statistically significant F/X exposure. In this study, we propose foreign ownership as another reason for this weak association. Especially, we aim at investigating whether the foreign ownership further complicates the effects of exchange rates on stock returns, and thereby rendering the relationship between the two obscure.

After Jorion (1990) suggested ‘currency beta’ as a measure of F/X exposure, subsequent empirical studies have expanded the concept of F/X exposure by including additional exchange rate related variables in the measurement model. For example, Bartov and Bodner (1994) and He and Ng (1998) add the lagged exchange rate movements as an explanatory variables to explain stock returns. Analyzing the U.S. firms, Bartov and Bodner (1994) report that the stock returns have no relation with contemporaneous changes in the exchange rates, but have a significant relation with lagged ones. On the contrary, He and Ng (1998) find that in the case of Japanese MNC’s the stock returns are not affected by the lagged exchange rate movements, but by the current movements. Koutmos and Martin (2003) further suggest volatility and asymmetric exposures. In order to estimate the volatility exposure they add the exchange rate volatility in the measurement equation. For asymmetric exposure, they include a dummy variable to measure whether the stock returns respond differently to the appreciation of the local currency than to the depreciation. Unlike the previous studies, however, they conduct the estimation only at the industry level, and do not perform the cross-sectional analyses to investigate the determinants of the F/X exposure. In this paper, we include all the variables that have been suggested by the previous studies as measures of the F/X exposure, and conduct cross-sectional analyses to investigate, among other things, how foreign ownership affects the F/X exposure. In particular, we investigate how foreign ownership affects four measures of the F/X exposure: appreciation exposure, depreciation exposure, volatility exposure, and lag exposure.

During the currency crises in 1997, Korea changed the exchange rate regime from the managed float to the free float. Bian and Cho (2008) find that even though exchange rate risk increased dramatically under the new regime, the F/X exposures on equity returns in general decreased. We argue that this seemingly contradicting result is at least partly attributable to the increase in foreign ownership. During the currency crises, in addition to changing the exchange rate regimes, the Korean government lifted almost all restrictions on foreign ownership to help capital inflow from foreign investors. Since then the foreign ownership has increased steadily to the extent that by 2006, about 5% of firms in our sample --26 firms out of 571, to be exact-- emerged with over 50 percents foreign ownership. Note that from the foreign investors’ point of view, their total investment returns depend on both the stock and the currency returns. Heuristically speaking, since the Korean economy is largely export-driven, the Korean Won value and Korean firms’ operating cash flows are negatively correlated. Therefore, in a period when the foreign ownership is expanding, one may find that the F/X exposures on equity returns are weaker than a period with little foreign ownership. Not only the exchange rate affects the foreign ownership, the changes in foreign ownership may also affect the exchange rates. When a large movement in exchange rates is observed, a typical news media posts an article suspecting large sales or purchases of Korean stocks by foreign investors as one of the reasons for the movement. Therefore, the foreign ownership seems to link the stock market and the market for foreign exchange, and understanding the link would definitely help understanding the pricing mechanisms in both markets.

The literature on foreign ownership has been developed mainly along the line of its implication on corporate governance. For example, Rajan and Zingales (1998) argue that foreigners tend to demand better corporate governance. This study steers away from this line of literature, but rather focuses on the effects of investment decisions taken by foreign investors on the relationship between exchange rates and equity returns.[[2]](#footnote-3)

We find Korea as an ideal testing bed for our empirical study for a number of reasons. First, reliable foreign ownership data is readily available. There are not many countries including the US, for which foreign ownership data is available.[[3]](#footnote-4) Second, during the sample period from 2000 to 2006, Korea had few, if any, restrictions on trades as well as capital flows. On stock investments, there were even no capital gains taxes. In addition, the exchange rates were fully free-float. Therefore, the empirical findings on F/X exposures are most likely to be driven by economic decisions by the agents free from regulations by the government. Last, since there is wide variations in corporate variables including foreign ownership, meaningful cross-sectional analyses can be conducted.

Like in the previous studies, we also find that only about 8% of the sample firms exhibit statistically significant currency beta. If we include other aspects of F/X exposure, the number of firms that have at least one significant exposure parameter increases to about 27% of the sample. Overall, we find that the stock returns in general are positively related to the currency value. This is somewhat surprising in that Korean economy is largely export-driven. From the cross-sectional analyses we find that different firm characteristics affect the exposure parameters in different directions, making the F/X exposure less significant. With respect to the foreign ownership, we first find that the foreign ownership has a strong relation to the depreciation beta. This implies that in a period when Korean Won depreciates, the stock returns of firms with a higher ownership tend to be lower than those with a lower ownership. In addition, the volatility beta becomes larger for firms with a higher foreign ownership. This means that as the volatility of the exchange rates increases, firms with a higher foreign ownership yields higher equity returns than those with a lower ownership. Another weak, yet interesting finding is that foreign investors tend to decrease the stock market efficiency. As Bartov and Bodner (1994) argue, a significant lag beta can be viewed as evidence that the stock market is inefficient. This is because with a significant lag beta, the stock returns are predictable by observing the past exchange rates. In this paper, we find that the statistical significance of lag beta becomes stronger for firms with a higher foreign ownership.

The remaining part of the paper is organized as follows. Section II provides empirical models together with the explanations on the variables used for the analyses. Section II also describes the data. The results from the empirical analyses are reported in Section III. Section VI concludes.

**II. Empirical Models**

**II.1 Measurement of F/X Exposures**

Measurement of F/X exposure hinges on the definition of the exposure. A typical textbook on international finance would define the exposure in three different concepts: transaction, translation and economic exposures. The transaction exposure measures the risks associated with expected cash flows in foreign currency due to unexpected changes in exchange rates. The translation exposure measures the exchange rate risks in accounting income when consolidated financial statements are prepared for a multinational corporation. Lastly, the economic exposure measures the exchange rate risks in firm value, and this is in line with how Adler and Dumas (1984) defined a firm’s F/X exposure: the correlation of the value of an asset or liability to the changes in real exchange rates. Most of the empirical research on F/X exposure has largely been on measurement of the economic exposure, especially of the exchange rate risks in equity returns. This is possibly due to the data availability, but more importantly to the fact that only the economic exposure measures the ultimate impact of the exchange rates on the value of the residual claim, *i.e.* equity, after all the effects on cash flows and accounting income are considered.

The first such attempt is Jorion (1990). He develops a model to measure F/X exposure by estimating the ‘currency beta’: a slope coefficient of stock returns against the exchange rate changes. Using the data on US multinational firms, he finds that only 5% of his sample firms have significant currency beta. Subsequent research finds that the equity returns respond differently to the appreciation and to the depreciation of the local currency. For example, Miller and Reurer (1998) report a significant difference in the US firms’ currency betas in the period of currency appreciation compared to those in the period of depreciation. By analyzing Japanese firms, Chow and Chen (1998) report that compared to appreciation of Japanese Yen, depreciation affects the firm value more. Di Iorio & Faff (2000) also find significant asymmetric exposure in Australian data. Koutmos & Martin (2003b) estimate asymmetric exposure imbedded in industry stock returns of firms in Germany, Japan, the US, and the UK. They also find that about 40 percent of the cases exhibit significant asymmetric exposure.

In an attempt to explain the currency beta’s weak significance found by Jorion (1990), Bartov and Bodner (1994) include the lagged exchange rate movements as explanatory variables. They argue that the weak significance may arise from mispricing in the stock market, and provide evidence that the US stock returns are significantly related to the lagged changes in exchange rates. Investigating the F/X exposure in Japanese firms, He and Ng (1998) also test whether the stock returns are related to the lagged exchange rate movements. Contrary to the findings by Bartov and Bodner (1994), in the case of Japanese MNC’s, the stock returns are affected by the current movement in the exchange rates, and not by the lagged ones.

Recently, Kotumos & Martin (2003a) add exchange rate volatility to Jorion’s (1990) measurement model. They argue that the exchange rate volatility can affect the cash flows of a firm by altering the volume of international trade or increasing the volume of hedging activities. They analyze whether the stock returns from nine major U.S. sectors are affected by the exchange rate volatility of 5 major currencies. They find that the non-cyclical consumer and financial sectors have significant sensitivity to exchange rate volatility for four counties’ currencies.

In this paper, we take a comprehensive approach and include all four measures of F/X exposure: first moment exposure, i.e. the currency beta, asymmetric exposure, volatility exposure, and lag exposure. This will result in the following measurement model for F/X exposures at the firm level:

, (1)

where  
 *Rit*= the log rate of return on *ith* firm’s stock at month *t*,

*Rmt* = the log rate of return on KOSPI at month *t*,

*Rxt* = the log rate of change in the exchange rate at month *t*,

σ*xt* = the exchange rate volatility at month *t*,[[4]](#footnote-5)

*Rxt-1* = the lagged rate of change in the exchange rate at month *t-1*,

*Dt* is a dummy variable, which is 1 if *Rxt* < 0, and

ε*t* is the error term at month *t*.

Hence, the four slope coefficients of Equation (1), *βx*, *βD*, *βσ* and *βL*, are used to measure the four aspects of F/X exposure. Specifically, *βx* measures the currency exposure, *βD*, the asymmetric exposure, *βσ*, the volatility exposure, and lastly *βL*, the lag exposure. Note that the response of *Rit* to exchange rate will be equal to *βx* if *Rxt* > 0, and *βx* +*βD* if *Rxt* < 0. Therefore, the currency exposure, *βix*, can be interpreted as the ‘appreciation exposure’, while *βx* +*βD*, the ‘depreciation exposure’. In what follows, we redefine the depreciation exposure, *βx* +*βD* as *βDep*. Equation (1) is similar to the measurement equation in Koutmos and Martin (2003a), except that in our model, the lag effect is added.

