Available online at www.sciencedirect.com
ScienceDirect
Physica A 378 (2007) 357–373
PHYSICA A
www.elsevier.com/locate/physa

Some new evidence on bond initial public offerings in the Taiwan Stock Exchange: An industrial perspective

Mei-Chu Ke[a,*], Tung Liang Liao[b], Hong-Ming Hsu[c]

[a]*Department of Industrial Engineering and Management, National Chin-Yi Institute of Technology, 35, Lane 215, Section 1, Chung-Shan Road, Taiping City, Taichung County, 411, Taiwan, ROC*
[b]*Department of Finance, Feng Chia University, Taiwan, ROC*
[c]*Department of Business Administration, Feng Chia University, Taiwan, ROC*

Received 24 April 2006; received in revised form 6 December 2006
Available online 22 December 2006

Abstract

This study examines the determinants of types of bonds at the initial public offerings (IPOs) for the Taiwan Stock Exchange (TWSE). From an industrial perspective, R&D expenditures are mainly positively related to issuing straight bonds and future growth opportunities to convertible bonds for electronic firms. In the non-electronic industry, firms with significant financing needs are more likely to issue convertible bonds, whereas those without such requirement are more likely to issue straight bonds. It is also found that electronic firms convey a significant negative signal to the stock market, while non-electronic firms experience an insignificant stock price response surrounding the announcements of the bond IPO.
© 2007 Elsevier B.V. All rights reserved.

Keywords: Bond initial public offerings; Multinomial logit model; Event study

1. Introduction

According to the *Financial Statistics Monthly*, *Taiwan District*, *the Republic of China* [1], almost 40% of all issued bonds (including government bonds and corporate bonds) are corporate bonds, with their issued amount in the Taiwan bond market totaling NT$2,778,880 million in 2003.[1] The statistics show that the bond market has become an increasingly important source of funds for Taiwan firms. The *Taiwan Economic Journal Data Bank* (*TEJDB*) also indicates that a somewhat striking 151 firms, exclusive of financial firms, made an initial public offering of bonds (bond IPO) in the Taiwan bond market during the 1990–2003 period.

*Corresponding author. Tel.: +88 6423924505x7654; fax: +88 6423934620.
E-mail address: kemc@chinyi.ncit.edu.tw (M.-C. Ke).
[1]The exchange rate fluctuated between NT$ 24.430/$ and NT$35.125/$ during our study period.

0378-4371/$ - see front matter © 2007 Elsevier B.V. All rights reserved.
doi:10.1016/j.physa.2006.12.007

The average number of firms with straight bond IPO was approximately four each year in the Taiwan market, merely less than that in the US market, about six per year.[2]

The number of electronic firms listed in the Taiwan Stock Exchange (TWSE) rapidly soared from only 12 to an overwhelming 267 during the 1990–2003 period.[3] Meanwhile, the ratio of the market value of listed electronic firms to total market value was a mere 3.08% at the end of 1990, but that rocketed to an impressive 53.76% by the end of 2003.[4] The ratio of the trading volume of electronic firms to the total market trading volume similarly swelled from 3.61% to 57.65% during the same period. Another feature with regard to electronic firms is that they had a substantially higher average earnings per share quarterly (NT$ 1.69) than did non-electronic firms (NT$ 0.70) during the study period. Since electronic firms tend to be larger in size and have a higher trading volume along with greater profitability when compared with non-electronic firms, this makes it easier for them to raise capital on the stock market and to gain stronger bargaining power vis-à-vis banks and bondholders. That is, relative to non-electronic firms, electronic firms evidently have more flexibility in choosing their funding sources. Given the availability of industrial characteristics, this study takes advantage of this ideal opportunity to partition our whole sample firms into electronic and non-electronic firms to examine whether the two industry groups have different motives for issuing different types of bonds and to investigate whether the two industry groups exhibit different stock price behavior around the announcement date of the bond IPO.[5]

Green [3] asserted that the reason for issuing convertible bonds is to reduce agency costs between stockholders and bondholders. Brennan and Schwartz [4] also argued that due to the relative insensitivity of convertible bonds to the risk of the issuing firm, it is not difficult for the bond purchaser and issuer to agree on the value of the bonds. Copeland and Weston [5] further argued that convertible bonds are better tailored to the cash flow patterns of rapidly growing firms. Stein [32] contended that firms will select convertibles as an indirect method to get equity into their capital structures when adverse selection problems make a common stock issue unattractive. Recently, Mayers [33] argued that firms use convertible bond's conversion option to lower issuance costs of sequential financing. Based on the view the above scholars, it is clearly apparent that the possible reasons for issuing convertible bonds are distinctly different from those for issuing straight bonds. Which alternative, issuing straight bonds or convertible bonds, and non-issuing, is chosen is an important topic for financial managers at the bond IPO. However, to the best of our knowledge, very few empirical studies in this field have been reported in the extant literature. Important here, the multinominal logit model can effectively investigate the factors that influence the choice of types of bonds for two industry groups at the bond IPO. This, therefore, is the contribution that this study makes to the literature in this line of research.

Fama [7] asserted that banks have a comparative cost advantage in monitoring loan agreements, thus being able to reduce the adverse selection and moral hazard costs of new financing. James [8], Lummer and McConnell [9] and Shockley and Thakor [10] have empirically documented that bank loan agreements typically engender a positive stock price response. However, the bond IPO could result in less monitoring than inside debt, introducing public debt to firm's capital structure can increase the agency costs. Datta et al. [2] have found that the debt IPO announcements convey a negative signal to the stock market.

Different from the negative stock price reaction noted above, Ross [12] and Heinkel [13] have pointed out that increased firm leverage is a positive signal of the quality of a firm. Thus, a positive stock price response to the initial infusion of public debt capital can be anticipated. Rajan [11] asserted that accessing the public bond market can diversify the firms' debt sources. Because of this, a positive stock price reaction to bond IPO can be

[2]Our sample consists of 151 initial public offerings, 49 of these offerings are straight bond and the remaining is convertible bond. According to the statistics in the paper of Datta et al. [2], the average number of US straight bond IPOs was about six firms per year during the 1971–1994 period.

[3]Firms classified as electronic firms are semiconductor producers, manufactures of TFT-LCDs, telecom suppliers and computer equipment manufacturers listed on the TWSE.

[4]The related financial figures in the TWSE, including the earnings per share (EPS), trading value and trading volume as well as the market value, are all taken or calculated from the *Taiwan Economic Journal Data Bank*. Note that the TWSE was established in 1962 and is an important equity market in the Asia–Pacific region. For example, from January to June, 2005, the trading value of the TWSE ranked the fourth and fifteenth largest stock exchange in the Asia–Pacific region and worldwide, respectively. (see World Federation of Exchange: *Focus Monthly Statistics*, p. 47).

[5]The other differences between the two industries can consult Section 3.

also expected. Given the diverse views of numerous scholars, we conclude that the bond IPO conveys a positive and negative signal to the stock market. This study examines stock price reactions surrounding the announcements of bond IPOs for two industry groups.

Our multinomial logit analysis reveals that R&D expenditures and future growth opportunities are the two main factors that affect the decision as to which types of bonds electronic firms choose to issue. To be more specific, those firms with higher R&D expenditures are more likely to issue straight bonds, while those with higher future growth opportunities are more likely to issue convertible bonds at the bond IPO. We also find that the need for financing is a major factor influencing types of bonds non-electronic firms issue. On the weight of the evidence here, it is clear that firms with significant financing needs are more likely to issue convertible bonds, whereas those without such requirements are more apt to issue straight bonds.

