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Information Ratings and Capital Structure

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Abstract

We examine the impact of information asymmetry on a firm's capital structure decisions with a unique information rating scheme that draws from 114 measures over five dimensions of information disclosures on each firm from 2006 to 2012. We find that a firm with high (low) information rating is related to low (high) debt financing and leverage. In particular, a firm that moves from the lowest to the highest information rating experiences a 7.8% reduction in firm leverage on average. This relationship is robust to firm characteristics, incentive conflicts, and the agreement theory of Dittmar and Thakor (2007). Our results suggest that information asymmetry is influential on a firm's pecking order behavior independent of these effects.

Keywords: Information Asymmetry; Capital structure; Information ratings; Pecking order theory; Incentive conflicts.

JEL Classification: G32

1. Introduction

Since the seminal work of Modigliani and Miller's (1958) irrelevancy proposition on capital structure in a market without frictions, there has been ongoing research to understand how market imperfections affect a firm's financing decisions. One source of market frictions is the information asymmetry between managers and investors about firm value. Myers (1984) and Myers and Majluf (1984) argue that as the manager know more about their firms' true values than investors, they tend to exhibit a particular preference for their financing choices. In particular, the manager follows the pecking order of internal capital over debt, and external equity as a last resort to minimize adverse selection costs.

To date, the empirical findings on the pecking order model are mixed. While Shyam-Sunder and Myers (1999) show that firms' financing priorities are consistent with the hypothesis, Fama and French (2005) find that managers across various firm size frequently issue and retire equity. To accommodate alternative theories in explaining a firm's behavior on financing decisions, Bharath et al. (2009), Lemmon and Zender (2010), and Rapp et al. (2014) expand the scope of empirical tests with financial slack and flexibility for investment opportunities and costs of financial distress. However, Jung et al. (1996) and Leary and Roberts (2010) continue to cast doubt on the

robustness of the prescribed order. They suggest that agency conflicts are better equipped to explain the observed debt and equity issuances than information asymmetry.

Given that information asymmetry is hypothesized to play an important role in a firm's financing choices, one key challenge in testing the model validity rests with how well the information barrier between the manager and investors can be estimated. In this study, we take advantage of a unique information rating score on the amount of information disclosed by firms to examine the role of information asymmetry. Based on 114 indicators on information disclosure over five different sub-categories, the Securities and Futures Institute (SFI) in Taiwan compiles disclosed information of each firm and assigns an information rating accordingly. These five sub-categories include information related to regulatory compliance, information timeliness, forward-looking information, and information reported in annual reports and in company websites. Ranging from C- to A++, a firm that receives a C- (A++) rating is said to have the lowest (highest) corporate transparency or exhibit the highest (lowest) asymmetric information. Appendix A lists each of the 114 criteria.

Similar to a change in credit rating on the credit worthiness of a firm, an upgrade (downgrade) of a firm's information rating indicates that information asymmetry

between the firm and investors is lower (higher) than before. A change in information rating is thus more definitive, intuitive, and meaningful than proxies that carry multi-faceted interpretations found in previous studies. For example, Autore et al. (2014) use volatility of stock returns, firm size, institutional ownership, and the proportion of independent directors as proxies for information asymmetry. However, these proxies are also used as measures for firm risk and incentive conflicts. While a large firm is related to lower asymmetric information, it also indicates higher agency costs. Meanwhile, a firm with high proportion of institutional ownership and independent directors has lower information asymmetry, but it may also reflect lower agency cost. Other more dynamic proxies, such as the level of analyst coverage and dispersion of analysts' forecasts, are highly correlated with these proxies and therefore subject to different interpretations.

More sophisticated proxies related to adverse selection based on the market microstructure framework have been used to extract information asymmetry. For example, effective bid-ask spread (George et al., 1991), probability of informed trading (PIN, Easley et al., 1996), and price impact measure (Amihud, 2002) were developed to measure the information from trading. Using a composite index approach, Bharath et al. (2009) estimate the first principal component of four adverse selection and three market

liquidity measures for measuring information asymmetry. In a similar vein, Andres et al. (2014) compile an information asymmetry index based on six liquidity measures that capture trading activity, trading costs, and the price impact of order flow. While such approaches may increase the accuracy of the measurement, they continue to be indirect measures. More importantly, they may be subject to measurement errors due to "non-informational" liquidity components in the proxies.

Overall, we find that information asymmetry is important in explaining financing decisions. In particular, the level and the change of information ratings are negatively related to net debt. A firm with higher information rating tends to exhibit lower leverage as the adverse selection cost of issuing equity is likely to be less. Our results are therefore consistent with pecking order theory. Our findings also complement Chung et al. (2013) who show that capital structure of a firm in the oil industry has little influence on its survival probability. They suggest that firm performance tends to be driven largely by its business fundamentals.

In examining the role of information asymmetry, we also broaden the scope of the study by including incentive conflicts in the sense of Jensen and Meckling (1976) and the agreement theory of Dittmar and Thakor (2007). Accordingly, a firm with higher incentive conflicts is more likely to issue debt than equity. A firm with lower agreement

between the manager and investors on managerial decisions and stock prices also tends to choose debt over equity to reduce adverse selection costs. We find that information ratings continue to be influential in a firm's capital structure decisions independent of these alternative theories. However, our results also suggest that incentive conflicts and the agreement theory can affect a firm's financing mix.

Our findings highlight the complementary role of information transparency in a climate of stronger governance practices around the world initiated by Sarbane-Oxley Act. As summarized by Kim and Lu (2013) on the recent corporate governance reforms in 26 advanced and emerging economies, much of the focus has been on improving governance mechanisms.

Nevertheless, Healy and Palepu (2001) point out that there also appears to be a convergence in information disclosure practices driven by the globalization of capital markets as institutional investors are looking for diversification and corporations are seeking capital at the best possible terms. The introduction and increasing adoption of international financial reporting standards (IFRS) to harmonize financial disclosures across countries facilitate such process. For example, Singapore introduces a legislation in 2001 to increase the quality and broaden the scope of information disclosure. China has adopted IFRS since 2001 as the basis for enhancing the quality and transparency of

financial information. In developed countries, France and Germany encourage firms to disclose share ownership for as low as 5% and 3% of total shares respectively. Our results based on the ratings of multi-dimensional information disclosure practices in Taiwan may therefore suggest similar financing behaviors of firms in countries of comparable information settings.

The remainder of the paper is organized as follows. Section 2 discusses the background and the development of the information rating framework. Section 3 compares the measures of information asymmetry in the finance and accounting literature with those established by the SFI. Section 4 describes the data and research design. The empirical results are reported in Section 5, and the last section concludes the paper.

2. Brief History of Information Disclosure and Ratings in Taiwan

The Company Law in Taiwan was first established in 1919 and the Security Law in 1968. They defined the rights and responsibilities of firms to protect the interests of shareholders and debt holders. However, investor protection based on these laws are either inadequate or ineffective to meet the welfare of shareholders and debt holders. La Porta et al. (1998) report that the efficiency of the judicial system and corruption in

Taiwan are poorly ranked among countries with the same German legal origin.

Recent high profile corporate and accounting scandals, such as Enron, Merck, and WorldCom in the early 2000's, have paved the way for the introduction of the Sarbanes-Oxley Act of 2002 in the US, followed by similar governance regulations around the world. They require publicly listed firms to comply with enhanced disclosure standards. In the case of Taiwan, the Taiwan Stock Exchange Corporation (TSE) and the Gre-Tai Securities Market (GTSM) jointly adopted the Corporate Governance Best-Practice Principles (CGBPP) for firms listed on the TSE and the GTSM in 2002. The main objectives of the CGBPP include protecting shareholders' rights and interests, strengthening the monitoring powers of supervisors and the board of directors, and enhancing information transparency.

Following the enactment of the CGBPP, Taiwan's Securities and Futures Institute (SFI), a quasi-government organization entrusted by the TSE and the GTSM, introduced the Information Disclosure and Transparency Ratings System (information ratings thereafter) in 2003. The main objectives of implementing information ratings are to develop criteria to evaluate the level of information disclosure for publicly listed firms, and assist regulators to monitor the financial markets in Taiwan.

To assess the level of corporate transparency, information ratings identified 114

indicators as evaluation criteria, which can be classified into five sub-categories: (1) compliance with the mandatory information disclosures, (2) timeliness of information reporting, (3) disclosure of financial forecast, (4) disclosure of annual report, and (5) disclosure of corporate website. Appendix B summarizes the distribution of indicators across these five different dimensions of information. Each disclosure indicator represents a "yes" or "no" question. One point is given to the question with a "yes" answer and zero otherwise. A firm's total score is the sum of the points from each indicator. The score mechanism is therefore similar to the governance index (G-index) compiled by Gompers et al. (2003) on a firm's governance practices. Based on the scores, the SFI releases the annual full-year ranking results ranging from A++ to C- for every TWSE / GTSM listed firm.[1] A firm with the highest corporate transparency is assigned to an A++ rating, whereas a firm with the lowest corporate transparency is given a C- rating.

To ensure the accuracy of the assessments, information ratings are provided to all firms with remote web-based access to review the preliminary assessment, including the score on each of the 114 indicators and the overall corporate transparency ranking. If a firm disagrees with the preliminary findings, it is allowed to file a report within a

[1] The full-year ranking results are accessible to the general public through the website of the Securities and Futures Institute at http://www.sfi.org.tw.

certain time frame explaining areas of concern to the committee for a further review. A revised evaluation result is given if (1) at least two thirds of the committee members are present at the meeting and (2) the majority of the participants agree with the revision. This two-stage screening process should enhance the accuracy and objectivity of the ratings.

