Corporate Governance and Equity Liquidity: An Analysis of S&P Transparency and Disclosure Ranking

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ABSTRACT

This paper investigates the effects of disclosure and other corporate governance mechanism on equity liquidity. We posit that companies with poor information disclosure and transparency practices incur more serious information asymmetry problem. Since poor corporate governance leads to greater information asymmetry, liquidity providers will incur relatively higher adverse information risks and will therefore offer higher adverse information components of the effective bid-ask spreads. The S&P T&D rankings on the individual stocks of S&P 500 index are employed to examine whether firms with greater T&D rankings have lower the effective bid-ask spread of their stocks. Our results reveal that companies with poor information disclosure and transparency practices have larger economic costs of equity liquidity, i.e., the effective spread.

JEL classification: G10; G30; G34

Keywords: Corporate Governance, Transparency and Disclosure, Asymmetric information costs, Liquidity

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1. Introduction

Financial transparency and information disclosure are important elements of corporate governance. Better financial transparency and information disclosure can help shareholders to understand more amply about firm's management, and reduce the information asymmetries faced by investors. Reflecting on the equity market, investors are willing to pay higher price to get stocks of companies that have better information disclosure. Furthermore, there are more investors who are willing to trade the stocks with better information disclosure, so these stocks will have better market liquidity.

Recently, the issue on firm's financial transparency and information disclosure has gained much attention by market regulators and investors. Ranking institutions such as Standard & Poor's and Moody tend to use financial transparency and information disclosure as one of their criteria of assessing firm's managing ability and reputation. On October 16, 2002, Standard & Poor's publish the results of their Transparency and Disclosure Study (T&D Study)[1]. According to each firm's T&D practices, this study provides firm's Transparency and Disclosure rankings (T&D rankings) in three disclosure categories and then calculating a final ranking. These rankings provide a reference that enables investors to assess firm's transparency and disclosure practice.

This paper investigates the relationship between corporate governance and equity liquidity. We conjecture that companies with poor corporate governance incur higher information asymmetric costs. Liquidity suppliers will take their price protection action and thus broaden the effective bid-ask spread of the equity of firms with poor corporate governance. The S&P T&D ranking is used as a proxy variable for corporate governance, and is employed to examine whether firms with greater rankings have better liquidity for their stocks.

Liquidity is usually defined as the ability that an asset can be trade quickly with the least cost of searching counterpart and the least price concession. Stoll (2000) indicates that immediate sales are usually made at the bid price, and immediate purchase are usually made at ask price. On the one hand, the spread is the price concession needed for an immediate transaction to liquidity demanders; on the other

[1] The T&D study focus on several questions such as: which companies provide the most extensive disclosure in their basic corporate filings? Which companies disclose above and beyond what the law requires? See Patel and Dallas (2002) for a detail description.

hand, it is the revenue earned by liquidity suppliers such as market makers or dealers. Thus, the quoted bid-ask spread is often used as a measure of market liquidity. Furthermore, from their empirical result, Lin, Sanger, and Booth (1995) indicate that demanders of immediacy services rarely received prices which were less favorable than prevailing quotes on the NYSE. Therefore, another better measure, effective spread, which is defined as the absolute value of the difference between the trade price and the quote midpoint just prior the trade, is viewed as a more precise measure of firm's market liquidity. We use the effective spread as the proxy for firm's market liquidity and examine whether it is influenced by T&D ranking.

When a company's information disclosure and transparency practices become worse, the market will expect to face more serious information asymmetry problem. In order to offset this possible adverse selection problem, the liquidity suppliers will take their price protection action, i.e. to broaden the spread of the firm's equity. Consequently, an increase in investors' demand for trade immediacy might incur higher transaction costs due to higher spread and therefore reducing market liquidity of the stock. Thus, we predict that there should be a negative relation between firm's S&P T&D ranking and the effective spread of its stock.

From the view of the liquidity suppliers, bid-ask spread is primarily composed of three components: the order processing cost, inventory cost, and adverse selection cost of information asymmetry (Lin, Sanger, and Booth, 1995). The order processing and inventory cost can be viewed as the real cost of liquidity suppliers. These two costs come from the use of real economic resources to provide immediate trades. Adverse information component is a compensation that arises from information asymmetric risk faced by liquidity suppliers. Because it is difficult to tell who the informed trader is, the liquidity suppliers can't prevent the loss when they actually trade with an informed trader. Appropriate adverse information component of the effective spread must be existed to compensate this risk of loss, and the liquidity providers therefore could maintain their operation against informed trading activities. Intuitively, T&D ranking should be directly correlated with adverse information component. This is because that the worse T&D ranking implies worse disclosure practice and thus induces higher information asymmetric risk faced by liquidity suppliers. To compensate this higher risk, liquidity suppliers will increase adverse information component of the effective spread in response. For the reason above-mentioned, we follow the model suggested by Huang and Stoll (1994), Lin (1992), and Lin, Sanger, and Booth (1995) to calculate the adverse information component of the effective spread, and use it as a measure of immediate transaction

cost due to information asymmetric risk of the firm. We predict that there should be stronger negative relation between the firm's T&D ranking and the adverse information component of its effective spread.

Our study may also provide an analysis on the quality and accuracy of T&D rankings by testing if they have significant relation to the market liquidity of firms' stocks. According to many previous studies such as Copeland and Galai (1983), Glosten and Milgrom (1985), Kyle (1985), Welker (1995), and Stoll (2000), the spread includes the value of the adverse selection cost due to information asymmetry, so we expect the firm having greater disclosure practice will have less information asymmetric cost, and thus, smaller effective bid-ask spread. If S&P T&D ranking is adequate proxy of firm's disclosure practice, we predict that the firm with greater T&D ranking will have both less effective bid-ask spread and adverse information component of its equity, implying better market liquidity; inversely, if the firm has lower ranking, which implying worse disclosure practice, we predict both wider effective spread and adverse information component of its stock, which representing worse market liquidity.