The traditional event study finds that electronic firms experience significant negative abnormal returns around bond IPO announcements, while non-electronic firms experience an insignificant stock price response. We also use various robustness tests to analyze the stock price reaction to initial public bond offer announcements. The results are clear-cut: the stock price response of electronic firms varies with the increment in the public–private debt ratio, the length of maturity, growth prospects, the increment in leverage, the purpose of the bond offer and types of bonds issued. However, based on the results from the robustness tests for non-electronic firms, abnormal returns of various partitioned portfolios are still mostly insignificantly different from zero.

The remainder of this paper is organized as follows: Section 2 develops testable hypotheses. Section 3 provides a description of the data. Section 4 explains the empirical results, and finally, Section 5 presents the conclusions that we draw from this research.

2. Testable hypotheses

A convertible bond permits the owner to exchange it for a specified number of shares of common stock anytime up to and including the maturity of the bonds; by contrast, straight bonds are nonconvertible. As noted above, Green [3] asserted that the reason for issuing convertible bonds is to reduce agency costs between stockholders and bondholders. Bondholders tend to be less concerned about the possibility that stockholders may undertake risky projects since their conversion privilege enables them to participate in the value created if riskier projects are successful. Along similar lines, Brennan and Schwartz [4] contended that in light of the relative insensitivity of convertible bonds to the risk of the issuing firm, it is easier for the bond purchaser and issuer to agree on the value of the bonds. Copeland and Weston [5] also asserted that convertible bonds are better tailored to the cash flow patterns of rapidly growing firms. The lower coupon rate issued during the early periods ensures that the likelihood of bankruptcy is kept at a lower level than is straight bonds; and it follows that, on the condition that the company is successful, more cash for growth becomes available after conversion happens. Lowering issuance of sequential financing and selecting indirect way to get equity, respectively contended by Stein [32] and Mayers [33], are the other possible reasons for issuing convertible bonds.

As noted earlier, electronic firms tend to have a higher future growth opportunities and greater profitability when compared with non-electronic firms. Furthermore, electronic firms belong to the high-technology industry, they may need more external funds for R&D expenditure than non-electronic firms. Our statistics also show that electronic firms not only are in urgent need of public debt financing but also raise more public capital for future expansion than non-electronic firms.[6] Based on the view of the above scholars and the different characteristics of two industry groups, we propose the following hypothesis.

Hypothesis 1. The different characteristics such as future growth opportunities, R&D expenditure and the degree of financing needs exist between electronic firms and non-electronic firms. These characteristics are the main factors to influence types of bonds issuance at the IPO for two industry groups.

[6]The mean time from the stock IPO to the bond IPO for the electronic firms, 2.62 years, is much shorter than that for the non-electronic firms, 9.47 years. The other statistics also show that the mean amount of the initial public debt offer of the electronic firms, NT$1,273.39 million, is greater than that of the non-electronic firms, NT$965.90 million.

Fama [6], Berlin and Loeys [14] and Diamond [15] contended that because informational asymmetry is greater between bondholders and stockholders than it is between banks and stockholders, bond IPOs may produce problems related to asset substitution and under-investment. Therefore, in contrast to bank loan agreements which typically engender a positive stock price response, bond IPOs should convey a negative signal to the stock market. Easterbrook [16], Flannery [17], James [8] and Kale and Noe [18] made the claim that high quality firms are more likely to issue short-term debt. The reasons are that short-term debt can reduce the agency costs of monitoring and potentially be more correctly priced than long-term debt. Thus, those researchers predicted a negative relation between firm quality and debt maturity. Since public debt typically has longer maturity than private debt,[7] it might be expected that bond IPOs have a tendency to convey a negative signal to the stock market.

However, Rajan [11] put forth the view that accessing the public bond market can be less subject to bank hold-up problems that may occur when a firm relies merely on bank borrowing. If this is the case, then the introduction of bond IPOs should have a positive stock price reaction. Ross [13] and Heinkel [14] pointed out that increased firm leverage is a positive signal of the quality of a firm; thus, increased firm leverage is also expected to predict a positive stock price response with the initial infusion of public debt capital. It is notable that Datta et al. [19,20] have found that IPOs of speculative grade debt are underpriced, while those rated investment grade are overpriced, which imply that stock price reactions to bond IPOs may be influenced by bond ratings.

Our statistics show that the amount of initial public offerings to the book value of total debt is 62% for electronic firms but only 33% for non-electronic firms, which indicates that the bond IPOs of electronic firms have a greater change in the firm's private–public debt mix than non-electronic firms do. The other statistics show that the average maturity of the bond IPOs for electronic firms and non-electronic firms is about 5.575 and 5.577 years, respectively. Based on the above discussion, we propose the following hypothesis.

Hypothesis 2. The altering mix of public relative to private debt and the extension of the firm's debt maturity for electronic firms are different from that for non-electronic firms at the initial infusion of public debt capital, therefore different stock price reactions of two industry groups around bond IPO announcements are expected.

3. Data description

We obtain a sample of initial public offers of corporate bonds made during the 14-year, 1990–2003 period from TEJDB. During the study period, the sample consists of 151 initial public debt offerings, except for those of financial firms. Eighty of these offerings are made by electronic firms, and the remaining by non-electronic firms.

Table 1 shows the frequency distribution of bond IPOs by offer year, by types of issuing bonds and by length of time between the stock IPO and the bond IPO. The results shown in Panel A reveal a wide range in the number of initial public bond offers over time, from no observations in 1993 and 1995 to the considerably high number of 37 in 2002. In our sample, the mean number of bond IPOs is approximately 11 firms each year. Panel B indicates types of bonds issued, with over 67% being convertible bonds and the remaining being straight bonds. Noteworthy is that about 76% of the electronic firms issued convertible bonds, a figure which is larger than that for non-electronic firms (58%). The possible reasons for issuing convertible bonds stated in the previous section may well explain this finding.

The length of time between the stock IPO and the bond IPO is shown in Panel C of Table 1 and Panel A of Table 2. The mean (median) time between the initial public offers of equity and the first public bond offers is 5.84 (2.89) years for the whole sample. Note that the stock IPO must have come before the debt IPO in our sample firms. The results also show that the mean (median) time from the equity IPO to the bond IPO for non-electronic firms, 9.47 (6.03) years, is much longer than that for electronic firms, 2.62 (1.92) years. This may be attributed to the fact that electronic firms grew faster than non-electronic firms during our study period; thus,

[7]Public debt typically has longer maturity than does private debt (such as a bank debt). For example, Gudes and Opler [31] reported that the mean maturity of seasoned offers is 12.2 years, and Datta et al. [2] found that the mean maturity of bond IPOs is 12 years in the US. The statistics also show that the mean maturity of bond IPOs is 5.58 years in Taiwan.