3. Information Asymmetry Measurements

3.1. Proxies for information asymmetry in the finance literature

The proxies for information asymmetry in the extant finance literature can be categorized into three groups. The first group is based on firm characteristics such as firm size, market-to-book equity, growth opportunities, or intangible assets (e.g. Titman and Wessels, 1988; Baker and Wurgler, 2002: Frank and Goyal, 2003; Lemmon and Zender, 2010). Large firms are often viewed with lower information asymmetry, while firms with high market-to-book equity are characterized by high growth opportunities. The latter, which is also related to intangible assets, is linked to the information opaqueness of a firm. However, these firm characteristics are well known to be proxies for systematic risk (Fama and French, 1993) or mispricing (Lakonishok et al., 1994). Therefore, these measurements represent noisy measures of asymmetric information at

best. Bharath et al. (2009) further argue that they are inherently static and persistent.

The second group of proxies is more dynamic, such as the level of analyst coverage and dispersion of analysts' earnings forecasts. These proxies, however, are also found to have different or conflicting interpretations and are likely to be noisy that capture similar firm characteristics as the first group (e.g. Chang et al., 2006; Gomes and Phillips, 2012). For example, large firms tend to be covered by more analysts and firms with high book-to-market, growth opportunities, or intangible assets generate higher dispersion of earnings forecast.

The last group includes more sophisticated proxies based on the adverse selection component in the market microstructure framework. Effective bid-ask spread (George et al., 1991), probability of informed trading (Easley et al., 1996 and 1997), and price impact measure (Amihud, 2002) are common candidates for measuring the information gap between informed and noisy traders. Although these measurements are an improvement on estimating the extent of information asymmetry, they remain a less direct measure and are restricted by limited data availability and multifaceted interpretations of liquidity (see Frank and Goyal, 2003; Bharath et al., 2009; Andres et al., 2014).

On the contrary, information ratings draw from both direct financial and

non-financial information. Therefore, these measures are likely to be superior because they are not sensitive to the way in which asymmetric information is extracted. As a result, they are less entangled with firm characteristics, analyst interpretations, and not limited to high-frequency data availability that may cause sample selection bias.

Furthermore, in response to investors' increasing demand for quality corporate disclosure, the SFI has incorporated voluntary disclosure measurements such as the willingness to disclose consolidated financial forecast information and the amount of non-audit fees from the same auditor into the evaluation criteria. Healy and Palepu (2001) report that voluntary disclosures are credible and should enhance information quality. Vanstraelen et al. (2003) also find that the non-financial voluntary information is helpful in improving the accuracy of analysts' forecasts. In sum, Ajinkya et al. (2005) suggest that firms with voluntarily disclose non-mandatory items are more likely to have low information asymmetry.

3.2. Proxies for information asymmetry in the accounting literature

Existing studies in the accounting literature share similar proxies to measure information asymmetry as those in the finance literature. They include firm characteristics (e.g. Lang and Lundholm, 1993), analyst coverage (Piotroski and

Roulstone, 2005), and bid-ask spread, PIN, and price impact of trade in market microstructure framework (Bhattacharya et al., 2012; Bhattacharya et al., 2013). Additional proxies include public listing of a firm and the auditor's reputation.

In addition to these standard proxies, the accounting literature also relies on a broader set of information from published reports (e.g. annual reports) and investor relations measures (e.g. Francis et al., 2005) provided by the Association for Investment Management and Research (AIMR) and the Center for International Financial Analysis and Research (CIFAR). These proxies for information asymmetry / disclosure are evaluated based on the completeness, clarity, and timeliness of information across a broad spectrum of industries.

However, there are several limitations of investor relations measures. First, AIMR scores are not available after 1996. Second, the rating scale and criteria used by leading analysts may differ across industries. Therefore, while disclosures within the same industry are comparable, those across different industries are likely to be subject to different interpretations (Brown and Hillegeist, 2007). Third, firms evaluated by investor relations associations tend to be larger with wider analyst coverage. This creates sample selection bias and may reduce the variation in firms' disclosure quality, as large firms are generally expected to have lower information asymmetry (Lang and

Lundholm, 1993; Brown and Hillegeist, 2007).

In contrast, the SFI forms a research team of experts from accounting and finance professions, academic researchers, in-house research staff, and IT personnel. They evaluate the information quality of all listed firms, except for some firms with inadequate data or under regulatory investigation. Therefore, information ranking is based on the same set of information criteria and is not skewed to large firms.

4. Research Design and Data

4.1. Research design

We follow the standard approach of Shyam-Sunder and Myers (1999) to test the pecking order model by regressing net debt issuance, $\Delta D_{i,t}$, on the financing deficit, $DEF_{i,t}$, as follows:

$$\Delta D_{i,t} = \alpha + \beta DEF_{i,t} + \varepsilon_{i,t} \quad (1)$$

where $\Delta D_{i,t}$ is the long-term debt issuance minus long-term debt reduction for firm i at time t, and $DEF_{i,t}$ is defined by the accounting cash flow identity,

$$DEF_{i,t} = DIV_{i,t} + CEX_{i,t} + \Delta WC_{i,t} - CF_{i,t} \quad (2)$$

where $DIV_{i,t}$ are dividends and share repurchases, $CEX_{i,t}$ are capital expenditures, $\Delta WC_{i,t}$ is the net change in working capital, and $CF_{i,t}$ is the operating cash flow after interest and taxes. All variables are scaled by total assets. The pecking order model

predicts that the slope coefficient β should be close to 1 according to the strict version of the theory (Shyam-Sunder and Myers (1999)) and lower than 1 but positive based on the modified version (Lemmon and Zender, 2010).

If information asymmetry is a driver for financing decisions, firms with higher information ratings should be related to lower β coefficients. Therefore, we assess the relationship between the extent of debt issuance and information ratings by estimating an interaction term of financing deficit and information ratings as follows,

$$\Delta D_{i,t} = \alpha + \beta DEF_{i,t} + \gamma DEF_{i,t} * IR_{i,t} + \varepsilon_{i,t} \quad (3)$$

where $IR_{i,t}$ is the information rating for firm i at time t. To operationalize the information ratings in our analysis, we assign a score from 1 to 7 for firms whose ratings vary from C- to A++. However, only five information ratings between C- and A++ are provided from 2006 to 2010. To ensure compatibility of scores over the entire sample period, we standardize the scores by mapping information ratings with their corresponding scores, as reported in Appendix C.

For additional tests on the effect of information asymmetry, we follow Frank and Goyal (2003) and Bharath et al. (2009) by examining a firm's leverage as a function of its information asymmetry along with its firm characteristics. As in Shyam-Sunder and Myers (1999) and Bharath et al. (2009), we use the broadest measure of leverage as the

ratio of total debt to market value of assets. We include financial slack, tangibility, Tobin's q, firm size, and firm profitability for firm characteristics.

Furthermore, Leary and Roberts (2010) argue that agency-based explanations can account for a firm's financing decisions more than information asymmetry. This may especially be the case for firms in East Asian countries including Taiwan (but except Japan) that are typically family-controlled and exhibit a substantial wedge between ownership and control (see Claessens et al., 2002). The corporate control is enhanced through cross-holdings and pyramidal structures in the firms. As a result, 66% of firms in Taiwan are in family hands compared to 2.9% that are widely held for the ultimate control of firms at the cutoff level of 10% of voting rights.

To capture the agency-based effect, we use six proxies for ownership structure and divergence of cash flow rights and control rights. The former (see Coles et al., 2008) includes the shareholdings of board directors and supervisors (SDS), the largest shareholders (SLS), controlling family (TFS), and individual investors (SID). The latter (see La Porta et al., 1999) includes times of controlling family shareholdings to cash flow rights (TFC) and voting rights (TFV). These two ratios measure the extent to which the proportion of share ownership of controlling families exceeds cash flow rights and voting rights for the ultimate control of firms.

Finally, we jointly examine the agreement theory of Dittmar and Thakor (2007) with pecking order and agency-based theories in explaining a firm's capital structure decisions. Accordingly, the manager is concerned about the impact of equity issuance on stock price in both short-term and long-term. Therefore, the manager is more likely to issue equity (debt) when investors have higher (lower) propensity to agree with managerial decisions because it has less (more) adverse effect on stock price. It explains why a firm tends to issue equity when stock price is high as the likelihood of disagreement is low. We follow Dittmar and Thakor (2007) and use two proxies for agreement. They are the difference between the actual earnings and analyst forecasted earnings scaled by actual earnings (AG1) and the dispersion of the forecasted earnings scaled by book equity (AG2). The propensity of investors to agree with the manager varies positively with the former but negatively with the latter.

