

The Motives of Corporate Use of Derivatives: Evidence from Taiwan

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Abstract

In this study we examine the incentives of the derivatives use of Taiwanese non-financial firms. We find the use of derivatives of Taiwanese firms positively correlated with firm size. Derivative-using firms tend to exhibit higher leverage than nonusers. Furthermore, the evidence indicates that firms with foreign sales are more likely to use derivatives. In addition, the evidence indicates that the role of nature hedge may play an important role for Taiwanese firms. We find that foreign revenue significantly affects the use of off-balance sheet hedge for firms without foreign debts. In contrast, we did not find strong evidence that foreign revenue is important in hedging decisions for exporting firms with foreign debts. Finally we examine the factors influencing the use of swaps versus forward contracts. The evidence suggests that swaps are preferred by firms with predetermined and repeated flow of costs and revenues; while forward contracts are used for transactions with uncertain timing and values.

Key words: derivative uses, off-balance sheet hedge, nature hedge

Theoretical backgrounds and Proxy variables

In this section, we first review various hedging hypotheses advanced in previous literature, and propose measures to test those hypotheses. The incentive of hedging is related with the degree of risk exposure. Firms that engage more in multinational activities are expected to face larger cash flow fluctuations, and, thus may have stronger incentives to hedge. Following Geczy et al. (1997), we measure the involvement of international activities by foreign sales to total sales and foreign assets to total assets.

Mayers and Smith (1982) and Smith and Stulz (1985) argue that hedging reduces the expected cash flow volatility, that in turn lowers the probability of default and expected cost of financial distress. The magnitude of the expected bankruptcy costs is directly related with the size and risks of firms' fixed liability. Therefore, we expect high levered and less liquid firms should have stronger incentive to hedge. Following Nance et al (1993) , Mian (1996) and Geczy et al.(1997), we measure the possibility of financial distress by long-term debt ratio to total assets. Liquidity is measured by the quick ratio, measured by cash and short term investments to current liabilities.

Shapiro and Titman (1986) and Lessard (1990) and Nance, Smith and Smithson (1993) suggest that hedging is effective in solving the problem of underinvestment that shareholders would destroy firms value by forgoing positive NPV projects (Mayers, 1977). Furthermore, Froot, Scharfstein and Stein (1993) propose that hedging not only reduce the costs of external financing, but also the dependence on

the costly external financial markets as well. For high growth firms the problem of costly external financing is expected to be more important because the extent of information asymmetry for high growth firms tend to be larger. Following the theoretical arguments, firms with better investment opportunities are thus expected to benefit more from corporate hedging. To test the hypothesis, we follow Geczy et al (1997) to measure growth opportunity by research and development (R&D) expenditure to total sales, and the market value of total assets to the book value. Firms' growth opportunities are expected to be positively associated with the likelihood of derivatives use.

The decision of hedging may be influenced by managerial incentives. Smith and Stulz (1985) and Tufano(1996) both demonstrated that risk-averse managers whose wealth is correlated with share prices will benefit from hedging because it reduce the variation of share prices, and thus, managerial wealth. The more the managers' wealth is within the firms, the more likely that managers would implement risk management by derivatives. We measure managers' wealth by the proportion of managerial holding of equity shares.¹

The cost of hedging is another important consideration in the decision of risk management. The costs would include the special human capital with specialized expertise and personnel necessary to evaluate, implement and monitor the risk management program. Nance, Smith and Smithson (1993) argue that the costs of hedging exhibit significant economy-of-scale in terms of both informational and operational resources commitments. And because of this reason, larger firms are more likely to use derivatives in hedging various types of risks. In contrast, Warner (1977) suggests that smaller firms should be more likely to hedge because they face higher possibilities of financial difficulties. We test the hypothesis of scale economies in risk management by examining the relationship of firm size and hedging decisions. Firm size is measured by the market value of total assets, the sum of book value of debt and the market value of equity.