In estimating Equation (1), we use 84 monthly observations spanning 7 years from 2000 to 2006. There are at least two reasons why we use monthly data instead of a data with a higher frequency. First, since the F/X exposure relates the exchange rate risks to firm value, we believe that it should be measured over medium- to long-term intervals. Second, in order to estimate Equation (1), we need data on the exchange rate volatility, σ*xt*. Due to data availability,[[5]](#footnote-6) we cannot generate observations of σ*xt* on a higher frequency data. This In order to estimate the exchange rate volatility for month *t*, σ*xt*, we take the similar approach as described along the equations (2) ~ (4) in Koutmos and Martin (2003a). In essence, we first assume that the conditional variance of innovations in the exchange rate movement follows a GARCH(1,1) process. Then, we take the sum of daily conditional variances of the month. We then take the square root of the sum to obtain σ*xt*. The description about the exact procedure is left in Appendix.

As for the exchange rate, we use trade-weighted exchange rates developed by JP Morgan. This index is evaluated by taking a geometric weighted average of exchange rates, where the weights are measured in terms of trading partners’ weights in total volume of trades. In the case of Korean Won, the trading partners include the U.S., China, Japan, Hong Kong, the UK, Switzerland, Germany, and etc. Jorion (1990), Bodnar and Gentry (1993) and He and Ng (1998) all use trade-weighted exchange rates in their study for F/X exposure. Since Korea over the years has had foreign activities across all over the world, measuring F/X exposure against the trade-weighted index seems to be appropriate. The exchange rates are obtained from Bloomberg Database. The data on KOSPI index and returns on the sample firms are from KSRI --Korea Securities Research Institute--. The equity returns are adjusted for dividends, splits, and reverse-splits.

**II.2 Determinants of F/X Exposure**

Once the exposure parameters, *βx*, *βD*, *βσ* and *βL*, are estimated at the firm level, we conduct cross-sectional analyses on these parameters to investigate how firm characteristics including foreign ownership (hereafter referred to as ‘*FO*’) are related to the F/X exposure. We conjecture that foreign ownership plays an important role in linking the currency and the capital markets. From the foreign investors’ point of view, the changes in the currency value will have at least two implications in their investment decisions. First, unless their investment value is properly hedged, the total return from their investment is directly affected by the currency return. Second, depending on the industrial structure the firm is in and the degree of hedging activities the firm takes, the change in exchange rates will affect the firm value by altering the operating income and balance sheet items. The latter effects do not seem to have direct impacts on foreign investors’ return, since these are rather longer term effects. However, if the capital market prices the effects of exchange rates properly into the stock price, then the latter effects should also have direct implications on the foreign investors’ investment decision. Therefore, if the foreign investors are risk averse with only limited access to the markets for currency hedge, we predict that they will prefer stocks that have relatively immune to the F/X risk.

Not only the exchange rate affects the foreign ownership, the changes in foreign ownership may also affect the exchange rates. When the exchange rate moves significantly, foreign investors’ large sales or purchases of Korean stocks are often quoted as one of the reasons for the significant move. Therefore, the foreign ownership seems to link the stock market and the market for foreign exchange, and understanding the link would definitely help understanding the pricing mechanisms in both markets.

[Insert Table 1 here.]

[Insert Figure 1 here.]

[Insert Figure 2 here.]

Table 1 shows how *FO* in our sample changed over time during the sample period. The average of foreign ownership has been gradually on the rise over the sample period from 5.72% in 2000 to 12.27% in 2006. The average over the whole sample period is 8.98%. Since median is much smaller than the average throughout the sample period, the distribution of *FO* is largely skewed to the right. Figure 1 plots the relationship between the monthly changes in the average *FO* and return on KOSPI index. As the graph shows, the two variables seem to move in the same direction, indicating that these two variables are inter-related. The correlation between these two variables is 14%. In addition, we plot the relationship between the monthly changes in the average *FO*, and this time, the return on the exchange rates. This is reported in Figure 2. Unlike the relation between the *FO* and KOSPI index, at the aggregate level, the average *FO* and the exchange rates are almost unrelated, with the correlation coefficient standing at 0.14%. This weak association between the two variables may arise from loss of information at the aggregate level. We hope to uncover the lost information while we investigate the relationship between the two at the firm level.

In the cross-sectional analyses, we include other firm specific variables as controls. In the previous literature, various variables have been used as explanatory variable for F/X exposure.[[6]](#footnote-7) These variables can be largely grouped into two sets: (i) variables that proxy the firm’s degree of foreign activities, and (ii) those of hedging activities. The variables that belong to the first set is export ratio, while those that belong to the second set, amount of foreign debt, size, leverage ratio, market-to-book ratio, and amount of derivative use.

Export ratio (hereafter referred to as ‘*ExpR*’)is regarded as the most important variable that characterizes a firm’s F/X exposure. Jorion (1990), He and Ng (1998) and Chow and Chen (1998) all find that the export ratio is positively related to firms’ exchange rate exposure. In our analyses, we also use the ratio of (foreign debt + foreign asset) to total assets (hereafter referred to as ‘*FAFD*’) to measure the degree of foreign activities taken by a firm. We predict that firms with a higher ratio would exhibit a higher degree of F/X exposure.

Regarding the amount of foreign debt used (hereafter referred to as ‘*FDeR*’), papers like Keloharju and Niskanen (2001), Kedia and Mozumdar (2003), and Elliott Huffman and Makar (2003) find that most firms use foreign debt for hedging purpose, and as a result, those firms with a larger amount of foreign debt are less exposed to exchange rate fluctuation. Whether a firm uses foreign debt as hedging purposes or not can be evaluate by taking the difference between the foreign debt and assets, since if a firm uses debt as hedging, then it will finance a foreign activity via a matching foreign currency debt. Therefore, a firm with well balanced foreign assets and debt would exhibit a lower degree of F/X exposure. In this paper, we also include, as control variables, the ratios of (foreign debt – foreign asset) to total assets (hereafter referred to as ‘*NetFD*’), and the absolute value of (foreign debt – foreign asset) to total assets (hereafter referred to as ‘*aNetFD*’).[[7]](#footnote-8)

There are two conflicting views about how firm size (hereafter referred to as ‘*Size*’) would affect the exchange rate exposure. Nance, Smith & Smithson (1993) argue that larger firms have economy of scale in hedging costs, so they should be able to hedge risks more effectively than the smaller firms. This implies that larger firms should have a lower exchange rate exposure. On the other hand, Warner (1977) and He and Ng (1998) find evidence that firm size is positively related to the F/X exposure. They contend that smaller firms actually have more incentives to hedge exchange rate risk because of the high bankruptcy costs.

Leverage ratio is also widely tested as a factor of F/X exposure. Note that firms with a higher leverage ratio (hereafter referred to as ‘*LTD*’) are exposed to a higher likelihood of bankruptcy. Therefore, they are expected to engage more actively in hedging activities. In fact, He and Ng (1998) and Chow and Chen (1998) report evidence that firms with a higher leverage ratio have a lower exchange rate exposure.

Froot, Scharfstein and Stein (1993) argue that hedging will mitigate the underinvestment problem. By resorting to the underinvestment cost hypothesis that links the underinvestment problem with growth opportunities, and the assumption that market-to-book ratio (hereafter referred to as ‘*MB*’) serves as a proxy for growth opportunities, Gèczy, Minton and Schrand (1997) and He and Ng (1998) test whether *MB* is related to the F/X exposure. In particular, they test whether firms with a higher *MB* engage in greater hedging activities, and find evidence to support the hypothesis. This implies a negative relation between *MB* and F/X exposure.

One of the obvious candidates as an explanatory variable for F/X exposure is the amount of derivative use (hereafter referred to as ‘*Deriv*’). A plethora of research exists to study the relationship between derivative use and firm value or firm risk. For example, Allayannis and Weston (2001) analyze 720 large U.S. non-financial firms to find a positive relation between derivative use and firm value. With respect to the relationship between derivative use and firm risk, using a sample of 254 U.S. non-financial firms that begin using derivatives, Guay (1999) finds a decline in firm risk following the derivatives use. We conjecture that derivative use would reduce the F/X exposure.

In sum, we use nine control variables together with the foreign ownership ratio in the cross-sectional analyses. These variables are formally defined in the following:

*FO* ≡ number of shares held by foreigners / total number of shares

*ExpR* ≡ export / total sales

*FAFD* ≡ (foreign debt + foreign asset) / total assets

*Size* ≡ *log* (total assets)

*LTD* ≡ long-term debt / total assets

*MB* ≡ market value of equity / book value of equity

*Deriv* ≡ total derivative use / total assets

*FDeR* ≡ foreign debt / total assets

*NetFD* ≡ (foreign debt – foreign asset) / total assets

*aNetFD* ≡ │foreign debt – foreign asset│ / total assets

The sample in this research contains 571 Korean listed firms continually having existed from 2000 to 2006. The data on these firm-specific variables are obtained from the Korea Listed Companies Association database. In order to conduct the cross-sectional analyses, we use the average of the yearly observations. We cannot conduct the panel estimation, since we cannot produce the exposure *β*’s on the yearly basis. In order to obtain the yearly *β*’s, Equation (1) has to be estimated on the year’s 12 monthly observations, which are not enough to generate power of the estimation.[[8]](#footnote-9)

**III. Results**

**III.1 Measurement of F/X Exposures**

[Insert Table 2 here.]

