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Review Article

Disclosure Levels, Stock Market Liquidity, and Earnings Quality: Evidence from Taiwan

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Abstract

In 2003, authorities in Taiwan launched a system to annually rank listed firms according to disclosure levels to encourage increasing disclosure levels so as to reduce the cost of capital. This study explores the relation between disclosure levels (as proxied by the ranking results of the system) and market liquidity (as measured by effective bid-ask spreads) to empirically test whether the objective of the system can be achieved. In examining the relation between disclosure and the cost of capital, Francis et al. [1] find that the relation between the constructs is caused because disclosure is merely seen as a proxy for earnings quality. Following Francis et al. [1], this study examines whether earnings quality plays a role in the relation between disclosure and liquidity. The results of the study reveal that market liquidity is better for firms with higher levels of disclosure. In addition, this study finds that market liquidity is higher (lower) for firms with higher (lower) earnings quality. Finally, in contrast to Francis et al. [1], this study finds no significant difference in the relation between disclosure levels and liquidity after controlling for earnings quality, which indicates that, aside from earnings quality, information disclosure is also affected by other factors.

Keywords: Disclosure; Information transparency; Earnings quality; Liquidity

Introduction

In response to calls for increased information transparency, which were prompted by the financial scandals that had continued to come to light since Enron (2001), authorities in Taiwan launched a system (the Information Transparency and Disclosure Ranking System, the *ITDRS*) in 2003 to annually rank listed firms according to their disclosure level, with one of its objectives being to encourage raising disclosure levels so as to reduce the cost of capital. In the literature, while most prior research holds that greater disclosure is associated with a lower cost of capital, empirical studies have documented mixed results concerning the relation between the two, largely due to the complexity and alternative operationalizations of the constructs examined. Some researchers suggest that, given a lack of consensus on how best to measure the cost of capital, market liquidity can be used instead to infer the relation between disclosure and the cost of capital, which bypasses the potential measurement bias problem. Therefore, this study explores the relation between disclosure levels (as proxied by the ranking results of the *ITDRS*) and market liquidity (as measured by effective bid-ask spreads) to empirically test whether the objective of the *ITDRS* can be achieved as asserted.

In an earlier study, Francis et al. [1] investigated the relations among voluntary disclosure, earnings quality and the cost of capital, and found a negative association between disclosure and the cost of capital. The disclosure effect on the cost of capital, however, substantially diminishes or disappears after they controlled for earnings quality, which implies that disclosure is merely a proxy for earnings quality. Following Francis et al. [1], this study examines whether earnings quality plays a role in the relation between disclosure and liquidity. The results of the study reveal that market liquidity is better (1) for firms covered by the *ITDRS* relative to firms unranked for regulatory problems, (2) for firms with greater voluntary disclosure, (3) for high ranking firms relative to low ranking firms, and (4) for firms that are consistently ranked high by the system. In addition, this study finds that market liquidity is higher (lower) for firms with higher (lower) earnings quality. Finally, in contrast to Francis et al. [1], this study finds no significant difference in the relation between disclosure levels and liquidity after controlling for earnings quality, which indicates that, aside from earnings quality, information disclosure is also affected by other factors.

Literature Review and Hypothesis Development

Traditionally, theories that link disclosure to market liquidity suggest that greater disclosure reduces the information asymmetry between firm insiders and shareholders or among potential buyers and sellers of firm shares, and it increases liquidity in equity markets. The stated relation between disclosure and liquidity is considered valid because uninformed investors generally price protect against potential losses from trading with better informed market participants [2], and market liquidity (often measured by bid-ask spreads) provides a measure of such price protection that uninformed market participants demand as compensation for the perceived information risk associated with trading in equity markets [3][1]. As a result, increases in disclosure, which can lower information asymmetry, tend to promote investors' willingness to trade, which increases the demand for the stock and stock liquidity. Moreover, Diamond and Verrecchia [4] claim that greater disclosure reduces the amount of information revealed by a large trade. When the adverse price impact of such a trade is reduced, investors are willing to take larger positions in a firm's securities, which then increases the demand for or the liquidity of the securities.

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Empirically, Welker [3] documents a negative association between disclosure levels and relative bid-ask spreads, and shows that the spreads for firms with disclosure rankings in the bottom third of the sample are approximately 50 percent higher than the spreads for firms in the top third. Healy, et al. [5] focus on firms with large and sustained increases in their disclosure strategies over an eleven-year period, and find that expanded disclosure is accompanied by improved stock liquidity. Heflin et al. [6] also find financial analysts' ratings of firm disclosures to be inversely related to bid-ask spreads, both unconditional and conditional on order size and quoted depth (which are also considered to impact on disclosure levels). Finally, Leuz and Verrecchia [7] find that firms that adopt accounting standards characterized by higher levels of disclosure exhibit lower bid-ask spreads than firms that adopt standards requiring less disclosure.

The theoretical and empirical research, discussed above, support the following hypothesis:

H1:

The higher the disclosure levels, the better the stock market liquidity.

Financial accounting plays a role in conveying useful information to the public, and earnings are arguably the vehicle that companies use most commonly to convey the information, based on which investors and analysts make their decisions. More important, for the information to be useful, earnings must be of good quality, which implies that current financial statement information must be closely related to future firm performance [8]. In the literature, many studies find that managers choose accounting policies or actions to try to affect earnings so as to achieve some specific reported earnings objectives. Under the circumstances, investors are likely to be misled if they take this information at face value without seeing through the reported figures, and thus it is essential that earnings be of good quality for investors to consider the information both credible and useful. Empirically, Teoh et al. [9] report that issuers of initial public offerings, with unusually high accruals in the IPO year, experience poor stock return performance in the subsequent three years. Dechow et al. [10] find that firms manipulating earnings experience significant increases in their costs of capital when the manipulations are made public. Sengupta [11] documents that firms with high disclosure quality ratings from financial analysts enjoy a lower effective interest cost of issuing debt. Finally, Francis et al. [12] find that poorer accruals quality is associated with larger costs of debt and equity. In essence, the research referred to above examines how the cost of capital or stock performance is affected by earnings quality, and yet the immediate reaction from investors to high or low quality earnings figures remains to be seen. There is no doubt that investors benefit from better-quality information insofar as this helps reduce the risk facing investors and assess the risk and return more accurately. However, whether investors actually place earnings quality among the most important criteria to influence their investment decisions merits further investigation. Consequently, we formulate the second hypothesis to see whether companies with better quality of earnings benefit from higher stock market liquidity.

H2:

The better the quality of earnings, the better the stock market liquidity.

In regard to the relation between disclosure levels and information quality, two different views can be found in the literature. On the one hand, there are researchers who argue that firms with poor earnings quality will issue more expansive disclosures because information asymmetry is higher in these firms, and the value of additional information to reduce the information asymmetry is greater [13-15]. On the other hand, there are also researchers who believe that firms with poor earnings quality will disclose less because investors will treat their disclosures as less credible any way. By contrast, companies with good earnings quality will disclose more because investors would otherwise interpret nondisclosure as unfavorable news and consequently discount the value of the firm [13,14,16]. Generally, past empirical results [16-18] support the view that disclosure increases as earnings quality increases. In addition, both Imhoff and Cox [19,20] provide evidence that companies that voluntarily publish management earnings forecasts have significantly more stable earnings than non-forecasting companies. In sum, the evidence presented in these studies is consistent with the view that firms with better earnings quality tend to disclose more. Building on the previously established positive relation between disclosure and earnings quality which is also documented in their study, Francis et al. [1] demonstrate that the relation between disclosure and the cost of capital is fundamentally driven by the first-order effect of earnings quality on the cost of capital. After the earnings quality effect on the cost of capital is controlled for, the disclosure effect is either substantially reduced or disappears. Along this line of reasoning, this study examines whether the link between disclosure and market liquidity is affected by how disclosure relates to earnings quality, which leads to the following hypothesis.

