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Association Between Credit Rating Changes and High-Tech M&A in Taiwan*

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The primary purpose of this study is to examine the impact of high-tech and non-high-tech mergers and acquisitions (M&A) on the credit rating changes in Taiwan. We utilized the ordered probit model with random effect for the empirical works. A variety of econometric tests were conducted using pooled data of 101 firms in Taiwan over the period Sep. 1996 to Dec. 2001. This paper tries to examine whether the financial and strategy factors affect the credit risks. Our results indicate that Insider Ownership and Leverage Ratio are negatively related to credit rating changes, while Return on Equity and High-tech Firm are positively related to credit rating changes for both pre- and post-M&A activities. Although higher Institutional Ownership increases in credit rating changes for pre-M&A, it decreases credit rating changes for post-M&A.

Introduction

During the 1990s, there were a number of changes in the competitive environment of the high-technology industry in Taiwan due to deregulation. After joining the World Trade Organization (WTO), Taiwan's high-technology firms face more severe competition from foreign competitors than from domestic ones. In particular, the foreign acquirers have introduced technological advances and know-how to business with the globally-accepted

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practices and standards, that have successfully upgraded industrial restructuring, improved management performance, eliminated inefficient corporations, and contributed to efficiency gains, which helped the recovery of Asian economies from financial crisis. (Agami, 2002)

Technical innovation, technology transfer, and advanced information system have contributed to increase efficiency by introducing new economies of scale into the high-technology industry. To enrich profitability by providing more efficient service to customers and by increasing the shareholders' wealth, frequent takeovers within the high-technology industry have been considered as one of the major strategies for reducing the number of competitors during the process of deregulation. To enhance market power and utilize tax credits, many high-tech firms participated in takeovers targeting on the firms whose assets are undervalued and have relatively low share prices. (Walker, 2000) As a result, takeovers in related industry may facilitate the efficient redeployment of assets and improve the operation performance of targeting firms in resolving financial distress. (Hotchkiss and Mooradian, 1998)

However, high-tech targets associated with the inherent uncertainty of future outcomes and the unproven nature of technological innovation may produce higher likelihood of valuation risk for the acquirers than in the other takeover activities. The acquirers tend to be suspicious about whether the benefits of value creation in this high-risk acquisition can help them obtain a steady growth and offset the destructive impacts. To reduce the skepticism of high-tech acquisitions, the acquirers needed to measure continuously relative credit risk under an affordable cost. The credit rating agencies can provide such accurate rank-orderings of the default risks in the credit evaluation process to define investment prohibitions, to determine default probabilities, and to assist the acquirers in assorting more carefully among targets. (Cantor and Packer, 1994) However, the major determinants with respect to the empirical link between the wealth of acquirers and the credit rating changes remain unknown.

This study aims to estimate the impact of mergers and acquisitions on the credit rating changes for high-tech and non-high-tech acquirers in Taiwan. We hypothesize the key determinants of pre- and post-M&A activities to increase the awareness of the acquirer's ability to create value and reduce default risks, and to provide more detailed information to help investors distinguish more carefully among takeovers. We utilize the ordered probit model with random effect for the empirical works. A variety of econometric tests are conducted using a pooled data of cross-section and time-series for 101 firms of high-tech and non-high-tech acquisitions in Taiwan over the period Sept. 1996 to Dec. 2001. This study demonstrates the difference between high-tech and non-high-tech takeovers and provides some unique empirical results for examining how financial factors (such as Return on Equity, Cash Flow Return on Sales, Leverage Ratio, and Price-earnings Ratio) and strategy factors (such as Insider Ownership, Institutional Ownership, Market-to-book Ratio, and Industrial Relatedness) affect the credit rating changes.

The important findings of this study show that high-tech acquisitions are more likely to upgrade credit ratings than non-high-tech acquisitions. These results provide evidence that credit rating changes depend heavily on the presence of Return on Equity, Insider Ownership, and Leverage Ratio. While institutional investors play an important role in increasing credit ratings for pre-M&A due to a strong capacity of targeting firms to meet financial obligations, they found to decrease credit ratings because of pessimism of managerial performance and default risks for post-M&A. We also found an inverse relationship between Industrial Relatedness and credit ratings for post-M&A.

The evidence in this study sheds light on the determinants of the credit ratings for an accurate assessment to alleviate the credit risks involved in the high-tech and non-high-tech

acquisitions. This paper provides valuable information not only to improve investment decisions for financial institutions and to reinforce the evaluation of loans for bankers, but also to enhance the acquirer's performance in takeover activities.