Table 2 reports summary information on the cross-sectional distribution of the coefficients from the estimation of Equation (1). The columns of the table, labeled as ‘n+’ and ‘n-’, show the number of firms with positive and negative exposure coefficients, while those of ‘N+’ and ‘N-’ show the number of firms with positive and negative coefficients significant at 10%. The last column labeled as ‘N’ shows the sum of ‘N+’ and ‘N-’ firm for the *β* under consideration. As it is reported at the bottom of the table, there are in total 167 firms that have at least one significant *β*’s. This represents 29% of the total sample firms. This ratio is comparable to 25% found in He and Ng (1998), even though the volatility and the asymmetry exposures are added. This implies that even with the expanded notions of F/X exposure, more than two thirds of firms have their stock returns immune to the changes in the currency value at least in statistical sense. Moreover, with respect to the individual *β*’s, the ratios of firms that have significant exposures range from about 9% for *βx*, *βD*, and *βσ*, to 14% for *βLx*. Therefore, the spirit of Jorion’s (1990) seemingly puzzling finding of prevalent insignificant F/X exposure looms large also to Korean firms that are quite open to the global markets. We believe that the firms in the sample engage in various hedging activities, both financial and non-financial[[9]](#footnote-10), to manage the risks originating from the currency market. Later in this paper, we provide evidence that different firm characteristics affect the exposure measures in different directions, resulting in the insignificant net exposures. Now even though the F/X exposures seem to be largely insignificant, some observations can be made with regard to each measure of exposure.

First, if we confine our investigation only on means or medians of the *β*-coefficients, the sample firms in general have positive currency exposure, *βx*, and asymmetry exposure, *βD*. This implies that both the appreciation and the depreciation exposures are positive, but the depreciation exposure, *βDep* (≡ *βx* +*βD*), is in general greater than the appreciation exposure. In fact, the median of appreciation exposure is 0.349, while that of depreciation exposure is 0.627. The fact that the contemporaneous currency exposure, both appreciation and depreciation, is positive is somewhat surprising, in that it is a widely held view that Korean companies, being mostly export oriented, would perform better when the value of Korean Won weakens.[[10]](#footnote-11) The data, however, tells that the converse is true. When the value of Won appreciates, the stock returns gain, and *vice versa*. In addition, the fact that *βDep* in general is greater than *βx* implies that the negative impact on stock returns in response to currency depreciation is greater than the positive impact of currency appreciation on stock returns.

Second, the sample firms in general have negative volatility exposure, *βσ*. Out of the 50 firms that have significant *βσ*, the ones that have negative sign outnumber those with positive sign in two-to-one margin. This implies that the stock returns in general are lower during the months when the exchange rate volatility is higher. In Koutmos and Martin (2003a), the financial sector is found to have a positively significant relationship. Unfortunately, in the present study, only three firms are from the financial industry, and have significant *βσ*, keeping us from making any statistically meaningful statement. Just for a reference, however, out of the three firms, two have positively significant *βσ*.

Last, with respect to the lag exposure, the mean and the median are all negative. The ratio of firms that have significant *βLx* is the greatest at 14%, and interestingly, 95% of these are negatively significant. This implies that for the sample firms, the equity returns are mostly negatively related to the value of Korean Won in the previous month. The literature has regarded *βLx* as evidence of market inefficiency. The stock market’s delayed reaction to the changes in the exchange rates would make the stock price predictable, and therefore is an evidence of mis-pricing. In an attempt to explain the weak F/X exposure found in Jorion (1990), Bartov and Bodner (1994) attempt to see whether the weak significance is due to this type of delayed reaction by the stock market. Using the U.S. firms, they also find that the means of estimated coefficients on the lagged exchange rates are negative. On the contrary, He and Ng (1998) find that in the case of Japanese MNC’s, only 6 firms out of 171 (3.5%) of the sample firms have significant lagged exposure. Therefore, the results from the present paper are somewhat closer to those from Bartov and Bodner (1994). Putting together the results on the lagged exposure and the contemporaneous exposures, we learn that the policy makers should not make a sweeping judgment that depreciation or appreciation of their home currency will bring about deterministic changes in the firm value. Now, we will turn our attention to the determinants of the F/X measures.

**III.2 Determinants of F/X Exposures**

[Insert Table 3 here.]

In Table 3, we report the summary statistics on the firm specific variables that are used in the cross-sectional analyses. As we mentioned in the precious section, we take the average of yearly observations of these variables, and run an OLS on the F/X exposure coefficients instead of panel regression. So, the table reports the cross-sectional mean and standard deviation of the average of these variables, and the correlations of each pair. First, with regard to foreign ownership, *FO*, it has the highest correlation with firm size, and this is somewhat expected. Second, It is interesting to see that derivative usage, *Deriv*, is negatively related to all the variables that measure the degree of firm’s foreign activities and hedging activities. The only exception is firm size. Recall that the F/X exposures are insignificant for the majority of the firms. Therefore, the smaller firms seem to engage in hedging activities other than the use of derivatives. These activities may include matching foreign currency cash flows, and foreign currency assets and liabilities. Last, the variables that involve foreign debt and assets are highly correlated. This will pose multicollinearity problem, so some cautions are needed when running the regression. Now, we present the results from the cross-sectional estimations.

**III.2.1 Appreciation Exposure: *βx***

[Insert Table 4 here.]

In Table 4, we report the results from the cross-sectional regression of firm-specific variables on the appreciation exposure. We run two regressions: one on the exposure coefficient, *βx*, itself, and the other on the *t*-statistics of *βx*. We perform the latter regression, since we believe that in understanding the determinants of F/X exposure, the significance of the estimates is also very important, if not more. Also, we can mitigate the problem associated with even including the non-significant *β* estimates in the cross-sectional regression.[[11]](#footnote-12) Panel A shows the results on the exposure coefficient, and Panel B, on the *t*-statistics.

First of all, we find some evidence that foreign ownership and the appreciation exposure are inversely related. The inverse relation is statistically significant only in the regressions on the *t*-statistics of *βx*. Recall that *βx* is in general positive. The fact that foreign ownership negatively affects *βx* means that with a higher ownership the currency exposure actually decreases. This inverse relation implies that when the local currency appreciates, the stock return will be lower for firms with a higher foreign ownership. From the investors’ point of view, having a larger foreign ownership would not help, since the stock return would not increase as much as for a company with a smaller foreign ownership.

With regard to the control variables, the appreciation exposure is negatively related to the export ratio, derivative usage, and foreign debt, while positively related to firm size and long term debt. First of all, our result on the export ratio is in general in line with the previous studies such as in Jorion (1990) and He and Ng (1998).[[12]](#footnote-13) When the local currency appreciates, the stock returns of firms’ with a higher export ratio would respond less favorably than those of firms’ with a lower export ratio. This is reasonable in that export oriented firms will suffer from the operation when the value of their home currency appreciates.

Derivative usage has a similar effect as foreign ownership. When the local currency appreciates, the stock returns of firms that use derivatives more actively would respond less favorably than those use derivatives less actively. Foreign debt also reduces the appreciation exposure. This, however, is somewhat surprising in that if the local currency value increases, the value of the foreign debt will decrease. Therefore, other things being equal, the stock return of firms with a higher foreign debt ratio should be higher than those with a lower ratio. The fact that we have the opposite results would then mean that the condition of ‘other-things-being-equal’ does not apply here, and the decision on foreign debt is jointly made with the other policy variables possibly weighing its effect on hedging.

The effect of firm size on the appreciation exposure also deserves a remark. There are two conflicting views on how the size of a firm would affect the F/X exposure. Nance, Smith and Smithson (1993) contend that since larger firms have economy of scale in hedging, they would have a lower exchange rate exposure than smaller firms. On the contrary, Warner (1977) and He and Ng (1998) argue that due to higher bankruptcy costs, smaller firms have more incentives to hedge. The present paper supports the former view in that firm size increases the *t*-statistics of appreciation exposure.

**III.2.2 Depreciation Exposure: *βDep* (≡ *βx* + *βD*)**

[Insert Table 5 here.]

Before we investigate the determinants of depreciation exposure, we first present the results from the cross-sectional regression on the asymmetry exposure. As Table 5 shows, the asymmetry exposure is affected by most of the variables. Foreign ownership, export ratio, derivative use and foreign debt all increase both the exposure coefficient and its *t*-statistic. On the contrary, firm size and leverage reduce both of them. Since the relationships between the asymmetry exposure, *βD*, and these variables are in general opposite to those between *βx* and them, we can conjecture that the firms in general respond differently to the appreciation of their home currency than to the depreciation of it. Now, we turn to the determinants of depreciation exposure, *βDep*, to see if this conjecture is corroborated by the data.

[Insert Table 6 here.]

Table 6 reports the results. Unlike in the case of analyses on the other exposure coefficients, we report the results only on the coefficient, and not on the *t*-statistics. This is because *βDep* is not estimated directly, but by adding *βx* and *βD* estimates from the estimation of Equation (1). Therefore, the *t*-statistics for *βDep* are not available. Even though most of the variables affect the asymmetry exposure, only foreign ownership, firm size and foreign debt ratio remain as significant factors that determine the depreciation exposure.