H3:

Controlling for earnings quality, variation in disclosure levels is related to variation in market liquidity.

Measurement of Test Variables

Disclosure levels

In the literature, researchers use management forecasts, conference calls, and self-constructed, or externally generated scores (e.g., scores reported by the Association for Investment Management and Research or the Financial Analysts Federation) to proxy for disclosure policies or practices. In Taiwan, the Securities and Futures Institute, entrusted by the authorities, established a system (the IRDRS) in 2003 to evaluate the level of information transparency for practically all listed firms.[2] Each year, based on disclosure levels, local listed firms are ranked as "Grade A+", "Grade A", "Grade B", "Grade C", and "Grade C" firms. Although there are other financial information providers that release similar information, we use the ranking results published by the IRDRS because the selection criteria that this system uses provide a more comprehensive evaluation of disclosure practices in Taiwan. Specifically, to evaluate the level of information transparency, the IRDRS identifies 114 disclosure items as evaluation criteria, which are then grouped into five categories (compliance with mandatory disclosures, timeliness of reporting, disclosure of financial forecast, disclosure of annual report, and corporate website disclosure). It should be noted that, in addition to ranking listed firms according to disclosure levels, each year the IRDRS also publishes a listing of firms whose voluntary disclosures

are considered more transparent. The classification of firms based on whether their voluntary disclosures are deemed more transparent is also used in this study.

Earnings quality

While different measures have been used to proxy for earnings quality (accruals quality, earnings variability, and absolute abnormal accruals), Francis et al. [21] report that the three measures are essentially the same in terms of their capital market effects. This study chooses to use the modified Jones Model to estimate the absolute value of abnormal accruals (or discretionary accruals) to proxy for earnings quality, with the detailed estimation procedure of discretionary accruals described as follows:

$$\frac{TA_{i,t}}{A_{i,t-1}} = a_0\left(\frac{1}{A_{i,t-1}}\right) + a_1\left(\frac{\Delta REV_{i,t}}{A_{i,t-1}}\right) + a_2\left(\frac{PPE_{i,t}}{A_{i,t-1}}\right) + \varepsilon_{i,t} \quad \text{(Step 1)}$$

$$NDA_{i,t} = \alpha_0\left(\frac{1}{A_{i,t-1}}\right) + \alpha_1\left(\frac{\Delta REV_{i,t} - \Delta AR_{i,t}}{A_{i,t-1}}\right) + \alpha_2\left(PPE_{i,t}/A_{i,t-1}\right) \quad \text{(Step 2)}$$

$$DA_{i,t} = TA_{i,t} - NDA_{i,t} \quad \text{(Step 3)}$$

where, α_0, $\alpha_1$and α_2 in step 2 are the parameters estimated from step 1.

$A_{i,t-1}$	firm *i*'s year-end total assets in year t-1
$TA_{i,t}$	$NI_{i,t}$-$CFO_{i,t}$
$TA_{i,t}$	firm *i*'s total accruals in year t
$NI_{i,t}$	firm *i*'s net income from continuing operations in year t
$CFO_{i,t}$	firm *i*'s cash flows from operating activities in year t
$NDA_{i,t}$	firm *i*'s nondiscretionary accruals in year t deflated by $\mathbf{A_{i,t-1}}$
$\Delta REV_{i,t}$	firm *i*'s change in revenues between year t-1 and year t
$\Delta Ar_{i,t}$	firm *i*'s change in accounts receivable between year t-1 and year t
$\varepsilon_{i,t}$	residual term
$PPE_{i,t}$	firm *i*'s gross value of property, plant, and equipment in year t
$DA_{i,t}$	firm *i*'s discretionary accruals in year t

Stock market liquidity

As pointed out by Dubofsky and Growth [22], there is no universally accepted measure of liquidity, and each measure that has been used has its limitations. Recently, Huang and Stoll [23] argue that, because the prices at which trades take place are likely to be inside the bid and ask quotes, the use of a difference between bids and ask quotes to calculate spread may overestimate execution costs. Given that trades can occur inside the spread, they suggest that a better measure of execution costs and liquidity would be effective spread, which is based on trade price. As a result, this study uses effective spread to measure liquidity, which is calculated as follows:

Quote midpoint at time of trade $(qt) = \frac{ask_t + bid_t}{2}$

Effective spread $= 2 \times \left| p_t - q_t \right|$

Where P_t *is the trade price at time t.*

Control variables

Several control variables are included in this study: firm size, share price, the variability of stock returns, number of transactions, and transaction size. Among these, firm size (as a proxy for information asymmetry), number of transactions and transaction size (as proxies for trading activity) are all predicted to be negatively related to effective spreads, while share price and the variability of stock returns are predicted to be positively related to effective spreads[3] [3,6,24]. The control variables mentioned here are measured as follows:

(1) Firm size (ln Size): the natural log of the daily average number of shares outstanding times the daily average share price for the year.

(2) Share price (ln Price): the natural log of the daily average price quote midpoint for the year.

(3) Variability of stock returns (Vr): the standard deviation of the daily stock returns for the year.

(4) Number of transactions (ln Trans): the natural log of the daily average number of transactions.

(5) Transaction size (Transize): the daily average number of shares traded (measured in thousands).

Sample Selection and Data Collection

Sample period

The IDTRS started to evaluate Taiwanese firms' disclosure practices in 2003. However, in 2003 and 2004, the system provided only a list of companies with more transparent disclosures. In addition, in 2005, considering that the listed firms might not be quite ready for the evaluation, the ranking category of "Grade C" was excluded from the system for the year. Consequently, to be able to compare ranking results between the years involved, our sample period covers 2006-2008. Data from more recent years were excluded for comparability reasons because further changes were made in the ranking system, which occurred in the years following the selected period.

Sources of data

Each year's ranking results of disclosure are available from the website of the Securities and Futures Institute, and the Taiwan Economic Journal provides the rest of the data needed for the study.

Sample companies with complete data for the three-year period (2006-2008) are summarized in Table 1, which shows the year-by-year distribution of listed firms across the different disclosure scores.

Table 1: Distribution of Firm Year Observations across Different Disclosure Scores.