Several past researches, including theoretical and empirical works, have indicated that simultaneity may exist in the determination of bid-ask spread and firm's disclosure policy (Dye, 1985; Lang and Lundholm, 1993; Welker, 1995). When a manager determines firm's disclosure policy, he or she is likely to consider present market liquidity of firm's stock. Besides, when liquidity suppliers quote the bid and ask price of a stock, they necessarily take this firm's disclosure practice as important reference of the degree of information asymmetry. Accordingly, a test for endogeneity is needed. Hence, we apply the Hausman test to examine whether effective spread and disclosure policy are simultaneously determined. If the result of Hausman test indicates that there are no simultaneity in the determination of effective spread and firm's disclosure policy, an OLS procedure is appropriate to examine the relation of effective spread and T&D ranking. If the result exhibits existing of simultaneity, we must use 2SLS procedure to remove the estimated bias induced by endogeneity of explanatory variable and get the consistent estimates of the parameters in our model. The same procedure is also employed before we analysis the partial effect of T&D ranking on adverse information component of the effective spread.

Our empirical results reveal that simultaneity does not exist in the determination of effective spread and firm's T&D ranking. Thus, we don't have to employ 2SLS procedure to estimate and test the relation between the effective spread and T&D

ranking. The same scenario is found in the model of T&D ranking and adverse information component of the effective spread. After controlling firm's trading characteristics, the result of OLS procedure exhibits that the negative relation between effective spread and composite basis T&D ranking is statistically significant while the coefficient estimate of annual basis T&D rankings is not statistically significant. Although the sign of parameter estimate is consistent with prediction, the OLS result for adverse information component and composite basis T&D rankings is not statistically significant. Unfortunately, the direction of the relation between adverse information component and annual basis T&D rankings is inconsistent with our prediction and is not statistically significant. The parameters estimates of all control variables except average daily dollar volume are in the direction that we predicted and statistically significant.

The remainder of this paper is organized as follows. A review of the related literature is undertaken in the next section, followed, in the subsequent section, by a description of the data and the research methodology adopted for this study. The penultimate section presents the empirical results of our research, with the final section providing some concluding remarks drawn from this study.

2. Literature review

2.1 Disclosure practice, corporate governance, and information asymmetry

Many previous studies had indicated the relationship between disclosure practice and corporate governance. Lowenstein (1996) argues that good disclosure has been a most efficient and effective mechanism for inducing managers to manage better. This implies that firms with better information disclosure may have better corporate governance. Patel and Dalas (2002) argues, in their report of S&P Transparency and Disclosure methodology and study results, that good corporate governance includes a vigilant board of directors, timely and adequate disclosure of financial information, meaningful disclosure about the board and management process, and a transparent ownership structure identifying any conflicts of interests between managers, directors, shareholders, and other related parties. Therefore, transparency and disclosure are very important and basic element of corporate governance, indicating again that good disclosure practice could be viewed as good corporate governance.

The extent of disclosure practice will affect the information asymmetric risk of a

firm. Higher levels of disclosure should lead to lower cost of capital by reducing the information risk and the transaction costs (Lang and Lundholm 1999). Patel and Dallas (2002) also show that both the composite and the annual basis T&D rankings have negative relationship with market risk. Botosan (1997) also argues that firms' increased disclosures can reduce the information asymmetry between managers and investors and thus reduce firms' cost of equity capital. Accordingly, our study predicts that if S&P T&D rankings can describe firms' disclosure practices well, the firms with higher T&D rankings will have better disclosure practices and thus increase their market liquidity by reducing information asymmetric risk.

2.2 Market liquidity and disclosure practice

Market liquidity could be measured by how long it takes optimally to trade a given amount of an asset, or be measured by the price concession for an immediate transaction (Lippman and Mccall, 1986; Demsetz, 1968). Under this view, the market liquidity is viewed as the price of immediacy, and the spread which determined by dealer's order processing cost, inventory holding cost, and information asymmetric cost is one measure of market liquidity. Stoll (1978) models the source of that spread in the spirit of Demsetz by analyzing cross-sectional relation of the stock's proportional quoted half-spreads to firm's trading characteristics and finds that this relation is strong and has changed a little over time.

Later views of market liquidity relied on information arguments as in Copeland and Galai (1983), Glosten and Milgrom (1985), Kyle (1985), and Lin, Sanger, and Booth (1995). Under this view, the spread is the value of information lost to timelier or better informed traders. Welker (1995) considered that quoted bid-ask spread set by market specialists are an increasing function of the adverse selection risk perceived by specialists, and perceived adverse selection risk is a function of firm disclosure practices. He used simultaneous equations in which both spreads and disclosure practice rankings appear as endogenous variables to conduct tests for cross-sectional differences in the relation between disclosure policy and bid-ask spreads. After controlling for return volatility, trading volume, and share price, the empirical results reveal predicted negative relation between disclosure practice rankings and proportional quoted bid-ask spreads. However, the results are not significant due to the increase in standard errors accompanying the two-stage least squares procedure and partitioning of the sample.

Extending the research of Welker, this study uses S&P T&D ranking as a proxy

for firm's disclosure practices, and we conjecture that the ranking could be a good measure of adverse selection risk perceived by dealers or market makers. Furthermore, rather than using quoted bid-ask spread, we use the effective spread, a more precise measure of firm's liquidity, and adverse information component of the effective spread to examining the relation between firm's disclosure practice and its market liquidity. If S&P T&D ranking is indeed a good proxy for firm's disclosure practices, we expect that the firm with higher T&D ranking will have both smaller effective spread and adverse information component, indicating better market liquidity.

