

4. Determinants of the exchange-rate exposure

Traditionally, there are many possible reasons for these ambiguous results. The main reason why stock returns are not exposed to exchange-rate fluctuations is due to hedging derivatives such as swaps, options, etc. Generally speaking, a depreciation of domestic currency is beneficial (harmful) to domestic exporting (importing) firms, and an appreciation is harmful (beneficial) to domestic importing (exporting) firms. Therefore, these firms may devote substantial resources to hedge from exchange-rate risk.

In this section, we show that the estimated exposure to exchange-rate fluctuations varied substantially across firms. First of all, we will discuss some possible determinants of the exchange-rate exposure of the electronic industry in Taiwan.

4.1. Hypotheses and corresponding models

. Exports-to-sales ratio

As previous studies pointed out, the involvement in foreign operations of firms may affect their exchange-rate exposure. Intuitively, with high degree of involvement in foreign operations, a firm will have more opportunities to trade in foreign currency and then have higher exchange-rate exposure.

Roughly, exporting electronic firms are expected to benefit from an effective depreciation of NT dollars and hence have positive exposure. Besides, this exposure should increase with the fraction of total sales made abroad. That is to say; the higher the exports-to-sales ratio, the higher the exchange-rate exposure is.

. Incentives to hedge

The involvement in foreign operations of firms consists of not only both importing and exporting activities but also of some hedging activities. Firms, especially those with high degree of involvement in foreign activities, have incentives to apply derivative instruments to hedge against exchange-rate risk due to the uncertainty of fluctuations in exchange-rate

Smith and Stulz (1985) pointed out hedging will reduce the probability that a firm will go bankrupt and thereby reduce the expected costs of financial distress. The higher probability a firm falls in financial distress, the more incentives to engage in hedging activities. Therefore, it will decrease exchange-rate exposure. Now we are going to discuss some incentives to hedge for the electronic firms in Taiwan.

A. Firm size

No matter what kind of hedging activities a firm engages in, they cost the firm much. For small firms, they have small scale of economy and small lump of foreign currency with exchange-rate exposure. When engaging in hedging, they do not have economies of scale in hedging cost. Oppositely, larger firms have access to management enterprise through economies of scale. Therefore, it seems reasonable to assume firm size have significant influence on exchange-rate exposure.

The larger the firm size, the lower the exchange-rate exposure is. Now we use the firm's total sales¹ to represent firm size and try to investigate this hypothesis.

¹ Some economists, e.g. He and Ng (1998), use the market value to proxy the firm size. In this research, we view total sales as a better proxy to capture the economies of scale or the extent to which a firm is exposed to an economics environment.

B. Quick ratio

Nance, Smith and Smithson (1993) look at the determinants of exchange-rate exposure and the impact of hedging. From their empirical examinations, they argue that firms can mitigate expected costs of financial distress by maintaining a larger short-run liquidity position in terms of keeping a lower dividend payout ratio or a higher quick ratio.

Because of the limit of data, we use only the quick ratio to identify the relations between the liquidity of firms and exchange-rate exposure. We are going to investigate if the quick ratio is positively related to the exchange-rate exposure or not.

C. The long-term debt ratio

As the earlier part mentioned, hedging will reduce the probability that a firm will go bankrupt and thereby reduce the expected costs of financial distress. For firms with financial leverage, they have more incentives to hedge. We employ long-term debt ratio to stand for financial leverage of firms and try to examine whether there is a negative relation between the ratio of long-term debt and the exchange-rate exposure.

D. Institutional investment ratio²

The stockholders in Taiwan market are mainly composed of individual investors. When considering the influences of exchange-rate fluctuations in stock prices, investors need more professional knowledge and enough information. Generally

² In the composition of investors in Taiwan stock market, 15% are institutional investors and among these 11% are foreign institutional investors. Due to the limited availability of data, we are unable to obtain institutional investment ratio and use foreign institutional investment ratio to replace it.

speaking, institutional investors have more access than individual investors to gathering all the information before investing. As a result, institutional investors could react immediately when they observe any exchange-rate fluctuations.

With regard to the specificity in Taiwan stock market, we must take institutional investors into consideration. Xie (2002), in her textbook, tried to find out the relation between the exchange-rate exposure and institutional investment ratio. She argued that firms with high institutional investment ratio usually have significant effect of exchange-rate fluctuations on stock prices. Therefore, we use foreign institutional investment ratio to represent the institutional investment ratio and examine the hypothesis that the higher the institutional investment ratio, the higher the exchange-rate exposure is.