	2006	2007	2008	Total
Grade A+	8	8	24	40
GradeA	191	189	299	679
GradeB	588	545	631	1764
GradeC	194	246	104	544
GradeC-	0	52	12	64
Subtotal	981	1040	1070	3091
Unranked	131	123	126	380
Total	1112	1163	1196	3471

Method of Analysis

We estimate a total of nine regressions to test the hypotheses formulated earlier. Regarding Hypothesis 1, four regressions are shown below.

$$(1) Spread_{eff} = \beta_0 + \beta_1 DA^{+} + \beta_2 DA + \beta_3 DB + \beta_4 DC + \beta_5 DC^{-} + \beta_6 VolDisc + \beta_7 InSize + \beta_8 In\,\mathrm{Price} + \beta_9 InTrans + \beta_{10} Vr + \beta_{11} Transize + \varepsilon$$

$$(2) Spread_{eff} = \beta_0 + \beta_1 VolDisc + \beta_2 InSize + \beta_3 In\,\mathrm{Price} + \beta_4 InTrans + \beta_5 Vr + \beta_6 Transize + \varepsilon$$

$$(3) Spread_{eff} = \beta_0 + \beta_1 HighScore + \beta_2 InSize + \beta_3 In\,\mathrm{Price} + \beta_4 InTrans + \beta_5 Vr + \beta_6 Transize + \varepsilon$$

$$(4) Spread_{eff} = \beta_0 + \beta_1 ConsisDisc + \beta_2 InSize + \beta_3 In\,\mathrm{Price} + \beta_4 Trans + \beta_5 InVr + \beta_6 Transize + \varepsilon$$

For *Hypothesis 2*, the regression equation appears below.

$$(5) Spread_{eff} = \beta_0 + \beta_1 ADA + \beta_2 InSize + \beta_3 In\,\mathrm{Price} + \beta_4 InTrans + \beta_5 Vr + \beta_6 Transize + \varepsilon$$

For *Hypothesis 3*, the following regression equations are used:

$$(6) Spread_{eff} = \beta_0 + \beta_1 DA^{+} + \beta_2 DB + \beta_3 DC + \beta_4 DC^{-} + \beta_5 VolDisc + \beta_6 ADA + \beta_7 InSize + \beta_8 InP\,\mathrm{rice} + \beta_9 InTrans + \beta_{10} Vr + \beta_{11} Transize + \varepsilon$$

$$(7) Spread_{eff} = \beta_0 + \beta_1 VolDisc + \beta_2 ADA + \beta_3 InSize + \beta_4 In\,\mathrm{Price} + \beta_5 InTrans + \beta_6 Vr + \beta_7 TranSize + \varepsilon$$

$$(8) Spread_{eff} = \beta_0 + \beta_1 HighScore + \beta_2 ADA + \beta_3 InSize + \beta_4 In\,\mathrm{Price} + \beta_5 InTrans + \beta_6 Vr + \beta_7 TranSize + \varepsilon$$

$$(9) Spread_{eff} = \beta_0 + \beta_1 ConsisDisc + \beta_2 ADA + \beta_3 InSize + \beta_4 In\,\mathrm{Price} + \beta_5 InTrans + \beta_6 Vr + \beta_7 TranSize + \varepsilon$$

Additionally, variables in these equations are defined as follows:

DA^{+}	A dummy variable which equals 1 if the firm was ranked A+ for the year, and 0 otherwise.
DA	A dummy variable which equals 1 if the firm was ranked A for the year, and 0 otherwise.
DB	A dummy variable which equals 1 if the firm was ranked B for the year, and 0 otherwise.
DC	A dummy variable which equals 1 if the firm was ranked C for the year, and 0 otherwise.
DC^{-}	A dummy variable which equals 1 if the firm was ranked C- for the year, and 0 otherwise.
VolDisc	A dummy variable which equals 1 if the firm had greater voluntary disclosure for the year, and 0 otherwise.
InSize	The natural log of firm size (or the daily average market value of equity).
InPrice	The natural log of the daily average share price.
Vr	The variability of stock returns
InTrans	The natural log of the daily average number of transactions
Transize	The daily average number of shares traded per transaction/1,000
HighScore	A dummy variable which equals 1 if the firm was ranked A+ or A for the year, and 0 if the firm was ranked B, C, or C-
Consis Disc	A dummy variable which equals 1 if the firm was consistently ranked A+ or A in three years (2006-2008), and 0 otherwise.
ADA	The absolute value of discretionary accruals

Empirical Results

Descriptive statistics

Table 2 reports descriptive statistics on the dependent, independent, and control variables for the regressions depicted earlier for the sample firms, with both ranked and unranked firms included. The results reported here indicate that, for effective spreads (Spread_eff), the difference between the 10th percentile and the 90th percentile is 9.741, while the difference between the 25th percentile and the 90th percentile is 8.910. Meanwhile, the mean and standard deviation for effective spreads are 4.734 and 6.390, respectively. Basically, the inter-percentile range and standard deviation reported here indicate substantial variation in effective spreads across the 3471 observations. For the absolute value of discretionary accruals (ADA), the inter-percentile differences for the 10th vs. the 90th and for the 25th vs. the 90th are 0.337 and 0.309, respectively, while the mean and standard deviation of ADA are 0.163 and 0.247. As such, there is also considerable variation in earnings quality across the sample observations.

Table 2: Descriptive Statistics (with unranked firms included).

Variables	n	Mean	s.d.	10th percentile	25th percentile	Med.	75th percentile	90th percentile
DA+	3471	0.012	0.107	0	0	0	0	0
DA	3471	0.196	0.397	0	0	0	0	1
DB	3471	0.508	0.500	0	0	1	1	1
DC	3471	0.157	0.364	0	0	0	0	1
DC-	3471	0.018	0.135	0	0	0	0	0
VolDisc	3471	0.073	0.260	0	0	0	0	0
Spread_eff	3471	4.734	6.390	0.617	1.448	2.932	5.707	10.358
ADA	3471	0.163	0.247	0.016	0.044	0.096	0.190	0.353
Transize	3471	3.339	1.587	1.801	2.263	3.022	4.033	5.207
lnSize	3471	8.045	1.480	6.308	7.001	7.901	8.903	9.946
lnPrice	3471	3.046	0.918	1.944	2.452	3.010	3.592	4.193
lnTrans	3471	5.528	1.662	3.393	4.495	5.635	6.719	7.578
Vr	3471	3.094	2.171	1.867	2.359	2.914	3.506	4.123

DA+: a dummy variable which equals 1 if the firm was ranked A+ for the year, and 0 otherwise. DA: a dummy variable which equals 1 if the firm was ranked A for the year, and 0 otherwise; DB: a dummy variable which equals 1 if the firm was ranked B for the year, and 0 otherwise; DC: a dummy variable which equals 1 if the firm was ranked C for the year, and 0 otherwise; VolDisc: a dummy variable which equals 1 if the firm had greater voluntary disclosure for the year, and 0 otherwise; Spread_eff: effective spreads; ADA: the absolute value of discretionary accruals; lnSize: the natural log of firm size; lnPrice: the natural log of share price; Vr: the variability of stock returns; lnTrans: the natural log of the number of transactions; Transize: Transaction size.

In regard to the dummies that denote various disclosure categories, mean disclosure rankings for DA+, DA, DB, DC, DC-, and mean Voluntary Disclosure (Vol Disc) are 0.012, 0.196, 0.508, 0.157, 0.018 and 0.073, respectively. The median values of the dummies are 0, except that for DB (which equals 1), and the 90th percentiles of DA, DB, and DC are all equal to 1. Essentially, the median and percentile figures of the dummies reported here reveal that there is a large degree of concentration of firm-year observations that fall within the upper range of DB, and that the results in the table practically show that at least 50% of the total observations were ranked Grade B, while Grade A and Grade C observations each account for at least 10% of the total sample. Finally, for the control variables, the mean values of transaction size (Tran size), firm size (ln Size), share price (ln Price), number of transactions (ln Trans) and variability of stock returns (Vr) are 3.340, 8.045, 3.046, 5.528, and 3.094, respectively.