In fact, foreign ownership is positively related to the depreciation exposure. Since the depreciation exposure is in general positive as shown in Table 2, this implies that with a higher foreign ownership, the positive slope becomes steeper. Note that the depreciation exposure measures the response of equity returns to the depreciation of the local currency. Therefore, the positively steeper slope means that the equity return goes down further for a same degree of currency depreciation. In other words, if the home currency depreciates, the stock returns of firms with a higher foreign ownership would go down more than those of firms with a lower foreign ownership. Therefore, even though the signs of depreciation and appreciation exposures are different, having a higher foreign ownership would have the same negative impact to the stock returns whether the local currency depreciates or appreciates.

It appears that the effect of firm size is greater for depreciation exposure than that for appreciation exposure. In the case of home currency depreciation, firm size is significant even in the case of cross-sectional regression on the coefficient,[[13]](#footnote-14) and the estimates are greater in absolute value terms. When the home currency depreciates, the stock returns of larger firms would respond more negatively than those of smaller firms. The effect of foreign debt is again somewhat counter-intuitive in that when the home currency depreciates, firms with a higher foreign debt ratio would witness their stock return perform better than those with a smaller ratio. But as was argued above, this may prove to be evidence that the firms make decisions on foreign debt, jointly with the other policy variables possibly weighing its effect on hedging. Unlike in the case of appreciation exposure, derivative use is no longer a significant variable in explaining the depreciation exposure. In other words, when the home currency depreciates, the use of derivatives would not have an impact on the exposure coefficient.

**III.2.3 Volatility Exposure: *βσ***

[Insert Table 7 here.]

Table 7 shows the results from the cross-sectional regression to investigate the effects of firm characteristics on the volatility exposure, *βσ*. In order to interpret the results properly, we first have to recall that *βσ* is in general negative for the sample firms. This implies that for most of the sample firms, the volatility of exchange rates have negative impact on their stock returns. Both the mean and median of *βσ* are negative, and out of the 50 firms that have significant *βσ*, two thirds of the firms have negatively significant volatility exposure. Therefore, if some variable in the cross-sectional regression has positive coefficient, this variable can be interpreted as reducing the volatility exposure, and *vice versa*.

There are three variables that are significant in explaining both *βσ* and its *t*-statistic. These are foreign ownership, size and long-term debt ratio. With regard to the foreign ownership, the relationship is positive, implying that the stock returns of firms with a higher foreign ownership would react more favorably to the increase in the exchange rate volatility than those with a lower foreign ownership. Since in general *βσ* has a negative relation with the stock return, we can interpret the positive relation between foreign ownership and *βσ* as foreign ownership’ reducing the negative impact of exchange rate volatility on stock returns. Therefore, in a period when the exchange rate volatility is higher, the existence of foreign investors would help the stock returns.

The other two variables, firm size and the long-term debt ratio, have negative relations with the volatility exposure. This implies that larger firms and firms with high leverage are exposed to greater down-side risks in the face of more volatile currency market.

**III.2.4 Lag Exposure: *βL***

[Insert Table 8 here.]

The significant lag exposure has been regarded as evidence of mis-pricing in the stock market. In our sample, about 14% firms have significant lag exposure, *βL*, and 95% of those have negative relations. Just like for the volatility exposure, the mean and median of *βL* are all negative, too. Therefore, in the cross-sectional regression, if some variable has a negative relation with the lag exposure, this variable can be interpreted as decreasing the efficiency in the stock market.

As Table 8 shows, not many explanatory variables seem to have significant relation with the lag exposure. But one of them is foreign ownership. Even though foreign ownership does not have a statistically significant relation with the coefficient, it has significantly negative relation with the *t*-statistics of *βL*. Since the negative relationship can be regarded as decreasing market efficiency, this result suggests weak evidence of foreign investors’ actually decreasing the stock market efficiency.

The other two variables that have significant relation with the lag exposure are derivative use and market-to-book ratio. For Model1, derivative use has a significant relation even with the coefficient itself. This implies that for companies with a higher derivative usage or market-to-book ratio, the negative relation between the lagged home currency value and the stock return becomes less significant, improving the market efficiency.

**III.3 Robustness Check for Endogeneity Problem**

So far, we have been analyzing the relation between foreign ownership and F/X exposure under the assumption that the latter is determined by the former. However, the causality may go in the opposite direction, and foreign investors choose to invest in firms according to their preference toward F/X exposure. If the reverse causality exists, then the cross-sectional regressions are exposed to the endogeneity problem, and econometrically, the estimators will not be consistent. In this section, we try check the degree of the endogeneity problem following the approach adopted by Lowry and Shu (2002) and Cliff and Denis (2004). In the first stage, we use the same set of exogenous variables to estimate both the foreign ownership and the F/X exposures. In choosing the exogenous variables, we try to include other variables that are shown to affect both the foreign ownership and F/X exposures in the literature. The additional variables included in the first stage are quick ratio and dividend ratio. Then, in the second stage estimation, we use the predicted value of foreign ownership from the first stage estimation as the instrumental variables for the F/X exposures and their *t*-statistics, while we use the predicted values of F/X exposures as the instrumental variable for foreign ownership. In the second stage estimation, as the other explanatory variables, we use only the ones that are estimated to be statistically significant in the first stage. The results are reported in Table 9.

[Insert Table 9 here.]

For the sake of parsimony, we report only the coefficients on the instrumental variables. In Panel A, we report the coefficients of the predicted value of foreign ownership used as the instrumental value for the second stage regression on the F/X exposures and their *t*-statistics. In Panel B, on the other hand, we report the coefficients of the predicted values of the F/X exposures and their *t*-statistics used as the instrumental values for the second stage regression on foreign ownership.

First of all, none of the F/X instrumental variables is statistically significant in explaining foreign ownership. On the other hand, the foreign ownership instrumental variable is in general statistically significant in explaining F/X exposures. The signs of the coefficients are consistent with the signs from the OLS regressions presented in the previous sections. These results provide evidence that the causality flows in one direction, namely from foreign ownership to F/X exposures, and not the other way around. In other words, it appears that the investment decisions made by foreign investors affect the F/X exposures, but the F/X exposures do not affect the foreign investors’ investment decisions. As a result, we can safely proceed with the assumption that the endogeneity problem is not a significant concern in our analyses.

**IV. Conclusion**

In this paper, using trade weighted currency index and monthly stock returns on 571 Korean firms from 2000 to 2006, we estimate four types of F/X exposures: appreciation, depreciation, volatility and lag exposures. We then analyze how these exposures are affected by foreign ownership. Among other things, we find that during months of home currency depreciation, the stock returns of firms with a higher ownership experience a greater negative shock, but during months of increased exchange rate volatility, it is the firms with a lower ownership that receive a greater negative shock. Overall, various firm characteristics are found to affect the F/X exposures in different directions, weakening the significance of them. This finding helps explain the previously documented weak association between exchange rates and stock returns.

This study can be meaningfully extended by further investigating the links between foreign ownership and F/X exposures. Are the positive or negative F/X exposures stemming from buying and selling decisions by the foreign investors? The answer to this question is only possible if the data on ‘buying’ or ‘selling’ of foreign investors on individuals stocks are available on a higher frequency. Currently, over the sample period used in this study, the ownership data is available only on the yearly basis. Recently, however, the data on foreign investors’ net buying or net selling became available on the daily basis. When enough data is accumulated, we hope to uncover the link between foreign ownership and the F/X exposures.

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**Appendix**

The standard deviation of exchange rates, σ*x*, is estimated by the following equation

 , (A1)

where *St* is logarithm of the exchange rate index, *St-1*, lag of *St*, and *st*, unexpected exchange rate changes. It describes the Martingale processes of exchange rates as most of other studies indicate.

We assume that the conditional variation of *st* is defined as a GARCH(1,1) process indicated by

 , (A2)

where the subscript *s* denotes the month of the data to be used in Equation (1). Then, we use the daily exchange rates of the year the month-*s* is in, and estimate (A1) and (A2) via maximum likelihood estimation. Then, for each month *s*, we add the daily conditional variances, *hs,t*, to obtain σ*x*.

**Table 1** Summary Statistics of Foreign Ownership

This table reports the summary statistics of *FO* (foreign ownership) of 571 firms in each sample year.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| YEAR | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | Full |
|  |  |  |  |  |  |  |  |  |
| Mean | 5.72 | 6.23 | 6.88 | 8.97 | 10.95 | 11.79 | 12.27 | 8.98 |
| Median | 0.37 | 0.42 | 0.52 | 0.76 | 1.61 | 3.06 | 4.90 | 1.17 |
| Q1 | 0.01 | 0.02 | 0.03 | 0.06 | 0.05 | 0.24 | 0.51 | 0.07 |
| Q3 | 4.89 | 5.715 | 7.03 | 11.46 | 16.29 | 17.95 | 18.17 | 11.6 |
| Max | 85.95 | 82.94 | 86.06 | 92.43 | 92.97 | 85.47 | 87.55 | 92.97 |
| Min | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| STD | 11.74 | 12.55 | 12.99 | 15.12 | 17.14 | 16.96 | 16.30 | 15.04 |
|  |  |  |  |  |  |  |  |  |

**Table 2** Cross-Sectional Distribution of F/X Exposure Coefficients

This table provides summary information on the cross-sectional distribution of the coefficients from estimation of Equation (1):