Table 1
Frequency distribution of bond IPOs by issue year, type of the bond IPO and time between the stock IPO and the bond IPO

Year	Frequency	Percentage	Year	Frequency	Percentage
Panel A: *Frequency distribution of initial public bond offers by offer year*[a]					
1990	1	0.66	1998	14	9.27
1991	9	5.96	1999	10	6.62
1992	4	2.65	2000	21	13.91
1994	4	2.65	2001	19	12.58
1996	14	9.27	2002	37	24.50
1997	17	11.26	2003	1	0.66
Panel B: *Types of issuing bonds*					
				Frequency	Percentage
Electronic firms:				80	
Straight bond				19	12.58 (23.75)[b]
Convertible bond				61	40.40 (76.25)
Non-electronic firms:				71	
Straight bond				30	19.87 (42.26)
Convertible bond				41	27.15 (57.74)
Panel C: *Time in years from the stock IPO to the bond IPO*					
				Frequency	Percentage
Lag $\leqslant$ 1 Year				12	7.95
1 $<$ lag $\leqslant$ 5				89	58.94
5 $<$ lag $\leqslant$ 10				27	17.88
10 $<$ lag				23	15.23

[a]The study period was from June, 1990 to January, 2003.
[b]$19/151 = 0.1258$ and $19/80 = 0.2375$.

in addition to making equity financing and bank borrowing, electronic firms seem to have been eager to obtain public debt financing for their long-term investments.

As shown at the top of Table 2, the mean of the book value of total assets for non-electronic firms, as measured in the pre-offering year, is larger than that for electronic firms; conversely, the mean of the market value of common stocks for non-electronic firms is smaller than that for electronic firms. As noted above, the quarterly average earnings per share of electronic firms is NT$ 1.69, whereas that of non-electronic firms is only NT$ 0.70 in our study period. This may be the reason that the market value of common stocks for electronic firms is larger than that for non-electronic firms.

The middle part of Table 2 shows that the debt ratio averages about 40% for the whole sample in the pre-offering year, with about 74% of the debt consisting of current liabilities. The fact that long-term debt is about 26% of total debt implies that the long-term debt is about 10.4% of the total assets for the whole sample.[8] We also obtain the ratio of the long-term debt to total assets for the two industry groups: about 8% for electronic firms and 13.4% for non-electronic firms. The different proportion between the two groups may be on account of the fact that non-electronic firms had more real assets, such as land and buildings, which could be used as collateral for a loan, thereby enabling them to finance more of their assets with debt. Electronic firms, on the other hand, belong to the high-technology industry where assets are ''soft'', such as those for research and development, thus making these firms less able to acquire debt financing.

The mean amount of the initial public debt offer of electronic firms, NT$1273.39 million, is greater than that of non-electronic firms, NT$965.90 million. This is highly indicative not only that electronic firms are in urgent need of public debt financing but also that they raise more public capital for future expansion. The amount of offering as a percentage of the book value of total assets, the market value of common stocks and the book value of total debt are shown at the bottom of Table 2. For the whole sample, the mean issue size is 15.71% of the book value of total assets, 11.90% of the market value of equity and 48.31% of the book value

[8]Long-term debt/total assets = (total debt/total assets) × (long-term debt/total debt) = 40.12% × 25.99% = 10.4%.

Table 2
Descriptive statistics of offering firms and their bond IPOs

Variables	Mean	Median	Std Dev.
Panel A: *Descriptive Statistics*[a]			
Time from stock IPO to bond IPO:			
Whole sample (in years)	5.84	2.89	7.56
Electronic firms	2.62	1.92	2.71
Non-electronic firms	9.47	6.03	9.43
Book value of total assets:			
Whole sample (in NT$ millions)	10937.59	5327.14	15964.18
Electronic firms	9553.84	4497.16	13466.56
Non-electronic firms	12496.77	6737.37	18352.10
Market value of common stock:			
Whole sample (in NT$ millions)	16527.79	7215.00	26751.42
Electronic firms	19033.46	6987.50	30601.81
Non-electronic firms	13704.51	7371.00	21479.68
Debt ratio (Total debt/total assets):			
Whole sample (%)	40.12	40.21	12.33
Electronic firms	38.67	38.92	12.92
Non-electronic firms	41.76	41.59	11.49
Current liabilities/total debt:			
Whole sample (%)	74.01	78.68	20.30
Electronic firms	79.36	84.26	18.40
Non-electronic firms	67.99	70.45	20.77
Amount of offering:			
Whole sample (in NT$ millions)	1128.81	700.00	1296.46
Electronic firms	1273.39	800.00	1486.59
Non-electronic firms	965.90	650.00	1028.03
Amount of offering/book value of total assets :			
Whole sample (%)	15.71	14.11	9.50
Electronic firms	19.15	19.79	10.24
Non-electronic firms	11.83	10.66	6.82
Amount of offering/market value of common stock:			
Whole sample (%)	11.90	10.29	7.57
Electronic firms	12.27	10.25	8.62
Non-electronic firms	11.49	10.44	6.22
Amount of offering/book value of total debt:			
Whole sample (%)	48.31	36.18	45.40
Electronic firms	62.00	42.40	54.33
Non-electronic firms	32.89	23.96	25.11

Panel B: *Maturity distribution of sample debt IPOs*		
Maturity (Years)	Frequency	Percentage
3	9	5.96
4	4	2.65
5	105	69.54
7	18	11.92
8	1	0.66
10	14	9.27

[a]The financial variables are collected from the *Taiwan Economic Journal Data Bank* for the year preceding the bond IPOs.

of total debt prior to the offer. The last statistics (48.31%) indicate that introducing bond IPOs significantly impacts a firm's leverage, and thus, should lead to a major change in the debt ownership structure, which is consistent with the finding of Datta et al. [2] in the United States. When either the mean or median value of each of the two industry groups is compared, it is obvious that the values for electronic firms are higher than those for non-electronic firms. For example, the mean issue value is 62% of the book value of total debt for electronic firms, but only 33% for non-electronic firms, which indicates that the bond IPOs of electronic firms have a greater impact on those firms' leverage. Panel B of Table 2 shows that more than 90% of bond IPOs have a maturity ranging from 5 to 10 years. The mean maturity of bond IPOs is 5.58 years, with a standard deviation of 1.67 years. This finding shows that bond IPOs obviously contribute to extending a firm's average debt maturity.

Overall, our analysis of the financial variables in Taiwan reveals that the characteristics of electronic firms are substantially different from those of non-electronic firms, which reconfirms our initial expectation. It is appropriate that we partition the whole sample into two groups: electronic firms and non-electronic firms.

4. Empirical results

Our empirical study includes of a multinomial logit model, an event study, robustness tests and cross-sectional regressions in this section. The multinomial logit model is capable of shedding light on those factors that influence types of bonds that firms decide to issue the first time. The standard event study method is used to examine stock price responses to the bond IPOs announcements. The robustness tests examine whether stock price reactions can be attributed to variations in the ΔPP ratio (increment in the public–private debt ratio), the length of maturity, the increment in leverage, variations in MTB, different purposes for the bond offers and different types of bonds issued. It should be pointed out that there is some overlap among the various sub-samples in the robustness tests. Our cross-sectional regressions which use stepwise selection procedures, nevertheless, can distinguish between the confounding effects of the variables. The empirical findings are individually discussed in the following.

4.1. Multinomial logit analysis

As noted earlier, in choosing types of bonds a firm issues at the bond IPOs, there are but three alternatives; these are issuing straight bonds (non-convertible), issuing convertible bonds and non-issuing. As for which alternative is selected, the multinomial logit model is an ideal approach to analyzing the issue when there are more than two alternatives.[9]

Integrating the assertions of Myers [23], Pagano et al. [24], Datta et al. [2] and Denis and Mihov [25], this study uses sales as the proxy for firm size (*Sales*). It also uses the sales growth rate (*Growth*) and the ratio of capital expenditures to total assets (*Capex*) to measure a firm's need for financing.[10] Additionally, it uses the ratio of the market value of equity plus the book value of total debt to the book value of assets (*MTB*) as the proxy for future growth opportunities. To measure insider stock ownership, this study employs the ratio of the number of shares owned by directors, governors and managers to the total number of shares outstanding (*Inership*). This study asserts that research and development expenditure, especially those for electronic firms, are an important influential factor when it chooses to types of bonds a firm issues.[11] Accordingly, the analysis also considers the ratio of research and development expenditure to sales (*R&D*). These variables are considered as independent variables in our multinomial logit analysis.