Hedging could enhance firm value by reducing the potential interest conflicts between shareholders and bondholders (Mayers and Smith, 1987; Bessembinder, 1991). Because of the potential opportunistic behaviors of shareholders, firms could reduce the financing debt costs by assuring the wealth transfer from bondholders will not happen (Nance, Smith and Smithson, 1993). Hedging, however, is not the only way of solving the problem of interest conflicts. Convertible bonds, for example, could serve this purpose as well. Brennan and Kraus (1987) argue that the option of

¹ Besides equity shares, managers' wealth in stock options also provide incentives to hedge (Geczy, et al, 1997). Stock options, however, are currently not available in Taiwan.

equity participation of convertible bonds may play an important role in migrating the interest conflict between shareholders and bondholders. Therefore, firms with convertibles are expected to have less incentive to conduct off-balance sheet hedge. In addition, the corporate financial policy could be also effective in reducing the potential costs of bondholders by structuring assets and liabilities to reduce the risk exposure (Nance, Smith and Smithson,1993). For example, through matching cash inflow and outflow in the same foreign currency, foreign debts are found to be helpful in reducing currency risk for firms significant portion of foreign operations (Geczy, Minton and Schrand, 1997). The reduction in risk exposure would benefit bondholders that in turn would be willing to lend at a lower rate.

The incentive to hedge may be related with the degree of information asymmetry between managers and shareholders. DeMarzo and Duffie (1991) argue that uninformed shareholders will benefit from hedging in the portfolio allocation because it reduces the uncertainty of information regarding the variance of firms' payoff. Their model predicts that firms with more serious information asymmetry will receive more benefit from hedging. Following Geczy et al (1997), we measure information asymmetry by the ownership of institutional ownership. Since intuitional investors tend to act as information diggers, firms with higher intuitional ownership is thus assumed to have less serious problem of information asymmetry. We expect a negative relationship between institutional ownership and the incentive to hedge.

Sample

We construct the sample from the public firms listed on the Taiwan Stock Exchange in 1998. Firms in the financial industries are excluded because the use of derivatives is mainly for purpose of trading. To identify the use of derivatives, we search for the information of derivative transactions disclosed in the annual reports². We include only those derivative transactions that are not aimed for the purpose of speculating.³ We are not able to measure the magnitude of derivative transactions because the notional amounts of derivatives are available only for a limited number of firms. Finally 390 firms are included in the sample. The financial data of the listed firms are from *Taiwan Economic Journal* (TEJ). The industry distributions of the sample firms are shown in table 1.

About 42.3% of the sample firms report use of various types of derivatives. This

² Data of annual reports are from the Securities and Futures Institute Database.

³ Taiwanese firms are required to disclosure both the magnitude and purpose of derivative transaction information started in 1986.

is comparable with Geczy, Minton and Schrand's (1997) findings that 41% of the US firms reports derivatives transactions. There are 52 firms use more than one type of derivatives. The derivative-using firms are distributed over a wide range of industries: seventeen 2-digit Standard Industrial Classification (SIC) codes are represented.⁴ Panel B, table 1 shows that forward contract is most widely used derivative. There are 130 sample firms report uses of forward contracts, followed by options (53 firms), swaps (34 firms) and futures (11 firms)⁵.

⁴ The industry classification obtained from TEJ is based on that used by the Taiwan Stock Exchange (TSE). Totally there are 21 2-digit SIC codes used by the TSE.

⁵ Some firms report the use several types of derivatives.

Table 1
The Use of Derivatives by Taiwanese firms

This table summarizes the distribution of derivatives use, by industry and by product types, of Taiwanese listed non-financial firms in 1998. There are 390 firms in the sample. The data of derivatives transactions are from the annual financial statements provided in *Securities and Futures Institute Database*. The industry classification obtained from the *Taiwan Economic Journal Data Bank* is based on that used by the Taiwan Stock Exchange.

Panel A: Distribution of derivatives use by industries

Industry	Numbers	% Of Derivatives users
Automobile	6	83.3%
Elec. Appliance & Cable	12	66.7%
Electronics	82	65.9%
Plastics	21	61.9%
Chemicals	19	47.4%
Steel & Iron	27	44.4%
Transportation	16	43.8%
Electric & Machinery	23	43.5%
Paper & Pulp	7	42.9%
Textiles	49	38.8%
Wholesale & Retail	12	33.3%
Glass and Ceramics	7	28.6%
Cement	8	25.0%
Rubber	8	25.0%
Foods	29	24.1%
Construction	36	2.8%
Tourism	7	0.0%
Others	21	33.3%

Panel B: Distribution of derivatives use by product types

Forward	130
Options	53
Swaps	34
Futures	11

Empirical results

Univariate Analysis

Table 2 presents the univariate tests of the variables between derivative-using and non-using firms. All variables are measured as the mean value over the period of 1996-1998.