Equations (3) and (8) described earlier do not include unranked firms in the model. Table 3 shows the descriptive statistics for ranked firms only, with the sample size reduced from 3,471 to 3,091. As shown in the table, for effective spreads, the inter-percentile differences for the 10th vs. the 90th and the 25th vs. the 90th are 9.176 and 8.368, respectively. The mean and standard deviation are 4.681 and 6.091, respectively, which indicates that the distribution of effective spreads exhibits great dispersion. Meanwhile, the mean and standard deviation for ADA are 0.151 and 0.230, which also reveals substantial variation in abnormal accruals across the observations. In addition, the mean values for DA+, DA, DB, DC, DC-, and VolDisc are 0.013, 0.220, 0.571, 0.176, 0.021 and 0.082, respectively. Regarding the control variables, the mean values of Transize, ln Size, ln Price, ln

Table 3: Descriptive Statistics (with unranked firms excluded).

Variables	n	Mean	s.d.	10th percentile	25th percentile	Med.	75th percentile	90th percentile
DA+	3091	0.013	0.113	0	0	0	0	0
DA	3091	0.220	0.414	0	0	0	0	1
DB	3091	0.571	0.495	0	0	1	1	1
DC	3091	0.176	0.381	0	0	0	0	1
DC-	3091	0.021	0.142	0	0	0	0	0
VolDisc	3091	0.082	0.275	0	0	0	0	0
Spread_ eff	3091	4.681	6.091	0.743	1.551	3.029	5.713	9.919
ADA	3091	0.151	0.230	0.015	0.043	0.093	0.177	0.329
Transize	3091	3.292	1.372	1.858	2.293	3.033	3.979	5.056
lnSize	3091	8.152	1.435	6.465	7.108	7.995	8.991	9.987
lnPrice	3091	3.098	0.848	2.084	2.520	3.038	3.596	4.171
lnTrans	3091	5.683	1.531	3.704	4.651	5.745	6.810	7.628
Vr	3091	2.829	0.763	1.833	2.310	2.825	3.345	3.847

DA+: a dummy variable which equals 1 if the firm was ranked A+ for the year, and 0 otherwise; DA: a dummy variable which equals 1 if the firm was ranked A for the year, and 0 otherwise; DB: a dummy variable which equals 1 if the firm was ranked B for the year, and 0 otherwise; DC: a dummy variable which equals 1 if the firm was ranked C for the year, and 0 otherwise; VolDisc: a dummy variable which equals 1 if the firm had greater voluntary disclosure for the year, and 0 otherwise; Spread_eff: effective spreads; ADA: the absolute value of discretionary accruals; lnSize: the natural log of firm size; lnPrice: the natural log of share price; Vr: the variability of stock returns; lnTrans: the natural log of the number of transactions; Transize: transaction size.

Trans, and Vr are 3.292, 8.152, 3.098, 5.683, and 2.829, respectively. Meanwhile, the median values for the disclosure ranking dummies are all 0, except that for DB (which is 1). The 90th percentiles for DA, DB, and DC are all equal to 1.The principal difference between Table 2 and Table 3 lies in the fact that the dummies across the different disclosure ranking categories for unranked firms always take the value of 0 in Table 2. Once the unranked firms are excluded, Table 3 shows higher mean values for disclosure rankings, and smaller means and standard deviations for effective spreads and abnormal accruals. In terms of control variables, in Table 3, the mean and standard deviation decrease for transaction size; the means (standard deviations) for firm size, share price and number of transactions increase (decrease); and the mean and standard deviation for the variability of stock returns decrease. As a further step, we partition the sample into six groups based on disclosure rankings (including five disclosure-level-ranked groups plus the unranked one) to examine how changes in disclosure rankings affect effective spreads, abnormal accruals, and the control variables. The results are shown in Table 4. First, the mean values of effective spreads for the various disclosure ranking groups (in descending order of disclosure level) are 3.975, 4.165, 5.079, 4.182, 3.848, and 5.169, respectively. Ranked firms have lower effective spreads than unranked firms. Second, Grade A+ firms have the smallest mean of abnormal accruals (0.103), an indication of better earnings quality. On the other hand, as predicted, unranked firms have the highest mean value of abnormal accruals, a sign of poorer earnings quality. Third, in terms of the control variables, the relations depicted in the table are as predicted. Generally, firm size increases with increases in disclosure rankings, and the average firm size for each of the ranked groups is greater than that of the unranked firms. Moreover, as disclosure rankings increase, the

Table 4: Means and Standard Deviations of Effective Spreads, Abnormal Accruals, and Control Variables (for five ranked groups and the unranked one).

	DA+		DA		DB		DC		DC-		Unranked	
	n=40		n=679		N=1764		N=544		N=64		N=380	
Variables	Mean	s.d	Mean	s.d.	Mean	s.d.	Mean	s.d	Mean	s.d.	Mean	s.d.
Spread_ eff	3.975	6.213	4.165	5.426	5.079	6.513	4.182	5.486	3.848	4.668	5.169	8.438
ADA	0.103	0.081	0.155	0.223	0.149	0.230	0.161	0.252	0.133	0.158	0.260	0.341
Transize	3.880	1.597	3.341	1.386	3.140	1.243	3.627	1.625	3.771	1.398	3.723	2.745
lnSize	9.948	2.328	8.750	1.602	8.060	1.304	7.616	1.177	7.787	1.349	7.176	1.551
lnPrice	3.409	0.793	3.241	0.860	3.137	0.837	2.808	0.790	2.788	0.871	2.617	1.287
lnTrans	6.808	1.628	6.155	1.494	5.632	1.484	5.211	1.537	5.367	1.438	4.265	2.092
Vr	2.638	0.952	2.796	0.766	2.844	0.750	2.838	0.781	2.806	0.763	5.255	5.757

DA+: a dummy variable which equals 1 if the firm was ranked A+ for the year and 0 otherwise. DA: a dummy variable which equals 1 if the firm was ranked A for the year and 0 otherwise. DB: a dummy variable which equals 1 if the firm was ranked B for the year and 0 otherwise. DC: a dummy variable which equals 1 if the firm was ranked C for the year and 0 otherwise. VolDisc: a dummy variable which equals 1 if the firm had greater voluntary disclosure for the year and 0 otherwise. $Spread_{eff}$: effective spreads ADA: the absolute value of discretionary accruals lnSize: the natural log of firm size. lnPrice: the natural log of share price. Vr: the variability of stock returns lnTrans: the natural log of the number of transactions Transize: transaction size.

mean values of share price and number of transactions also increase, and at the same time the mean values of Ln Price and Ln Trans for ranked firms are higher than those for unranked firms. In terms of the variability of stock returns, unranked firms' stock returns exhibit greater variability than those of ranked firms. Overall, unranked firms have greater effective spreads, greater abnormal accruals, and greater variability of stock returns. Additionally, among ranked firms, increases in disclosure rankings are generally accompanied by smaller effective spreads, smaller abnormal accruals, and smaller variability of stock returns and these increases in disclosure rankings meanwhile are accompanied by greater transaction size, greater number of transactions, and larger firm size. The disclosure effects are particularly salient when a comparison is made between DA+ and any of the other ranking categories.