*Rit= β0 +βmRmt +(βx + βDDt)Rxt+βσ σxt +βL Rxt-1+εt*,

where *Rit* is log rate of return on *ith* firm’s stock at time *t*; *Rmt*, log rate of return on market index at time *t*; *Rxt*, log rate of change in the exchange rate at time *t*; *Rxt-1*, lagged rate of change in the exchange rate at time *t-1*; *Dt*, a dummy variable, which is 1 if *Rxt* < 0; *σxt*, exchange rate volatility at time *t*; and *εt*, error term at time *t*. Five F/X exposure coefficients are reported: *βx* is the currency exposure, which can be interpreted as ‘appreciation’ exposure; *βD*, asymmetric exposure; *βσ*, volatility exposure; *βL*, lag exposure; and *βDep*, the sum of *βx* and *βD*, which can be interpreted as ‘depreciation’ exposure. n+ and n- shows the number of firms with positive and negative exposure coefficients, while N+ and N- report the number of firms with positive and negative coefficients significant at 10%. N is the sum of N+ and N-. The sample comprises 571 Korean listed firms continually having existed from 2000 to 2006.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | Mean | Median | Max | Min | Q1 | Q3 | n+ | n- | N+ | N- | N |
|  |  |  |  |  |  |  |  |  |  |  |  |
| *βx* | 0.65 | 0.35 | 26.55 | -10.85 | -0.87 | 1.85 | 324 | 247 | 36 | 11 | 47 |
| *βD* | 0.02 | 0.20 | 21.97 | -41.05 | -2.30 | 2.49 | 303 | 268 | 31 | 20 | 51 |
| *βσ* | -0.60 | -0.58 | 24.08 | -40.20 | -3.25 | 1.70 | 236 | 335 | 17 | 33 | 50 |
| *βLx* | -0.66 | -0.51 | 3.42 | -7.51 | -1.36 | 0.25 | 182 | 389 | 4 | 76 | 80 |
| *βDep* (≡ *βx+βD*) | 0.67 | 0.63 | 16.17 | -14.51 | -0.80 | 1.95 | 351 | 220 |  |  |  |

Number of firms that have at least one significant *β* is 167 (29%).

**Table 3** Summary Statistics of Firm Specific Variables

Table 3 provides the summary information about the firm-specific variables that are used as independent variables for the cross-sectional analyses on the determinants of F/X exposures. The first two rows of the table report the means and the standard deviation of the variables, while the remaining rows report the correlation coefficients among the variables. ‘*FO*’ is foreign ownership; ‘*ExpR*’, export ratio; ‘*FAFD*’, foreign debt and asset ratio; ‘*Size*’, firm size; ‘*LTD*’, long-term debt ratio; ‘*MB*’, market-to-book ratio; ‘*Deriv*’, derivative usage; ‘*FDeR*’, foreign debt ratio; ‘*NetFD*’, ratio of net difference between foreign debt and equity; ‘*aNetFD*’, the absolute value of ‘*NetFD*’. These variables are evaluated by taking averages over seven year period from 2000 to 2006.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | *FO* | *ExpR* | *FAFD* | *Size* | *LTD* | *MB* | *Deriv* | *FDeR* | *NetFD* | a*NetFD* |
| MEAN | 0.089 | 0.259 | 0.130 | 12.507 | 0.062 | 1.002 | 0.044 | 0.083 | 0.021 | 0.066 |
| STD | 0.133 | 0.284 | 0.249 | 1.500 | 0.129 | 2.130 | 0.338 | 0.357 | 0.192 | 0.182 |
|  |  |  |  |  |  |  |  |  |  |  |
| *FO* | 1 | 0.049 | 0.010 | 0.542 | -0.164 | 0.024 | 0.097 | 0.010 | 0.025 | 0.002 |
| *ExpR* |  | 1 | 0.293 | 0.022 | 0.006 | 0.002 | -0.074 | 0.070 | -0.066 | 0.126 |
| *FAFD* |  |  | 1 | 0.047 | 0.125 | 0.064 | -0.008 | 0.871 | 0.599 | 0.921 |
| *Size* |  |  |  | 1 | -0.158 | -0.078 | 0.239 | 0.041 | 0.079 | 0.028 |
| *LTD* |  |  |  |  | 1 | 0.291 | -0.056 | 0.112 | 0.157 | 0.154 |
| *MB* |  |  |  |  |  | 1 | -0.007 | 0.022 | 0.013 | 0.028 |
| *Deriv* |  |  |  |  |  |  | 1 | -0.013 | -0.011 | -0.033 |
| *FDeR* |  |  |  |  |  |  |  | 1 | 0.874 | 0.937 |
| *NetFD* |  |  |  |  |  |  |  |  | 1 | 0.758 |
| *aNetFD* |  |  |  |  |  |  |  |  |  | 1 |

*FO* ≡ number of shares held by foreigners / total number of shares

*ExpR* ≡ export / total sales

*FAFD* ≡ (foreign debt + foreign asset) / total assets

*Size* ≡ *log* (total assets)

*LTD* ≡ long-term debt / total assets

*MB* ≡ market value of equity / book value of equity

*Deriv* ≡ total derivative use / total assets

*FDeR* ≡ foreign debt / total assets

*NetFD* ≡ (foreign debt – foreign asset) / total assets

*aNetFD* ≡ │foreign debt – foreign asset│ / total assets

**Table 4 Determinants of Appreciation Exposure: *βx***

This table reports the results from the cross-sectional regression of firm-specific variables on the appreciation exposure, *βx*. We run two regressions: one on the exposure coefficient, *βx*, and the other on the *t*-statistics of *βx*. Panel A shows the results on the exposure coefficient, and Panel B, on the *t*-statistics. The heteroskedasticity-consistent *t*-statistics are shown in the parentheses.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | Model1 |  | Model2 |  | Model3 | |  | Model4 |  |
|  |  |  |  |  |  | |  |  |  |
|  |  |  |  |  |  | |  |  |  |
| Panel A: Results by regression of *βix* | | | | | | | | | |
|  | | | | | | | | | |
| *Intercept* | 0.891 |  | 0.989 |  | 0.851 |  | | 0.981 |  |
|  | (0.67) |  | (0.73) |  | (0.62) |  | | (0.72) |  |
| *FO* | -1.252 |  | -1.304 |  | -1.292 |  | | -1.296 |  |
|  | (-1.28) |  | (-1.25) |  | (-1.24) |  | | (-1.24) |  |
|  |  |  |  |  |  |  | |  |  |
| *ExpR* | -1.162 | \*\*\* | -1.222 | \*\*\* | -1.339 | \*\*\* | | -1.239 | \*\*\* |
|  | (-2.51) |  | (-2.46) |  | (-2.84) |  | | (-2.63) |  |
| *FAFD* |  |  | -0.264 |  |  |  | |  |  |
|  |  |  | (-0.40) |  |  |  | |  |  |
|  |  |  |  |  |  |  | |  |  |
| *Size* | 0.012 |  | 0.009 |  | 0.021 |  | | 0.010 |  |
|  | (0.11) |  | (0.08) |  | (0.18) |  | | (0.09) |  |
| *LTD* | 1.847 | \* | 1.897 | \* | 2.108 | \* | | 1.983 | \* |
|  | (1.68) |  | (1.67) |  | (1.86) |  | | (1.75) |  |
| *MB* | -0.038 |  | -0.036 |  | -0.040 |  | | -0.038 |  |
|  | (-0.88) |  | (-0.84) |  | (-0.90) |  | | (-0.88) |  |
| *Deriv* | -0.700 | \*\*\* | -0.765 | \*\*\* | -0.786 | \*\*\* | | -0.776 | \*\*\* |
|  | (-5.01) |  | (-5.16) |  | (-5.27) |  | | (-5.28) |  |
|  |  |  |  |  |  |  | |  |  |
| *FDeR* | -0.284 | \*\*\* |  |  |  |  | |  |  |
|  | (-2.85) |  |  |  |  |  | |  |  |
| *NetFD* |  |  |  |  | -1.030 | \* | |  |  |
|  |  |  |  |  | (-1.72) |  | |  |  |
| *aNetFD* |  |  |  |  |  |  | | -0.647 |  |
|  |  |  |  |  |  |  | | (-1.02) |  |
| Adj *R*-Sq | 0.0217 |  | 0.0251 |  | 0.0293 |  | | 0.0260 |  |
|  |  |  |  |  |  |  | |  |  |

Panel B: Results by regression of *t*(*βix*)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |
| *Intercept* | -0.352 |  | -0.399 |  | -0.456 |  | -0.406 |  |
|  | (-0.96) |  | (-1.09) |  | (-1.23) |  | (-1.10) |  |
| *FO* | -0.685 | \*\*\* | -0.748 | \*\*\* | -0.746 | \*\*\* | -0.747 | \*\*\* |
|  | (-2.07) |  | (-2.17) |  | (-2.17) |  | (-2.16) |  |
|  |  |  |  |  |  |  |  |  |
| *ExpR* | -0.589 | \*\*\* | -0.624 | \*\*\* | -0.654 | \*\*\* | -0.619 | \*\*\* |
|  | (-4.51) |  | (-4.67) |  | (-5.00) |  | (-4.76) |  |
| *FAFD* |  |  | 0.044 |  |  |  |  |  |
|  |  |  | (-0.22) |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| *Size* | 0.061 | \*\*\* | 0.067 | \*\*\* | 0.072 | \*\*\* | 0.068 | \*\*\* |
|  | (2.05) |  | (2.23) |  | (2.38) |  | (2.26) |  |
| *LTD* | 0.487 | \* | 0.499 | \* | 0.589 | \*\* | 0.536 | \*\* |
|  | (1.92) |  | (1.87) |  | (2.26) |  | (2.02) |  |
| *MB* | -0.006 |  | -0.006 |  | -0.007 |  | -0.007 |  |
|  | (-0.68) |  | (-0.70) |  | (-0.79) |  | (-0.74) |  |
| *Deriv* | -0.439 | \*\*\* | -0.486 | \*\*\* | -0.494 | \*\*\* | -0.490 | \*\*\* |
|  | (-5.95) |  | (-6.47) |  | (-6.53) |  | (-6.50) |  |
|  |  |  |  |  |  |  |  |  |
| *FDeR* | -0.001 | \*\* |  |  |  |  |  |  |
|  | (-2.72) |  |  |  |  |  |  |  |
| *NetFD* |  |  |  |  | -0.040 | \* |  |  |
|  |  |  |  |  | (-1.92) |  |  |  |
| *aNetFD* |  |  |  |  |  |  | -0.037 |  |
|  |  |  |  |  |  |  | (-1.09) |  |
| Adj *R*-Sq | 0.0519 |  | 0.0611 |  | 0.0668 |  | 0.0625 |  |
|  |  |  |  |  |  |  |  |  |

The estimates with, \*\*\*, \*\* and \* are significant at the 1 percent, 5 percent, and 10 percent, respectively.