2.3 S&P Transparency and Disclosure Rankings

The proxy for firm's disclosure practices in our study is the T&D ranking provided by S&P Transparency and Disclosure study. The study identifies 98 disclosure items, classified into three broad categories (Patel and Dallas, 2002):

(1) Ownership structure and investor rights,

(2) Financial transparency and information disclosure, and

(3) Board and management structure and process.

The study indicates whether these individual items are disclosed, focusing primarily on annual reports as the primary source of corporate disclosure. In addition, this study also considers about additional forms of regulatory filings for another source of corporate disclosure. Therefore, the study evaluates disclosure patterns both on annual report alone, which is called annual basis, and on a composite basis, which incorporates annual reports, 10-Ks, and other proxy statements.

Each ranking of the three categories is evaluated on both two bases and then the final rankings of these two bases are calculated. We use these two final rankings respectively as the proxy for firm's disclosure practices, and want to examine if the ranking can be a good proxy for firm's disclosure practices by testing whether the ranking is significant negative to the effective spread and adverse information component.

Although Patel and Dallas claim that while transparency and disclosure are key components of corporate governance, T&D rankings are not proxies for corporate governance, they still find that the rankings reveal some interesting relations to firm's market risk, price to book ratio, and capitalization. Several recent studies also provide evidences that T&D rankings could be good proxies for corporate governance.

Durnev and Kim (2002) show that the S&P T&D rankings are positively correlated with the strength of corporate governance in emerging countries. Cheng, Collins, and Huang (2003) use T&D rankings as proxies for corporate governance to investigate the effects of the level of these rankings and the differential rankings between composite and annual report rankings on three market metrics: market beta, risk-adjusted abnormal returns and earnings response coefficients surrounding the announcement date. The results reveal that the release of the S&P T&D rankings brought new information to the market and that the rankings affect shareholder wealth in a manner that is consistent with the rankings measuring the strength of corporate governance. In this study, we also view S&P T&D ranking as a possible proxy for corporate governance, and want to find whether T&D rakings can correctly measure the differences among different firms' information disclosure practices. We do this by testing if these rankings have good explanatory ability to firms' market liquidity. If T&D rankings are good measures of firms' information disclosure practices, we predict that there will be negative relations between T&D rankings and effective spreads (and adverse information components), which indicate better disclosure practice accompanying with better market liquidity.

2.4 Simultaneity of bid-ask spread and disclosure practice

Several past researches, including theoretical and empirical works, have indicated that simultaneity may exist in the determination of bid-ask spread and firm's disclosure policy. Lang and Lundholm (1993) analyzes the determinants of voluntary disclosure policy and argues that there is simultaneity in the determination of bid-ask spread and disclosure practice. Welker (1995) suggests that disclosure policy choice may be influenced by the level of information asymmetry between management and uninformed investors as well as other determinants of bid-ask spreads. If the simultaneity exists indeed, the OLS procedure will have bias estimates, and our empirical tests will also have incorrect results. Accordingly, we utilize the determinants of disclosure practice and bid-ask spread to construct Hausman test, which is used to detect whether an explanatory variable in a regression model is endogenous.

The determinants of disclosure practice using in the Hausman test are from Lang and Lundholm (1993) and Welker (1995). Lang and Lundholm find that both the market adjusted return and firm size are positively related to disclosure policy, and that the disclosure policy is negatively related to return standard deviation and return-earnings correlation. Besides, disclosure levels increase if the firm will issue

new equities or new debts in the following two years. Welker follows the findings of Lang and Lundholm and uses share price, security offering, return, and return standard deviation as the determinants of disclosure practice. The determinants of disclosure practice used in our study are closing price, return, market value, and, return standard deviation. We will use all these variables and the other determinants of bid-ask spread as exogenous variables in the Hausman Test. If the result of test reveals significant evidence that T&D ranking is endogenous, we then have to use two-stage least square procedure instead of OLS to estimate and test our empirical models. Otherwise, the OLS procedure is adequate and appropriate.

3. Data and Research Methodology

3.1 Data

A joint hypothesis examined in this study is whether S&P T&D ranking is a good proxy for firm's information disclosure practice. For this purpose we choose the constituent stocks of S&P 500 index for our empirical test, and the S&P T&D study has T&D rankings for these stocks. Because the S&P T&D study is published on October 16, 2002, we pick October 17, 2002 to December 31, 2002, a period of 52 trading days, as our studying period. We expect that the impact of T&D rankings on firm's market liquidity might be the most significant during this period.

Stoll (2000) indicated that several previous empirical studies have shown that market design appears to have an effect on spread. Especially, there is large empirical evidence comparing dealer and auction markets, such as NASDAQ and NYSE (Huang and Stoll, 1996; Barclay et al, 1999). In particular, the spreads in dealer markets are wider than those in auction markets because dealers may have more market power in dealer markets. The dealers or market makers with stronger market power are expected to increase their revenues by widening bid-ask spreads. In order to eliminate this difference among the constituent stocks of S&P 500 index, we only use the stocks listed in NYSE. Under this condition, our sample size becomes 405 stocks.

In order to calculate the proxy of firm's market liquidity and other variables used in our cross-sectional model, we need daily intraday transactions data and quote data for these 405 stocks. Our data are obtained primarily from the Trade and Quote (TAQ) database which contains intraday transactions data (trades and quotes) for all securities listed on the New York Stock Exchange (NYSE) and American Stock Exchange (AMEX), as well as Nasdaq National Market System (NMS) and SmallCap

issues. We use the TAQ database to obtain intraday trading and quoted data such as closing prices, bid and ask prices, number of trades, and daily dollar volume. Additionally, we also obtain stocks' daily returns without dividends and market values from CRSP and Compustat database.

The data is arranged as follows. For intraday trading and quoted data, we delete the data outside the ordinary trading time, i.e. 9:30 AM to 4:00 PM. Besides, we calculate the average value of each variable during our sample period. The firms that have at least one incorrect or missing value of variable used in this study are deleted from our sample. Consequently, our sample size reduces to 364.