Review of Existing Literature

In finance literature, a considerable volume of empirical studies on the wealth and managerial performance effects of mergers and acquisitions has generally used financial ratios analysis and abnormal returns to hypothesize whether there are gains available to the stockholders of the acquirers and targets. Previous research has found somewhat mixed results on the excess returns of the acquirers. According to the U.S. foreign acquisition announcement, Doukas and Travlos (1988) provided empirical evidence to show that the acquirers expanded a multinational network into a new industry across borders in order to reduce institutional restrictions and to spread out country risks efficiently. Hence, these acquirers may obtain greater value than those who have already operated in the target firm's country. In support of this position, Cebenoyan, Papaioannou and Travlos (1992) found that foreign takeovers of the U.S. targets are likely to experience greater wealth gains than domestic takeovers of the U.S. targets especially for the high-technology sector. Consistent with the multinational-network hypothesis, Manzon, Sharp and Travlos (1994) and Lyroudi, Lazaridis and Subeniotis (1999) confirmed that the acquirers earn positive abnormal returns by acquiring target firms in less developed countries and European countries. However, inconsistent with the multinational network hypothesis, Dunne and Ndubizu (1995) found that the acquirers operating in the U.S. market, who have an advantage of lower coordination and monitoring cost and higher the efficiency in internal contracting process, transfer more wealth to target shareholders than those already having a subsidiary in the U.S. market. Yook and McCabe (1996) used a sample of 68 U.S. firms engaged in international acquisitions to examine the wealth effects of acquiring firms' shareholders. However, they find no evidence to support the multinational-network hypothesis.

Some researchers have examined the post-merge performance of acquirers. Regardless of the effects of payment method in cash or stock, Kohers and Kohers (2000) showed that the acquirers of high-tech targets often experienced significant positive abnormal returns to provide greater shareholder wealth benefits at the announcement date of high-tech takeovers. They indicated that the moderate level of managerial ownership of the acquirers, the larger size of transactions, and the lower institutional ownership of targets have a positive effect on acquirers' returns. To be consistent with the inefficient management hypothesis, Palepu (1986) and Cudd and Duggal (2000) adjusted the financial ratios for industry-specific distribution and found that the return on equity and leverage ratio are negative and significant, suggesting that the shareholders' wealth of the acquirers can be accumulated by disciplinary actions taken against the inefficient managers of targets prior to the acquisition. This conclusion was strengthened by the study of Ghosh and Lee (2000), who examined whether disciplinary or non-disciplinary acquisitions generated higher abnormal returns in terms of long-term earnings forecast revisions of target firms around acquisition announcement dates. The results showed that the acquirers were likely to pay a high premium to obtain gains from disciplinary actions when the managerial performance of targeting firms performed poorly. Kohers and Kohers (2001) also reported that the shareholders of acquirers respond favorably to high-tech takeover announcements in terms of the creation of their wealth, but the long-run post-merger performance of acquirers was poor if acquirers appeared to be related to a low book-to-market ratio, a low return on equity, and a small managerial ownership with a high potential of agency problems.

In addition to reviewing the acquirers' wealth effects of takeovers, some studies also

extend this framework for investigating the relationship between the wealth and the rating changes. Wansley, Elayan and Maris (1990), Goh and Ederington (1993) have examined the reaction of common stock returns and preferred stock returns for the credit quality placed on the rating agencies. They found a significant negative reaction to bond downgrades because the rating agency attributes a fall in firm value to a decrease in earnings, cash flow, or sales and by an increase in leverage, but no significant reaction to bond upgrades. Ederington and Goh (1998) supported this view and found Granger causality flows for both bond downgrades and earnings of the U.S. firms, but not for bond upgrades. They showed that bond downgrades altered by the rating agency in reflecting the firm's financial difficulty tend to make financial analysts lower the firms' earnings forecasts.

Lakshmi (1991) has used standard event study methodology to identify the impacts of the stock price reactions to the risk of industrial straight debts, measured by their bond ratings. Lakshmi found no evidence to show that the abnormal stock returns reaction of the announcements of investment-grade and non-investment-grade debts were significantly affected by the firms not involved in the takeovers. However, Billett (1996) and Goh and Ederington (1999) contended that firms with low-rated speculative debt might experience less likelihood of takeovers compared with those with an investment-grade debt because an increase in leverage weakened an attraction of a disciplinary takeover.

Despite previous research on the association between the wealth effects of takeovers and credit rating changes, factors influencing credit rating changes that are associated with the distinct high-growth/high-risk profile of high-tech takeovers remain to be studied.