Based on the above discussions, we estimate the following panel regressions with industry and year fixed effects,

$$Leverage_{i,t} = \alpha + \beta_1 IR_{i,t} + \beta_2 Slack_{i,t} + \beta_3 Tang_{i,t} + \beta_4 QRatios_{i,t} + \beta_5 Size_{i,t} + \beta_6 Pf_{i,t} + \beta_7 AB_{i,t} + \beta_8 AG_{i,t} + \beta_9 GGDP_{i,t} + \varepsilon_{i,t,} \quad (4)$$

where $Leverage_{i,t}$ is the ratio of total debt divided by market value of assets for firm *i* and time *t*. $Slack_{i,t}$ is the ratio of cash-to-total assets, $Tang_{i,t}$ is the ratio of fixed to total assets, $QRatios_{i,t}$ is the ratio of market-to-book assets, $Size_{i,t}$ is the natural log of

sales, $Pf_{i,t}$ is the profitability, $AB_{i,t}$ are measures of agency-based factors, $AG_{i,t}$ are agreement-based factors, and $GGDP_{i,t}$ is real GDP growth. We include $GGDP_{i,t}$ since forecast earnings may be downward biased in periods of higher real GDP growth. Appendix D provides the definition of each of the variables in Eq. (4). To address the potential bias in the standard errors of a panel data due to residuals correlated across firms and time, we estimate robust standard errors clustered by both firm and year according to Flannery and Hankins (2013).

4.2. Data and summary statistics

Other than information ratings, annual financial, governance, and earnings forecast data are obtained from the Taiwan Economic Journal (TEJ), the most reliable database for publicly listed firms in Taiwan. The sample period begins in 2006 when the current ranking format is first available and ends in 2012. Our sample firms include all the firms publicly listed on the Taiwan Stock Exchange and the Gre-Tai Securities Market. Following Shyam-Sunder and Myers (1999), Fama and French (2005), Leary and Roberts (2010), and Dong et al. (2012), we exclude financial firms and regulated firms since firms in these industries are subject to different regulations. After excluding data

with missing observations and eliminating variables with extreme values, our sample consists of 1,278 firms and 7,466 firm-year observations.

Table 1 shows the distribution of sample firms across 27 industries. As Taiwan's economy is skewed more toward high-tech industries, it is not surprising that firms in electronic components, semiconductor, and computer peripherals are more represented with 14.0%, 9.6%, and 8.2% of the total sample firms respectively. For the remaining two-thirds of the sample firms, they are more evenly spread across other industries. The sample distribution indicates that our sample firms are not driven by firms in particular industries.

<Insert Table 1>

Table 2 reports the summary statistics of each variable in the models discussed earlier. Ranging from 1 to 7, the mean and median of the information ratings (IR) are 3.47 and 3.00, respectively with a standard deviation of 1.15. The standardized information ratings (IRS) provides a similar distribution property of mean and standard deviation. The negatively skewed distribution indicates that there are few firms receiving higher ratings and the majority of sample firms have lower than average information rating. Among firm characteristics, tangibility and Q-ratios appear to be low with an average of 0.21 and 1.36, respectively. However, firms on average seem to be

profitable with average asset returns of 7.94%. As expected, firm size varies widely from NT$90 million to NT$276.859 billion. The variability of firm size in our sample ensures that our data does not suffer from limited variations in firms' disclosure quality related to firm size (see Lang and Lundholm, 1993; Brown and Hillegeist, (2007).

The percentage of shareholdings of directors and supervisors (SDS) averages 22.84% with a range from 5.13% to 69.23%. Similar measures such as the average shareholdings of the largest shareholder (SLS) of 19.11% is comparable to the average 18% of shares owned by the largest three shareholders reported by La Porta et al. (1999). As firms in Taiwan tend to be characterized by controlling families, the average family shareholdings (TFS) is 28.07%. To measure the wedge between cash flow rights and control rights for controlling families, we find that the number of times of controlling family shareholdings to voting rights (TFV) and cash flow rights (TFC) are 0.91 and 2.19 respectively for the ultimate control of a firm. They suggest that the shareholdings of controlling family are, on average, lower than those needed for firm controls. Overall, it appears that the separation of ownership and control is large for the sample firms.

Table 2 also shows that the propensity of investors to agree with managers based on the difference between actual earnings and forecasted earnings (AG1) appears to vary widely from -2.91 to 3.32 with the average of 0.10. According to Dittmar and

Thakor (2007), the greater the manager's ability to beat earnings forecast, the less likely are investors to question the manager's decisions and hence the higher the degree of agreement. The variability in the agreement measures provides a good control variable to examine the importance of information ratings.

<Insert Table 2>

Table 3 present correlations between explanatory variables at the level. Correlations between most pairs of variables appear to be generally low. The results seem to indicate that firm-specific measures adequately capture various aspects of firm characteristics. One exception is between QRATIO (Tobin's q) and PF (profitability) where their correlations are 0.43 (0.54 for Spearman's rank correlation). Since QRATIO is often used to measure a firm's performance, it also tends to reflect its profitability.

Among the agency-based measures, the correlation between TFS and SDS is relatively high at 0.64 (0.66 for Spearman's rank correlation). It highlights that with the majority of Taiwanese firms controlled by family, the proportion of controlling family ownership is closely linked to that of the directors and supervisors who are likely to be a member of the controlling family. Similarly, the correlation between TFS and TFV of 0.51 (0.60 for Spearman's rank correlation) is higher because TFV, the times of TFS over voting rights for the ultimate firm control, is influenced by variations in TFS rather

than voting rights, which tend to be low for controlling family. However, the overall low correlations among explanatory variables should not pose multicollinearity problems.

<Insert Table 3>

5. Empirical Results

5.1. The pecking order model test

To test the pecking order model, we begin by estimating the relationship between net debt issuance and financing deficit according to Eq. (1). Models 1 and 2 of Table 4 show that the relationship is significantly positive ($\beta = 0.142$ and 0.148) with or without industry and year fixed effects. The preliminary results are thus consistent with the modified version of the pecking order model in which β lies between 0 and 1 (see Myers and Majluf, 1984; Lemmon and Zender, 2010; Bharath et al., 2009).

We then include an interaction term of financing deficits and information ratings according to Eq. (3) to test if information asymmetry is an important factor behind a firm's financing choices. Accordingly, firms with higher information ratings should be related to lower adverse selection costs, which in turn should lead to less debt. Consistent with this prediction, Models 3 and 4 of Table 4 show a significant and negative relationship between the net debt issuance and the interaction term. As shown in Models 5 and 6, the results are robust to using the standardized information rating

(IRS) as a proxy for information asymmetry. It is worthwhile to note that including information ratings increases the adjusted R^2 from 0.13 to 0.26, indicating that information ratings exhibit explanatory power on net debt issuance.

Furthermore, if a firm's information rating is upgraded (downgraded) from the previous year, it should adhere less (more) to the pecking order behavior and rely less (more) on debt. Models 7 and 8 confirm the negative impact of a change in information ratings (ΔIRS) in the interaction term on net debt issuance. Our results thus far indicate that the level of and the change in the information ratings play an important role in a firm's capital structure decisions.

<Insert Table 4>

5.2. The augmented pecking order model test

Next, we present the results of the augmented pecking order model based on Bharath et al. (2009) according to Eq. (4). Consistent with earlier results, Models 1 to 4 in Table 5 show that information ratings measured by IR and IRS vary negatively with leverage.[2] The negative relationship is also economically significant where a rating upgrade lowers the total debt-to-market value of assets by 1.3% (Model 2). Therefore, a firm that moves from the lowest rating to the highest rating is, on average, related to a

[2] In addition to using actual information score to capture the IR effects, we also use dummies for individual IR scores for robustness checks. The results are consistent with those reported in the paper and are therefore not tabulated.

reduction of 7.8% in total debt. Our results are also consistent with Frank and Goyal (2003) and Leary and Roberts (2010) who find that large firms tend to adhere to the pecking order. As expected, firms with lower firm performance (QRATIO) and profitability (PF), and greater debt capacity (TANG) tend to have higher leverage.

Frank and Goyal (2003) point out that it is the change in leverage that the pecking order model is intended to explain, suggesting that running the leverage regression in the first differences may help to identify the potential factors. Therefore, we repeat the panel regressions with the first differences of leverage and the explanatory variables. We also include a lagged leverage term as suggested by Bharath et al. (2009) to account for the mean reversion in leverage. Models 5 to 8 of Table 5 show that changes in ΔIR and ΔIRS remain negatively related to the change of firm leverage after controlling for firm characteristics, industry, and firm fixed effects.

<Insert Table 5>

5.3. The augmented pecking order model test with incentive conflicts

Another important source of market frictions that can influence the pecking order behavior is incentive conflicts. Firms with higher agency costs tend to prefer debt over equity to internalize the costs of private benefits. Leary and Roberts (2010) find that proxies related to agency costs have more explanatory powers than those related to

information asymmetry. To test against this alternative hypothesis, we include a number of agency-based proxies as discussed earlier.

Panels A and B of Table 6 present the results of the effects of information asymmetry and incentive conflicts on firm leverage at the level and the change, respectively. As shown in Panel A, IR continues to explain firm leverage in the presence of firm characteristics and agency-based measures. Furthermore, the economic significance of IR appears to be largely unaffected. For a firm that moves from the lowest to the highest rating, its leverage ratio is reduced, on average by 6.6%. Panel B of Table 6 shows that the results change little when we use IRS measure for information ratings. They remain robust to different model specifications.[3]

Table 6 also shows that shareholdings of board directors and supervisors (SDS) are positively related to firm leverage. One would expect that as board directors and supervisors own more shares, the principal-agent conflicts would be lower, which in turn would reduce firm leverage. However, Yeh et al. (2001) argue that controlling families in Taiwan often set up nominal investment firms to increase their controls by assigning family members or their designated persons to the board after the investments firms are elected for board positions. As a result, higher SDS do not necessarily indicate

[3] For further robustness checks, the results without lagged leverage as an independent variable are similar to those tabulated in Panel B of Table 6.

lower agency cost. Rather, it may reflect an increase in corporate control by the controlling family. It follows that higher shareholdings of controlling family (TFS) and the largest shareholder (SLS), who is often a member of the controlling family, also increase firm leverage. Therefore, despite the importance of information asymmetry, our results suggest that agency-based conflicts are also influential on a firm's financing decisions.