3.2 Methodology

3.2.1 Effective spread and adverse information component

Following standard market microstructure literature, the effective spread is used as the proxy of equity liquidity. This variable is used by Huang and Stoll (1996), Lin, Sanger, and Booth (1995), and Stoll (2000), to measure firm's market liquidity, and is defined as the absolute value of the difference between the trade price and the quote midpoint just prior the trade :

$$ESP = |P - Q| \qquad (1),$$

where P is the trade price and Q is the quote midpoint just prior to the trade.

Lee and Ready (1991) conclude that prevailing quote may sometimes be recorded ahead of trades. According to their suggestion, we follow Lin, Sanger, and Booth (1995) to identify the prevailing quotes for each transaction as the quotes that are in the effect five seconds, and then compute the quote midpoint as the average of the prevailing quoted bid and ask prices.

In order to examine the relation between the firm's disclosure practice and the information asymmetric cost faced by liquidity suppliers when trading its stocks, we additionally estimate the adverse information component of the effective spread of each firm's stock. Following Lin (1992), Huang and Stoll (1994), and Lin, Sanger, and Booth (1995), we compute the adverse information component of the effective spread by following procedure. First, let Q_t be the quote midpoint just prior to the

trade, and $z_t = P_t - Q_t$ is the sign effective half-spread where P_t is the trade price at time t. After computing the value of z_t for each trade, we estimate following models to get the adverse information component as a fraction of the effective spread:

$$Q_{t+1} - Q_t = l z_t + e_{t+1}, \quad (2),$$
$$z_{t+1} = q z_t + h_{t+1}, \quad (3),$$

where l is the adverse information component as a fraction of the effective spread, and the disturbance terms e_{t+1} and h_{t+1} are assumed to be uncorrelated.

The idea of this model is straightforward. The liquidity suppliers such as market makers or dealers will adjust their quotes after each trade in response to the new information conveyed by the prior trade. Therefore, the coefficient l can be explained as the adverse information component of effective spread, and liquidity suppliers use it to determine the appropriate quote revision after a trade. We compute $\hat{l} \cdot |z_t|$ for each trade during our sampling period, and then calculate the average value of it for each firm during the sample period as our measure of the dollar adverse information component.

3.2.2 Control variables of the cross-sectional regression model

Previous cross-sectional studies of spreads suggest a number of spread determinants other than disclosure policy that should be controlled for in the empirical analysis (Welker, 1995). Stoll (2000) models the source of the spread, and find that daily dollar volume, the return variance, the number of trades per day, and the stock's closing price have significant relation to proportional quoted half-spread. These variables explain over 65 percent of the cross-sectional variance in proportional quoted half-spread.

Following Stoll (2000), we use the stock's closing price (CLP), daily dollar volume (DOLVOL), return standard deviation (RETSTD), number of trades (N), and market value (MKV) as control variables of the effective spread (ESP) and adverse information component (INF). Return standard deviation is calculated as the measure of return volatility by using the return data of each firm during September 16 to October 15.

Our control variables for effective spread are defined respectively as follows:

CLP_i = the average closing price of stock i during our sampling period,

$DOLVOL_i$ = the average daily dollar volume of stock i during our sampling period.

N_i = the average daily number of trades of stock i during our sampling period

$RETSTD_i$ = the return standard deviation of stock i during Sep.16 to Oct.15,

MKV_i = the firm's average market value during our sampling period.

According to previous studies such as Welker (1995), Stoll (2000), and Agrawal et al (2004), we predict that the stocks listed in NYSE with large return volatility will have wider effective bid-ask spreads and adverse information components, and the stocks having larger daily dollar volume, number of trades, and market value will have smaller effective spreads and adverse information components. Futhermore, in the studies of Welker (1995), and Stoll (2000), they use relative spread which is defined as the quoted spread divided by quote midpoint or closing price to be a measure of market liquidity, and find a significant negative relation between closing price and relative spread. This is not surprising because the closing price is the denominator of relative spread. Oppositely, we use the dollar value of effective spread and adverse information components as explained variables in our model, so the negative relation between closing price and our measure of liquidity, as well as previous studies, may not exist. We expect that there should be positive relation between closing price and our two measures of liquidity

Both T&D final rankings on annual basis and composite basis are used in our empirical model to see which rankings are better in representing firms' information asymmetric risk perceived by the market. We use the stock's closing price (CLP), daily dollar volume (DOLVOL), number of trades (N), return volatility (RETSTD), and market value (MKV) as control variables of effective spread (ESP) and adverse information component (INF) in our empirical models in order to analysis the partial effect of T&D final rankings. All variables except RETSTD are taken log value in order to smooth the data and to get elasticity coefficients from the estimated equation. Thus, our cross-sectional empirical regression models are set up as follows:

$$\ln ESP_i = \alpha_1 + \alpha_2 \ln CFR_i + \alpha_3 \ln CLP_i + \alpha_4 \ln DOLVOL_i + \alpha_5 \ln N_i + \alpha_6 RETSTD + \alpha_7 \ln MKV_i + \varepsilon_i \quad (4),$$

$$\ln INF_i = b_1 + b_2 \ln CFR_i + b_3 \ln CLP_i + b_4 \ln DOLVOL_i + b_5 \ln N_i + b_6 RETSTD_i + b_7 \ln MKV_i + h_i \quad (5),$$

$$\ln ESP_i = g_1 + g_2 \ln AFR_i + g_3 \ln CLP_i + g_4 \ln DOLVOL_i + g_5 \ln N_i + g_6 RETSTD_i + g_7 \ln MKV_i + n_i \quad (6),$$

$$\ln INF_i = d_1 + d_2 \ln AFR_i + d_3 \ln CLP_i + d_4 \ln DOLVOL_i + d_5 \ln N_i + d_6 RETSTD_i + d_7 \ln MKV_i + u_i \quad (7),$$

where CFR_i = composite basis T&D final ranking for firm i, AFR_i = annual basis T&D final ranking for firm i , and e_i, h_i, n_i, and u_i are disturbance terms

3.2.3 Hausman test for endogeneity

Before we use OLS to estimate equation (4) to equation (7), we have to confirm that the proxy for disclosure practice, T&D ranking, is not an endogenous variable in each regression model. Thus, we use Hausman test to examine if T&D ranking is endogenous in each model.