Univariate t-tests

To conduct the t-tests, we first separated firm-year observations into two groups based on whether the firm's voluntary disclosures were deemed transparent for the year. The t-test results are reported in Table 5, which shows that, effective spreads are significantly smaller for firms with more transparent voluntary disclosures. Moreover, these voluntary disclosure firms tend to be larger in size, have higher share prices and larger number of transactions and transaction size, with less variable stock returns. The differences referred to above are all significant and consistent with earlier predictions. On the other hand, the difference in abnormal accruals is not significant between high and low voluntary disclosure firms. Next, we compared high disclosure ranking firms (DA+ and DA) with low disclosure ranking firms (DB, DC, and DC-).The results are reported in Table 6, which shows that high ranking firms have smaller spreads, while the difference in abnormal accruals is not significant. With respect to the control variables, the results generally confirm earlier predictions, except that the difference in Tran Size is insignificant. Finally, we separated observations into four groups, based on the absolute value of abnormal accruals (ADA), and then compared firms in the top

Table 5: T-test Results: High Voluntary Disclosure Firms vs. Low Voluntary Disclosure Firms.

	Vol Disc=0		Vol Disc=1		Difference (1)-(2)	t-value
	n=2837		n=254			
Variables	Mean(1)	s.d.	Mean(2)	s.d.		
Spread_eff	4.756	6.222	3.840	4.293	0.916	2.298**
ADA	0.151	0.232	0.155	0.202	-0.004	-0.272
Transize	3.272	1.360	3.522	1.481	-0.250	-2.790***
lnSize	8.062	1.362	9.165	1.799	-1.103	-12.005***
lnPrice	3.077	0.849	3.336	0.801	-0.258	-4.669***
lnTrans	5.617	1.514	6.422	1.530	-0.806	-8.118***
Vr	2.844	0.755	2.661	0.824	0.183	3.667***

VolDisc: a dummy variable which equals 1 if the firm had greater voluntary disclosure for the year, and 0 otherwise; $Spread_{eff}$: effective spreads; ADA: the absolute value of discretionary accruals; lnSize: the natural log of firm size; lnPrice: the natural log of share price; Vr: the variability of stock returns; lnTrans: the natural log of the number of transactions; Transize: transaction size

***significant at the 1% level, ** significant at the 5% level,* significant at the 10% level.

Table 6: T-test Results: High DisclosureRanking Firms vs. Low DisclosureRanking Firms.

	DB&DC&DC-		DA+ & DA		Difference (1)-(2)	t-value
	n=2372		n=719			
Variables	Mean(1)	s.d.	Mean(2)	s.d.		
Spread_eff	4.840	6.260	4.155	5.469	0.686	2.646***
ADA	0.151	0.233	0.152	0.218	-0.001	-0.102
Transize	3.268	1.362	3.371	1.403	-0.102	-0.076
lnSize	7.951	1.290	8.816	1.672	-0.865	-14.645***
lnPrice	3.052	0.839	3.251	0.857	-0.198	-5.526***
lnTrans	5.529	1.505	6.192	1.508	-0.663	-1.755*
Vr	2.841	0.758	2.788	0.778	0.054	1.654*

DA+: a dummy variable which equals 1 if the firm was ranked A+ for the year, and 0 otherwise; DA: a dummy variable which equals 1 if the firm was ranked A for the year, and 0 otherwise; DB: a dummy variable which equals 1 if the firm was ranked B for the year, and 0 otherwise; DC: a dummy variable which equals 1 if the firm was ranked C for the year, and 0 otherwise; DC-: a dummy variable which equals 1 if the firm was ranked C- for the year, and 0 otherwise; VolDisc: a dummy variable which equals 1 if the firm had greater voluntary disclosure for the year, and 0 otherwise; Spread_eff : effective spreads; ADA: the absolute value of discretionary accruals; lnSize: the natural log of firm size; lnPrice: the natural log of share price; Vr: the variability of stock returns; lnTrans: the natural log of the number of transactions; Transize: transaction size

***significant at the 1% level; ** significant at the 5% level; * significant at the 10% level.

quartile (having the lowest absolute value of discretionary accruals) with firms in the bottom quartile. The results, presented in Table 7, indicate that companies in the top quartile (with better earnings quality) have smaller spreads and better stock liquidity. However, no significant difference is found in disclosure levels between the top and bottom quartiles. Moreover, share price and variability of stock returns are lower for the top quartile firms, and yet transaction size is larger for firms in the top quartile.

Correlation Analysis

Because multicollinearity may be of concern when performing a regression analysis, a correlation matrix is provided in Table 8 to show the Pearson correlation coefficients among the variables involved. In the table, the correlation coefficients are calculated with

Table 7: T-test Results: Low Abnormal Accrual vs. High Abnormal Accrual Firms.

	Top Quartile (ADA)		Bottom Quartile(ADA)		Difference (2)-(1)	t-value
Variables	**Mean(1)**	**s.d.**	**Mean(2)**	**s.d.**		
Spread_ eff	4.652	5.110	5.466	8.503	0.815	2.269**
DA+	0.013	0.112	0.007	0.084	-0.006	-1.069
DA	0.207	0.405	0.218	0.413	0.012	0.550
DB	0.580	0.494	0.555	0.497	-0.026	-0.994
DC	0.170	0.376	0.201	0.401	0.031	1.555
DC-	0.030	0.172	0.019	0.135	-0.012	-1.470
VolDisc	0.084	0.277	0.087	0.282	0.003	0.232
lnSize	8.211	1.436	8.107	1.448	-0.104	-1.393
lnPrice	3.053	0.796	3.174	0.959	0.121	2.654***
lnTrans	5.739	1.507	5.689	1.525	-0.050	-0.641
Vr	2.828	0.766	2.917	0.752	0.089	2.247**
Transize	3.328	1.315	3.182	1.254	-0.145	-2.177**

DA+: a dummy variable which equals 1 if the firm was ranked A+ for the year, and 0 otherwise; DA: a dummy variable which equals 1 if the firm was ranked A for the year, and 0 otherwise; DB: a dummy variable which equals 1 if the firm was ranked B for the year, and 0 otherwise; DC: a dummy variable which equals 1 if the firm was ranked C for the year, and 0 otherwise; DC-: a dummy variable which equals 1 if the firm was ranked C- for the year, and 0 otherwise; VolDisc: a dummy variable which equals 1 if the firm had greater voluntary disclosure for the year, and 0 otherwise; Spread eff: effective spreads; ADA: the absolute value of discretionary accruals; lnSize: the natural log of firm size; lnPrice: the natural log of share price; Vr: the variability of stock returns; lnTrans: the natural log of the number of transactions; Transize: transaction size.