The results show that the mean leverage ratio of derivative users is 12.22, while that for nonusers is 6.67. The difference is significantly at the 1% level. This finding is consistent with the predictions of costs of financial distress hypothesis that high-levered firms are confronted with larger possibility of financial distress, therefore, have strong incentive for corporate hedging. We also find that derivative users spend relatively more on research and development than nonusers, supporting the hypothesis of underinvestment that high-growth firms benefit from hedging by reducing costs of underinvestment. But this result should be taken with caution because when market-to-book ratio is used as the alternative measure of growth opportunity, the difference between derivative users and nonusers become insignificant.

Table 2 also indicates that the average firm size of derivative users is NT 25 billion, significantly larger than NT 11 billion for nonusers. Consistent with the hypothesis of scale economies in risk management, larger firms are more likely to specifically contribute resources in both organization and human capital to handle hedging practice. This implies that larger firms will not only have high volume of derivatives purchases, they are also more likely to transact with different types of derivatives. We also find that derivative users tend to involve more deeply in international business transactions as measured by foreign sales and assets. This result is expected since firms would receive greater benefit from hedging when they face higher risk exposure from cross-border activities. Finally, different from the prediction that convertibles would serve as a substitute of off-balance sheet hedging, derivative-users are found to be associated with higher convertible debt offers. The results of the univariate tests do not show any significant difference between derivative-users and nonusers with respect to managerial and institutional ownership, quick ratio and market-to-book ratio.

Table 2
Sample Characteristics

The sample consists of 390 Taiwanese listed non-financial firms in 1988. All variables, except for firm size, are the average value over 1996-1998. Financial data are obtained from *Taiwan Economic Journal Databank*. Managerial wealth is the percentage of equity holding by directors and managers. Quick ratio is cash and short-term investment to current liability. Long-term debt ratio is the long-term debt divided by book value of total assets. Ratio of R&D is measured by R&D expense to total sales. Market-to-book ratio is estimated as the ratio of the market value of the firm's assets to the book value of the firm's assets, where the market value of assets is estimated as the book value of assets minus the book value of common equity plus the market value of common equity. Convertible debt ratio is convertible debts to the book value of total assets. Institutional ownership is the percentage of equity holdings by institutional investors. Foreign sales ratio is foreign revenue divided by total sales. Foreign debt ratio is measured by foreign debt to book value of total assets. Firm size is the market value of assets in 1998, where market value of assets is the sum of market value of equity plus book value of debts. The t-statistics of mean difference is reported assuming unequal variance. The "****" represent 1% significance levels using a two-tailed test.

Variable	Derivative Users (N=165)		Derivative Non-Users (N=225)		t-stat.
	Mean	Std. dev.	Mean	Std. dev.	
Managerial wealth (%)	24.37	14.75	21.99	13.72	1.63
Quick ratio (%)	126.5	119.8	111.0	134.1	1.18
Long-term debt ratio (%)	12.22	11.69	6.67	8.16	5.24***
R&D expenses (%)	1.67	2.81	0.87	1.96	3.17***
Market-to-book ratio	1.70	0.93	1.56	0.81	1.53
Convertible debt ratio (%)	0.02	0.05	0.01	0.02	3.97***
Institutional ownership (%)	7.30	14.41	7.85	15.17	-0.37
Foreign sales ratio (%)	45.71	35.13	21.73	29.31	7.10***
Foreign assets ratio (%)	0.12	0.14	0.07	0.11	3.77***
Foreign debt ratio (%)	0.04	0.08	0.01	0.04	4.98***
Firm size (NT, mi.)	24,919	17,209	11,069	50,951	3.35***

The determinants of incentives of hedge

We test various corporate hedging hypotheses by logit regressions analysis. The dependent variable takes a value of one for derivative users and zero for nonusers. Besides the prospective variables reviewed in previous section, we also include industry dummies to control for the industry-specific effects not captured by other variables (Geczy et al, 1997).