[9]For a review of the multinomial logit model, see Refs. [21,22].

[10]The sales growth rate is defined as follows: $Growth = (Sales_t - Sales_{t-1})/Sales_{t-1}$. The subscript t indicates the year-end value for the year of the offer, and $t-1$ indicates the year-end value for the year prior to the offer.

[11]In the unreported results from the univariate test and logit analysis, R&D expenditures have a significantly positive impact on the probability of undertaking a bond IPO for the electronic firms, but for the non-electronic firms, R&D expenditures have an insignificant impact on access to the public debt market. The results suggest that the electronic firms may require more external funds for R&D expenditures than the non-electronic firms.

Table 3
Multinomial logit regressions predicting types of bonds at the IPOs

	Whole sample		Electronic firms		Non-electronic firms	
	(1) $\ln\left(\frac{P_{si}}{P_{ni}}\right)$[1]	(2) $\ln\left(\frac{P_{ci}}{P_{ni}}\right)$[1]	(3) $\ln\left(\frac{P_{si}}{P_{ni}}\right)$	(4) $\ln\left(\frac{P_{ci}}{P_{ni}}\right)$	(5) $\ln\left(\frac{P_{si}}{P_{ni}}\right)$	(6) $\ln\left(\frac{P_{ci}}{P_{ni}}\right)$
Sales	1.084[a] [2]	0.769[a]	0.999[a]	0.707[a]	1.046[a]	0.693[a]
	(0.209)	(0.160)	(0.343)	(0.235)	(0.287)	(0.237)
Growth	0.012[b]	0.012[b]	0.012[c]	0.012[c]	0.008	0.004
	(0.005)	(0.005)	(0.007)	(0.007)	(0.012)	(0.011)
Capex	0.028	0.043[a]	0.067[b]	0.056[a]	0.006	0.039[c]
	(0.021)	(0.016)	(0.033)	(0.025)	(0.030)	(0.022)
MTB	−0.902[a]	−0.061	−0.456	0.356[c]	−1.647[a]	−0.836[b]
	(0.277)	(0.136)	(0.377)	(0.205)	(0.514)	(0.324)
R&D	0.179[b]	0.119[b]	0.241[a]	0.114	0.053	0.149
	(0.074)	(0.058)	(0.091)	(0.073)	(0.256)	(0.163)
Inership	−0.024[c]	−0.012	−0.026	−0.019	−0.017	−0.004
	(0.013)	(0.010)	(0.026)	(0.017)	(0.016)	(0.013)

[1] P_{ni}, P_{si} and P_{ci} are the probability of the ith firm nonissuing, issuing straight bonds and issuing convertible bonds, respectively.
[2] a, b and c indicate statistical significance at the 1, 5 and 10 percent level, respectively, and the standard errors are reported in parentheses below the corresponding coefficients.

In a multinomial logit, one alternative has to be selected as the base alternative, and then each other possible choice is compared to this base alternative with a logit equation. Non-issuing is an appropriate base alternative in our study. The dependent variables of these equations are the log-odds ratios of the probability of each of the other possible alternatives to the base alternative. Here, we estimate the following multinomial logit model[12]:

$$\ln\left(\frac{P_{si}}{P_{ni}}\right) = \alpha_0 + \alpha_1 Sales_i + \alpha_2 Growth_i + \alpha_3 Capex_i + \alpha_4 MTB_i + \alpha_5 R\&D_i + \alpha_6 Inership_i, \quad (1)$$

$$\ln\left(\frac{P_{ci}}{P_{ni}}\right) = \beta_0 + \beta_1 Sales_i + \beta_2 Growth_i + \beta_3 Capex_i + \beta_4 MTB_i + \beta_5 R\&D_i + \beta_6 Inership_i. \quad (2)$$

In Eqs. (1) and (2), P_{ni} is the probability of the ith firm choosing non-issuing; P_{si} and P_{ci} are the probability of the ith firm choosing to issue straight bonds and convertible bonds, respectively.

The estimated coefficients and their standard errors are given in Table 3. The "whole sample" column of the table reports that firm size, as measured by the *Sales* variable, is respectively significant and positively related to the probability of issuing straight bonds and convertible bonds relative to non-issuing at the 1% level. The results of a firm's need for financing, as measured by the *Growth* and *Capex* variables, show that the coefficients of the *Growth* variable are, respectively, significant and positively related to the probability of selecting straight bonds and convertible bonds at the 5% level. Although the coefficient of the *Capex* variable is only significantly positively related to the probability of issuing convertible bonds at the 1% level, it also has a positive impact on the probability of selecting straight bonds for the whole sample.

Our empirical proxy for expected future growth opportunities (*MTB*) is statistically negatively related to the probability of choosing straight bonds at the 1% level, and the coefficient of the *MTB* variable is still negative but insignificantly related to the probability of selecting convertible bonds for the whole sample. These findings suggest that issuing straight bonds is more likely to be associated with lower expected future growth opportunities than is the issuing of convertible bonds.

[12] The multicollinearity problem is detected in the regressions.

The coefficient of the *R&D* variable is, respectively, significantly positively related to the probability of the whole sample issuing straight bonds and convertible bonds at the 5% level. Finally, the probability of issuing straight bonds is significantly negative to managerial ownership (*Inership*), which supports the finding of Denis and Mihov [25]. The result, however, also reveals that managerial ownership is not related to the likelihood of issuing convertible bonds at the debt IPOs.

Next, we shift our focus to comparing the differences between the two industry groups. The first difference, as shown in columns (3) and (5) of Table 3, is that the coefficients of the *Growth* and *Capex* variables, the proxies for a firm's need for financing, are significantly positively related to the likelihood of the electronic firms issuing straight bonds, yet they are unrelated to the likelihood of the non-electronic firms issuing straight bonds. These findings strongly indicate that during the sample period, when firms chose straight bonds to raise new funds, electronic firms had a stronger need for external capital than did non-electronic firms.

The second difference between the two groups is that, for non-electronic firms, the variable for expected future growth opportunities (*MTB*) is, respectively, significantly negatively related to the likelihood of issuing straight and convertible bonds. For electronic firms, however, the coefficients of the *MTB* variable are, respectively, insignificantly and significantly positively related to the likelihood of issuing straight and convertible bonds.

In the case of non-electronic firms, owing to the negative relation between the MTB and the issuance of public debt, it may be interpreted that firms with greater growth prospects are more apt to be regarded as good customers by banks. Therefore, in comparison with public debt, bank debt (private debt) financing is a less costly financing source for higher growth firms. As Myers' [23] corollary contends that firms with access to the public debt market are liable to have lower future growth opportunities than are firms that depend mainly on internal equity capital. Our finding for non-electronic firms does, indeed, support Myers' corollary and is also consistent with the evidence of a negative relation between expected future growth opportunities and leverage, as reported by Rajan and Zingales [26], Jung et al. [27] and Datta et al. [2] for US firms.