***significant at the 1% level, ** significant at the 5% level,* significant at the 10% level.

both ranked and unranked firms included. As shown in the table, the bid-ask spread is negatively related to firms ranked Grade A, Grade C, or firms classified as having more transparent voluntary disclosures. In addition, the spread is positively related to ADA or abnormal accruals. Meanwhile, disclosure ranking dummies are all negatively related to abnormal accruals, but the relation is only significant for DB. On the other hand, Table 9 reports the correlation coefficients without regard to the unranked firms, and the results are essentially similar to those reported in Table 8. In sum, in view of the fact that the absolute values of these correlation coefficients are all less than 0.80, and the variance inflation factors (not reported here) are all smaller than 10, no serious multicollinearity problem is detected.

Multivariate Analysis

Hypothesis 1: Disclosure vs. Liquidity

Hypothesis 1 examines the relation between disclosure levels and stock market liquidity, and predicts that higher disclosure levels are accompanied by better stock market liquidity (or smaller bid-ask spreads). Four different approaches are used to examine the relation predicted by *Hypothesis 1*: (i) based on disclosure rankings, (ii) based on whether voluntary disclosure is considered transparent, (iii) based on whether the firm is a high or low ranking firm, (iv) based on whether the firm is consistently ranked high.

Based on disclosure rankings

Table 10 compares ranked with unranked firms for stock liquidity to see whether the liquidity of a ranked firm (in each of the five ranking categories) is higher than that of an unranked firm. *Hypothesis*

Table 8: Correlation Matrix (For ranked and unranked firms).

	Spread_eff	DA+	DA	DB	DC	DC-	VolDisc	ADA	lnSize	lnPrice	lnTrans	Vr
Spread_eff	1.000											
DA+	-0.013	1.000										
DA	-0.044***	-0.053***	1.000									
DB	0.055***	-0.110***	-0.501***	1.000								
DC	-0.037**	-0.047***	-0.213***	-0.438***	1.000							
DC-	-0.019	-0.015	-0.068***	-0.139***	-0.059***	1.000						
VolDisc	-0.039**	0.384***	0.455***	-0.283***	-0.121***	-0.039**	1.000					
ADA	0.118***	-0.027	-0.017	-0.059***	-0.005	-0.017	-0.009	1.000				
lnSize	0.136***	0.139***	0.235***	0.010	-0.125***	-0.024	0.213***	-0.049***	1.000			
lnPrice	0.454***	0.043**	0.105***	0.101***	-0.111***	-0.038**	0.089***	0.037**	0.615***	1.000		
lnTrans	0.127***	0.083***	0.186***	0.064***	-0.082***	-0.013	0.151***	-0.054***	0.781***	0.435***	1.000	
Vr	0.187***	-0.023	-0.068***	-0.117***	-0.051***	-0.018	-0.056***	0.125***	-0.068***	0.036**	0.018	1.000
Transize	-0.324***	0.037**	0.000	-0.128***	0.078***	0.037**	0.032*	-0.032*	-0.034**	-0.617***	0.063***	-0.066***

Table 9: Correlation Matrix (For ranked firms only).

	Spread_eff	DA+	DA	DB	DC	DC-	VolDisc	ADA	lnSize	lnPrice	lnTrans	Vr
Spread_eff	1.000											
DA+	-0.013	1.000										
DA	-0.045**	-0.061***	1.000									
DB	0.075***	-0.132***	-0.612***	1.000								
DC	-0.038**	-0.053***	-0.245***	-0.533***	1.000							
DC-	-0.020	-0.017	-0.077***	-0.168***	-0.067***	1.000						
VolDisc	-0.041**	0.383***	0.447***	-0.343***	-0.138***	-0.044**	1.000					
ADA	0.097***	-0.024	0.008	-0.012	0.018	-0.012	0.005	1.000				
lnSize	0.105***	0.143***	0.221***	-0.074***	-0.173***	-0.037**	0.211***	-0.020	1.000			
lnPrice	0.437***	0.042**	0.090***	0.053***	-0.158***	-0.053***	0.084***	0.059***	0.584***	1.000		
lnTrans	0.106***	0.084***	0.164***	-0.038**	-0.142***	-0.030*	0.145***	0.004	0.768***	0.368***	1.000	
Vr	0.253***	-0.029	-0.023	0.023	0.005	-0.004	-0.066***	0.079***	-0.096***	-0.015	0.189***	1.000
Transize	-0.338***	0.049***	0.019	-0.128***	0.113***	0.051***	0.050***	-0.038**	0.039**	-0.621***	0.175***	-0.105***

Table 10: Multivariate Analysis: Regression of effective spreads on the dummies of disclosure rankings.

Regression Model				
(1)$Spread_{eff}=\beta_0+\beta_1 DA^{+}+\beta_2 DA+\beta_3 DB+\beta_4 DC+\beta_5 DC^{-}+\beta_6 VolDisc+\beta_7 lnSize+\beta_8 lnPrice+\beta_9 lnTrans+\beta_{10} Vr+\beta_{11} Transize+\varepsilon$				
Variables	Predicted sign	Coefficients	t-value	p-value
Intercept	+/-	-1.631**	-2.2	0.028
DA+	-	-0.473	-0.46	0.647
DA	-	-1.214***	-2.93	0.003
DB	-	-0.705**	-2.03	0.043
DC	-	-0.679*	-1.74	0.083
DC-	-	-0.778	-1.04	0.301
VolDisc	-	-0.597	-1.32	0.186
Transize	-	0.261***	2.88	0.004
lnSize	-	-1.343***	-10.49	0.000
lnPrice	+	4.509***	22.92	0.000
lnTrans	-	0.388***	4.12	0.000
Vr	+	0.382***	8.14	0.000
n		F-value	Adjusted R2	
3,471		117.12(0.0000)	0.2691	

***significant at the 1% level, ** significant at the 5% level,* significant at the 10% level

1 predicts that stock liquidity is better for ranked firms relative to that of unranked firms, which implies a negative relation between disclosure rankings and effective spreads. The results reported in the table indicate a negative relation across the five disclosure categories. In particular, companies that were ranked A, B, and C have effective spreads that are significantly smaller than unranked firms, and the absolute value of the coefficient on the ranking variable increases with increases in disclosure levels (from C to B, to A). In fact, in the case of "Grade A vs. Unranked ", the coefficient is even significant at the 1% level.

Based on whether voluntary disclosure is considered more transparent

Table 11 shows that the coefficient on *VolDisc* is negative and significant, indicating that whether a firm's voluntary disclosure is considered transparent has a significant impact on its bid-ask spread. In other words, when the firm discloses more, it tends to have better liquidity. Earlier in Table 10, we have also included *VolDisc* as an independent variable, but the coefficient on the variable, *albeit* negative, is insignificant. The reason the coefficient on *VolDisc* in Table 10 is found insignificant is likely attributable to the fact that *VolDisc* is included in the model together with disclosure ranking variables. Due to the fact that the evaluation criteria used for disclosure rankings, and for classifying voluntary disclosure as transparent, are likely to be the same, this could cause the effect of *VolDisc* on liquidity to be less obvious in the model for *Hypothesis 1,* as is shown in Table 10.

Based on whether the firm is classified as a high or low ranking firm.