Table 3 presents the empirical results. Consistent with Nance, Smith and Smithson (1993) and Block and Gallagher (1986), the evidence indicates that firm

size has a significantly positive influence on the decision of derivative use in Taiwan. This result suggests that costs of implementing risk management policy could exhibit strong informational and operational scale economies. Consequently, smaller firms are less able to conduct hedging, even though they are more vulnerable to the outside risks (Warner, 1977). Similar evidence is also found in the US (Geczy et al, 1997), Sewden (Alkeback and Hagelin, 1999), Germany (Bodbar and Gebhardt, 1999) and New Zealand (Berkman, Brdabury and Magan, 1997).

Long-term debt ratio is found to be significantly positively correlated with the likelihood of derivative uses, providing a strong support on the hypothesis of costs of financial distress. High leverage firms are expected to benefit from corporate hedging through reduction in expected costs of financial distress. In contrast, Geczy et al. (1997) find long-term debt ratio an insignificant factor in the hedging decision of the US firms. The different behavior, in our opinion, could be attributed to the differential scale and scope of capital market developments. Relative to the US firms, the source of external financing for Taiwanese is very limited. The corporate bond and money markets play a minimal role in external financing, and most Taiwanese firms rely on bank loan and equity markets as the primary source of external financing. In this case, it is then expected that limited availability of sources of external financing would be associated with a more serious threat on the liquidity of business operation, because it is more difficult to raise necessary funds when firms are under financial difficulties. Consequently, leverage may play a more important role in the corporate hedging policy in comparison with the US markets.

Consistent with the theoretical prediction, we also find that managerial wealth as measured by the stock ownership of officers and directors positively related to the likelihood of derivative use. The coefficient is marginally significant at the 10% level. In comparison, Geczy et al (1997) does not find managerial wealth to be a significant factor in corporate hedging decisions. Smith and Stulz (1985) argue that managers with large number of company's share have stronger incentive to hedge. Following this argument, one possible explanation for the different results of managerial wealth between Taiwan and the US markets is that managers in Taiwanese firms may have larger wealth tied with firms' performance than the US counterparts. Morck, Shleifer and Vishny (1988) report the mean (median) board ownership as 10.6% (3.4%) for the US Fortune-500 public firms⁶. In contrast, the officers and directors in our sample firms on average own as much as 23% of the ownership. Therefore, managers of Taiwanese firms may have higher incentive for hedging since a relatively larger

⁶ Geczy et al (1997) does not report the statistics of managerial wealth.

Table 3

Logit analysis on the determinants of derivative uses

All variables, except for firm size, are the average value over 1996-1998. Financial data are obtained from Taiwan Economic Journal Data Bank. The dependent variable is equal to one for derivative users, and zero for nonusers in 1998. Managerial wealth is the percentage of equity holding by directors and managers. Long-term debt ratio is long-term debt divided by book value of total assets. Quick ratio is cash and short-term investment to current liability. Ratio of R&D is measured by R&D expense to total sales. Market-to-book ratio is estimated as the ratio of the market value of the firm's assets to the book value of the firm's assets, where the market value of assets is estimated as the book value of assets minus the book value of common equity plus the market value of common equity. Convertible debt ratio is convertible debts to the book value of total assets. Institutional ownership is the percentage of equity holdings by institutional investors. Foreign sales ratio is foreign revenue divided by total sales. Foreign assets ratio is foreign assets divided by total assets. Foreign debts ratio is measured by foreign debt to book value of total assets. Firm size is logarithm of the market value of assets in 1998. Values in the parenthesis are standard deviation of the estimated coefficient. The "****", "****" and "****" represent 10%, 5% and 1% significance levels, respectively.

Variables	1	2	3	4
Constant	7.001 (2.23)****	-7.51 (2.21)****	6.55 (2.17)****	8.12 (2.34)****
Managerial wealth	.016 (.009)*	.016 (.009)*	.016 (.009)*	.017 (.009)*
Long-term debt ratio	.039 (.016)**		.039 (.016)**	.034 (.016)**
Quick ratio		-.001 (.001)		
R&D expenses ratio	.004 (.062)	.026 (.06)	-.003 (.06)	
Market to Book ratio				-.281 (.175)
Convertible debts ratio	5.97 (4.86)	11.16 (4.5)**	3.72 (4.81)	5.42 (4.86)
Institutional investors ownership	.001 (.012)	-.002 (.012)	-.005 (.012)	.001 (.012)
Foreign sales ratio	.018 (.005)****	.017 (.005)****		.02 (.005)****
Foreign assets ratio			1.92 (.98)**	
Foreign debts ratio	3.456 (2.95)	4.05 (2.92)	4.99 (2.90)*	3.03 (2.96)
Firm size	.711 (.316)**	.83 (.31)****	.686 (.31)**	.94 (.342)****
Industry dummies	Yes	Yes	Yes	Yes
-2 log likelihood	400.10	406.07	418.89	399.12
% Correct prediction	74.5	73.0	70.1	72.6

percentage of wealth is linked with the firm's performance. The empirical difference for Taiwanese and the US firms is consistent with the hypothesis of managerial incentive to hedge as in Smith and Stulz (1985)