The procedure of Hausman test for endogeneity has three steps. First, we must determine the possible endogenous explanatory variable in our model and suitable exogenous instrument variables. As earlier motioned, the possible endogenous explanatory variable in our model is T&D ranking. The problem is how to decide suitable exogenous instrument variables. In general, we can pick the exogenous determinants of the possible endogenous explanatory variable and the other exogenous explanatory variables in original model as suitable instrument variables. Following Lang and Lundholm (1993) and Welker (1995), the determinants of disclosure practice used in our study are closing price (CLP), return (RET), market value (MKV), and return volatility (RETSTD). The exogenous explanatory variables except for T&D ranking in original model are closing price (CLP), daily dollar volume (DOLVOL), number of trades (N), return volatility (RETSTD), and market value (MKV). Therefore, the appropriate instrument variables are CLP, DOLVOL, N, RETSTD, MKV, and RET.

The next step of Hausman test is to perform OLS for T&D ranking on all instrument variables. Thus, the first-stage regression model is set up as follows:

$$\ln Rank_i = q_1 + q_2 \ln CLP_i + q_3 \ln DOLVOL_i + q_4 \ln N_i + q_5 RETSTD_i + q_6 \ln MKV_i + q_7 \ln RET + j_i \quad (8),$$

where $Rank_i$ can be CFR or AFR, and j_i is the disturbance term of the regression model. After getting the estimated equation, we can calculate the residual series $\{e_i\}$ of Eq. (8).

Finally, add the residuals as a new explanatory variable to original regression model and run OLS to estimate and test the parameter of this new variable. For example, the second-stage regression model of ESP on CFR and other control variables is then as follows:

$$\ln ESP_i = a_1 + a_2 \ln CFR_i + a_3 \ln CLP_i + a_4 \ln DOLVOL_i + a_5 \ln N_i + a_6 RETSTD_i + a_7 \ln MKV_i + r_1 e_i + e_i \quad (9),$$

If the parameter, r_1, is significant different from zero, then the composite basis T&D final ranking is endogenous in our regression model, and we have to use 2SLS procedure to remove the estimated bias induced by endogeniety of explanatory variable. If the result of Hausman test indicates there is no simultaneity in the determination of market liquidity and firm's disclosure policy, an OLS procedure for Eq.(4) to Eq. (7) is appropriate to examine the relation of firm's market liquidity and its T&D ranking.

4. Empirical results

4.1 Sample characteristics

Panel A of Table 1 shows the descriptive statistics of all selected variables during our sample period (October 17 2002– December 31 2002, 52 trading days). The mean of effected spread (ESP) is about 1.305 cents, and its range is about 2.472 cents. The mean of dollar adverse information component (INF) is around 0.737 cents, and is about 56% of the effected spread. The range of adverse information component is between 0.27 cents and 1.686 cents. The average closing price (CLP) for our sample is approximately \$34.64, and ranges are between \$6.07 and \$126.42. The mean dollar volume (DOLVOL) is around \$62.30 million and the sample range is

between $ 2.16 million and $507.69 million. The mean daily number of trades (N) for the sample is 1549, and the sample range is from 428 to 5573. The return volatility (RETSTD) has the average value about 0.03728, and the sample range is from 0.01036 to 0.15524. The average market value is approximately $16767 million and its range is between $543.76 million and $254441 million. The returns (RET) for our sample have the mean around 0.14 %, and the range is about 3.81%. The median of S&P T&D rankings on composite basis (CFR) is 7.55, and the range is between 7 and 9. The median of S&P T&D rankings on annual basis (AFR) is 4.78, and the range is between 1 and 8. Taking notice of the difference between these two rankings, the annual basis rankings have lower median but larger range while the composite basis rankings have higher median but smaller range. This characteristic is consistent with the argument of Pantel and Dallas (2002). They suggest that the annual basis rankings which only focus on firms' annual reports could be viewed as firms' voluntary disclosures. On the contrary, the composite basis rankings which include annual reports, 10-Ks, and other proxy statements might be regarded as regulatory disclosure practices. Thus, due to strict laws of investor protection and severe disclosure regulations in U.S., the firms reveal consistently higher rankings on composite basis, and there are smaller differences between firms' composite basis rankings than their annual basis rankings. Panel B of Table1 presents Pearson correlation coefficients between selected variables.

4.2 Regression results of effective spread against control variables.

We first examine that during our sample period if the effective spreads of the sample firms are related to the determinants of spreads found in earlier studies, such as Stoll (1978), Welker (1995), Stoll (2000), and Argrawal at el (2002). Panel A of Table 2 presents the regression result of effective spread against these determinants. All explanatory variables except the daily number of trades (N) are significant at the 0.05 confidence level. The p-value of the daily number of trades (N) is 0.0973. The directions of the parameters except average daily dollar volume (DOLVOL) are consistent with previous studies that we mentioned above. The average daily dollar volume (DOLVOL) reveals a significant positive relation with effective spread during our sampling period. Notice that the result shows that about 85 percent of cross-sectional variation can be explained by these control variables, indicating that there is not much space for other variables to explain the effective spreads.