Ordered Probit Analysis of Credit Rating Changes in the Process of Takeover

We begin by specifying ordered probit as the estimation method for capturing the relations between discrete-valued dependent variables and continuous-valued independent variables. It is to be noted that the ordered probit models for pooled data were first developed by McKelvey and Zavoina (1975), and have been used in previous economics and finance studies of bond ratings (see Kamstra, Keenedy and Suan, 2001; Badu and Daniels, 1997; and Blume, Lim and McKinlay, 1998). The random effect estimates of both methods use maximum likelihood functions and asymptotic standard errors to estimate the model parameters that have essentially similar statistical characteristics. In principle, the ordered probit models are derived from the normal probability distribution. (Greene, 1993).

The original specification for the ordered probit models with the random effects used in this research took the following latent regression:

$$Y_{it}^{*} = \beta' x_{it} + \varepsilon_{it} + \varpi_i, \qquad (1)$$

where Y_{it}^{*} refers to an approximation of the unobserved measure of credit risk for the acquirers involved in high-tech or non-high-tech acquisition. It is to be noted that x_{it} is a matrix of the independent variables for the acquirer i at time t and β' is a vector of the estimated coefficients. ε is the white-noise residual which is normalized to a mean of zero and variance of one, where the group specific term, ϖ_i, is distributed as $N\left(o, \sigma^2\right)$. The following numerous values of the dependent variable are observed:

$$
\begin{aligned}
&Y_{it} = 0, \quad \text{if } Y_{it}^{*} \le z_0, \\
&Y_{it} = 1, \quad \text{if } z_0 < Y_{it}^{*} \le z_1, \\
&Y_{it} = 2, \quad \text{if } z_1 < Y_{it}^{*} \le z_2, \\
&\quad \cdots\cdots \\
&Y_{it} = J, \quad \text{if } Y_{it}^{*} > z_{J-1}, \\
&Var\left[\varepsilon_{it} + \varpi_i\right] = Var\left[v_{it}\right] = \sigma_{\varepsilon}^{2} + \sigma_{\varpi}^{2}, \\
&Cov\left[v_{it}, v_{is}\right] = \sigma_{\varpi}^{2}, \\
&Corr\left[v_{it}, v_{is}\right] = \rho = \frac{\sigma_{\varpi}^{2}}{\sigma_{\varepsilon}^{2} + \sigma_{\varpi}^{2}}.
\end{aligned}
$$

Here, z is the unknown "threshold" parameter defined as the range of the observed dependent variable, Y_{it}, to be estimated along with parameter vector β'. Y_{it} represents an approximation of the unobserved variable for credit ratings, Y_{it}^{*}. We assume that there are J categories ordered from the lowest to the highest as $0<z_1<z_2<.....<z_{J-1}$. The probability function of Y_{it} has the form:

$$Prob(Y_{it}=0)=\Phi(-\beta' x_{it}), \tag{2}$$

$$Prob(Y_{it}=1)=\Phi(z_1-\beta' x_{it})-\Phi(-\beta' x_{it}), \tag{3}$$

$$prob(Y_{it}=2)=\Phi(z_2-\beta' x_{it})-\Phi(z_1-\beta' x_{it}), \tag{4}$$

$$\vdots$$

$$Prob(Y_{it}=J)=1-\Phi(z_{J-1}-\beta' x_{it}), \tag{5}$$

where Φ is the standard normal density.

Given the cross-section and time series of credit ratings, we estimate the ordered probit with the random effect model as follows:

$$
\begin{aligned}
RATING_{i,t}^{*} = {} & \alpha_1 + \alpha_2 \cdot PE_{i,t} + +\alpha_3 \cdot CASH_{i,t} + \alpha_4 \cdot ROE_{i,t} + \alpha_5 \cdot LEV_{i,t} + \alpha_6 \cdot INSIDER_{i,t} \\
& + \alpha_7 \cdot INST_{i,t} + \alpha_8 \cdot MARKET_{i,t} + \alpha_9 \cdot RELATED_{i,t} + \alpha_{10} \cdot HIGH_{i,t} \\
& + \varepsilon_{i,t} + \psi_i,
\end{aligned} \tag{6}
$$

where $RATING_{i,t}^{*}$ refers to some unobserved measure of credit ratings. It is to be noted that $\varepsilon_{i,t}$ and ψ_i are the white-noise residual and group specific term, respectively. The following six values of dependent variable of $RATING_{i,t}$ are observed:

$$RATING_{i,t} = \begin{cases} 0 \ if \ \ RATING^*_{i,t} \le B \\ 1 \ if \ \ B < RATING^*_{i,t} \le BB \\ 2 \ if \ BB < RATING^*_{i,t} \le BBB \\ 3 \ if \ BBB < RATING^*_{i,t} \le A \\ 4 \ if \ A < RATING^*_{i,t} \le AA \\ 5 \ if \ \ RATING^*_{i,t} > AA \end{cases}.$$