E. TSEC Taiwan 50 index

The quota investors often used in Taiwan is TAIEX (TSEC Capitalization Weighted Index), which is composed of about 600 stocks. However, “weighted index” takes all the stocks into account, even though those with unsound constitution and low trading volume. Hence, “Taiwan Weighted” is not a good quota when investing.

In order to improve the financial system, increase the trading volume, and consider the demand for risk-averter, TSEC enlisted the expertise of FTSE in the design and ongoing calculation of the TSEC Taiwan 50 Index. This index covers the top 50 companies by total market capitalization and is the ideal tool to gain exposure to the Taiwanese market. It is the first index for Taiwan designed specifically for derivative and OTC trading. Consequently, Taiwan 50 Index is a better representative of the situation in Taiwan stock market.

Furthermore, all the constituent stocks included in Taiwan 50 Index conform to the investibility screened norm, such as liquidity tested and free float adjusted. Intuitively, the constituent stock firms of Taiwan 50 Index ought to be more conservative in managing firms. When observing exchange-rate fluctuations, these firms will take action to reduce its influence upon firm's value. Therefore, it seems reasonable to hypothesize that the constituent stock firms of Taiwan 50 Index have lower exchange-rate risk. Then, we will try to use a dummy variable to divide sample firms into two groups and examine whether the constituent stock firms have lower exchange-rate exposure.

. Corresponding model for determinants of the exchange-rate exposure

As mentioned earlier, besides exports-to-sales ratio, some hedging activities firms engage in should reduce firms' exposure to exchange-rate risk. To investigate all the hypotheses stated above, we develop the corresponding model as follows:

$$\begin{aligned} \hat{\beta}_i = & \gamma_0 + \gamma_1 \times EXPORT_i + \gamma_2 \times \ln SIZE_i + \gamma_3 \times QR_i + \gamma_4 \times LDR_i \\ & + \gamma_5 \times INSIR_i + \delta_1 dum_i + \mu_i, \end{aligned} \tag{6}$$

where $\hat{\beta}_i$ is the estimated exchange-rate exposure on firm i from model (5); $EXPORT_i$ is the ratio of exports to total sales of firm i ; $SIZE_i$ ³ is the total sales of firm i ; QR_i is the quick ratio of firm i ; LDR_i is the long-term debt ratio of firm

³ In order to modify the variance of firm size, we replace SIZE by ln(SIZE) in the corresponding model.

i ; $INSIR_i$ is the Institutional investment ratio of firm i ; dum_i is the dummy variable, which equals 1 if firm i is the constituent stock of Taiwan 50 Index and equals 0 if firm i is *not* the constituent stock of Taiwan 50 Index.

4.2. Data descriptions and empirical results

.Data descriptions

All the accounting data is gathered from Taiwan Economic Journal Database. Due to the limited availability, we use only yearly data and calculate their average to represent the properties of individual firms for the covered period from 1998 to 2003.

.Empirical results

Using the estimated exchange-rate exposure $\hat{\beta}_{i,USD}$ and $\hat{\beta}_{i,JPY}$ from nonlinear model, we will further examine whether those determinants mentioned in earlier part significantly affect exchange-rate exposure. Unlike other studies, to proceed with the cross-sectional analysis, we use the estimated exchange-rate exposure via nonlinear model and consider another two variables- institutional investment ratio and a dummy variable, which distinguishes the constituent stocks of Taiwan 50 Index from our sample with regarded to the properties of the stock market in Taiwan.

Considering the correlations existing among all the possible determinants, it may be difficult to examine all their influences on exchange-rate exposure at a time. Hence, we separate all the possible determinants with potential correlations into different regressions and the corresponding results are listed below.

Table 5. The effects of possible determinants on the estimated exchange-rate exposure- $(\hat{\beta}_{i,USD})$

$$\hat{\beta}_{i,USD} = \gamma_0 + \gamma_1 \times EXPORT_i + \gamma_2 \times \ln SIZE_i + \gamma_3 \times QR_i + \gamma_4 \times LDR_i + \gamma_5 \times INSIR_i + \delta_1 dum_i + \mu_i.$$

T statistics are in parentheses for estimated coefficient.