In the case of electronic firms, the positive relation between the MTB and the issuance of convertible bonds obviously contradicts the findings from previous studies. This phenomenon may be explained by Green's [3] assertion, noted above, that argues that the reason for issuing convertible bonds is that it can reduce agency costs between stockholders and bondholders. Higher growth firms generally incur higher agency costs, and the mean MTB of electronic firms (2.35) is higher than that of non-electronic firms (1.55) in our sample. Therefore, for the purpose of reducing their agency costs, electronic firms have a greater incentive to issue convertible bonds than do non-electronic firms.

The final difference between the two industry groups, shown in columns (3) and (5) of Table 3, is that the coefficient of *R&D* is significantly positively related to the likelihood of electronic firms issuing straight bonds; by contrast, it is unrelated to the probability of non-electronic firms issuing straight bonds. The result reveals that research and development expenditures are an important predictor of issuing straight bonds for electronic firms. These findings of the difference between the two industry groups are consistent with Hypothesis 1, which asserts that future growth opportunities, R&D expenditure and the degree of financing needs are the main factors to influence types of bonds issuance at the IPO for two industry groups.

4.2. Abnormal returns around the announcement date

This section uses the market model to examine stock price behavior around the announcement date of bond IPOs. The parameters are estimated using daily stock returns from day -150 to -31, where the announcement (event) date is defined as day 0 and the TWSE Equity Index is used as the proxy for the market. The daily average abnormal returns (AARs) and the cumulative average abnormal returns (CARs) are calculated over the day -30–$+30$ period relative to the event day 0 (announcement day) for the full sample of the 151 bond IPOs. Due to space constraints, only some of the AARs and CARs are reported in Table 4.

The "whole sample" column in the Table 4 shows that on the announcement day (day 0), there is a negative stock price response of -0.204% which is statistically significant at the 5% level. The two-day $(0,+1)$ cumulative abnormal returns of -0.259% around the announcement date are also statistically significant. Similarly, the "electronic firms" column in Table 4 shows that the AARs of day 0 and 1 are -0.261% and -0.198%, respectively, both of which are statistically significantly negative. The CARs for the (0,1) and

Table 4
Standardized daily stock abnormal returns (SAR)[1] around bond IPO announcements

Windows	Whole sample	Electronic firms	Non-electronic firms
−1	0.065 (%)[2]	−0.057 (%)	0.198 (%)
	(0.129)	(0.101)	(0.247)
0	−0.204[b] [3]	−0.261[a]	−0.143
	(0.103)	(0.129)	(0.165)
+1	−0.055	−0.198[b]	0.101
	(0.087)	(0.104)	(0.141)
(0, +1)	−0.259[c]	−0.458[a]	−0.042
	(0.155)	(0.182)	(0.254)
(−1, +1)	−0.194	−0.516[a]	0.156
	(0.201)	(0.229)	(0.334)
(−4, +4)	−0.119	−0.711[b]	0.525
	(0.351)	(0.386)	(0.594)
(−30, −2)	−0.071	−0.268	0.142
	(0.685)	(0.882)	(1.065)
(+2, +30)	0.210	−0.710	1.211
	(0.663)	(0.769)	(1.095)

[1]An abnormal return is calculated as the difference between the actual and expected return.An expected return is generated from the market model parameters.

[2]0.065% is the standardized daily stock abnormal returns (SAR).

[3]a, b and c indicate statistical significance at the 1, 5 and 10% level, respectively, and the standard errors are reported in parentheses below the corresponding AARs or CARs.

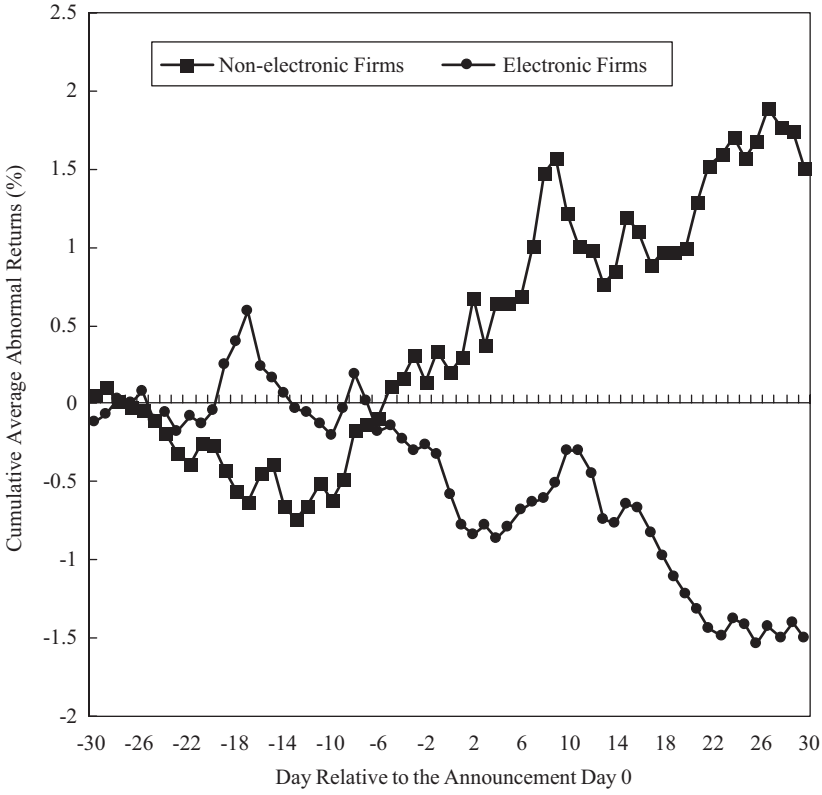

Fig. 1. Cumulative abnormal returns (CARs) surrounding the announcement day of the two industry groups.

$(-1,+1)$ windows are -0.458% and -0.516%, respectively, and both are significantly negative at the 1% level. The stock price behavior around the bond IPO announcement date of the non-electronic firms reveals a totally different phenomenon: all the windows are statistically insignificant. Fig. 1 exhibits the CARs surrounding the announcement day of the two industry groups. Integrating the findings for the two industry groups can be useful in explaining the results of the significantly negative AARs on the announcement day and the CARs in the $(0,+1)$ window for the whole sample, i.e., the stock price reactions of the whole sample are influenced by the electronic firms, not by the non-electronic firms.

The increased monitoring cost associated with the introduction of public debt is one explanation for the negative stock price response of electronic firms at the bond IPOs. A corollary of Myers [23] model states that maturity-extending issuance is a signal of poor growth opportunity, also explaining the adverse price response to bond IPOs announcement. However, this finding obviously does not support the contention that firms with increased leverage and more diversified debt financing sources with initial public debt offerings should convey a favorable signal to the stock market.

Overall, our empirical results indicate that electronic firms appear to have statistically significantly negative abnormal returns and that non-electronic firms experience insignificant abnormal returns surrounding the announcements of debt IPOs. The results support Hypothesis 2, which predicts different stock price reactions of two industry groups around bond IPOs announcements. The result also implies that investment strategies based on the announcements of bond IPOs for electronic firms should generate gains in wealth or reduce losses in the wealth of investors; that is to say that investors can sell shares short if they do not already own or that investors can sell shares if they own shares on hand just on and before the announcements of bond IPOs.

4.3. Robustness tests

The results from the above research show that bond IPO announcements for electronic and non-electronic firms convey different information to the stock market. It is important to investigate whether negative abnormal returns can be attributed to the ΔPP ratio (increment in the public–private debt ratio), the length of maturity, an increment in leverage, the variations in MTB, the purpose for the bond offers and types of issuing bonds. To this end, we partition the whole sample and the two industry groups into various sub-groups. The findings are described in the following.