4.3 Regression results of adverse information component against control variables.

Panel B of Table 2 presents the regression result of adverse information component against these control variables. Similar to the result of effective spread, all explanatory variables except the number of trades (N) are significant at the 0.05 confidence level. The p-value of the number of trades (N) is 0.1869. The directions of the parameters except average daily dollar volume (DOLVOL) are consistent with previous studies that we mentioned above. The average daily dollar volume (DOLVOL) also reveals a significant positive relation with adverse information component during our sampling period. The adjusted R-square of the model is 0.8643 which is slightly higher than the model of effective spread.

4.4 Results of Hausman test

To detect whether the T&D rankings are endogenous variables in Eq. (4) to (7), we employ Hausman test to test the endogeneity. The results of Hausman test for annual basis rankings and composite basis rankings are respectively shown in Panel A to D of Table 3. Panel A present that the coefficient r_1 in Eq. (9) for composite basis rankings is not statistically significant, indicating that composite basis ranking is not a endogenous variable in Eq. (1). The similar results are found in the regression of adverse information component on composite basis ranking, the regression of effective spread on annual basis ranking, and the regression of adverse information component on annual basis ranking. These results are shown in Panel B to Panel D of Table 3 where the coefficients, r_2, r_3, and r_4 are all insignificant in the models. According to these results, the simultaneity in the determination of spread and firm's disclosure policy does not exist for our sample firms during this studying period. Thus, the OLS procedure is appropriate for Eq.(4) to Eq.(7) to estimate and test the parameters of our interests.

4.5 Regression result of the effective spread and adverse information component on composite basis T&D ranking

The OLS procedures for effective spread and adverse information component on composite basis T&D rankings and other control variables is appropriate because composite basis T&D rankings do not reveal significant endogeneity in Eq.(4) and Eq.(5). Thus we simply regress the effective spread and adverse information component respectively on composite basis T&D ranking and other control variables. The results of estimating and testing are shown in the Panel A and Panel B of Table 4.

Panel A of Table 4 shows the regression result of effective spread on composite

basis T&D ranking. All variables except average daily dollar volume (DOLVOL) are in the direction that we predicted, and all coefficients except average daily number of trades (N) are significant at ordinary confidence level. Although the p-value of average daily number of trades is 0.0575, it is slightly bigger than ordinary confidence level, 0.05. The estimated parameter of composite basis T&D ranking is -0.3070 and statistically significant from zero. This result implies that firms with higher composite basis T&D rankings will have less effective spreads, and thus have better market liquidity. This result is consistent with our prediction.

Panel B of Table 4 shows the regression result of adverse information component on composite basis T&D ranking. Like the result of effective spread, all variables except average daily dollar volume (DOLVOL) are in the direction that we predicted, and all coefficients except average daily number of trades are significant at ordinary confidence level. The estimated parameter of composite basis T&D ranking is -0.2744 and is statistically significant from zero. Consistent with our expectation this result implies that firms with higher composite basis T&D rankings will have less information asymmetric problems, and thus have less adverse information component.

The results mentioned above also suggest that composite basis T&D rankings are good proxy for firms' disclosure practices and information asymmetric risk perceived by the market. Our empirical results have some important meaning for corporate governance: the managers should endeavor to conform various disclosure regulations and investor protection codes by disclosing firm's information to the best of their abilities. When a firm can provide better disclosure and transparency, it will get a higher level composite basis T&D ranking, and this will lower firm's information asymmetric risk perceived by market. Consequently, the firm will has smaller adverse information component and effective spread, and therefore increasing market liquidity of its stock.

4.6 Regression result of the effective spread and adverse information component on annual basis T&D ranking

The OLS procedures for effective spread and adverse information component on annual basis T&D ranking and other control variables is also appropriate because annual basis T&D rankings do not reveal significant endogeneity in Eq.(6) and Eq.(7). Therefore we simply regress the effective spread and adverse information component respectively on annual basis T&D ranking and other control variables. The results of estimating and testing are shown in the Panel A and Panel B of Table 5.

Panel A of Table 5 shows the regression result of effective spread on annual basis T&D ranking. All control variables except average daily dollar volume (DOLVOL) are in the direction that we predicted, and all of their coefficients except average daily number of trades (N) are significant at ordinary confidence level. The estimated coefficient of annual basis T&D ranking is in the direction that we predicted, but it reveals statistically insignificant.

Similar to the result for effective spread on annual basis T&D ranking, the regression result of adverse information component on annual basis T&D ranking shows that all control variables except average daily dollar volume (DOLVOL) are in the direction that we predicted, and the coefficients except average daily number of trades (N) are significant at ordinary confidence level. Unfortunately the estimated coefficient of annual basis T&D ranking is not only in the opposite direction, but also reveals statistically insignificant. The result is shown in the Panel B of Table 5.

Our empirical results suggest that the annual basis T&D ranking is not a good explanatory variable of effective spread and adverse information component. We argue that there are least two possible reasons for this suggestion. First, the disclosure regulations and investors protection in U.S. are quite well. Even though the investors can't easily get the regulatory disclosure documents such as 10-Ks, and other proxy statements, they may believes that although the firm's annual report, which represents firm's voluntary disclosure, does not disclose enough information, these regulatory disclosure documents will make sure that the firm has done sufficient disclosure practice. Second, when the market makers or specialists quote the spreads of these firms, they might use not only annual reports but also the regulatory disclosure documents such as 10-Ks, and other proxy statements as reference material for firm's disclosure practices and corresponding information asymmetric risks. So it is reasonable that our result reveal that the composite basis T&D ranking is a better explanatory variable of market liquidity than the annual basis T&D ranking.