The results also show that the extent of foreign exchange exposure provides important incentives for hedging. Firms with higher portion of sales from abroad are significantly more likely to use derivatives. We also test the risk exposure hypothesis by replacing foreign sale with foreign assets ratio in model 3, and the results remain essentially the same. This is also consistent with the US evidence in Geczy et al (1997). But this result should be taken with caution because foreign sales may only incur greater risk exposure for firms without foreign currency dominated cash outflow, such as foreign debts. For those firms with costs in foreign currency, foreign revenue may actually risk-reducing, and result in less hedging activities. We will explore more about this issue in the following section.

The rest of the variables are generally not significant. Although there exists a significant difference in univariate tests shown in table2, R&D expense is not significant in the logit regression analysis. The alternative proxy of growth opportunity, market-to-book ratio, does not show any significant influence in predicting the use of derivatives, either (model 4). Convertible debts, institutional ownership and foreign debt ratio are generally not found to have a consistent significant effect on the decision of using derivatives⁷.

The results in table 3 are robust with different specifications of logic regressions analysis. We also get very similar results when industry dummies are excluded in the regressions. To further test the robustness of the results, we follow Geczy et al (1997) to conduct the analysis by measuring the independent variables as the mean value over 1996 – 1997, and the choice of derivatives in 1998. The results remain essentially the same.

Nature hedge

In countries like Taiwan, where limited instruments are available for corporate

⁷ Even though convertibles are expected to reduce the sensitivity of risk shifting (Green, 1984; Brennan and Kraus, 1987; Brennan and Schwartz, 1988), the empirical findings do not lend support for this argument. Most of the findings indicates that firms issue convertibles mainly for the purpose of future equity conversion (Stein, 1992) or the problem of sequential financing (Mayers, 1998). Testing the incentive of corporate hedging of US firms, Geczy, Minton and Schrand, (1997) do not find convertibles important in explanation the hedging decisions. Thus, the Taiwan evidence is consistent with the US findings.

hedging, nature hedge may play an important role in reducing risks. The essence of nature hedge typically involves match of cash inflow and outflow in the same foreign currency. For example, the interest payment of foreign currency-dominated debt alone may impose firms with greater foreign exchange risk. On the other hand, foreign debt may be actually risk-reducing for firms with foreign revenues dominated in the same currency. Consequently, nature hedge may act as a substitute of off-balance sheet instruments in corporate hedging policy.

To further examine the effect of nature hedge on the use of derivatives, we select an exporting sample consisted of firms that report foreign sales in the financial statements. The exporting sample is then further separated into subsamples of firms with foreign debts (n=184) and those without (n=97). If nature hedge plays an important role as a substitute for derivatives, we would expect a much smaller influence of foreign sales on the incentive to hedging for firms with foreign debts. Therefore, we conduct logit analysis for exporting firms with and without foreign sales. The results are presented in table 4. Model 1 and 3 include only those significant variables from table 3, while model 2 and 4 include all the variables.

Consistent with the hypothesis of nature hedge, the results in model 3, table 4 suggests that for firms with foreign revenue, but no foreign debts, foreign sale ratio is a significant factor influencing the corporate hedging decisions. In contrast, the results in model 1 indicate that for the subsample of firms with both foreign sales and debts, not only is the magnitudes of coefficients of foreign sales much smaller than that in model 3, it even becomes statistically insignificant. The results hold even after controlling for all the other variables (model 2 and 4). The comparison provides strong evidence that foreign debts serves as an important risk-reducing instruments for Taiwanese firms. The use of nature hedge in managing risks could be very important for firms in an economy where only limited hedging instruments are available.