4.3.1. Stock price response and public–private debt mix

Because debt IPOs alter the public–private debt mix, we can evaluate an increment in public–private debt after undertaking a bond IPO. An increment in the public–private debt, the ΔPP ratio, is defined as the public offering amount divided by the private debt of the pre-offering. Since a public debt offer of a larger amount affects the ΔPP ratio more than one of a smaller amount, it is anticipated that a firm with a higher ΔPP ratio should experience a more negative stock price response than a firm with a lower ΔPP ratio.

On the basis of their respective ΔPP value, we rank from the smallest to the largest, and then we form three portfolios for 151 sample firms. The lower ΔPP ratio portfolio consists of those firms with the lowest ΔPP values, the medium ΔPP ratio portfolio represents those with the next lowest and the higher ΔPP ratio portfolio comprises those with the highest ΔPP values. To analyze the differences in the stock price reactions to the various portfolios, we estimate the stock abnormal returns for each portfolio in the $(0,+1)$ window. The empirical findings are reported in the upper part of Table 5.

The "whole sample" column in Table 5 shows that the CARs for the lower and medium ΔPP portfolios are 0.013% and -0.201% in the $(0,+1)$ window, respectively, and these are both insignificantly different from zero. However, the CARs for the Higher ΔPP ratio portfolio present a negative and significant stock price reaction, with the CARs of -0.534% ($t=-1.963$). Similarly, the CARs of electronic firms for both the lower and higher ΔPP ratio portfolios show an insignificant stock price reaction, while that for the medium ΔPP ratio portfolio, with the CARs of -0.465% ($t=-2.102$), shows a negative and significant stock price reaction. The results for non-electronic firms display totally different findings, i.e., all three portfolios show an insignificant stock price reaction in the $(0,+1)$ window. The findings for the whole sample and electronic firms reveal that a firm with a higher ΔPP ratio tends to experience a more negative stock price response.

Table 5
Robustness tests around bond IPO announcements

Subsample type	Whole sample		Electronic firms		Non-electronic firms	
	CAR (%)	*t*-statistic (n[1])	CAR (%)	*t*-statistic (n)	CAR (%)	*t*-statistic (n)
Public-private debt mix:						
Lower ΔPP ratio portfolio	0.013	0.041 (49)	−0.084	−0.423 (25)	0.379	0.705 (23)
Medium ΔPP ratio portfolio	−0.201	0.907 (49)	−0.465[b]	−2.102 (26)	−0.082	−0.175 (23)
Higher ΔPP ratio portfolio	−0.534[b] [2]	−1.963 (49)	−0.683	−1.448 (26)	−0.444	−1.384 (24)
Maturity of BIPO:						
Portfolio 1 (0 < Maturity < 5 years)	−0.094	−0.238 (18)	−0.076	−0.173 (10)	−0.109	−0.165 (9)
Portfolio 2 (Maturity = 5 years)	−0.238	−1.250 (97)	−0.347[b]	−2.030 (53)	−0.109	−0.299 (44)
Portfolio 3 (5 years < maturity)	−0.384	−1.125 (36)	−0.963	−1.573 (18)	0.160	0.550 (18)
Market-to-book ratio:						
Lower MTB portfolio	−0.175	−0.693 (50)	0.034	0.148 (26)	−0.908[b]	−2.615 (23)
Medium MTB portfolio	0.300	1.148 (50)	−0.213	−0.974 (27)	0.715	1.425 (24)
Higher MTB portfolio	−0.889[a]	−3.339 (51)	−1.176[a]	−2.870 (27)	0.030	0.075 (24)
Impact of increment in leverage:						
Lower ΔOT ratio portfolio	0.083	0.262 (50)	−0.015	−0.075 (26)	0.185	0.342 (23)
Medium ΔOT ratio portfolio	−0.222	−1.032 (50)	−0.381	−1.488 (27)	−0.120	−0.251 (24)
Higher ΔOT ratio portfolio	−0.630[b]	−2.427 (51)	−0.961[b]	−2.293 (27)	−0.181	−0.628 (24)
Purpose of the offering[3]*:*						
Capital expenditure	−0.020	−0.074 (44)	−0.235	−1.121 (31)	0.476	0.651 (13)
Repayment of bank debt	−0.242	−0.590 (34)	−0.939	−1.391 (14)	0.317	0.668 (20)
Repayment of other debt	−0.317	−1.031 (39)	−0.024	−0.082 (14)	−0.452	−1.051 (25)
General funding	−0.510[c]	−1.789 (34)	−0.766[c]	−1.910 (21)	−0.145	−0.377 (13)
Types of issuing bonds:						
Convertible bond	−0.145	−0.770 (101)	−0.504[b]	−2.308 (61)	0.412	1.268 (40)
Straight bond	−0.504[c]	−1.867 (50)	−0.279	−1.041 (19)	−0.617	−1.607 (31)

[1]"n" indicates the number of firms in each sub-sample.
[2]a, b and c indicate the significant difference at the 1, 5 and 10% level, respectively.
[3]Following the paper of Datta et al. [2], the sample is divided into four groups.

4.3.2. Stock price response and the maturity of bond IPOs

As noted above, Flannery [17] and Kale and Noe [18] advocated that high quality firms are more likely to issue short-term debt, whereas low quality firms are more likely to issue long-term debt. A decision to issue public debt obviously extends a firm's average debt maturity, and therefore, the bond IPOs are expected to convey a negative signal to the stock market. Further, the longer the maturity of a debt offer is, the more negative the anticipated stock price response is. As noted earlier, more than 90% of the bond IPOs in the Taiwan bond market have a maturity ranging from 5 to 10 years. Hence, we partition the sample into three groups, i.e., the maturity of the bond IPOs is less than 5 years form portfolio 1, equal to 5 years make up portfolio 2 and greater than 5 years form portfolio 3. The empirical findings are presented in the upper part of Table 5.

The finding in the "electronic firms" column shows insignificantly negative stock price reactions for portfolio 1 in the $(0,+1)$ window. However, the CARs of portfolio 2 which are -0.347% ($t=-2.030$) appear to be significantly negative at the 5% level. The CARs of portfolio 3 are also weakly significantly negative at the 12.5% level. When we compare the results of three portfolios for electronic firms, the result shows that a firm with longer maturity tends to experience a more negative stock price response. The findings for non-electronic firms display a completely different phenomenon, i.e., the CARs of the three portfolios are all insignificantly different from zero during the $(0,+1)$ period. Integrating the CARs of both electronic firms and non-electronic firms, it reasonably results in the CARs for the whole sample. When the maturity distribution of bonds between the US and Taiwan markets are compared, the range or standard deviation of

maturity distribution of the bonds in the Taiwan market is smaller than that in the US market,[13] which may explain why firms with the longer maturity do not experience more obvious negative stock price responses in the TWSE.

4.3.3. Stock price response and the monopoly of bank information

In arguing that costs are incurred in bank financing because of a monopoly of bank information, Rajan [11] claimed that the diversification of a firm's debt financing sources should prevent a bank from being able to extract a surplus from that firm. High growth firms that reduce their reliance on bank debt after the bond IPOs may benefit from the broadening and diversification of their financing options through bond IPOs. As mentioned earlier, Diamond [28] also conjectured that the diversification of a firm's debt sources implies financial flexibility. Therefore, this study uses the MTB variable, i.e., the proxy for growth opportunities, to indirectly test the relation between stock price responses and the monopoly of bank information. We expect that firms with higher MTB experience a less adverse stock price response to debt IPO announcements. We rank our sample firms on the basis of their MTB values, from the smallest to the largest, and then we form three portfolios. We partition the sample into three portfolios in the same way as that described for the ΔPP ratio portfolios.