Table 1 details the number of credit rating changes for the high-tech and the non-high-tech acquirers. We find the most notable differences between the two rating categories. Most of the credit rating changes ranging from AAA to A for the high-tech firms were superior to those ranging from A to BB for the non-high-tech firms. The recent history of credit rating changes for high-tech and non-high-tech acquirers is shown in Table 2. Generally, the high-tech acquirers had a rating of BBB or higher, whereas the non-high-tech acquirers were mostly in the range of BBB or lower. The high-tech acquirers including United Microelectronics, Acer, Inventec, TSMC, Chroma Ate, Yageo, ASE, Winbond, and Mosel Vitelic, and the non-high-tech acquirers such as WUS have received the highest ratings (i.e., AAA) since 1996 (3Q). These firms were downgraded to lower levels in the following quarters except for TSMC. However, the non-high-tech acquirers such as Ruentex have received the lowest ratings. Ruentex experienced a downward grading from BB to CCC during 1999 (3Q) to 2000 (4Q), the lowest rating ever assigned to listed firms by Taiwan Corporate Credit Risks Index (TCRI). Lian Chen has even declared bankruptcy due to its financial distress since 1999 (3Q).

Data

We selected our initial sample of 101 acquirers involving both domestic and foreign mergers and acquisitions occurring between Sep. 1996 and Dec. 2001 as reported from Economic Daily News in Taiwan.[1] According to the special high-tech classification codes provided by the Ministry of Economic Affairs (MOEA), high-tech sectors included areas in biotechnology, information technology, semi-conductor, communications, environmental equipment, machinery, and pharmaceuticals, among others. Using the pooled quarterly dataset, we separated high-tech and non-high-tech acquirers with the credit ratings in terms of the effects of pre- and post-merger and acquisition activities.

Table 3 presents the definitions of the entire set of Taiwan Corporate Credit Risks Index (TCRI) created by Taiwan Economic Journal (TEJ) in comparison with the credit ratings of Standard & Poor (S&P) and Moody's rating agencies. The proportions of credit ratings in the seven categories (i.e. AAA, AA, A, BBB, BB, B, and CCC by S&P and Aaa, Aa, A, Baa, Ba, B, and C by Moody's) are approximately the same. TEJ combined the numerous credit risk indices into three major categories, investment-grade with lower risk rating (1-4 degrees), medium risk rating (5-6 degrees), and speculative-grade with higher risk rating (7-9 degrees). However, as a further check, the exact proportions of credit

[1] We excluded 56 unlisted firms because the data were not available on the Taiwan Stock Exchange database, and ruled out 16 listed firms due to the lack of credit ratings announced by Taiwan Economic Journal.

ratings by TCRI according to the classification scheme used by TEJ has a slight difference in two categories of BB and B by S&P and Ba and B by Moody's. The degree in credit rating in these two categories can be expanded further to become four sub-categories in order to match the different levels of descending financial performance or losses experienced by the firms.

The definition and notation of credit ratings as the dependant variable are obtained for each acquirer where data available from TEJ are detailed in Table 4. To match the classification scheme employed by S&P, we combined the degrees of 5 and 6 to BB level, and narrowed the degrees of 7 and 8 to BBB level of the credit rating categories, RATING, for high-tech and non-high-tech takeovers. We defined the threshold values ranging from 0 to 5 in order to symbolize an ascending rating of B or below, BB, BBB, A, AA, and AAA, respectively. On the basis of relevant literature, the data for the independent variables grouped into two categories—financial factors and strategy factors, were taken from TEJ database to study how the credit ratings were influenced.

The first category reflects the financial factors including Leverage Ratio (LEV), Cash Flow Returns on Sales (CASH), Return on Equity (ROE), and Price-earnings Ratio (PE). An increase in PE of the acquirer may enhance wealth gains from the acquisition of lower PE targets. Hence, the market tended to reevaluate the combined firms' value according to the acquirer's original high PE ratio, thus leading to a lower default risk (Cudd and Duggal, 2000). Therefore, one may expect a positive relationship between PE and credit ratings.

It is hypothesized that CASH has an important effect on credit quality. When CASH increases, the credit ratings may be upgraded because the amount of operating cash flow available to the acquirers accelerates business expansions. This may encourage takeovers and improve the acquirers' operation performance to strengthen their financial conditions (Hotchkiss and Mooradian, 1998). We expect CASH to be positively related to the credit ratings for the acquirers involved in high-tech and non-high-tech acquisitions.

We employ ROE to capture the effect of the acquirer's long-run performance for high-tech and non-high-tech acquisitions on the credit risk. Kohers and Kohers (2000) found that ROE seems to have a relatively strong impact on high-tech acquirers in reinforcing market's confidence with respect to the acquirer's ability to create wealth gains in the high-risk deals. Thus, the higher ROE as a managerial entrenchment motive is expected to increase the credit rating.