(Insert Table 6>

5.4. The augmented pecking order model test with agreement theory

In addition to the explanations of information asymmetry and incentive conflicts on capital structure, Dittmar and Thakor (2007) argue that the degree of agreement between the manager and investors can affect how a firm determines its financing policy. Table 7 shows that adding the two agreement proxies, AG1 (the difference between actual and forecasted earnings) AG2 (the standard deviation of forecasted earnings), does not change the effect of information ratings on firm leverage.[4] Taking together with the measures of incentive conflicts, the effect of information ratings remain largely unchanged and are economic significant. A firm that moves from the lowest rating to the higher rating category amounts to an average leverage reduction between 6 to 7 percent.

[4] Using AG2 yields fewer observations than AG1 as some of the sample firms have few analyst coverage to estimate the standard deviations of forecasted earnings.

<Insert Table 7>

6. Conclusion

Using a unique dataset of information scores based on 114 measures of corporate transparency across five dimensions of information disclosure, we find that a firm with higher information ratings is related to lower net debt. Furthermore, an upgrade in information ratings leads to a reduction in firm leverage. These results are consistent with the observed pecking order behavior as lower information barrier reduces a firm's adverse selection costs.

The negative relationship between firm leverage and information ratings remains unchanged in the presence of alternative theories for the prescribed financing behavior. In particular, when incentive conflicts between the manager and shareholders are reduced (e.g. improved governance mechanisms), a firm is more likely to issue equity than debt. However, after controlling for various governance measures, information ratings continue to play an important role in explaining firm leverage. The extent of agreement between the manager and investors on a firm's investment decisions and stock prices may also be influential in a firm's financing choices. As the agreement increases, a firm is likely to issue equity than debt because adverse selection costs are lower. Again, we find that the degree of agreement fails to subsume explanatory power

of information ratings.

Our results do not imply that other theories are not important in a firm's financing decisions. A firm with the same level of information ratings but higher incentive conflicts is likely to rely more on debt over equity. By the same token, a firm with the same level of information ratings and incentive conflicts but less agreement between the manager and investors may choose debt over equity.

One caveat is in order here. Due to the unavailability of information scores in each of the five dimensions of the unique dataset we use, we cannot differentiate which aspects of information disclosure are more instrumental to the choices of debt and equity. However, it would be worthwhile to investigate the differential impacts of the types of information disclosure on a firm's financing behavior. Such findings may provide further insights and important policy implications.

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Table 1

Distribution of firms by industry

This table reports the distribution of sample firms by industry. *N*firms (*N*obs.) is the number of firms (observations) in each industry. % of firms (obs.) is the percentage of firms (observations) represented by each industry. The classifications of industry are obtained and cross-checked from the Taiwan Stock Exchange, Gre-Tai Securities Market, and Kimo-Yahoo website.

	Industry	*N*firms	*N*obs	% of firms	% of obs.
1	Auto	5	35	0.40	0.50
2	Biotechnology and medical care	47	245	3.70	3.30
3	Building material and construction	67	373	5.20	5.00
4	Cement	7	48	0.50	0.60
5	Chemical and biological technology	37	241	2.90	3.20
6	Communications network operator	66	398	5.20	5.30
7	Computer peripherals	105	628	8.20	8.40
8	Electric cables	17	99	1.30	1.30
9	Electric machinery	62	385	4.90	5.20
10	Electronic access	44	263	3.40	3.50
11	Electronic components	179	1,028	14.00	13.80
12	Food	23	160	1.80	2.10
13	Glass ceramic	4	28	0.30	0.40
14	Information services	39	237	3.10	3.20
15	Oil, gas, and electricity	12	84	0.90	1.10
16	Other electronics	71	396	5.60	5.30
17	Others	70	404	5.50	5.40
18	Paper	7	49	0.50	0.70
19	Photoelectric	105	527	8.20	7.10
20	Plastics	28	185	2.20	2.50
21	Rubber	11	74	0.90	1.00
22	Semiconductor	123	654	9.60	8.80
23	Shipping	24	144	1.90	1.90
24	Sightseeing	11	77	0.90	1.00
25	Steel	39	239	3.10	3.20
26	Textile	54	340	4.20	4.60
27	Trade department	21	125	1.60	1.70
	Total	1,278	7,466	100.0	100.0

Table 2

Summary statistics of all firms

This table reports the descriptive statistics of firm characteristics, agency-based and agreement measures of the sample firms. IR is the information rating ranging from 1 to 7. IRS is the standardized information rating, the difference between IR and average IR scaled by the firm's IR standard deviation. SLACK is the ratio of cash-to total assets. TANG is tangibility, the ratio of fixed to total assets. QRATIO is Tobin's q, the ratio of market-to-book assets, SIZE is the natural log of net sales, and PF is profitability, the ratio of EBITDA-to-total assets. SDS is the proportion of total shares outstanding of board directors and supervisors, SLS is the proportion of total shares outstanding of the largest shareholder, SID is the proportion of shareholdings by individual shareholders, TFS is the proportion of shares outstanding of controlling family members, TFC is the times of the ratio of family share ownership-to-cash flow rights, TFV is the ratio of family share ownership-to-voting rights. AG1 is the difference between actual EPS and forecasted EPS divided by actual EPS, AG2 is the standard deviation of forecasted EPS.

	MIN	Q1	MEDIAN	MEAN	Q3	MAX	STD
IR	1.00	3.00	3.00	3.47	5.00	7.00	1.15
IRS	-2.47	-0.54	-0.43	-0.04	1.00	3.20	0.98
SLACK	0.02	0.24	0.37	0.40	0.53	1.04	0.26
TANG	0.00	0.06	0.16	0.21	0.30	0.75	0.18
QRATIOS (%)	49.12	90.17	114.61	136.35	156.23	446.47	80.82
SIZE (million NT$ in Sales)	90	1,079	2,481	14,447	6,569	276,859	82,981
PF (%)	-20.79	3.30	7.76	7.94	13.12	32.08	9.84
SDS (%)	5.13	12.65	19.26	22.84	29.24	69.23	13.95
SLS (%)	0.02	11.44	17.24	19.11	24.64	55.06	11.12
SID (%)	10.59	48.75	68.47	64.55	82.68	98.99	22.30
TFS (%)	1.28	13.54	25.18	28.07	40.02	75.51	17.94
TFC	1.00	1.00	1.00	2.19	1.15	17.86	10.32
TFV	0.38	0.89	0.97	0.91	1.00	1.00	0.14
AG1	-2.91	-0.07	0.12	0.10	0.31	3.32	0.90
AG2	0.00	0.01	0.02	0.03	0.04	0.13	0.03

Table 3

Correlation matrix between explanatory variables at the level and change

This table reports the correlation coefficients between independent variables. Pearson's correlation coefficients are below the diagonal, while the Spearman's rank correlation coefficients are above the diagonal. IR is the information rating ranging from 1 to 7. IRS is the standardized information rating, the difference between IR and average IR scaled by the firm's IR standard deviation. SLACK is the ratio of cash-to total assets. TANG is tangibility, the ratio of fixed to total assets. QRATIO is Tobin's q, the ratio of market-to-book assets, SIZE is the natural log of net sales, and PF is profitability, the ratio of EBITDA-to-total assets. SDS is the proportion of total shares outstanding of board directors and supervisors, SLS is the proportion of total shares outstanding of the largest shareholder, SID is the proportion of shareholdings by individual shareholders, TFS is the proportion of shares outstanding of controlling family members, TFC is the times of the ratio of family share ownership-to-cash flow rights, TFV is the ratio of family share ownership-to-voting rights. AG1 is the difference between actual EPS and forecasted EPS divided by actual EPS, AG2 is the standard deviation of forecasted EPS, GGDP is the growth in real GDP. ***, **, * denote statistical significance at 1%, 5%, and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(1) IR		0.93 ***	0.11 ***	-0.05 ***	0.07 ***	0.20 ***	0.11 ***	-0.02 **	-0.04 ***	-0.12 ***	-0.04 ***	0.12 ***	-0.04 ***	-0.03 **	0.01	-0.09 ***
(2) IRS	0.97 ***		0.08 ***	-0.03 **	0.10 ***	0.20 ***	0.15 ***	-0.01	-0.06 ***	-0.11 ***	-0.04 ***	0.11 ***	-0.06 ***	0.02	0.04 ***	0.00
(3) SLACK	0.08 ***	0.06 ***		-0.50 ***	0.10 ***	0.01	0.10 ***	-0.07 ***	-0.12 ***	0.12 ***	-0.19 ***	-0.03 ***	-0.31 ***	-0.26 ***	0.12 ***	-0.02
(4) TANG	-0.04 ***	-0.04 ***	-0.43 ***		-0.11 ***	-0.06 ***	0.04 ***	0.05 ***	0.02 **	0.01	0.09 ***	0.01	0.20 ***	0.35 ***	-0.12 ***	0.01
(5) QRATIO	0.06 ***	0.07 ***	0.09 ***	-0.09 ***		0.04 ***	0.54 ***	0.02 *	0.03 ***	-0.21 ***	-0.04 ***	0.02 *	-0.10 ***	-0.11 ***	0.18 ***	0.17 ***
(6) SIZE	0.24 ***	0.25 ***	-0.01	-0.03 **	0.01		0.23 ***	-0.15 ***	-0.11 ***	-0.33 ***	-0.07 ***	0.17 ***	0.01	0.05 ***	0.10 ***	0.04 ***
(7) PF	0.12 ***	0.14 ***	0.04 ***	0.05 ***	0.43 ***	0.23 ***		0.05 ***	-0.02	-0.24 ***	-0.01	0.03 ***	-0.12 ***	0.00	0.14 ***	0.14 ***
(8) SDS	0.00	0.00	-0.05 ***	0.08 ***	0.02	-0.08 ***	0.07 ***		-0.09 ***	-0.30 ***	0.66 ***	0.15 ***	0.28 ***	0.01	-0.04 ***	0.00
(9) SLS	-0.05 ***	-0.06 ***	-0.08 ***	0.02 *	0.03 **	-0.11 ***	-0.01	-0.15 ***		-0.22 ***	0.33 ***	-0.06 ***	0.23 ***	-0.03 **	-0.05 ***	-0.04 ***