For electronic firms, the results indicate that a portfolio with higher MTB tends to experience more adverse stock price responses to bond IPO announcements. For example, the CARs of the higher MTB portfolio are -1.176%, which is significantly negative at the 1% level. For non-electronic firms, however, the results show that the CARs of the lower MTB portfolio are -0.908% in the $(0,+1)$ window, which is significantly negative at the 5% level. Both the medium and higher MTB portfolios experience positive cumulative abnormal returns, but these are insignificantly different from zero. In brief, in the electronic industry, the results show that high growth firms cannot benefit from diversifying their debt financing sources through bond IPOs. For non-electronic firms, the findings indicate that a portfolio with lower MTB experiences more adverse stock price responses to debt IPO announcements, which is consistent with our expectation.

4.3.4. Stock price response and increment in leverage

As mentioned above, Ross [12] and Heinkel [13] argued that increased firm leverage is a positive signal of a firm's quality. Moreover, the literature survey of Smith [29] also reported a positive relation between a change in leverage and stock price reaction. In order to examine the relation between a pure increment in leverage and stock price response surrounding announcements of bond IPOs, we define an increment in leverage, ΔOT, as the offering amount divided by the total assets of the pre-offering.[14] We rank the sample firms on the basis of their ΔOT values, from the smallest to the largest. We partition the sample into sub-groups in the same way as that for the ΔPP ratio portfolios and MTB portfolios. The empirical findings are presented in the middle part of Table 5.

The CARs for the whole sample and electronic firms are insignificantly different from zero for the lower and medium ΔOT ratio portfolios. Only the higher ΔOT ratio portfolio has a negative and significant stock price response, with CARs of -0.630% ($t=-2.427$) for the whole sample and of -0.961% ($t=-2.293$) for electronic firms in the $(0,+1)$ window. These findings indicate that the greater the amount of the initial public debt offer is, the more negative the stock price response is; this is not consistent with Ross and Heinkel's assertion. The CARs of the three portfolios for non-electronic firms are still insignificantly different from zero during the $(0,+1)$ period.

4.3.5. Stock price response to bond IPOs by offering purpose

Newly raised public funds may be used to buy land, property plants and equipment, to repay a debt or to serve as general funding, which contain different levels of information. As noted above, McConnell and

[13]The range and standard deviation of the maturity distribution of bonds in the U.S. market, estimated from the paper of Datta et al. [2], are about 28 and 4.58 years, respectively, and those in the Taiwan market are about 7 and 1.67 years, respectively.

[14]A traditional increment in leverage is defined as the difference in debt ratio (total debt/total asset, DR) between DR at time t and DR at time $t-1$. In order to capture the increased use of debt financing caused by bond IPOs, a pure increment in leverage, ΔOT, is defined as the ratio of the offering amount to total assets of the pre-offering.

Muscarella [30] found that announcements of an increase in planned future capital expenditures are associated with significantly positive excess stock returns for industrial firms. Datta et al. [2], however, have found evidence in support of a negative stock price response to capital expenditures on the announcement date of the bond IPO. Four primary purposes for the bond IPOs are capital expenditure, repayment of bank debt, repayment of other debts and general funding in the Taiwan bond market. To determine whether the stock price reactions are related to the purpose of the offer, we partition the sample into four groups based on the purpose of the offer.

The findings for stock price responses to the purpose of the offering are presented in the bottom part of Table 5. The CARs for the whole sample and electronic firms show an insignificant stock price reaction for capital expenditure, repayment of bank debt and repayment of other debt purposes. Only the purpose of general funding presents a negative and significant stock price reaction, with CARs of -0.510% ($t = -1.789$) for the whole sample and -0.766% ($t = -1.910$) for electronic firms in the $(0, +1)$ window. The CARs for non-electronic firms are still insignificantly different from zero for four subsamples. In short, our results indicate that negative stock price reactions can be attributed to the purpose of the offer for both the whole sample and electronic firms.

4.3.6. *Stock price response and the types of issuing bonds*

As noted earlier, the possible reasons for issuing convertible bonds are to reduce agency costs, to lower the probability of bankruptcy and to facilitate agreements between issuers and purchasers as to the value of bonds, which differ from the reasons for issuing straight bonds. To test whether there are differences in the stock price reactions to the types of issuing bonds, we classify the sample into a convertible bonds group and a straight bonds group. The stock price responses to the types of issuing bonds are presented in the bottom part of Table 5.

For the whole sample, the results demonstrate that the stock price reaction to issuing straight bonds is statistically significantly negative, with CARs of -0.504% ($t = -1.867$) in the $(0, +1)$ window. For electronic firms, the results show that the cumulative abnormal returns of issuing convertible bonds are also statistically significantly negative, with CARs of -0.504% ($t = -2.308$) during the $(0, +1)$ period. This may be because convertible bonds can be exchanged for common stocks in the future. That is, issuing convertible bonds to raise capital may merely be considered a "deferred equity"; therefore, the stock price response is similar to the response of stock IPOs. For non-electronic firms, the findings show that the stock price reaction to issuing convertible bonds or straight bonds is insignificant around the announcement date.

4.4. *Cross-sectional regressions*

One inherent problem with investigating sub-groups independently is that there is the possibility of there being an overlap among various sub-groups. With regard to the whole sample, for example, 29 of the 49 firms that are in the higher ΔPP ratio portfolio are also in the higher ΔOT ratio portfolio. To overcome such problem, we run a stepwise regression to distinguish between the confounding effects of the variables. The dependent variable in the regression model is the CARs in the $(0, +1)$ window. The independent variables are the ΔPP ratio (increment in the public–private debt ratio), maturity, the ΔOT ratio (increment in leverage), MTB, three dummy variables for the offering purposes (indicating whether the purpose is for repayment of a bank debt (Bank debt), repayment of other debt (Other debt), general funding (Funding) or capital expenditure (base level)) and one dummy variable for types of bonds issued (convertible bonds or straight bonds). The regression results are presented in Table 6.

For the whole sample, the coefficient of the ΔOT ratio, representing an increment in leverage, has a significantly negative relationship with the CARs. The fact that a change in equity wealth at the bond IPO announcement is inversely related to an increment in leverage is obvious. This finding is inconsistent with Ross' [12] signaling model, which contends that an increased use of debt financing is a "positive news" event. The MTB variable, the proxy for bank information monopoly, does not enter the stepwise regression, which indicates that firms with more diversified debt financing sources through the bond IPO do not convey a favorable signal to the stock market. The coefficient of the dummy variable (Convertible), representing the issuance of convertible bonds, is significantly positively related to the CARs, suggesting that issuing

Table 6
Cross-sectional regression results[1]

Independent variable	Dependent variable	
	Whole sample	Electronic firms
Intercept	−0.0819	0.2783
	(0.78)	(0.41)
ΔPP Ratio	***[2]	***
Maturity	***	***
ΔOT ratio	−4.1980	−2.7759
	(0.01)[3]	(0.07)
MTB	***	***
Bank debt	***	−0.8533
		(0.03)
Other debt	***	***
Funding	***	***
Convertible	0.7361	***
	(0.03)	
R^2	0.051	0.088
F	3.88	3.48

[1]The CARs of the non-electronic firms in the (0, 1) window are not significant; thus, the non-electronic industry is not considered in the regression analyses.
[2]*** indicates that the ΔPP ratio does not enter the stepwise regression.
[3]The p-values are reported in parentheses.

convertible bonds at the bond IPOs is received less negatively compared to the issuing of straight bonds (used as the base level).