Palepu (1986) and Song and Walkling (1993) found a negative relationship between financial leverage and takeover likelihood that suffered a decline in value. These findings are consistent with our view that the larger the acquirer's LEV, the greater the market's concerns on the acquirer's ability to fulfill its financial obligations corresponding to a higher risk of default through the downgrade of credit rating.

The second category reflects strategy factors consisting of Insider Ownership (INSIDER), Institutional Ownership (INST), Market-to-book Ratio (MARKET), and the Industrial Relatedness (RELATED) of the acquisition. To examine the role played by the agency problem in the high-tech and non-high-tech takeovers, we assumed that INSIDER which proxied for management quality, equals to 1 if the total insider ownership exceeds 15 percent, and 0 otherwise.[2] Song and Walkling (1993) and Kohers and Kohers (2000) revealed that increasing management quality has an effect on the acquirer's abnormal returns at the high-tech merger announcement date in alleviating agency problem when managers are in alignment with owners of the company. Additionally, Bathala, Moon and Rao (1994)

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[2] See Yook and McCabe, 1996.

suggested that increased managerial ownership, as an agency-conflict-mitigating device, was more prone to reduce the role of debt in order to minimize capital structure risks. Thus, we expect that an increasing Insider Ownership can be positively related to credit ratings because less agency problem signaling better quality management may improve the firm's financial prospects and lower default risks.

A dummy variable for INST is expected to be a major determinant of credit rating changes for takeovers. Bathala, Moon and Rao (1994) and Cebenoyan, Cooperman and Register (1999) recognized that institutional investors have played a significant role as external effective monitors and have made proxy fights to restrain management behavior of myopic managers. With higher levels of INST and better external monitoring, the "Prudent-man Hypothesis", firms may experience less debt leverage associated with lower level of default risk.[3] Thus, the acquirers with the existence of a greater INST are expected to have upgraded credit rating because of a strong capacity to meet their financial commitments.

We utilize MARKET to be a proxy for measuring the presence of asymmetric information of the acquirers. If the acquirer experiences a high MARKET, it may reflect a high potential of asymmetric information related to favorable future earnings opportunities according to the market-to-book hypothesis (Emery and Switzer, 1999). To generate the wealth for shareholders and increase the firm's credit quality, managers, who own a large proportion of the acquirer's shares, may be motivated by a realized growth opportunities and an enhanced managerial performance.[4] Hence, one may expect a positive relationship between MARKET and credit ratings. Another factor influencing the acquirer's strategy is industrial relatedness of the acquisition. Doukas and Travlos (1988) found that multinational firms expanded into the unrelated industries at new foreign locations may experience a high wealth gain for their shareholders. However, to determine the value of an acquisition, Manzon, Sharp and Travlos (1994) found that Industrial Relatedness to the acquirer's core business is positively associated with its abnormal returns. We included Industrial Relatedness, RELATED, as a dummy variable that equals 1 if the acquirer and target have the same two-digit SIC, and 0 otherwise. Our reasoning is that industrial relatedness as a measure of synergistic gains reduces credit risks when there is a close relationship between the acquirers and targets.

In addition to the financial and strategy factors, Kohers and Kohers (2000) and Ang (2000) examined the role of high-tech acquirers in affecting shareholders' wealth and choosing payment contract. They found that the abnormal returns and the tendency to select deferred payment would be higher for high-tech acquirers than for non-high-tech acquirers. The hypothesis is that, regardless of the inherent uncertainty of cash flow and technological innovation, if the market recognizes the potential synergies of high-tech takeovers as a means to increase growth potential, enhance technological advancements, offer job growth creation, provide efficiency gains, and improved shareholder's wealth, the credit rating should be viewed positively by the rating agency.

Empirical Results

The results obtained by the ordered probit with random effect model for examining the determinants of pre- and post-M&A activities are shown in Table 5. As can be seen,

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[3] To obtain a better monitoring of management performance, Cebenoyan, Cooperman, and Register (1999) developed the Prudent-man Hypothesis to predict a negative relation between institutional investor ownership and risk measures.

[4] Walkling (2000) used the market-to-book ratio as a proxy for the Tobin's q ratio to measure managerial performance.

there are three columns for the obtained estimates. The credit rating changes for M&A activities are in columns (I), while the estimated results used to analyze pre-M&A and post-M&A activities are detailed in column (II) and (III), respectively. To test the overall explanatory power of the model, we performed a likelihood ratio (LR) test to examine the group specific heterogeneity in Table 5. The LR test of the null hypothesis of a fixed constant in the probability function versus the alternative hypothesis of a random draw from the normal distribution yielded statistics of 249.106, 332.838, and 315.308 for the three columns. The critical value of the statistic is $\chi^2(0.01,1) = 6.64$, indicating that we reject the null hypothesis and accept the random effect for the estimations. The findings for the threshold values, as shown by BB-BBB, BBB-A, A-AA, and AA-AAA, are all strongly significant, indicating that categorizing credit ratings with uneven spacing intervals are evidently appropriate and definable.