5. Robustness check

In our regression analysis, there are two econometric issues which need to be further explored. First of all, the estimated coefficient of average daily dollar volume (DOLVOL) in each model is statistically significant but reveals contrary direction to our prediction. This result is inconsistent with the findings documented in previous literatures. One possibility to cause this result is that highly multicollinearity might exist among the indenpendent variables used in our models. To eliminate this

possible problem, we calculate the Variance Inflation Factors (VIFs) of all variables to measure the inflation in the variances of the parameter estimates due to collinearities that exist among the independent variables. Panel A of Table 6 reports the variance inflation factors (VIFs) and estimated parameters for all explanatory variables of our original empirical models. The VIFs of the average daily dollar volume (DOLVOL) and the average daily number of trades (N) are extremely higher than the ordinary tolerance value, 10. For this reason, we consider that both the average daily dollar volume and the average daily number of trades might be highly linear dependent with other independent variables. Thus, we exclude these two control variables from all of our models, and estimate these new models by OLS again. We also calculate the VIFs of the remainder explanatory variables for comparison with original models. These results are reported in Panel B of Table 6. We can see that after excluding average daily dollar volume and average daily number of trades from our original regression model the coefficient estimates of remainder explanatory variables are still statistically significant and the values of these estimates do not change a lot. More importantly, all estimated coefficients still reveal the consistent sign with our predictions, and the adjusted R-square of each regression model just decreases slightly. The VIFs of the explanatory variables in these new regression models, comparing to original models, also decrease significantly, especially for average daily market value. These results seem to suggest that the three control variables, average daily closing price (CLP), return standard deviation (RETSTD), and average daily market value (MKV), already have quite enough explanatory power and do not have the problem of multicollinearity for our sample firm during the studying period.

The next econometric issue is that there might be heteroskedasticity problem in our regression analysis. To correct for heteroskedasticity, we calculate the White's heteroskedasticity-consistent standard errors (HCSEs) for each coefficient estimate, and use these robust standard errors to test whether coefficient estimates are statistically significant. The estimated results are reported in Table 7 and Table 8. Table 7 report the heteroskedasticity-robust regression results of the effective spread and adverse information component on composite basis T&D rankings while Table 8 report the annual basis one. In these regression analyses, we also exclude the average daily dollar volume (DOLVOL) and the average daily number of trades (N) from the regression models. We find that the heteroskedasticity-robust standard errors do not have very big differences between OLS standard errors and the t-value and p-value calculated by heteroskedasticity-robust standard errors do not change a lot either. Therefore, we argue that the heteroskedasticity problem is slight in our empirical models. All coefficient estimates under heteroskedasticity-robust test are statistically

significant and thus have the same financial implications that we discussed in section 4.5 and 4.6.

6. Conclusion

This paper investigates the quality and accuracy of the S&P T&D rankings by testing if they have significant relation to effective spreads and adverse information components of firms' stocks. Besides, we also examine whether firms' disclosure practices can affect their market liquidity. In order to increase the robustness of our cross-sectional empirical analysis, we also incorporate several determinants of bid-ask spreads suggested by previous studies as explanatory variables in our models. Moreover, we consider about the simultaneity that might exist in the determination of the spread and firm's disclosure policy. We employ Hausmant test to detect whether the S&P T&D rankings in our model reveal endogeneity. The results show that composite and annual basis T&D rankings do not have significant endogeneity, and thus the OLS procedure is appropriate to proceed our estimates and tests.

Our empirical results suggest that the annual basis T&D ranking is not a good explanatory variable of effective spread and adverse information component. Under OLS procedure, the coefficient of annual basis T&D ranking is not statistically significant in the model of effective spread and in the model of adverse information component. The results of OLS procedure for effective spread and adverse information component on composite basis T&D rankings and other control variables are better. In each regression model, the coefficient of composite basis T&D ranking is in the same direction that we predict, and reveal statistically significant at ordinary confidence level in our study. These results imply that the firms with higher composite basis T&D rankings will have less effective spread and adverse information component, and thus have better market liquidity of their equities.

We argue that the composite basis ranking is a better explanatory variable for firm's market liquidity perceived by the market, and therefore a better proxy for firm's disclosure practice. There are two reasons for our suggestion. First, the disclosure regulations and investors protection in U.S. are quite well. Even though the investors can't easily get the regulatory disclosure documents such as 10-Ks, and other proxy statements, they may believes that although the firm's annual report, which represents firm's voluntary disclosure, does not disclose enough information, these regulatory disclosure documents will make sure that the firm has done sufficient disclosure practice. Second, when the market makers or specialists quote the spreads

of these firms, they might use not only annual reports but also the regulatory disclosure documents such as 10-Ks, and other proxy statements as reference material for firm's disclosure practices and corresponding information asymmetric risks. Therefore, we consider that the annual basis T&D rankings have less prediction power in explaining firms' market liquidity than composite basis T&D rankings.

The results of our study have some important meaning for corporate governance: the managers should endeavor to conform to various disclosure regulations and investor protection codes by disclosing firm's information to the best of their abilities. When a firm can provide better disclosure and transparency, it will get a higher level composite basis T&D ranking, and this will lower firm's information asymmetric risk perceived by market. Consequently, the firm will has smaller adverse information component and effective spread, and therefore increasing market liquidity of its stock.

We have to note that our study only provides an indirect way to examine whether the composite and annual basis T&D rankings are good proxies for firms' corporate governance by testing if they are significant related to firms' market liquidity. Although the annual basis T&D ranking can not be a good explanatory variable for firm's market liquidity perceived by the market in our study, it still might be a good proxy for firm's corporate governance. Further researches are needed to examine the extent of the annual basis T&D ranking in measuring firm's corporate governance.

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TABLE 1

Descriptive statistics and Pearson correlations coefficients of selected variables: 2002/10/17-2002/12/31.

Panel A : **Descriptive statistics**

	N	Mean	Std Dev	Minimum	Maximum
ESP	364	0.01305	0.00397	0.0057	0.03042
INF	364	0.00737	0.00264	0.0027	0.01686
CLP	364	34.6410	18.6625	6.0652	126.4227
DOLVOL (million's)	364	62.2984	76.0509	2.1576	507.6905
N	364	1549	790.91404	428	5573
RETSTD	364	0.03728	0.01592	0.01036	0.15524
MKV (million's)	364	16767	32348	543.75533	254441
RET	364	0.00142	0.00335	-0.01662	0.02152
CFR	364	7.55495	0.51399	7	9
AFR	364	4.78022	0.98252	1	8

ESP= the mean for firm i of the effective bid-ask spread during our sampling period.