Variable	Regression	Regression	Regression	Regression	Regression
<i>Constat</i>	-0.109 (-3.845)**	-0.078 (-4.962)**	-0.114 (-6.527)**	-0.102 (-3.554)**	-0.009 (-3.194)**
<i>EXPORT_i</i>		-0.019 (-1.001)	-0.013 (-0.653)		-0.016 (-0.799)
<i>lnSIZE_i</i>	0.003 (0.488)			-0.001 (-0.044)	0.001 (0.142)
<i>QR_i</i>	0.008 (1.488)		0.010 (1.828)*	0.008 (1.408)	0.007 (1.332)
<i>LDR_i</i>	-0.166 (-2.394)**	-0.188 (-2.801)**		-0.166 (-2.420)**	-0.17 (-2.465)**
<i>INSIR_i</i>		0.085 (1.531)	0.081 (1.413)	0.085 (1.439)	0.085 (1.420)
<i>dum</i>	-0.008 (-0.439)	-0.008 (-0.512)	-0.018 (-1.080)	-0.015 (-0.851)	-0.016 (-0.877)

*Coefficient is significant at 0.1level (2-tailed)

**Coefficient is significant at 0.05level (2-tailed)

Generally speaking, the higher the absolute estimated exchange-rate exposure, the higher the exchange-rate risk is. Take the level of exports-to-sales to example, the level of exports-to-sales theoretically will increase the absolute exchange-rate exposure. That is to say, when investigating the relationship between the exports-to-sales ratio and the estimated exchange-rate exposure, the sign of the

Table 6. The effects of possible determinants on the estimated exchange-rate exposure- $(\hat{\beta}_{i,JPY})$

$$\hat{\beta}_{i,JPY} = \gamma_0 + \gamma_1 \times EXPORT_i + \gamma_2 \times \ln SIZE_i + \gamma_3 \times QR_i + \gamma_4 \times LDR_i + \gamma_5 \times INSIR_i + \delta_1 dum_i + \mu_i.$$

T statistics are in parentheses for estimated coefficient.

Variable	Regression	Regression	Regression	Regression	Regression
<i>Constat</i>	-5.706 (-5.007)**	-4.616 (-7.304)**	-5.363 (-8.108)**	-5.409 (-4.705)**	-4.941 (-4.171)**
<i>EXPORT_i</i>		-1.469 (-1.905)*	-1.255 (-1.653)*		-1.149 (-1.453)
<i>lnSIZE_i</i>	-0.097 (-0.409)			-0.223 (-0.891)	-0.137 (-0.537)
<i>QR_i</i>	0.423 (1.927)*		0.397 (1.950)*	0.404 (1.850)*	0.377 (1.736)*
<i>LDR_i</i>	1.018 (0.368)	0.521 (0.194)		0.996 (0.363)	0.712 (0.261)
<i>INSIR_i</i>		2.799 (1.249)	2.939 (1.348)	3.417 (1.440)	3.354 (1.425)
<i>dum</i>	0.571 (0.812)	0.447 (0.705)	0.065 (0.101)	0.257 (0.351)	0.219 (0.302)

**Coefficient is significant at 0.1level (2-tailed)*

***Coefficient is significant at 0.05level (2-tailed)*

coefficient of exports-to-sales ratio should be positive if the estimated exchange-rate exposure is positive, but the sign of the coefficient of exports-to-sales ratio should be negative if the estimated exchange-rate exposure is negative. As a result, when investigating the relationship between the possible determinants and the estimated negative exchange-rate exposure, the signs of the coefficients are theoretically

opposite to earlier assumptions that the estimated exchange-rate exposure coefficients are supposed to be positive.

From the empirical results of the estimated exchange-rate exposure - $\hat{\beta}_{i,USD}$, we found that almost every firm is negatively exposed to the changes in exchange rate of NT dollar against US dollar. This would be not consistent with the idea that a depreciation of NT dollar is beneficial to domestic exporting firms. Suppose firms are really negatively exposed to changes in exchange rate of NT dollar against US dollar. As shown in Table 5, we found only the sign of exports-to-sales ratio is consistent with the hypothesis. Besides, the ratio of long-term debt has significant effect on the estimated exposure of exchange rate measured as NT dollar against US dollar but its sign is not consistent with the hypothesis.

Further examining the effects of possible determinant on the estimated exchange-rate exposure - $\beta_{i,JPY}$, the empirical results are shown in Table 6. We found the sign of $EXPORT_i$, LDR_i and the dummy variable are consistent with the hypotheses in any regression. Unfortunately, it seems that there is no strong evidence to support our hypotheses discussed earlier. There are only showing weak evidence for the influence of the possible determinants, such as $EXPORT_i$, LDR_i and the dummy variable, on the estimated exchange-rate exposure.