(10) SID	-0.15 ***	-0.15 ***	0.08 ***	-0.04 ***	-0.17 ***	-0.37 ***	-0.24 ***	-0.41 ***	-0.23 ***		-0.35 ***	-0.35 ***	-0.25 ***	0.00		-0.04 ***	-0.01	
(11) TFS	-0.03 ***	-0.04 ***	-0.14 ***	0.08 ***	-0.03 ***	-0.07 ***	0.02	0.64 ***	0.39 ***	-0.39 ***		0.18 ***	0.60 ***	0.01		-0.07 ***	-0.01	
(12) TFC	0.10 ***	0.10 ***	0.02 *	0.01	0.05 ***	0.07 ***	0.06 ***	0.11 ***	-0.06 ***	-0.11 ***	0.02		0.12 ***	0.05	***	-0.01	-0.01	
(13) TFV	-0.01	-0.02 *	-0.15 ***	0.13 ***	-0.08 ***	-0.01	-0.09 ***	0.25 ***	0.19 ***	-0.21 ***	0.51 ***	0.01		0.09	***	-0.09 ***	-0.02	
(14) AG1	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.02 *	-0.02	-0.02	0.02 *	-0.02 *	0.00	-0.01			-0.24 ***	0.06	***
(15) AG2	-0.01	-0.01	0.04 ***	-0.04 ***	0.04 ***	0.02	-0.02	0.00	-0.01	-0.01	-0.01	0.00	-0.02	*	-0.04	***	-0.11	***
(16)GGDP	-0.05	0.00	0.00	0.00	0.08	0.04	0.11	-0.01	-0.02	-0.01	-0.01	0.01	-0.01		0.00	-0.01		

Table 4

Results of the pecking order model test

This table reports the panel regression results of net debt issuance on financing deficit and information ratings. DEF is the financing deficit or the sum of cash payouts including dividends and share repurchases, capital expenditure, and net change in working capital minus the operating cash flow after interest and taxes. IR is the information ratings ranging from 1 to 7. IRS is the standardized information rating, the difference between IR and average IR scaled by the firm's IR standard deviation. ΔIRS is the change in IRS. ***, **, * denote statistical significance at 1%, 5%, and 10%, respectively based on robust standard errors clustered by firm and time.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Intercept	0.169 ***	-0.891	0.123 ***	-1.078	0.122 ***	-1.151	0.155 ***	-0.970
	(4.19)	(-0.72)	(3.28)	(-0.95)	(3.28)	(-1.02)	(3.90)	(-0.80)
DEF	0.142 ***	0.148 ***	0.554 ***	0.559 ***	0.220 ***	0.225 ***	0.150 ***	0.155 ***
	(33.24)	(34.13)	(45.72)	(46.21)	(49.42)	(50.27)	(35.23)	(36.14)
DEF* IR			-0.096 ***	-0.096 ***				
			(-35.94)	(-36.03)				
DEF* IRS					-0.116 ***	-0.117 ***		
					(-37.20)	(-37.33)		
DEF* ΔIRS							-0.027 ***	-0.028 ***
							(-14.64)	(-14.74)
Industry Dummy	NO	YES	NO	YES	NO	YES	NO	YES
Year Dummy	NO	YES	NO	YES	NO	YES	NO	YES
Adj R^2	0.13	0.14	0.26	0.27	0.26	0.27	0.15	0.16
N	7,465	7,465	7,465	7,465	7,465	7,465	7,465	7,465

Table 5

Results of the augmented pecking order model test

This table reports the panel regression results of firm leverage according on information ratings and firm characteristics. IR is the information rating ranging from 1 to 7. IRS is the standardized information rating, the difference between IR and average IR scaled by the firm's IR standard deviation. SLACK is the ratio of cash-to total assets. TANG is tangibility, the ratio of fixed to total assets. QRATIO is Tobin's q, the ratio of market-to-book assets, SIZE is the natural log of net sales, and PF is profitability, the ratio of EBITDA-to-total assets. Model 5 to 8 reports the results of first difference in all of the variables. ***, **, * denote statistical significance at 1%, 5%, and 10%, respectively based on robust standard errors clustered by firm and time.

	Model 1	Model 2	Model 3	Model 4		Model 5	Model 6	Model 7	Model 8
Intercept	-6.095	-6.650	-10.294 ***	-10.871 ***	Intercept	2.598 **	2.784 **	2.596 **	2.783 **
	(-1.38)	(-1.48)	(-2.32)	(-2.41)		(2.19)	(2.25)	(2.19)	(2.25)
IR	-1.295 ***	-1.301 ***			△IR	-0.305 ***	-0.297 ***		
	(-8.56)	(-8.62)				(-2.54)	(-2.47)		
IRS			-1.513 ***	-1.520 ***	△IRS			-0.379 ***	-0.369 ***
			(-8.64)	(-8.70)				(-2.74)	(-2.67)
SLACK		0.890		0.895	△SLACK		-9.587 ***		-9.583 ***
		(1.11)		(1.12)			(-6.19)		(-6.19)
TANG	15.714 ***	16.205 ***	15.713 ***	16.207 ***	△TANG	5.849 *	4.152	5.857 *	4.161
	(13.31)	(12.71)	(13.31)	(12.71)		(1.84)	(1.33)	(1.84)	(1.33)
QRATIO	-0.069 ***	-0.069 ***	-0.069 ***	-0.069 ***	△QRATIO	-0.030 ***	-0.029 ***	-0.030 ***	-0.029 ***
	(-13.43)	(-13.40)	(-13.42)	(-13.40)		(-8.93)	(-8.87)	(-8.94)	(-8.88)
SIZE	3.639 ***	3.647 ***	3.643 ***	3.651 ***	△SIZE	1.822 ***	1.863 ***	1.823 ***	1.865 ***

	(27.97)	(27.93)	(28.00)	(27.96)		(3.69)	(3.76)	(3.69)	(3.76)
PF	-0.505 ***	-0.507 ***	-0.505 ***	-0.507 ***	△PF	-0.264 ***	-0.264 ***	-0.264 ***	-0.264 ***
	(-12.88)	(-12.80)	(-12.88)	(-12.80)		(-9.73)	(-9.70)	(-9.73)	(-9.69)
					$Leverage_{t-1}$	-0.132 ***	-0.131 ***	-0.132 ***	-0.131 ***
						(-18.19)	(-18.01)	(-18.18)	(-18.01)
Industry Dummy	YES	YES	YES	YES	Industry Dummy	YES	YES	YES	YES
Year Dummy	YES	YES	YES	YES	Year Dummy	YES	YES	YES	YES
Adj R^2	0.49	0.49	0.49	0.49	Adj R^2	0.56	0.56	0.56	0.56
N	6,931	6,931	6,931	6,931	*N*	6,930	6,930	6,930	6,930

Table 6

Results of pecking order model test with agency-based factors

This table reports the panel regression results of firm leverage on information ratings, firm characteristics and governance measures. IR is the information rating ranging from 1 to 7. IRS is the standardized information rating, the difference between IR and average IR scaled by the firm's IR standard deviation. SLACK is the ratio of cash-to total assets. TANG is tangibility, the ratio of fixed to total assets. QRATIO is Tobin's q, the ratio of market-to-book assets, SIZE is the natural log of net sales, and PF is profitability, the ratio of EBITDA-to-total assets. SDS is the proportion of total shares outstanding of board directors and supervisors, SLS is the proportion of total shares outstanding of the largest shareholder, SID is the proportion of shareholdings by individual shareholders, TFS is the proportion of shares outstanding of controlling family members, TFC is the times of the ratio of family share ownership-to-cash flow rights, TFV is the ratio of family share ownership-to-voting rights. Panel A reports the results at the level form and Panel B reports the results at the first difference. ***, **, * denote statistical significance at 1%, 5%, and 10%, respectively based on robust standard errors clustered by firm and time.