To start with, the results of the statistical significance of the determinants explaining the probability of credit rating changes for both pre-M&A and post-M&A are unique. Our findings suggest that Taiwanese high-tech acquirers wishing to preserve their credit ratings should seek to acquire firms with financial and strategy factors. We found that the coefficients relating to LEV, ROE and High-Tech (HIGH) are significant in all three columns. The results support the view that a higher ROE and a lower LEV are likely to increase the probability of higher credit ratings. This finding suggests that ROE, which represents a managerial entrenchment motive, would create an anticipation of the acquirer's ability to create greater wealth so as to increase the probability of upgrading credit ratings for both pre-M&A and post-M&A activities. On the other hand, a larger LEV viewed unfavorably in terms of greater debt burden corresponding to a higher default risk, is likely to downgrade credit ratings. Note that the negative impact of LEV on credit rating changes for post-M&A is greater than that for pre-M&A, suggesting that the market reacts worriedly about the acquirers suffering a change in financial burden via bridge loans and increasing operational costs after M&A.

In addition, the finding supports our expectation that the high-tech acquirers do receive relatively a greater probability to have a higher credit rating when compared with non-high-tech acquirers, as shown by HIGH, which is positive and significant at the 0.01 level in all three columns. In particular, the results show that the distinct high-growth/high-risk profile of high-tech acquirers for post-M&A activity in column (III) are likely to obtain a significantly higher credit rating than for pre-M&A activity in column (II).

Unexpectedly, the estimates of the dummy variable, INSIDER, indicate a strong negative influence on the credit rating changes for both pre-M&A and post-M&A activities. This finding does not support the notion that, to alleviate agency problem, excessive management quality would minimize default risks and upgrade credit ratings. One reason may be that excessive managerial ownership may be associated with strong management entrenchment and augmented debt financing, and thus having adverse consequences for financial performance and negative impact on credit risks.

As for the effects of ownership structure, the result reveals a positive and statistically significant impact of INST on credit rating changes for pre-M&A activity in column (II). Moreover, Bathala, Moon and Rao (1994), Cebenoyan, Cooperman and Register (1999), and Kohers and Kohers (2001) reported similar results. They noted that the greater the INST serving as an effective monitor, the lower the levels of firms' debt leverage would be. As INST increases, the probability of poor acquisition decisions made by acquiring-firm managers may reduce. For the post-M&A activity in column (III), a negative and statistically significant relationship is evident. This echoes the earlier findings of Kohers

and Kohers (2000), the negative coefficient for the dummy variable, INST, suggests that a higher INST is likely to be associated with lower credit rating for acquirers. Institutional investors tended to be skeptical about their assessments of takeover decisions and become dissatisfied with managerial performance due to the inherent uncertainty of technological innovations, cultural conflicts, the lack of cash flow, and less ability to reduce the debt leverage, contributing unique risks in financial distress.

The results strongly suggest that the Industrial Relatedness (RELATED) of the acquisition has a negative and statistically significant impact on the probability of credit rating changes in column (I). This implies an inverse relationship between synergistic gains and credit ratings. This is not surprising since the acquirers often overestimated the economies of scale or synergy gains of a merger and acquisition. These problems lead to the recognition that the acquirers may face weakening financial performance if targeting firms operate in the same two-digit SIC, thus increasing credit risks. (Burand, 1999)

We found that the financial variables such as MARKET, PE, and CASH show poor results. This suggests that for both pre-M&A and post-M&A activities, financial ratios are not important in explaining the probability of credit rating changes for high-tech and non-high-tech acquirers.

Conclusion

This paper investigates the determinants of credit rating changes for both pre-M&A and post-M&A activities. This study employs the ordered probit model with random effects to compare acquirers' ability to create value for high-tech and non-high-tech acquisitions.

The results suggest that a higher ROE and a lower LEV are likely to increase the probability of higher credit ratings. The positive coefficient for HIGH supports the notion that acquirers are likely to receive higher credit ratings when compared with takeovers involving non-high-tech acquirers. However, high levels of management quality would not minimize default risks owing to the problems of strong management entrenchment and augmented debt financing.

The coefficient for INST is significant and positive for the ordered probit equation for pre-M&A activity, but significant and negative for the post-M&A activity. This suggests that institutional investors tended to be pessimistic about their assessments of takeover decisions and dissatisfied with managerial performance. This would result in greater financial default risk and downgraded credit ratings. We also found an inverse relationship between industrial relatedness and credit ratings because the acquirers often overestimated the economies of scale or synergy gains of M&A.