Other significant variables are managerial wealth in model 1 and 2, and long-term debt ratio in model 3 and 4. The directions of influence on the hedging decision confirm to the theoretical predictions.

Table 4

Logit analysis on the effect of nature hedge on derivative uses

The sample consists of only firms with foreign sales. All variables, except for firm size, are the average value over 1996-1998. Financial data are obtained from *Taiwan Economic Journal Databank*. The dependent variable is equal to one for derivative users, and zero for nonusers in 1998. Managerial wealth is the percentage of equity holding by directors and managers. Long-term debt ratio is long-term debt divided by book value of total assets. Quick ratio is cash and short-term investment to current liability. Ratio of R&D is measured by R&D expense to total sales. Market-to-book ratio is estimated as the ratio of the market value of the firm's assets to the book value of the firm's assets, where the market value of assets is estimated as the book value of assets minus the book value of common equity plus the market value of common equity. Convertible debt ratio is convertible debts to the book value of total assets. Institutional ownership is the percentage of equity holdings by institutional investors. Foreign sales ratio is foreign revenue divided by total sales. Foreign asset ratio is foreign assets divided by total assets. Foreign debt ratio is measured by foreign debt to book value of total assets. Firm size is the market value of assets in 1998, where market value of assets is the sum of market value of equity plus book value of debts. Values in the parenthesis are standard deviation of the estimated coefficient. The ">", "**" and "***" represent 10%, 5% and 1% significance levels, respectively.

Variables	Exporting firms with foreign debts		Exporting firms without foreign debts	
	1	2	3	4
Constant	-6.18 (3.78)	-5.92 (3.88)	6.55 (2.17)***	3.84 (2.96)**
Managerial wealth	.037 (.019)*	.041 (.02)**	-.004 (.013)	-.005 (.013)
Long-term debt ratio	.029 (.027)	-.005 (.034)	.04 (.017)**	.037 (.019)*
R&D expenses ratio		-.004 (.08)		.053 (.075)
Convertible debts ratio		14.03 (8.34)*		4.86 (6.34)
Institutional investors ownership		.013 (.019)		-.001 (.001)
Foreign sales ratio	.012 (.007)	.013 (.008)	.018 (.005)***	.017 (.005)***
Firm size	.726 (.535)	.664 (.557)	.384 (.422)	.363 (.426)
Industry dummies	Yes	Yes	Yes	Yes
Number of observations	97	97	184	184
-2 log likelihood	107.07	103.0	228.88	225.52
% Correct prediction	74.0	69.8	64.8	59.1

The choice of forward versus swaps

In this section, we investigate the effect of exchange-risk exposure on the choice of different types of derivatives. Specifically, we examine if firms that use forward contracts are of different risk characteristics from those using swap contracts.⁸ Geczy et al. (1997) argue that forward contracts may be cost-effective for frequent short-term transactions with uncertain timing and quantities, such as foreign currency-dominated sales. In contrast, swap contracts is generally designed to match for multi-period, predetermined transactions, and have lower level of costs and basis risks than a series of forward contracts. To test the motives of choosing different derivatives, we apply logit regressions analysis to examine if there exists any characteristic difference between firms using forward versus swap contracts. The dependent variable takes a value of one for firms using swap or swap combination with other derivatives (n=34), and zero for firms involving forward or forward combination with other derivatives (n=130). We include the variables in table 2 in the logic regression analysis. To further test the motives of different choice for derivatives, we specifically distinguish measures of foreign long term from short-term debts to total assets, and domestic from foreign convertible bonds to total assets to test the hypothesis.

Besides foreign sales, model 1, table 5 includes other variables. The results show that firms with higher foreign exchange exposure, as measured by foreign sale ratio, prefer forward than swap contracts. This finding is consistent with our expectation since foreign sales are usually frequent and uncertain in both timing and transaction value, forward contracts can be customized to firm-specific needs, and thus better match the pattern of cash flow in terms of dynamic hedging than swap contracts. Similarly, firms with foreign convertible bonds are found to be more likely to use forward, because the unknown amount of convertibles conversion would result in uncertain foreign currency-dominated interest payment. The coefficient of foreign convertibles is negatively and significantly associated with the likelihood of using swap. In contrast, no significant results are found for domestic convertibles. We also find that long-term foreign debts are positively significantly related to the use of swap contracts. Unlike convertible bonds, the cash flow patterns of foreign debts are usually predetermined. Therefore, swap contracts are more effective in both lowering hedging costs and basis risks than a series of forward contracts. No significant result is found for foreign short-term debts⁹.