Panel A Leverage and information ratings

	Model 1	Model 2	Model 3	Model 4		Model 5	Model 6	Model 7	Model 8
Intercept	-38.320 ***	-38.242 ***	-38.192 ***	-35.041 ***	Intercept	-41.956 ***	-41.878 ***	-41.793 ***	-38.637 ***
	(-7.89)	(-7.83)	(-7.81)	(-6.85)		(-8.63)	(-8.57)	(-8.54)	(-7.54)
IR	-1.129 ***	-1.129 ***	-1.118 ***	-1.116 ***	IRS	-1.320 ***	-1.320 ***	-1.307 ***	-1.305 ***
	(-7.56)	(-7.56)	(-7.44)	(-7.42)		(-7.64)	(-7.64)	(-7.52)	(-7.50)
SLACK	0.818	0.821	0.839	0.831	SLACK	0.823	0.825	0.843	0.835
	(1.02)	(1.03)	(1.05)	(1.04)		(1.03)	(1.03)	(1.05)	(1.04)
TANG	15.897 ***	15.904 ***	15.904 ***	16.082 ***	TANG	15.898 ***	15.906 ***	15.906 ***	16.084 ***
	(12.51)	(12.52)	(12.49)	(12.62)		(12.51)	(12.53)	(12.49)	(12.62)
QRATIO	-0.065 ***	-0.065 ***	-0.065 ***	-0.065 ***	QRATIO	-0.065 ***	-0.065 ***	-0.065 ***	-0.065 ***

	(-13.05)	(-13.03)	(-13.04)	(-13.00)		(-13.04)	(-13.03)	(-13.03)	(-12.99)
SIZE	4.607 ***	4.604 ***	4.602 ***	4.596 ***	SIZE	4.610 ***	4.607 ***	4.605 ***	4.599 ***
	(30.92)	(30.76)	(30.62)	(30.53)		(30.95)	(30.79)	(30.65)	(30.56)
PF	-0.483 ***	-0.483 ***	-0.482 ***	-0.487 ***	PF	-0.483 ***	-0.483 ***	-0.482 ***	-0.487 ***
	(-12.64)	(-12.64)	(-12.61)	(-12.59)		(-12.64)	(-12.64)	(-12.60)	(-12.58)
SDS	0.107 ***	0.105 ***	0.103 ***	0.095	SDS	0.107 ***	0.105 ***	0.103 ***	0.095 ***
	(7.32)	(4.81)	(4.69)	(4.29)		(7.32)	(4.81)	(4.69)	(4.29)
SLS	0.131 ***	0.129 ***	0.128 ***	0.122 ***	SLS	0.131 ***	0.129 ***	0.128 ***	0.122 ***
	(7.20)	(5.56)	(5.48)	(5.17)		(7.20)	(5.56)	(5.48)	(5.17)
SID	0.152 ***	0.152 ***	0.152 ***	0.149 ***	SID	0.152 ***	0.151 ***	0.151 ***	0.149 ***
	(14.28)	(14.09)	(14.05)	(13.74)		(14.26)	(14.07)	(14.03)	(13.72)
TFS		0.003	0.003	0.018	TFS		0.003	0.003	0.018
		(0.16)	(0.17)	(0.99)			(0.16)	(0.17)	(0.99)
TFC			-0.001	0.000	TFC			-0.001	0.000
			(-0.10)	(0.01)				(-0.09)	(0.02)
TFV				-3.167 **	TFV				-3.166 **
				(-2.22)					(-2.22)
Industry Dummy	YES	YES	YES	YES		YES	YES	YES	YES
Year Dummy	YES	YES	YES	YES		YES	YES	YES	YES
Adj R^2	0.51	0.51	0.51	0.51		0.51	0.51	0.51	0.51
N	6,931	6,931	6,906	6,906		6,931	6,931	6,906	6,906

Panel B The change of leverage and information ratings

	Model 1	Model 2	Model 3	Model 4		Model 5	Model 6	Model 7	Model 8
Intercept	2.671 **	2.624 **	2.609 **	2.612 **	Intercept	2.669 **	2.622 **	2.608 **	2.611 **
	(2.10)	(2.13)	(2.11)	(2.11)		(2.10)	(2.13)	(2.11)	(2.11)
△IR	-0.311 ***	-0.307 ***	-0.267 **	-0.267 **	△IRS	-0.384 ***	-0.379 ***	-0.334 ***	-0.334 ***
	(-2.59)	(-2.56)	(-2.23)	(-2.23)		(-2.78)	(-2.74)	(-2.42)	(-2.42)
△SLACK	-9.657 ***	-9.583 ***	-9.665 ***	-9.664 ***	△SLACK	-9.653 ***	-9.580 ***	-9.662 ***	-9.661 ***
	(-6.20)	(-6.16)	(-6.17)	(-6.17)		(-6.20)	(-6.16)	(-6.17)	(-6.17)
△TANG	4.060	4.089	4.193	4.195	△TANG	4.069	4.097	4.201	4.204
	(1.29)	(1.30)	(1.34)	(1.34)		(1.30)	(1.31)	(1.34)	(1.34)
△QRATIO	-0.029 ***	-0.029 ***	-0.029 ***	-0.029 ***	△QRATIO	-0.029 ***	-0.029 ***	-0.029 ***	-0.029 ***
	(-8.77)	(-8.81)	(-8.80)	(-8.80)		(-8.78)	(-8.82)	(-8.80)	(-8.80)
△SIZE	1.912 ***	1.893 ***	1.872 ***	1.871 ***	△SIZE	1.913 ***	1.895 ***	1.873 ***	1.873 ***
	(3.79)	(3.73)	(3.69)	(3.69)		(3.79)	(3.74)	(3.70)	(3.70)
△PF	-0.261 ***	-0.262 ***	-0.261 ***	-0.261 ***	△PF	-0.261 ***	-0.262 ***	-0.261 ***	-0.261 ***
	(-9.66)	(-9.76)	(-9.71)	(-9.71)		(-9.65)	(-9.76)	(-9.71)	(-9.71)
△SDS	0.038	-0.001	0.000	0.000	△SDS	0.038	-0.001	0.000	0.000
	(1.35)	(-0.03)	(0.03)	(0.03)		(1.34)	(-0.03)	(0.03)	(0.03)
△SLS	0.029	0.001	-0.003	-0.003	△SLS	0.029	0.001	-0.003	-0.003
	(1.30)	(0.05)	(-0.11)	(-0.11)		(1.30)	(0.06)	(-0.10)	(-0.11)
△SID	0.053 ***	0.050 ***	0.046 ***	0.046 ***	△SID	0.053 ***	0.050 ***	0.046 ***	0.046 ***
	(3.09)	(2.94)	(2.69)	(2.69)		(3.09)	(2.95)	(2.70)	(2.70)
△TFS		0.065 **	0.061 **	0.061 **	△TFS		0.065 **	0.061 **	0.061 **

		(2.23)	(2.07)	(2.05)			(2.22)	(2.06)	(2.04)
△TFC			-0.025 *	-0.025 *	△TFC			-0.025 *	-0.025 *
			(-1.66)	(-1.66)				(-1.66)	(-1.66)
△TFV				-0.172	△TFV				-0.171
				(-0.07)					(-0.07)
$Leverage_{t-1}$	-0.132 ***	-0.131 ***	-0.131 ***	-0.131 ***		-0.132 ***	-0.131 ***	-0.131 ***	-0.131 ***
	-18.13	-18.04	-17.94	-17.94		-18.13	-18.04	-17.94	-17.94
Industry Dummy	YES	YES	YES	YES		YES	YES	YES	YES
Year Dummy	YES	YES	YES	YES		YES	YES	YES	YES
Adj R^2	0.56	0.56	0.56	0.56		0.56	0.56	0.56	0.56
N	6,930	6,930	6,904	6,904		6,930	6,930	6,904	6,904

Table 7

Results of pecking order model test with agency-based and agreement factors

This table reports the panel regression results of firm leverage on information ratings, firm characteristics, governance measures, and agreement proxies. IR is the information rating ranging from 1 to 7. IRS is the standardized information rating, the difference between IR and average IR scaled by the firm's IR standard deviation. SLACK is the ratio of cash-to total assets, TANG is tangibility, the ratio of fixed to total assets. QRATIO is Tobin's q, the ratio of market-to-book assets, SIZE is the natural log of net sales, and PF is profitability, the ratio of EBITDA-to-total assets. SDS is the proportion of total shares outstanding of board directors and supervisors, SLS is the proportion of total shares outstanding of the largest shareholder, SID is the proportion of shareholdings by individual shareholders, TFS is the proportion of shares outstanding of controlling family members, TFC is the times of the ratio of family share ownership-to-cash flow rights, TFV is the ratio of family share ownership-to-voting rights. AG1 is the difference between actual EPS and forecasted EPS divided by actual EPS, AG2 is the standard deviation of forecasted EPS, GGDP is the growth in real GDP. ***, **, * denote statistical significance at 1%, 5%, and 10%, respectively based on robust standard errors clustered by firm and time.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Intercept	21.127 ***	24.121 ***	-4.915	-2.352	25.416 ***	22.563 ***	-2.252	-4.766
	(3.72)	(4.26)	(-0.82)	(-0.39)	(4.42)	(3.90)	(-0.37)	(-0.78)
IR	-1.173 ***		-1.015 ***		-0.958 ***		-0.855 ***	
	(-6.78)		(-5.88)		(-5.83)		(-5.25)	
IRS		-1.005 ***		-0.866 ***		-1.120 ***		-1.001 ***
		(-6.63)		(-5.73)		(-6.00)		(-5.42)
SLACK	1.013	1.015	0.924	0.925	0.279	0.279	0.342	0.343
	(1.09)	(1.09)	(0.99)	(1.00)	(0.26)	(0.26)	(0.32)	(0.32)
TANG	13.060 ***	13.058 ***	13.341 ***	13.338 ***	12.282 ***	12.287 ***	12.672 ***	12.677 ***