For electronic firms, the coefficient of the ΔOT ratio, representing an increment in leverage, also has a significantly negative relationship with the CARs. The coefficient of Bank debt, representing the purpose of repaying a bank debt, is significantly negatively related to the CARs. This means that the average cumulative abnormal returns of the purpose of repaying a bank debt are lower than that of the purpose of capital expenditure (used as the base level) in the $(0, +1)$ window. This indicates that firms with the purpose of capital expenditure do experience a less adverse stock price relative to the purpose of repaying a bank debt. In short, our findings indicate that the four different purposes of debt IPOs generate different market reactions around an announcement period for electronic firms.

5. Conclusions

This study examines the determinants of types of bonds at the IPOs for the Taiwan stock exchange (TWSE) during the 1990–2003 period. The multinomial logit analysis reveals that firms with higher R&D expenditures are more likely to issue straight bonds, while those with higher future growth opportunities are more likely to issue convertible bonds. The regression results also show that the need for financing is the main factor that influences types of bonds issued for non-electronic firms; that is, firms with (without) significant financing needs are more likely to issue convertible (straight) bonds.

The primary evidence from the event study shows a significantly negative stock price response to debt IPO announcements for electronic firms. However, non-electronic firms evidently experience an insignificant stock price response around the announcement date. Various robustness tests show that the negative stock price response for electronic firms varies with increment in the public–private debt ratio, the length of maturity, the growth prospects, an increment in leverage, the purpose of the bond offer and with types of bonds issued. According to our various robustness tests, the abnormal returns for non-electronic firms are mostly insignificantly different from zero. One important policy implication here is that investors may use the findings

for electronic firms to design their investment strategies in order to generate gains in wealth or reduce losses in wealth.

The stepwise regression results reveal that a change in equity wealth at the announcement of bond IPOs is inversely related to an increment in leverage for the whole sample and electronic firms. Worth noting, however, is that these findings are inconsistent with Ross [12] signaling model, which contended that an increased use of debt financing is a "positive news" event. The findings also indicate that issuing convertible bonds is received less negatively when compared with issuing straight bonds at the announcement of bond IPOs for the whole sample. Finally, the regression results support the view that the different purposes of debt IPOs generate different market reactions around an announcement period for electronic firms.

In summary, it cannot be denied that our findings show that electronic firms and non-electronic firms do demonstrate different phenomena, the types of issuing bonds and stock price response, at the bond IPOs in the Taiwan Stock Exchange.

Acknowledgments

The authors are grateful to three reviewers and Professor Yi-Chein Chiang for their valuable suggestions. This study has benefitted from financial assistance of the National Science Council of the Republic of China (NSC 91-2416-H-035-013).

References

[1] Financial Statistics Monthly, Taiwan district, the Republic of China (2004/1), pp. 133–134.
[2] S. Datta, M.I. Datta, A. Patel, Some evidence on the uniqueness of initial public debt offerings, J. Finance 55 (2) (2000) 715–743.
[3] R. Green, Investment incentives, debt, and warrants, J. Finan. Econ. 13 (1) (1984) 115–136.
[4] M.J. Brennan, E.S. Schwartz, The case for convertibles, J. Appl. Corporate Finance 1 (2) (1988) 55–64.
[5] T.E. Copeland, J.F. Weston, Financial Theory and Corporate Policy, third ed., Addison-Wesley, Reading, MA, 1988.
[7] E. Fama, What's different about banks?, J. Monetary Econ. 15 (1) (1985) 29–37.
[8] C. James, Some evidence on the uniqueness of bank loans, J. Finan. Econ. 19 (2) (1987) 217–235.
[9] S. Lummer, J. McConnell, Further evidence on the bank lending process and the capital market response to bank loan agreements, J. Finan. Econ. 25 (1) (1989) 99–122.
[10] R. Shockley, A. Thakor, Information content of commitment to lend in the future: Theory and evidence on the gain from relationship banking, Working paper, India University, 1992.
[11] R. Rajan, Insiders and outsiders: the choice between informed and arm's-length debt, J. Finance 47 (4) (1992) 1367–1400.
[12] S. Ross, The determination of financial structure: the incentive-signaling approach, Bell J. Econ. 8 (1) (1977) 23–40.
[13] R. Heinkel, A theory of capital structure relevance under imperfect information, J. Finance 37 (5) (1982) 1141–1150.
[14] M. Berlin, J. Loeys, Bond covenants and delegated monitoring, J. Finance 43 (3) (1988) 397–412.
[15] D. Diamond, Monitoring and reputation: the choice between bank loans and directly placed debt, J. Polit. Econ. 99 (4) (1991) 689–721.
[16] F. Easterbrook, Two agency-cost explanations of dividends, Am. Econ. Rev. 74 (4) (1984) 650–660.
[17] M.J. Flannery, Asymmetric information and risky debt maturity choice, J. Finance 41 (1) (1986) 19–37.
[18] J. Kale, T. Noe, Risky debt maturity choice in a sequential equilibrium, J. Finan. Res. 13 (2) (1990) 155–165.
[19] S. Datta, M. Iskandar-Datta, A. Patel, The pricing of initial offers of corporate straight debt, J. Finance 52 (1) (1997) 379–396.
[20] S. Datta, M. Iskandar-Datta, A. Patel, The market's pricing of Debt IPOs, J. Appl. Corp. Finan. 12 (1) (1999) 86–91.
[21] P. Schmidt, R. Strauss, The prediction of occupation using multiple logit model, Int. Econ. Rev. 16 (2) (1975) 471–486.
[22] P. Schmidt, R. Strauss, Estimation of models with jointly dependent qualitative variables: a simultaneous logit approach, Econometrica 43 (4) (1975) 745–755.
[23] S. Myers, Determinants of corporate borrowing, J. Finan. Econ. 5 (2) (1977) 147–175.
[24] M. Pagano, F. Panetta, L. Zingales, Why do companies go public? an empirical analysis, J. Finance 53 (1) (1998) 27–64.
[25] D.J. Denis, V.T. Mihov, The choice among bank debt, non-bank private debt, and public debt: evidence from new corporate borrowings, J. Finan. Econom. 70 (1) (2003) 3–28.
[26] R. Rajan, L. Zingales, What do we know about capital structure? Some evidence from international data, J. Finance 50 (5) (1995) 1421–1460.
[27] K. Jung, Y.C. Kim, R. Stulz, Timing, investment opportunities, managerial discretion, and the security issue decision, J. Finan. Econ. 42 (2) (1996) 159–185.
[28] D. Diamond, Debt maturity structure and liquidity risk, Q. J. Econ. 106 (3) (1991) 709–737.

[29] C. Smith, Investment banking and the capital acquisition process, J. Finan. Econ. 15 (1/2) (1986) 3–29.
[30] J.J. McConnell, C.C. Muscarella, Corporate capital expenditure decisions and the market value of the firm, J. Finan. Econ. 14 (3) (1985) 399–422.
[31] J. Gudes, T. Opler, The determinants of the maturity of corporate issue, J. Finance 51 (5) (1996) 1809–1833.
[32] J.C. Stein, Convertible bonds as backdoor equity financing, J. Finan. Econ. 32 (1) (1992) 3–21.
[33] D. Mayers, Why firms issue convertible bonds: The matching of financial and real investment options, J. Finan. Econ. 47 (1) (1998) 83–102.