This approach excludes unranked firms, and classifies Grade A+ and Grade A firms as high scoring firms (denoted by a dummy *High Score*) to see whether high scoring firms have smaller spreads and higher market liquidity, relative to low scoring firms. As shown in Table 12,and as predicted, the variable *High Score* bears a significant and negative relation with effective spreads (coefficient -0.660, significant at the 1% level), meaning that firms with better disclosure rankings (Grade A+ and Grade A firms) also have better market liquidity, as compared to lower ranking firms (Grade B, Grade C, and Grade C- firms).

Based on whether the firm is consistently high ranking

This approach classifies firms as consistently high ranking, if the firm receives a grade of A+ or A each year throughout the sample period (2006-2008). A dummy variable, *ConsisDisc*, is used to denote firms identified as consistently high ranking. The regression results are presented in Table 13, which shows that the coefficient on *ConsisDisc* is -0.534 and significant at the 10% level, which supports the view that, with better disclosure, companies are better able to reduce effective spreads and promote stock liquidity.

To summarize, the results documented thus far indicate that effective spreads are smaller and market liquidity higher (1) for ranked relative to unranked firms, (2) for firms whose voluntary disclosure is considered more transparent, (3) for firms ranked A+ or A, relative to firms ranked B, C, or C-, and (4) for firms that consistently rank high in terms of disclosure levels. In other words, the evidence presented suggests that greater disclosure leads to better market liquidity.

Table 11: Multivariate Analysis: Regression of effective spreads on the dummy of voluntary disclosure.

Regression Model				
(2) $Spread_{eff}=\beta_0+\beta_1$ VolDisc$+\beta_2$ lnSize$+\beta_3$ lnPrice$+\beta_4$ lnTrans$+\beta_5$ Vr$+\beta_6$ Transi$+\varepsilon$				
Variables	Predicted sign	Coefficients	t-value	p-value
Intercept	+/-	-2.283***	-3.44	0.001
VolDisc	-	-0.937**	-2.56	0.010
Transize	-	0.289***	3.21	0.001
lnSize	-	-1.345***	-10.66	0.000
lnPrice	+	4.527***	23.06	0.000
lnTrans	-	0.334***	3.66	0.000
Vr	+	0.423***	9.74	0.000
n		F-value	Adjusted R2	
3,471		212.91(0.0000)	0.2682	

***significant at the 1% level, ** significant at the 5% level,* significant at the 10% level.

Table 12: Multivariate Analysis: Regression of effective spreads on the dummy of high ranking firms.

Regression Model				
(3)$Spread_{eff}=\beta_0+\beta_1$ HighScore$+\beta_2$ lnSize$+\beta_3$ lnPrice$+\beta_4$ lnTrans$+\beta_5$ Vr$+\beta_6$ Transize$+\varepsilon$				
Variables	Predicted sign	Coefficients	t-value	p-value
Intercept	+/-	-8.462***	-9.56	0.000
HighScore	-	-0.660***	-2.91	0.004
lnSize	-	-1.012***	-7.45	0.000
lnPrice	+	4.688***	21.10	0.000
lnTrans	-	-0.031	-0.29	0.774
Vr	+	2.002***	14.56	0.000
Transize	-	0.467***	4.06	0.000
n		F-value	Adjusted R2	
3,091		208.95(0.0000)	0.2876	

***significant at the 1% level, ** significant at the 5% level,* significant at the 10% level

Table 13: Multivariate Analysis: Regression of effective spreads on the dummy of consistently high ranking firms.

Regression Model				
(4) $Spread_{eff}=\beta_0+\beta_1$ ConsisDisc$+\beta_2$ lnSize$+\beta_3$ lnPrice$+\beta_4$ lnTrans$+\beta_5$ Vr$+\beta_6$ Transize$+\varepsilon$				
Variables	Predicted sign	Coefficients	t-value	p-value
Intercept	+/-	-7.358***	-8.42	0.000
ConsisDisc	-	-0.534*	-1.76	0.078
lnTrans	-	0.037	0.34	0.733
lnPrice	+	4.827***	17.82	0.000
lnSize	-	-1.069***	-6.94	0.000
Transize	-	0.549***	4.06	0.000
Vr	+	1.321***	11.75	0.000
n		F-value	Adjusted R2	
3,471		170.79(0.0000)	0.4786	

***significant at the 1% level, ** significant at the 5% level,* significant at the 10% level

Hypothesis 2: Earnings quality vs. liquidity

Hypothesis 2 examines whether earnings quality affects stock liquidity. In this study, earnings quality is measured by the absolute value of discretionary accruals (ADA). The results reported in Table 14 indicate a positive relation between effective spreads and the absolute value of discretionary accruals, with the coefficient on ADA being 1.78 which is significant at the 1% level. As such, the greater the absolute value of discretionary accruals, the poorer the earnings quality, the larger the effective spreads, and the lower the liquidity. Stated differently, there is a positive relation between earnings quality and liquidity, and *Hypothesis 2* is thus confirmed.

Hypothesis 3: Information disclosure, earnings quality, and liquidity

Francis et al. [1] argue that earnings quality has a positive impact on disclosure practices, and find that the relation between disclosure and the cost of capital, as often documented in the literature, is in fact a result of the consequential impact of earnings quality on disclosure policies. Following Francis et al. [1], to further investigate the relation between disclosure and liquidity (conditional on earnings quality), we include *ADA* in the original regression models of *Hypothesis 1* and rerun these regressions. As a result, Equations 1-4 are rewritten as Equations 6-9, and the results for Equations 6-9 are reported in Tables 15-18.

Table 15 compares the results reported for Equations 1 and 6. As shown in the table, once the earnings quality variable (ADA) is included in the model, disclosure rankings remain negatively related to effective spreads, although the coefficients on DB and DC are no longer found to be significant. Meanwhile, the coefficient on the dummy denoting Grade A firms (DA), -1.078, is again significant at the 1% level. In addition, the magnitude of the coefficients is similar to that reported earlier. As such, after controlling for earnings quality, the regression results remain substantially the same, and the disclosure-liquidity relation remains largely unaffected.

Table 16 shows the relation between voluntary disclosure and liquidity before and after earnings quality is controlled for. After controlling for earnings quality, the table shows that *VolDisc* continues to be significantly negatively related to effective spreads at the 1% level. Meanwhile, the remainder of the outcome resembles that for Equation 2. Table 17 shows the relation between the dummy for high ranking firms and liquidity. The results presented in the table once again reveal that high ranking firms tend to have better market liquidity relative to low ranking firms, as reflected by the negative coefficient on *High Score* (-0.660), which is significant at the 1% level. Finally, Table 18 shows the relation between liquidity and the dummy denoting that the firm was consistently ranked high. As shown in the table, the significantly negative relation between *Consis Disc* and effective spreads is not affected by the inclusion of *ADA* in the model. In sum, even though earnings quality is considered when testing the hypothesis relating to disclosure's effect on liquidity, this study provides evidence that the relation between disclosure levels and liquidity remains practically unchanged.

Summary and Conclusion

In 2003, the Securities and Futures Institute in Taiwan established

Table 14: Multivariate Analysis: Regression of effective spreads on abnormal accruals.