	(10.69)	(10.68)	(11.04)	(11.03)	(9.25)	(9.26)	(9.68)	(9.69)
QRATIO	-0.048 ***	-0.048 ***	-0.044 ***	-0.044 ***	-0.044 ***	-0.044 ***	-0.040 ***	-0.040 ***
	(-12.05)	(-12.06)	(-11.75)	(-11.75)	(-10.53)	(-10.52)	(-10.23)	(-10.23)
SIZE	3.239 ***	3.231 ***	4.230 ***	4.223 ***	2.963 ***	2.972 ***	4.036 ***	4.043 ***
	(25.88)	(25.82)	(28.72)	(28.67)	(22.23)	(22.30)	(25.68)	(25.75)
PF	-0.667 ***	-0.667 ***	-0.640 ***	-0.641 ***	-0.680 ***	-0.680 ***	-0.643 ***	-0.643 ***
	(-19.10)	(-19.11)	(-18.63)	(-18.64)	(-16.99)	(-16.99)	(-16.32)	(-16.32)
SDS			0.075 ***	0.075 ***			0.067 ***	0.067 ***
			(3.43)	(3.44)			(2.87)	(2.86)
SLS			0.077 ***	0.077 ***			0.061 ***	0.061 ***
			(3.40)	(3.41)			(2.44)	(2.43)
SID			0.143 ***	0.143 ***			0.149 ***	0.148 ***
			(13.99)	(14.01)			(13.61)	(13.59)
TFS			0.028	0.028			0.031	0.031
			(1.53)	(1.53)			(1.57)	(1.57)
TFC			-0.001	-0.001			0.003	0.003
			(-0.14)	(-0.15)			(0.30)	(0.31)
TFV			-3.637 ***	-3.635 ***			-3.485 ***	-3.487 ***
			(-2.68)	(-2.67)			(-2.44)	(-2.44)
AG1	-0.001	-0.001	-0.002	-0.002				
	(-0.16)	(-0.16)	(-0.25)	(-0.25)				
AG2					16.699 **	16.626 **	15.136 **	15.070 **
					(2.20)	(2.19)	(2.00)	(1.99)

GGDP	-5.153 ***	-5.080 ***	-5.163 ***	-5.100 ***	-4.920 ***	-4.994 ***	-5.019 ***	-5.084 ***
	(-6.38)	(-6.29)	(-6.54)	(-6.46)	(-6.01)	(-6.10)	(-6.30)	(-6.38)
Industry Dummy	YES	YES	YES	YES	YES	YES	YES	YES
Year Dummy	YES	YES	YES	YES	YES	YES	YES	YES
Adj R^2	0.54	0.54	0.56	0.56	0.55	0.55	0.57	0.57
N	5,993	5,993	5,982	5,982	4,884	4,884	4,878	4,878

Appendix A

Information disclosure and transparency measures

This appendix lists the 114 questions used to compile the transparency scores for each sample firm. The questions fall into five categories of information disclosures: compliance with the mandatory information disclosures, timeliness of information disclosure, disclosure of financial forecast, disclosure of annual reports, and corporate website disclosure. Each sample firm is assigned a rating from A++ to C- based on these questions.

	I. Compliance with the Mandatory Information Disclosures (Questions 1-12)
1	Whether companies comply with Procedures for Verification and Disclosure of Material Information of Listed Companies, and whether companies have no records of breach penalty or other more serious punishment due to violation of the above regulations?
2	Whether companies comply with Procedures for Holding Material Information Press Conference of Listed Companies, and whether companies have no records of breach penalty or other more serious punishment due to violation of the above regulations?
3	Whether companies comply with Procedures for Information Reporting of Listed Companies, and whether companies have no records of breach penalty or other more serious punishment due to violation of the above regulations?
4	Whether the announcement of ownership change of directors, supervisors, managers, and shareholders with more than 10% ownership complies with TWSE / GTSM's regulations and whether companies have no records of punishment due to violation of the above regulations?
5	Whether company's announcements of lending and guarantee from the company itself and its subsidiaries have no records of punishment due to violation of regulators' rules?
6	Whether company's announcements of asset disposal or acquisition have no records of punishment due to violation of regulators' rules?
7	Whether company announces major events that have significant impact on shareholders' rights or stock price on a timely basis, and whether company has no records of punishment due to violation of the above regulations?
8	Whether company has reported, on a timely basis, the internal control statement (four months within the completion of accounting year) and internal audit related operations, and whether company has no records of punishment due to violation

	of the above regulations?
9	Whether company discloses auditor's fee based on regulation and whether company has no records of punishment due to violation of the above regulations?
10	Whether company's financial report needs adjustment or re-statement as required by regulator, TWSE, or GTSM?
11	Whether company discloses clarification based on regulators' rules when the material information that has some impact on stock price is reported by the press media or investors, and whether company receives no notification of improvement in this matter?
12	Whether company reports and announces shareholder handbook and meeting supplement in time, and whether company receives no penalty associated with the violation of the above regulations?
	II. Timeliness of Information Reporting (Questions 13-39)
13	Whether company announces monthly financial report in time?
14	Whether company announces consolidated monthly financial report in time? (This item receives extra bonus point)
15	Whether company announces monthly operating income and before tax income statement in time? (This item receives extra bonus point)
16	Whether the company announces monthly guarantees and lending information backed up by the company itself and its subsidiaries in time?
17	Whether company announces operating income, operating income by products for major subsidiaries, and intra-company sales and its sales percentage between the company itself and its major subsidiaries on a timely basis?
18	Whether company announces monthly amount of derivative product trading for the company itself and its subsidiaries in time?
19	Whether company reports the investment information in Mainland from the company and its overseas subsidiaries based on the Operating Rules for Information Report of Listed Companies?
20	Whether company reports independent directors' and supervisors' position, experience, and education background and their part-time jobs as directors and supervisors for other companies in time?
21	Whether company reports treasury stock related operations to regulators, TWSE, or GTSM in time?
22	Whether company reports annual exercised and unexercised employee stock warrant information in time based on the Rules for Information Reporting of Listed Companies?

23	Whether company reports annual report in time?
24	Whether company finishes annual report within two months of accounting year-end? (This item receives extra bonus point)
25	Whether company reports annual report within three months of accounting year-end? (This item receives extra bonus point)
26	Whether company reports semi-annual report in time?
27	Whether company reports semi-annual report within one month of accounting half year-end? (This item receives extra bonus point)
28	Whether company reports first quarter and third quarter financial reports in time?
29	Whether company reports consolidated financial statements in time?
30	Whether company reports annual report in time?
31	Whether company reports first quarter and third quarter consolidated financial statements in time?
32	Whether company reports first quarter and third quarter consolidated financial statements within one month of first quarter-end and third quarter-end respectively in time? (This item receives extra bonus point)
33	Whether company reports accounting manager's qualifications and on-the-job professional training situation in time?
34	Whether company reports shareholder handbook and meeting supplement 30 days before the start of shareholder meeting? (This item receives extra bonus point)
35	Whether company reports English version shareholder handbook and meeting supplement 30 days before the start of shareholder meeting? (This item receives extra bonus point)
36	Whether company reports English version shareholder annual report and uploads it to market observation post system (MOPS)? (This item receives extra bonus point)
37	Whether company discloses English version material information concurrently when Chinese version material information is announced? (This item receives extra bonus point)
38	Whether company reports the date of shareholders' meeting in time based on pre-announcement reporting mechanism of publicly listed firms?
39	Whether company reports financial statements in XBRL format in time? (This item receives extra bonus point)
	III. Disclosure of Financial Forecast (Questions 40-44)
40	Whether company discloses financial forecast information of the current year

	voluntarily? (This item receives extra bonus point)
41	Whether company discloses consolidated financial forecast information of the current year voluntarily? (This item receives extra bonus point)
42	Whether company explains the possible factors that may lead to a discrepancy between financial forecast and actual financial results in advance (warning of forward looking information)?
43	Whether company has received rectification from regulator, and records of flaw from TWSE / GTSM due to the delayed update (correction) of financial forecast information?
44	Whether company has received rectification from regulator, and records of flaw from TWSE / GTSM due to unreasonable basic assumptions on the delayed update (correction) of financial forecast information?
	IV. Disclosure of Annual Report (Questions 45-94)
	(1) Transparency in Financial and Operating Information
45	Whether company discloses important accounting policy in annual report?
46	Whether the accounting standards that the company adopts are the same as the generally accepted accounting principles in Taiwan?
47	Whether the annual report discloses accounting adjustments due to the adoption of different accounting principles (Taiwan Vs. IFRS / U.S. GAAP)? (This item receives extra bonus point)
48	Whether company discloses the methods of fixed asset depreciation and depreciation age limit?
49	Whether company discloses the rules and methods of asset and liability valuation? (This item receives extra bonus point)
50	Whether company uses buying price or selling price to decide the fair value of non-stock and non-warrants derivative products? (This item receives extra bonus point)
51	Whether company discloses analytical information that is conducted by different departments in annual report?
52	Whether company discloses the name of certified audit firm and the unqualified (modified unqualified) audit report in annual report?
53	Whether company discloses the amount and types of other non-audit fees that are paid to the same certified audit firm or its affiliated enterprises in annual report? (This item receives extra bonus point)
54	Whether company discloses organizational and ownership structures in annual report?