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Table I

Credit Rating Changes

Rating	High-Tech Acquirers	Non-High-Tech Acquirers	All Acquirers
AAA	9	1	10
AA	7	5	12
A	9	8	17
BBB	7	10	17
BB	5	9	14
B	1	1	2
CCC	0	1	1
Total	38	35	73

Table II

Recent History of Credit Rating Changes

High-Tech Acquirers			
Company	Products	Ratings	Effective Date
United Microelectronics Corp.	Semiconductor	AAA	1996 (3Q)
		A	1999 (3Q)
		AA	2000 (4Q)
Accton Technology Corp.	Web Equipments	A	1996 (3Q)
		BB	1999 (3Q)
Acer Inc.	Computer	AAA	1996 (3Q)
		AA	1999 (3Q)
Mitac International Corp.	Computer	BBB	1996 (3Q)
		A	1999 (1Q)
Inventec Corp.	Notebook Computer	AAA	1996 (4Q)
		AA	1998 (1Q)
TSMC Technology Corp.	Semiconductor	AAA	1996 (3Q)
Chroma Ate Inc.	Testing Instruments	AAA	1996 (4Q)
		BBB	2000 (3Q)
Ritek Corp.	Storage Media	BBB	1996 (3Q)
		A	1997 (4Q)
		AA	1999 (3Q)
		A	2000 (3Q)
Via Technologies Inc.	Processors	AA	1999 (1Q)
Yageo Corp.	Passive Component	AAA	1996 (4Q)
		A	1999 (3Q)
ASE Inc.	IC	AAA	1996 (3Q)
		AA	1999 (3Q)
Winbond Electronics Corp.	IC	AAA	1996 (3Q)
		A	1997 (3Q)
		BB	1997 (4Q)
		BBB	1998 (3Q)
		A	2000 (3Q)
Mosel Vitelic Inc.	DRAM	AAA	1996 (3Q)
		A	1997 (3Q)
		BBB	1997 (4Q)
		BB	1998 (3Q)
		B	1999 (3Q)
Solomon Technology Corp.	Semiconductor	BBB	1996 (4Q)
		BB	1997 (4Q)
Orient Semiconductor Electronics Co. Ltd.	Semiconductor	AA	1996 (3Q)
		BBB	1999 (1Q)
		BB	1999 (3Q)

Table II
(continued)

Non-High-Tech Acquires			
Company	Products	Ratings	Effective Date
WUS Group Holding Co., Ltd	Electronics Parts	AAA	1996 (3Q)
		A	1999 (3Q)
		BBB	2000 (3Q)
Ruentex Corp.	Textile	BB	1996 (3Q)
		BBB	1997 (4Q)
		BB	1999 (3Q)
		B	2000 (1Q)
		CCC	2000 (4Q)
Uni-President Enterprise Co.	Food	AA	1996 (3Q)
Taisun Enterprise Corp.	Food	BBB	1996 (3Q)
		BB	1997 (2Q)
Yulon Motor Co., Ltd.	Automobile	BBB	1996 (3Q)
		A	1997 (1Q)
		AA	1997 (4Q)
Sanyo Textile Co.	Textile	BBB	1999 (1Q)
		BB	1999 (3Q)
Hog Tai Electric Industrial Co., Ltd.	Electric Cable	A	1996 (3Q)
		AA	1997 (3Q)
Lian Chen Food Co.	Food	BBB	1997 (2Q)
		BB	1997 (4Q)
		(a)	1999 (3Q)
Chung Hwa Pulp Corp.	Pulp	A	1996 (3Q)
		BB	1997 (3Q)
		BBB	2000 (3Q)
Potrans Electrical Corp.	Electrical Products	A	1998 (3Q)
		BBB	1999 (3Q)
CMC Magnetics Corp.	Storage Products	BB	1996 (3Q)
		BBB	1997 (3Q)
		A	1997 (4Q)
		BBB	1999 (3Q)
		A	1999 (4Q)
China Synthetic Rubber Corp.	Rubber	AA	1996 (3Q)
		A	1999 (1Q)
		BB	1999 (4Q)
Pouchen Group	Shoe	AA	1996 (3Q)
Tait Marketing & Distribution Corp.	Service	BB	1998 (1Q)

Note: (a) denoted "Bankruptcy".

Table III

The Definitions of Credit Ratings for Standard & Poor, Moody's, and TCRI Agencies.