Regression Model				
(5) $Spread_{eff}=\beta_0+\beta_1$ ADA$+\beta_2$ lnSize$+\beta_3$ lnPrice$+\beta_4$ lnTrans$+\beta_5$ Vr$+\beta_6$ Transize$+\varepsilon$				
Variables	Predicted sign	Coefficients	t-value	p-value
Intercept	+/-	-2.286***	3.48	0.001
ADA	+	1.780***	4.68	0.000
Transize	-	0.267***	2.97	0.003
lnSize	-	-1.364***	-10.93	0.000
lnPrice	+	4.466***	22.72	0.000
lnTrans	-	0.355***	3.90	0.000
Vr	+	0.403***	9.23	0.000
n		F-value	Adjusted R2	
3,471		216.40(0.0000)	0.2714	

***significant at the 1% level, ** significant at the 5% level,* significant at the 10% level

Table 15: Multivariate Analysis: Regression of effective spreads on the dummies of disclosure rankings.
(With abnormal accruals ADA included or not included in the equation).

	Regression(1) (ADA not included)		Regression(6) (ADA included)	
Variables	Coefficients	t-value	Coefficients	t-value
Intercept	-1.631**	-2.20	-1.979***	-2.66
ADA	-	-	1.735***	4.55
DA+	-0.473	-0.46	-0.247	-0.24
DA	-1.214***	-2.93	-1.078***	-2.60
DB	-0.705**	-2.03	-0.555	-1.59
DC	-0.679*	-1.74	-0.550	-1.41
DC-	-0.778	-1.04	-0.607	-0.81
VolDisc	-0.597	-1.32	-0.628	-1.39
Transize	0.261***	2.88	0.244***	2.70
lnSize	-1.343***	-10.49	-1.312***	-10.26
lnPrice	4.509***	22.92	4.432***	22.51
lnTrans	0.388***	4.12	0.393***	4.18
Vr	0.382***	8.14	0.366***	7.80

***significant at the 1% level, ** significant at the 5% level,* significant at the 10% level

Table 16: Multivariate Analysis: Regression of effective spreads on the dummy of voluntary disclosure.
(With abnormal accruals ADA included or not included in the equation).

	Regression(2) (ADA not included)		Regression(7) (ADA included)	
Variables	Coefficients	t-value	Coefficients	t-value
Intercept	-2.283***	-3.44	-2.501***	-3.78
ADA	-	-	1.789***	4.71
VolDisc	-0.937**	-2.56	-0.953***	-2.62
Transize	0.289***	3.21	0.268***	2.98
lnSize	-1.345***	-10.66	-1.317***	-10.45
lnPrice	4.527***	23.06	4.448***	22.64
lnTrans	0.334***	3.66	0.350***	3.84
Vr	0.423***	9.74	0.399***	9.14

***significant at the 1% level, ** significant at the 5% level,* significant at the 10% level

Table 17: Multivariate Analysis: Regression of effective spreads on the dummy of high ranking firms.
(With abnormal accruals ADA included or not included in the equation).

	Regression(3) (ADA not included)		Regression(8) (ADA included)	
Variables	Coefficients	t-value	Coefficients	t-value
Intercept	-8.462***	-9.56	-8.499***	-9.61
ADA	-	-	1.010**	2.49
HighScore	-0.660***	-2.91	-0.668***	-2.95
Transize	0.467***	4.06	0.449***	3.91
lnSize	-1.012***	-7.45	-0.989***	-7.28
lnPrice	4.688***	21.1	4.632***	20.76
lnTrans	-0.031	-0.29	-0.031	-0.29
Vr	2.002***	14.56	1.977***	14.36

***significant at the 1% level, ** significant at the 5% level,* significant at the 10% level.

Table 18: Multivariate Analysis: Regression of effective spreads on the dummy of consistently high ranking firms.
(With abnormal accruals ADA included or not included in the equation).

	Regression(4) (ADA not included)		Regression(9) (ADA included)	
Variables	Coefficients	t-value	Coefficients	t-value
Intercept	-7.358***	-8.42	-7.375***	-8.49
ADA	-	-	2.173***	3.72
ConsisDisc	-0.534*	-1.76	-0.549*	-1.83
Transize	0.549***	4.06	0.540***	4.02
lnSize	-1.069***	-6.94	-1.061***	-6.93
lnPrice	4.827***	17.82	4.755***	17.62
lnTrans	0.037	0.34	0.062	0.58
Vr	1.321***	11.75	1.222***	10.64

***significant at the 1% level, ** significant at the 5% level,* significant at the 10% level.

the *ITDRS* to annually rank listed firms according to disclosure levels, with one of its objectives being to encourage raising disclosure levels so as to reduce the cost of capital. This study explores the relation between disclosure levels and market liquidity for Taiwanese listed firms to empirically test whether the objective of the *ITDRS* can be achieved as asserted.

The results of our study show that, in different settings, there is a positive association between disclosure levels and stock market liquidity. Specifically, we demonstrate that market liquidity is better (1) for firms covered by the *ITDRS* relative to firms unranked for regulatory problems, (2) for firms with greater voluntary disclosure, (3) for high ranking firms relative to low ranking firms, and (4) for firms that are consistently ranked high by the system. Based on the assumption that quality of information is as important to investors as the amount of information available, we use earnings quality in this study to measure information quality and to examine investors' immediate reactions to financial information, which may be of either good or poor quality. It is of interest to learn whether investors' decisions are affected by information quality, as they are by disclosure levels. The results reported here indicate that market liquidity is higher (lower) for firms with higher (lower) earnings quality, which supports the claim that investors do take information quality into consideration during decision-making.

Francis et al. [1] provide evidence that earnings quality has a positive impact on disclosure policies. Furthermore, they demonstrate that disclosure is related to the cost of capital by reason of the consequential first-order effect of earnings quality on the cost of capital. After controlling for earnings quality, they find that the relation between disclosure and the cost of capital disappears or is substantially reduced. Following Francis et al. [1] we investigate the role of earnings quality in the relation between disclosure and market liquidity. Our results reveal that, once earnings quality is controlled for, the relation between disclosure and market liquidity remains virtually unchanged. One possible reason for this difference is that Francis et al. [1] use a self-constructed score, which is developed based on information from annual reports and 10-K filings, while the *ITDRS* considers many other aspects (such as compliance with mandatory disclosures and corporate website disclosures) for ranking purposes, in addition to annual report disclosures. The ranking criteria used by the *ITDRS*, which are based on a wide variety of information, inevitably result in other factors, besides earnings quality, affecting corporate disclosure policies. On the other hand, because the self-constructed score is based on annual report information, it is logical, in this situation, to find a stronger relation between earnings quality and disclosure levels, as is the case with Francis et al. [1].

Endnotes

[1]For instance, Coller and Yohn (1997) show that management earnings forecasts (a type of disclosure) are effective in reducing information asymmetry in the market for the firm's stock.

[2]Essentially, the IRDRS covers all listed firms except the following: (1) companies with inadequate data, (2) companies that were delisted, suspended from trading, or placed under the altered-trading-method category during the year, (3) companies whose top management was judged guilty for being involved in fraudulent activities during the year, (4) companies that received a modified unqualified opinion for going concern considerations for the year, and (5) companies with other regulatory problems considered to be severe. Those companies that are not covered by the system for these reasons are consequently unranked.

[3]In the case of Taiwan, the higher the share price, the greater the extent to which the quoted price varies each time the stock ticker, which displays stock market quotations, ticks.

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