**Table 5 Determinants of Asymmetry Exposure: *βD***

This table reports the results from the cross-sectional regression of firm-specific variables on the asymmetry exposure, *βD*. We run two regressions: one on the exposure coefficient, *βD*, and the other on the *t*-statistics of *βD*. Panel A shows the results on the exposure coefficient, and Panel B, on the *t*-statistics. The heteroskedasticity-consistent *t*-statistics are shown in the parentheses.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | Model1 |  | Model2 |  | Model3 | |  | Model4 |  |
|  |  |  |  |  |  | |  |  |  |
|  |  |  |  |  |  | |  |  |  |
| Panel A: Results by regression of *βD* | | | | | | | | | |
|  | | | | | | | | | |
| *Intercept* | 6.046 | \*\*\* | 5.995 | \*\*\* | 6.258 | \*\*\* | | 5.996 | \*\*\* |
|  | (2.52) |  | (2.44) |  | (2.52) |  | | (2.43) |  |
| *FO* | 3.370 | \*\* | 3.333 | \* | 3.303 | \* | | 3.310 | \* |
|  | (2.00) |  | (1.85) |  | (1.83) |  | | (1.83) |  |
|  |  |  |  |  |  |  | |  |  |
| *ExpR* | 1.385 | \* | 1.411 |  | 1.671 | \*\* | | 1.476 | \* |
|  | (1.70) |  | (1.59) |  | (2.01) |  | | (1.77) |  |
| *FAFD* |  |  | 0.638 |  |  |  | |  |  |
|  |  |  | (0.51) |  |  |  | |  |  |
|  |  |  |  |  |  |  | |  |  |
| *Size* | -0.533 | \*\*\* | -0.534 | \*\*\* | -0.556 | \*\*\* | | -0.535 | \*\*\* |
|  | (-2.77) |  | (-2.71) |  | (-2.77) |  | | (-2.70) |  |
| *LTD* | -2.912 | \*\* | -2.914 | \*\* | -3.307 | \*\* | | -3.050 | \*\* |
|  | (-2.10) |  | (-2.07) |  | (-2.33) |  | | (-2.14) |  |
| *MB* | 0.051 |  | 0.046 |  | 0.054 |  | | 0.050 |  |
|  | (0.63) |  | (0.58) |  | (0.66) |  | | (0.63) |  |
| *Deriv* | 1.118 | \*\*\* | 1.207 | \*\*\* | 1.250 | \*\*\* | | 1.229 | \*\*\* |
|  | (2.46) |  | (2.35) |  | (2.39) |  | | (2.37) |  |
|  |  |  |  |  |  |  | |  |  |
| *FDeR* | 0.720 | \*\* |  |  |  |  | |  |  |
|  | (4.04) |  |  |  |  |  | |  |  |
| *NetFD* |  |  |  |  | 2.050 | \*\* | |  |  |
|  |  |  |  |  | (2.08) |  | |  |  |
| *aNetFD* |  |  |  |  |  |  | | 1.246 |  |
|  |  |  |  |  |  |  | | (1.01) |  |
| Adj *R*-Sq | 0.0207 |  | 0.0203 |  | 0.0255 |  | | 0.0214 |  |
|  |  |  |  |  |  |  | |  |  |

Panel B: Results by regression of *t*( *βD*)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |
| *Intercept* | 1.760 | \*\*\* | 1.825 | \*\*\* | 1.873 | \*\*\* | 1.829 | \*\*\* |
|  | (4.74) |  | (4.84) |  | (4.95) |  | (4.84) |  |
| *FO* | 1.040 | \*\*\* | 1.093 | \*\*\* | 1.088 | \*\*\* | 1.090 | \*\*\* |
|  | (3.06) |  | (3.07) |  | (3.06) |  | (3.06) |  |
|  |  |  |  |  |  |  |  |  |
| *ExpR* | 0.423 | \*\*\* | 0.443 | \*\*\* | 0.488 | \*\*\* | 0.449 | \*\*\* |
|  | (3.01) |  | (3.07) |  | (3.48) |  | (3.24) |  |
| *FAFD* |  |  | 0.109 |  |  |  |  |  |
|  |  |  | (0.56) |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| *Size* | -0.152 | \*\*\* | -0.159 | \*\*\* | -0.163 | \*\*\* | -0.159 | \*\*\* |
|  | (-5.08) |  | (-5.23) |  | (-5.35) |  | (-5.25) |  |
| *LTD* | -0.448 | \*\* | -0.450 | \*\* | -0.522 | \*\*\* | -0.489 | \*\* |
|  | (-2.13) |  | (-2.09) |  | (-2.45) |  | (-2.24) |  |
| *MB* | -0.005 |  | -0.005 |  | -0.004 |  | -0.005 |  |
|  | (-0.58) |  | (-0.59) |  | (-0.42) |  | (-0.50) |  |
| *Deriv* | 0.355 | \*\*\* | 0.392 | \*\*\* | 0.400 | \*\*\* | 0.397 | \*\*\* |
|  | (2.77) |  | (2.70) |  | (2.72) |  | (2.71) |  |
|  |  |  |  |  |  |  |  |  |
| *FDeR* | 0.125 | \*\*\* |  |  |  |  |  |  |
|  | (3.72) |  |  |  |  |  |  |  |
| *NetFD* |  |  |  |  | 0.370 | \*\* |  |  |
|  |  |  |  |  | (2.31) |  |  |  |
| *aNetFD* |  |  |  |  |  |  | 0.279 |  |
|  |  |  |  |  |  |  | (1.50) |  |
| Adj *R*-Sq | 0.0472 |  | 0.0552 |  | 0.0596 |  | 0.0571 |  |
|  |  |  |  |  |  |  |  |  |

The estimates with, \*\*\*, \*\* and \* are significant at the 1 percent, 5 percent, and 10 percent, respectively.

**Table 6 Determinants of Depreciation Exposure: *βDep***

This table reports the results from the cross-sectional regression of firm-specific variables on the depreciation exposure, *βDep* (≡ *βx + βD*). For this table, we report the results only on the exposure coefficient, and not on the *t*-statistics. This is because *βDep* is not estimated directly, but by adding *βx* and *βD* estimates from the estimation of Equation (1). Therefore, the *t*-statistics for *βDep* are not available. The heteroskedasticity-consistent *t*-statistics are shown in the parentheses.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | Model1 |  | Model2 |  | Model3 | |  | Model4 |  |
|  |  |  |  |  |  | |  |  |  |
|  |  |  |  |  |  | |  |  |  |
|  | | | | | | | | | |
| *Intercept* | 6.937 | \*\*\* | 6.984 | \*\*\* | 7.108 | \*\*\* | | 6.977 | \*\*\* |
|  | (5.20) |  | (5.07) |  | (5.12) |  | | (5.05) |  |
| *FO* | 2.118 | \*\* | 2.029 | \*\* | 2.010 | \*\* | | 2.014 | \*\* |
|  | (2.34) |  | (2.11) |  | (2.09) |  | | (2.09) |  |
|  |  |  |  |  |  |  | |  |  |
| *ExpR* | 0.223 |  | 0.188 |  | 0.332 |  | | 0.237 |  |
|  | (0.51) |  | (0.39) |  | (0.74) |  | | (0.52) |  |
| *FAFD* |  |  | 0.374 |  |  |  | |  |  |
|  |  |  | (0.60) |  |  |  | |  |  |
|  |  |  |  |  |  |  | |  |  |
| *Size* | -0.521 | \*\*\* | -0.525 | \*\*\* | -0.536 | \*\*\* | | -0.525 | \*\*\* |
|  | (-4.92) |  | (-4.80) |  | (-4.85) |  | | (-4.79) |  |
| *LTD* | -1.065 |  | -1.017 |  | -1.199 |  | | -1.066 |  |
|  | (-1.13) |  | (-1.06) |  | (-1.23) |  | | (-1.10) |  |
| *MB* | 0.013 |  | 0.010 |  | 0.014 |  | | 0.012 |  |
|  | (0.30) |  | (0.24) |  | (0.33) |  | | (0.30) |  |
| *Deriv* | 0.418 |  | 0.442 |  | 0.464 |  | | 0.453 |  |
|  | (1.15) |  | (1.06) |  | (1.10) |  | | (1.08) |  |
|  |  |  |  |  |  |  | |  |  |
| *FDeR* | 0.436 | \*\*\* |  |  |  |  | |  |  |
|  | (4.43) |  |  |  |  |  | |  |  |
| *NetFD* |  |  |  |  | 1.018 | \*\* | |  |  |
|  |  |  |  |  | (2.22) |  | |  |  |
| *aNetFD* |  |  |  |  |  |  | | 0.599 |  |
|  |  |  |  |  |  |  | | (0.89) |  |
| Adj *R*-Sq | 0.0454 |  | 0.0448 |  | 0.0486 |  | | 0.0453 |  |
|  |  |  |  |  |  |  | |  |  |

The estimates with, \*\*\*, \*\* and \* are significant at the 1 percent, 5 percent, and 10 percent, respectively.