55	Whether company discloses the guarantee, lending, and other derivative trading information of itself or its affiliated enterprises in annual report?
56	Whether company discloses trading information for related persons (including its affiliation) in annual report?
57	Whether company discloses the review of company's operation from the management team in annual report?
58	Whether company discloses information about industry trend and macroeconomics environment in annual report?
59	Whether company discloses long-term and short-term sales expansion project in annual report?
60	Whether company discloses future R&D plan and its estimated expenses in annual report?
61	Whether company discloses R&D investment plan and progress in annual report? (This item receives extra bonus point)
62	Whether company discloses detailed information about the products and services manufactured and provided by the company in annual report?
63	Whether company discloses the amount produced and sold and product mix in annual report?
64	Whether company discloses industry-specific Key Performance Indicators (KPI) in annual report? (This item receives extra bonus point)
65	Whether company discloses historical performance indicator (such as ROE, ROA, etc.) in annual report?
66	Whether company discloses risk management policy in annual report?
67	Whether company discloses the organizational structure of risk management in annual report? (This item receives extra bonus point)
68	Whether company discloses the adoption of hedge accounting and its associated objective and methods in annual report?
69	Whether company discloses managers' participation in corporate governance related on-the-job training in annual report? (This item receives extra bonus point)
70	Whether company discloses the information of employees' on-the-job training in annual report?
71	Whether company discloses all kinds of employees' welfare, retirement plan, and their current practice in annual report?
72	Whether company discloses certificates (regulator certified) holding situation for the personnel responsible for the transparency of finance information in annual

	report? (This item receives extra bonus point)
73	Whether company discloses the ethic or moral rules for employees in annual report? (This item receives extra bonus point)
74	Whether company discloses the Procedures for Internal Material Information Processing in annual report? (This item receives extra bonus point)
75	Whether company discloses work environment and safety related protective measures in annual report? (This item receives extra bonus point)
76	Whether company discloses corporate social responsibility in annual report?
	(2) Board Meeting and Ownership Structure
77	Whether company discloses directors' or supervisors' names, education, experience, ownership, and the date of becoming board members in annual report?
78	Whether company discloses the classification of titles of directors and supervisors based on "independence" in annual report?
79	Whether company discloses the part-time positions that are held by directors and supervisors in annual report?
80	Whether company discloses directors' and supervisors' remuneration in annual report?
81	Whether company discloses the detailed breakdown of directors' and supervisors' remuneration except those items required for disclosure by regulators in annual report? (This item receives extra bonus point)
82	Whether company discloses the compensation of CEO, and vice presidents, and top management in annual report?
83	Whether company discloses the current situation (increase or decrease) of the stocks being used as collaterals by directors, supervisors, managers, and large shareholders in annual report?
84	Whether company discloses the board meeting attendance situation for directors and supervisors, and the attendance situation of audit committee meeting for independent directors in annual report?
85	Whether company discloses governing information regarding the operation of board meeting and audit committee meeting separately in annual report?
86	Whether company discloses training for directors and supervisors in annual report?
87	Whether company discloses the discussion of corporate governance in annual report?
88	Whether company discloses the resignation and dismissal situation for personnel

	related to corporate disclosure and financial report in annual report?
89	Whether company discloses the names and positions of top 10 employee stock warrants recipients in annual report?
90	Whether company discloses the bonus amount, names and positions of top 10 employees who receive stock bonus in annual report? (This item receives extra bonus point)
91	Whether company discloses managers' names, stock ownership, education, experience, current part-time positions in other companies, and the number of employee stock warrants in annual report?
92	Whether company discloses the amount and percentage of stock ownership for top 10 shareholders in annual report?
93	Whether company discloses the information of related persons between top 10 shareholders in annual report?
94	Whether company discloses the review of execution situation (for the items decided for execution in shareholder meeting) in annual report? (This item receives extra bonus point)
	V. Company Website Disclosure (Questions 95-114)
95	Whether company has corporate website that discloses public information (including detailed financial data) on website?
96	Whether company discloses shareholders annual report on corporate website?
97	Whether company discloses public information (including detailed financial data) in English on website?
98	Whether company discloses shareholder meeting information in English on corporate website?
99	Whether company discloses monthly operating profit / loss (financial holding companies, banks, and bills finance companies disclose profit and loss for the departments with continued operation) and accumulated operating profit / loss for the current year on corporate website?
100	Whether company discloses the reports of monthly revenue and the monthly revenue for the previous 24 months on corporate website?
101	Whether company discloses the compliance of TWSE's rule regarding the qualifications of appointing independent directors on corporate website?
102	Whether company discloses execution items of board meeting on corporate website?
103	Whether company discloses complete meeting minutes of board meeting on corporate website?

104	Whether company discloses dividends and stock price information on corporate website?
105	Whether company discloses material information on corporate website?
106	Whether company discloses articles of incorporation, and the operating procedures for acquisition and disposal of assets, lending, guarantee, and derivative trading on corporate website?
107	Whether company provides shareholders Q&A function on corporate website?
108	Whether company discloses information on whether the company holds a conference for institutional investor and posts meeting related information on corporate website?
109	Whether company discloses the audio or video recording throughout the conference of institutional investors on corporate website?
110	Whether shareholders are allowed to exert their voting rights in writing or via electronic media and whether such voting methods and their execution situation are posted on corporate website?
111	Whether company discloses the election regulation regarding the directors and supervisors to be elected are nominated by a nominating committee?
112	Whether company discloses corporate organizational structure, managers' positions, power, and their responsibility on corporate website?
113	Whether company discloses the organization and operation of internal audit on corporate website?
114	Whether company discloses corporate social responsibility on corporate website?

Appendix B

Measurements of information rating based on five different dimensions

This appendix categorizes the 114 items used to evaluate a firm's information rating in each of the five dimensions of information disclosure. Total items are the number of items in each dimension. Percentage of total items represented is the number of total items in each dimension divided by total items in the sample (114). Items with extra rewards are those items encouraged by the government regulator.

Dimension	Item range	Total items	Percentage of total items represented	Items with extra rewards
(1) Regulatory compliance	1-12	12	11%	None
(2) Timeliness of information disclosure	13-38	26	23%	9 items
(3) Disclosure of financial forecast	39-43	5	4%	5 items
(4) Disclosure of annual report	44-93	50	44%	4 items
(5) Disclosure of firm website	94-114	21	18%	21 items
Total			100%	49 items

Data sources: SFI database

Appendix C

Information ratings and their corresponding scores from 2006 to 2012

This appendix shows the corresponding information rating score for each information rating ranging from A++ to C-.

Information rating (IR)	2006	2007	2008	2009	2010	2011	2012
A++						7	7
A+	5	5	5	5	5	6	6
A	4	4	4	4	4	5	5
A-						4	4
B	3	3	3	3	3	3	3
C	2	2	2	2	2	2	2
C-	1	1	1	1	1	1	1

Data source: SFI database, Taiwan

Appendix D

Variable definitions

This appendix provides the definition of each dependent and independent variable used in the empirical analysis.

Variable	Definitions
	Firm Characteristics
LEVERAGE	The ratio of debt to market value of assets.
IR	The score of information rating ranging from 1 (the lowest) to 7 (the highest).
IRS	The standardized information rating score, the difference between IR for firm *I* at time *t* and the average IR, scaled by the firm's IR standard deviation.
SLACK	Cash/total assets
TANG	The ratio of fixed to total assets.
QRATIO	[(Total assets – book equity + market equity) / Total assets]*100%.
SIZE	Natural log of net sales.
PF	Profitability = (EBITDA / Total assets)*100%.
	Agency-based measurements
SDS	Percentage of total shares outstanding of directors and supervisors.
SLS	Percentage of total shares outstanding of the largest shareholder.
SID	Percentage of shareholdings of individual investors.
TFS	Percentage of total shares outstanding of controlling family members.
TFC	Times of family shareholdings to cash flow rights = family share ownership / cash flow rights, where cash flow rights is the percentage of cash flow rights for the ultimate control by the largest shareholder (La Porta et al. (2002), Claessens et al. (2002)).
TFV	Times of family shareholdings to voting rights = family share ownership / voting rights, where voting rights is the percentage of voting rights for the ultimate control by the largest shareholder (La Porta et al. (1999)).
	Agreement measurements
AG1	(Actual earnings per share - forecasted earnings per share) / Actual earnings per share (Dittmar and Thakor (2007))
AG2	The standard deviation of the analyst forecasts divided by book equity (Dittmar and Thakor (2007))

	Others
GGDP	Growth rate of real GDP

Highlights:

We examine the impact of information asymmetry on capital structure decisions.

We use a unique data that rates each firm's information transparency from C- to A++.

Firms with high (low) information ratings are related to low (high) debt financing.

The relationship is robust to incentive conflicts and the agreement theory of Dittmar and Thakor (2007).

Our findings support the pecking order theory independent of these effects.