⁸ Forward and swap contracts are more comparable than options because both forward and swap exhibit a symmetric payoff schedule. The payoff for options, however, is asymmetric.

⁹ In model 1 the results remain similar when the industry dummies are included in the regression.

Table 5

Logit analysis on the choices between swap versus forward contracts

The sample consists of firms using forward, swap or combinations contracts. All variables, except for firm size, are the average value over 1996-1998. Financial data are obtained from the annual financial statements provided in *Securities and Futures Institute Database* and *Taiwan Economic Journal Data Bank*. The dependent variable is equal to one for swap users, and zero for forward users in 1998. Foreign short- and long-term debts, domestic and foreign convertible bonds are deflated by book value of total assets. Foreign sales ratio is foreign revenue divided by total sales. Managerial wealth is the percentage of equity holding by directors and managers. Long-term debt ratio is long-term debt divided by book value of total assets. Long-term debt is the domestic long-term debt to book value of total assets. Ratio of R&D is measured by R&D expense to total sales. Institutional ownership is the percentage of equity holdings by institutional investors. Firm size is the logarithm of market value of assets in 1998, where market value of assets is the sum of market value of equity plus book value of debts. Values in the parenthesis are standard deviation of the estimated coefficient. The “*”, “**” and “***” represent 10%, 5% and 1% significance levels, respectively.

Variables	1	2
Constant	-1.44 (.433)***	-25.69 (10.04)***
Foreign short-term debts	8.04 (6.92)	6.10 (14.4)
Foreign long-term debts	43.15 (12.7)***	54.35 (20.72)***
Domestic convertible bonds	-17.62 (20.72)	-42.13
Foreign convertible bonds	-48.86 (16.92)***	-72.29 (31.96)**
Foreign sales	-0.03 (.012)**	-.002 (.017)
Managerial wealth		-.058 (.034)
Long-term debt ratio		.046 (.078)
R&D expenses ratio		-.079 (.18)
Institutional investors ownership		-.04 (.063)
Firm size		3.47 (1.36)**
Industry dummies		Yes
Number of observations	125	123
-2 log likelihood	75.76	46.11
% Correct prediction	89	94.3

Model 2 includes all the other prospective variables. The results in model 1 hold after controlling for other potential effects and industry dummies. In addition, we also find that larger firms are more likely to use swaps contracts. This may result from the advantages of informational scale economies owned by larger firms that expertise in risk management enable the use of the less popular, but maybe more effective for individual firms' specific needs. Managerial wealth, long-term debt ratio, R&D expense and institutional ownership are not significant determinants in the decision of using swaps versus forward contracts.

Conclusions

In this study we examine the observed difference in the use of derivatives across Taiwanese nonfinancial firms. Previous studies in corporate hedging have mainly focused only on countries with well-developed financial markets. Very little is known about firms' hedging policy in emerging economies. The study of Taiwanese markets, one of the fast-growing economies for the past decades, would fill the gap by providing useful evidence on the motives of corporate hedging policy.

Consistent with the US evidence, the results provide a direct support for the importance of scale economies in risk management. We find the use of derivatives of Taiwanese firms positively correlated with firm size. The results also support for hypotheses based on costly financial distress. Derivative-using firms exhibit higher leverage than nonusers. Furthermore, the evidence indicates that the potential exposure to foreign exchange risk is a significant determinant of corporate hedging decisions. Firms with foreign sales are more likely to use derivatives. The results lend a weak support for the hypothesis of managers' wealth. We find the directors' equity ownership only marginally influences the use of derivatives.

The evidence indicates that the role of nature hedge may play an important role for Taiwanese firms. We find that foreign revenue significantly affects the use of off-balance sheet hedge for firms without foreign debts. In contrast, we did not find strong evidence that foreign revenue is important in hedging decisions for exporting firms with foreign debts. Foreign debts serve the function as nature hedge for foreign revenue, and thus greatly reduce the likelihood of derivative use. Finally we examine the factors influencing the use of swaps versus forward contracts. The evidence suggests that swaps are preferred by firms with predetermined and repeated flow of costs and revenues; while forward contracts are used for transactions with uncertain timing and values.

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