**Table 7 Determinants of Volatility Exposure: *βσ***

This table reports the results from the cross-sectional regression of firm-specific variables on the volatility exposure, *βσ*. We run two regressions: one on the exposure coefficient, *βσ*, and the other on the *t*-statistics of *βσ*. Panel A shows the results on the exposure coefficient, and Panel B, on the *t*-statistics. The heteroskedasticity-consistent *t*-statistics are shown in the parentheses.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | Model1 |  | Model2 |  | Model3 | |  | Model4 |  |
|  |  |  |  |  |  | |  |  |  |
|  |  |  |  |  |  | |  |  |  |
| Panel A: Results by regression of *βσ* | | | | | | | | | |
|  | | | | | | | | | |
| *Intercept* | 8.325 | \*\*\* | 8.956 | \*\*\* | 8.855 | \*\*\* | | 8.925 | \*\*\* |
|  | (3.27) |  | (3.43) |  | (3.36) |  | | (3.41) |  |
| *FO* | 8.429 | \*\*\* | 8.451 | \*\*\* | 8.448 | \*\*\* | | 8.445 | \*\*\* |
|  | (5.36) |  | (5.18) |  | (5.18) |  | | (5.17) |  |
|  |  |  |  |  |  |  | |  |  |
| *ExpR* | 0.439 |  | 0.276 |  | 0.260 |  | | 0.323 |  |
|  | (0.47) |  | (0.28) |  | (0.27) |  | | (0.33) |  |
| *FAFD* |  |  | 0.048 |  |  |  | |  |  |
|  |  |  | (0.07) |  |  |  | |  |  |
|  |  |  |  |  |  |  | |  |  |
| *Size* | -0.747 | \*\*\* | -0.791 | \*\*\* | -0.782 | \*\*\* | | -0.787 | \*\*\* |
|  | (-3.64) |  | (-3.76) |  | (-3.67) |  | | (-3.73) |  |
| *LTD* | -6.326 | \*\*\* | -6.536 | \*\*\* | -6.368 | \*\*\* | | -6.422 | \*\*\* |
|  | (-2.81) |  | (-2.86) |  | (-2.75) |  | | (-2.78) |  |
| *MB* | -0.038 |  | -0.041 |  | -0.042 |  | | -0.041 |  |
|  | (-0.29) |  | (-0.31) |  | (-0.33) |  | | (-0.32) |  |
| *Deriv* | -0.271 |  | -0.166 |  | -0.178 |  | | -0.174 |  |
|  | (-0.85) |  | (-0.47) |  | (-0.50) |  | | (-0.49) |  |
|  |  |  |  |  |  |  | |  |  |
| *FDeR* | -0.155 |  |  |  |  |  | |  |  |
|  | (-0.67) |  |  |  |  |  | |  |  |
| *NetFD* |  |  |  |  | -0.591 |  | |  |  |
|  |  |  |  |  | (-1.06) |  | |  |  |
| *aNetFD* |  |  |  |  |  |  | | -0.450 |  |
|  |  |  |  |  |  |  | | (-0.77) |  |
| Adj *R*-Sq | 0.0536 |  | 0.0537 |  | 0.0541 |  | | 0.0539 |  |
|  |  |  |  |  |  |  | |  |  |

Panel B: Results by regression of *t*(*βσ*)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |
| *Intercept* | 1.554 | \*\*\* | 1.649 | \*\*\* | 1.630 | \*\*\* | 1.652 | \*\*\* |
|  | (3.86) |  | (3.99) |  | (3.94) |  | (4.01) |  |
| *FO* | 1.701 | \*\*\* | 1.662 | \*\*\* | 1.667 | \*\*\* | 1.666 | \*\*\* |
|  | (5.15) |  | (4.85) |  | (4.86) |  | (4.85) |  |
|  |  |  |  |  |  |  |  |  |
| *ExpR* | 0.121 |  | 0.122 |  | 0.088 |  | 0.108 |  |
|  | (0.88) |  | (0.87) |  | (0.63) |  | (0.76) |  |
| *FAFD* |  |  | -0.098 |  |  |  |  |  |
|  |  |  | (-0.73) |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| *Size* | -0.147 | \*\*\* | -0.154 | \*\*\* | -0.152 | \*\*\* | -0.154 | \*\*\* |
|  | (-4.47) |  | (-4.50) |  | (-4.46) |  | (-4.53) |  |
| *LTD* | -0.906 | \*\*\* | -0.922 | \*\*\* | -0.895 | \*\*\* | -0.913 | \*\*\* |
|  | (-3.00) |  | (-2.97) |  | (-2.88) |  | (-2.94) |  |
| *MB* | 0.013 |  | 0.012 |  | 0.011 |  | 0.011 |  |
|  | (0.56) |  | (0.55) |  | (0.51) |  | (0.51) |  |
| *Deriv* | -0.096 |  | -0.084 |  | -0.088 |  | -0.086 |  |
|  | (-1.19) |  | (-0.92) |  | (-0.96) |  | (-0.95) |  |
|  |  |  |  |  |  |  |  |  |
| *FDeR* | -0.055 |  |  |  |  |  |  |  |
|  | (-1.59) |  |  |  |  |  |  |  |
| *NetFD* |  |  |  |  | -0.187 |  |  |  |
|  |  |  |  |  | (-1.40) |  |  |  |
| *aNetFD* |  |  |  |  |  |  | -0.137 |  |
|  |  |  |  |  |  |  | (-1.32) |  |
| Adj *R*-Sq | 0.0614 |  | 0.0599 |  | 0.0607 |  | 0.0600 |  |
|  |  |  |  |  |  |  |  |  |

The estimates with, \*\*\*, \*\* and \* are significant at the 1 percent, 5 percent, and 10 percent, respectively.

**Table 8 Determinants of Lag Exposure: *βL***

This table reports the results from the cross-sectional regression of firm-specific variables on the lag exposure, *βL*. We run two regressions: one on the exposure coefficient, *βL*, and the other on the *t*-statistics of *βL*. Panel A shows the results on the exposure coefficient, and Panel B, on the *t*-statistics. The heteroskedasticity-consistent *t*-statistics are shown in the parentheses.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | Model1 |  | Model2 |  | Model3 | |  | Model4 |  |
|  |  |  |  |  |  | |  |  |  |
|  |  |  |  |  |  | |  |  |  |
| Panel A: Results by regression of *βL* | | | | | | | | | |
|  | | | | | | | | | |
| *Intercept* | -0.822 |  | -1.040 |  | -1.015 |  | | -1.030 |  |
|  | (-1.27) |  | (-1.59) |  | (-1.54) |  | | (-1.58) |  |
| *FO* | -0.051 |  | -0.289 |  | -0.290 |  | | -0.289 |  |
|  | (-0.10) |  | (-0.52) |  | (-0.52) |  | | (-0.52) |  |
|  |  |  |  |  |  |  | |  |  |
| *ExpR* | 0.166 |  | 0.183 |  | 0.198 |  | | 0.172 |  |
|  | (0.83) |  | (0.90) |  | (0.95) |  | | (0.84) |  |
| *FAFD* |  |  | 0.026 |  |  |  | |  |  |
|  |  |  | (0.11) |  |  |  | |  |  |
|  |  |  |  |  |  |  | |  |  |
| *Size* | 0.010 |  | 0.029 |  | 0.026 |  | | 0.027 |  |
|  | (0.20) |  | (0.56) |  | (0.51) |  | | (0.53) |  |
| *LTD* | -0.730 |  | -0.810 |  | -0.848 |  | | -0.855 |  |
|  | (-1.00) |  | (-1.05) |  | (-1.10) |  | | (-1.11) |  |
| *MB* | 0.032 |  | 0.031 |  | 0.031 |  | | 0.031 |  |
|  | (1.60) |  | (1.59) |  | (1.59) |  | | (1.60) |  |
| *Deriv* | 0.193 | \* | 0.172 |  | 0.176 |  | | 0.176 |  |
|  | (1.71) |  | (1.49) |  | (1.52) |  | | (1.53) |  |
|  |  |  |  |  |  |  | |  |  |
| *FDeR* | 0.007 |  |  |  |  |  | |  |  |
|  | (0.11) |  |  |  |  |  | |  |  |
| *NetFD* |  |  |  |  | 0.168 |  | |  |  |
|  |  |  |  |  | (0.73) |  | |  |  |
| *aNetFD* |  |  |  |  |  |  | | 0.223 |  |
|  |  |  |  |  |  |  | | (0.95) |  |
| Adj *R*-Sq | -0.0043 |  | 0.0038 |  | -0.0033 |  | | -0.0030 |  |
|  |  |  |  |  |  |  | |  |  |