Credit Ratings			Definitions
TCRI	S&P	Moody's	
1	AAA	Aaa	Extremely strong capacity to meet its financial commitments.
2	AA	Aa	Very strong capacity to meet its financial commitments.
3	A	A	Strong (Satisfactory) capacity to meet its financial commitments but is somewhat more susceptible to the adverse effects of changes in circumstances and economic conditions than debt in higher-rated categories.
4	BBB	Baa	Adequate capacity to meet its financial commitment, but adverse economic and financial conditions more likely to weaken capacity. Lowest Investment-grade rating.
5	BB	Ba	Any debt rated BB for long-term (or B for short-term) or below is regarded as having significant speculative characteristics. Debt has less near-term vulnerability to default than other speculative issues. However, it faces major ongoing uncertainties and exposure to adverse business, financial, or economic conditions that could lead to inadequate capacity.
6			
7	B	B	Greater vulnerability to default but still has the capacity to meet its financial commitments. Adverse business, financial, or economic conditions will likely impair capacity or willingness to meet its financial commitments.
8			
9	CCC	C	An obligor is currently vulnerable, and is dependent upon favorable business, financial, and economic conditions to meet its financial commitments.

Source:

(1) Creditweek, Standard & Poor's Service.

(2) Money Watching & Credit Rating, a Bi-Monthly Review, Taiwan Economic Journal.

Table IV

List of Dependent and Independent Variables

Variable	Notation	Definition
Credit Rating	RATING	The credit risk index: 0 = B or below, 1 = BB, 2 = BBB, 3 = A, 4 = AA, and 5 =A AA.
Price-earnings Ratio	PE	The PE ratio is the ratio of the acquirer's market price per share to its earnings per share.
Cash Flow Return on Sales	CASH	The pretax operating cash flow return on sales are measured as earnings before interest, taxes and depreciation (EBITDA) deflated by sales.
Return on Equity	ROE	ROE is earnings after tax as a proportion of the book value of equity.
Leverage Ratio	LEV	The Leverage Ratio is defined as the ratio of long-term debt to total equity.
Insider Ownership	INSIDER	INSIDER is a proxy variable for management quality that is 1 if total insider ownership exceeds 15 percent, and 0 otherwise.
Institutional Ownership	INST	A dummy variable for Institutional Ownership that is 1 if the percentage of equity held by institutional investors exceeds 20 percent, and 0 otherwise.
Market-to-book Ratio	MARKET	The Market-to-book Ratio is calculated by the market value of common equity to the book value of common equity.
Industrial Relatedness	RELATED	The Industrial Relatedness of the acquisition equals to 1 if the acquirer and target have the same two-digit SIC and zero otherwise.
High-Tech Firm	HIGH	A dummy variable for high-tech firms. If HIGH= 1, the acquirer was from a high-tech industries; 0 otherwise.

Table V

Ordered Probit with Random Effect of Merger and Acquisition

Regressor	Notation	M& A	Pre- M & A	Post- M & A
		I	II	III
Constant	Constant	3.351 (14.62)**	4.120 (11.54)**	3.870 (9.81)**
Price-earnings Ratio	PE	-0001 (-0.19)	-0.001 (-0.74)	-0.001 (-0.54)
Cash Flow Return on Sales	CASH	0.056 (0.52)	0.088 (0.57)	0.140 (0.90)
Return on Equity	ROE	0.016 (2.88)**	0.020 (3.32)**	0.021 (3.57)**
Leverage Ratio	LEV	-1.754 (-8.47)**	-2.412 (-8.32)**	-3.156 (-8.71)**
Insider Ownership	INSIDER	0.336 (1.30)	-0.771 (-4.75)**	-0.738 (-4.19)**
Institutional Ownership	INST	-0.653 (-2.95)**	0.465 (2.91)**	-0.662 (-2.77)**
Market-to-book Ratio	MARKET	0.004 (0.14)	0.006 (0.22)	0.007 (0.24)
Industrial Relatedness	RELATED	-0.895 (-10.52)**		-0.141 (-0.66)
High-Tech Firm	HIGH	1.303 (5.92)**	0.0783 (4.83)**	2.162 (8.01)**

Thresholds

BB - BBB	2.143 (18.72)**	2.847 (14.13)**	2.806 (9.10)**
BBB - A	2.938 (21.22)**	3.715 (17.02)**	3.699 (11.63)**
A - AA	3.704 (30.121)**	4.590 (21.35)**	4.620 (13.91)**
AA-~AAA	5.212 (36.44)**	6.380 (26.48)**	6.430 (19.15)**

Measure of Fit

Likelihood Ratio Test	249.106	332.838	315.308
Standard Deviation	1.135 (11.59)**	1.748 (17.34)**	1.366 (17.04)**

Note:

1. t-statistics is in Parentheses.
2. ** indicates significance at the 5 per cent levels of the two-tail test.