Panel B: Results by regression of t(*βL*)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |
| *Intercept* | -0.129 |  | -0.270 |  | -0.263 |  | -0.269 |  |
|  | (-0.30) |  | (-0.60) |  | (-0.59) |  | (-0.60) |  |
| *FO* | -0.641 |  | -0.873 | \* | -0.877 | \* | -0.876 | \* |
|  | (-1.37) |  | (-1.78) |  | (-1.79) |  | (-1.79) |  |
|  |  |  |  |  |  |  |  |  |
| *ExpR* | 0.102 |  | 0.098 |  | 0.123 |  | 0.104 |  |
|  | (0.69) |  | (0.65) |  | (0.81) |  | (0.69) |  |
| *FAFD* |  |  | 0.079 |  |  |  |  |  |
|  |  |  | (0.50) |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| *Size* | -0.028 |  | -0.016 |  | -0.016 |  | -0.016 |  |
|  | (-0.81) |  | (-0.44) |  | (-0.45) |  | (-0.45) |  |
| *LTD* | -0.240 |  | -0.297 |  | -0.305 |  | -0.319 |  |
|  | (-0.76) |  | (-0.87) |  | (-0.89) |  | (-0.94) |  |
| *MB* | 0.018 | \* | 0.016 | \* | 0.017 | \* | 0.017 | \* |
|  | (1.70) |  | (1.66) |  | (1.69) |  | (1.70) |  |
| *Deriv* | 0.230 | \*\* | 0.209 | \* | 0.211 | \* | 0.212 | \* |
|  | (2.13) |  | (1.78) |  | (1.81) |  | (1.82) |  |
|  |  |  |  |  |  |  |  |  |
| *FDeR* | 0.036 |  |  |  |  |  |  |  |
|  | (1.00) |  |  |  |  |  |  |  |
| *NetFD* |  |  |  |  | 0.099 |  |  |  |
|  |  |  |  |  | (0.71) |  |  |  |
| *aNetFD* |  |  |  |  |  |  | 0.176 |  |
|  |  |  |  |  |  |  | (1.26) |  |
| Adj *R*-Sq | 0.0053 |  | 0.0072 |  | 0.0072 |  | 0.0079 |  |
|  |  |  |  |  |  |  |  |  |

The estimates with, \*\*\*, \*\* and \* are significant at the 1 percent, 5 percent, and 10 percent, respectively.

**Table 9 Endogeneity Check via Two Stage Least Square Estimation**

This table reports the results from the two state least square estimations to check the degree of endogeneity problem. In doing so, ee follow the approach adopted by Lowry and Shu (2002) and Cliff and Denis (2004). In the first stage estimation, the same set of exogenous variables is used to estimate both the foreign ownership and F/X exposures. The exogenous variables used in this stage are export ratio, quick ratio, dividend ratio, foreign debt ratio, size, long-term debt ratio, M/B, and derivative use. Then, in the second stage estimation, we use the predicted value of foreign ownership from the first stage estimation as the instrumental variables for the F/X exposures and their *t*-statistics, while we use the predicted values of F/X exposures as the instrumental variable for foreign ownership. In the second stage estimation, as the other explanatory variables, we use only the ones that are estimated to be statistically significant in the first stage. For the sake of parsimony, we report only the coefficients on the instrumental variables. In Panel A, we report the coefficients of the predicted value of foreign ownership used as the instrumental value for the second stage regression on the F/X exposures and their *t*-statistics. In Panel B, on the other hand, we report the coefficients of the predicted values of the F/X exposures and their *t*-statistics used as the instrumental values for the second stage regression on foreign ownership. The heteroskedasticity-consistent *t*-statistics are shown in the parentheses.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Panel A FO as IV for F/X exposure** | | | | | | | | | | | | | | | | | | |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dep  IV |  | *β*x |  | *t(βx)* |  | *βD* |  | *t(βD)* |  | *βDep* |  | *βσ* |  | *t(βσ)* |  | *βL* |  | *t(βL)* |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| *Predicted values of FO* |  | -4.618 | \*\* | -1.632 | \* | 5.857 | \* | 1.725 | \*\* | 1.239 |  | 5.334 |  | 1.80 | \*\* | 2.38 | \*\* | 1.304 |  |
|  | (-1.98) |  | (-1.82) |  | (-1.66) |  | (-1.97) |  | (-0.7) |  | (-1.46) |  | (-2.21) |  | (-1.97) |  | (-1.32) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Panel B F/X exposure as IV for FO** | | | | | | | | | | | | | | | | | | |  |
|  | | | | | | | | | | | | | | | | | | |  |
| IV’s  Dep |  | *Predicted values of* | | | | | | | | | | | | | | | | |  |
|  | *β*x |  | *t(βx)* |  | *βD* |  | *t(βD)* |  | *βDep* |  | *βσ* |  | *t(βσ)* |  | *βL* |  | *t(βL)* |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| *FO* |  | 0.004 |  | 0.007 |  | -0.003 |  | -0.008 |  | -0.007 |  | 0.01 |  | 0.031 |  | -0.013 |  | -0.008 |  |
|  | (-0.2) |  | (-0.19) |  | (-0.19) |  | (-0.19) |  | (-0.17) |  | (-0.21) |  | (-0.2) |  | (-0.20) |  | (-0.19) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

The estimates with, \*\*\*, \*\* and \* are significant at the 1 percent, 5 percent, and 10 percent, respectively.

**Figure 1 Changes in Foreign Ownership and Stock Returns**

In this figure, the changes in foreign ownership and the returns in the KOSPI index of Korean Exchange from 2000 to 2006 are plotted. *FORET* is the monthly changes of foreign ownership over the sample firms, and *KOSPIRET*, the return on KOSPI index. For the sample period, the correlation of average foreign ownership and KOSPI return is 14%.



**Figure 2 Changes in Foreign Ownership and Currency Returns**

In this figure, we plot the changes in foreign ownership and the returns in trade-weighted index of Korean Won provided by JP Morgan. The sample period is from 2000 to 2006. *FORET* is the monthly changes of foreign ownership over the sample firms, and *FXRET*, the return on JP Morgan index. For the sample period, the correlation of average foreign ownership and KOSPI return is 0.14%.



1. Approximately 25%. In Jorion (1990), only about 5% of firms exhibited significant currency beta. [↑](#footnote-ref-2)
2. The effect of foreign ownership on F/X exposure has never been studied before. However, the relationship between corporate governance and derivative use, which can affect the F/X exposure, has been examined before. For example, see Whidbee and Wohar (1999), Easterbrook(2002), and Marsden and Pervost (2005). [↑](#footnote-ref-3)
3. In order to proxy the foreign ownership, Bae, Chan and Ng (2004) and Bae, Ozoguz and Tan (2008) use the ‘degree open factor’ variable provided by Standard and Poor’s Emerging Market Database. This variable takes a value between 0 and 1, and measures the “*quantity of a company’s market capitalization a foreign entity can legally own*”. This variable does not provide information on the exact holdings by foreign investors, but rather on the amount that they are *allowed* to hold legally. [↑](#footnote-ref-4)
4. We measured the exchange rate volatility by adopting a similar approach taken by Koutmos and Martin (2003a). The exact procedure is described in the appendix. [↑](#footnote-ref-5)
5. For exchange rate data, we use trade weighted index provided by JP Morgan. This data set includes daily nominal indices and monthly real indices. In our paper, we use daily series. [↑](#footnote-ref-6)
6. He and Ng (1994) also include quick ratio and dividend yield. We conducted the empirical analyses including these variables, but these variables turned out to be insignificant for all cases. In addition, leaving them out would not alter the results in a substantive way. So, for the sake of parsimony, we decided to report the results without these variables. We, however, include these variables in the first pass regression to obtain the predicted value for foreign ownership, when we check for the endogeneity issue. [↑](#footnote-ref-7)
7. One could create similar control variables from the income statements by using imports and exports. This, however, is not possible since data on imports are not available. [↑](#footnote-ref-8)
8. Running an OLS estimation using the yearly averages produces estimates that are less powerful than those from a panel estimation due to information loss. Therefore, the OLS estimation is more conservative, and a statistically significant result under the OLS would likely be even more significant under the panel estimation. [↑](#footnote-ref-9)
9. Non-financial hedging activities are mostly operational hedges. These include matching foreign currency cash inflows and outflows, assets and liabilities, and geographically diversifying the sourcing and marketing countries. [↑](#footnote-ref-10)
10. In fact, in early 2008, when the new president of Korean government, Myung-Bak Lee took office, the government pushed for weak Won in a hope to boost the economy, only to see both the values of Won and equities plummet. [↑](#footnote-ref-11)
11. Most of the related literature such as He and Ng (1998) also include the non-significant *β* estimates in the second stage cross-sectional regression. [↑](#footnote-ref-12)
12. In He and Ng (1998), the sign of this relationship is positive. This is not inconsistent with our result since they measured the exposure coefficient using the exchange rates quoted in direct quotation (Japanese Yen value of foreign currencies), while in the present study we use the exchange rates quoted in indirect quotation (foreign currencies’ value of Korean Won). [↑](#footnote-ref-13)
13. Even though the cross-sectional regression on the *t*-statistic is not conducted, we can conjecture that firm size would be significantly related to the *t*-statistic, since for most of the cases, the cross-sectional analyses provide more significant results on *t*-statistics than the coefficient itself. [↑](#footnote-ref-14)