INF= the mean for firm i of the dollar information asymmetric component of stock i during our sampling period.

CLP = the average closing price of stock i during our sampling period.

DOLVOL = the average daily dollar volume of stock i during our sampling period.

N= the average daily number of trades of stock i during our sampling period.

RETSTD= the average return standard deviation of firm i during the 21 trading days before our sampling period.

MKV = the firm's average market value during our sampling period.

RET = the average daily return of firm i during our sampling period.

CFR = the average S&P T&D ranking for firm i on composite basis.

AFR = the average S&P T&D ranking for firm i on annual basis.

TABLE 1 (continued)

PANEL B: Pearson correlation coefficients

	ESP	INF	CLP	DOLVOL	N	RETSTD	MKV	RET	CFR	AFR
ESP	1.0000	0.9489	0.8772	0.1833	0.0233	-0.2882	0.0182	-0.2121	-0.0930	-0.0020
		(<.0001)	(<.0001)	(0.0004)	(0.6574)	(<.0001)	(0.7301)	(<.0001)	(0.0763)	(0.9691)
INF		1.0000	0.8755	0.1923	0.0575	-0.2618	0.0335	-0.1908	-0.0853	0.0137
			(<.0001)	(0.0002)	(0.2738)	(<.0001)	(0.5236)	(0.0003)	(0.1042)	(0.7939)
CLP			1.0000	0.3724	0.2243	-0.4217	0.2218	-0.2725	-0.0660	0.0055
				(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(0.2094)	(0.9170)
DOLVOL				1.0000	0.8766	-0.0597	0.8720	-0.2286	-0.0886	0.0025
					(<.0001)	(0.2557)	(<.0001)	(<.0001)	(0.0916)	(0.9616)
N					1.0000	0.0748	0.7489	-0.1332	-0.0730	0.0033
						(0.1546)	(<.0001)	(0.0110)	(0.1644)	(0.9496)
RETSTD						1.0000	-0.0799	0.4403	0.0394	-0.1063
							(0.1281)	(<.0001)	(0.4542)	(0.0428)
MKV							1.0000	-0.1464	-0.0497	0.0156
								(0.0051)	(0.3444)	(0.7668)
RET								1.0000	0.1072	-0.0102
									(0.0409)	(0.8462)
CFR									1.0000	0.2913
										(<.0001)
AFR										1.0000

TABLE 2

Regression results of effective spread and adverse component against control variables

The dependent variable is logarithm of the effective spread (ESP) in the Panel A and adverse information component (INF) in the Panel B. CLP is average closing price during our sample period. DOLVOL is average daily dollar volume of trading during our sample period. N is the average number of trades during our sample period. RETSTD is the average return volatility during the 21 trading days before our sampling period. MKV is firm's average market value during our sample period.

Panel A: Regression results of effective spread against control variables

$$\ln ESP_i = f_1 + f_2 \ln CLP_i + f_3 \ln DOLVOL_i + f_4 \ln N_i + f_5 RETSTD + f_6 \ln MKV + w_i$$

	Prediction	Estimated Coefficient	Standard Error	t-value	Pr > | t |
Intercept		-4.5181	0.1362	-33.1759	<0.0001
ln *CLP*	+	0.5459	0.0163	33.5079	<0.0001
ln *DOLVOL*	—	0.0521	0.0242	2.1537	0.0319
ln *N*	—	-0.0765	0.0460	-1.6623	0.0973
RETSTD	+	3.6939	0.4834	7.6409	<0.0001
ln *MKV*	—	-0.0969	0.0124	-7.8296	<0.0001
Adj R^2	0.8490				
Observations	364				

Panel B. Regression results of adverse information component against control variables

$$\ln INF_i = y_1 + y_2 \ln CLP_i + y_3 \ln DOLVOL_i + y_4 \ln N_i + y_5 RETSTD + y_6 \ln MKV + t_i$$

	Prediction	Estimated Coefficient	Standard Error	t-value	Pr > | t |
Intercept		-5.3721	0.1541	-34.8562	<0.0001
ln *CLP*	+	0.6614	0.0184	35.8666	<0.0001
ln *DOLVOL*	—	0.0665	0.0274	2.4308	0.0156
ln *N*	—	-0.0689	0.0521	-1.3224	0.1869
RETSTD	+	5.1128	0.5472	9.3441	<0.0001
ln *MKV*	—	-0.1183	0.0140	-8.4427	<0.0001
Adj R^2	0.8643				
Observations	364				

TABLE 3

Results of Hausman test for T&D final rankings

Panel A to Panel D show the second-stage regression results of Hausman Test for composite basis and annual basis T&D rankings in our models of effective spread and adverse information component respectively. The residual (e) is from the first regression of CFR or AFR on all instrument variables (CLP, DOLVOL, N, RETSTD, MKV, and RET). The estimated coefficient of the residual in each equation is not statistically significant form zero at 0.05 confidence level, indicating that the both composite basis and annual basis ranking are not an endogenous variable in our models.

Panel A: Result of Hausman Test for composite basis T&D ranking in the model of effective spread

	Estimated Coefficient	Standard Error	t-value	Pr > | t |
Intercept	-2.6157	1.8699	-1.4003	0.1627
ln *CFR*	-0.9404	0.9219	-1.0200	0.3084
ln *CLP*	0.5396	0.0172	31.4004	<0.0001
ln *DOLVOL*	0.0604	0.0252	2.3994	0.0169
ln *N*	-0.1071	0.0544	-1.9704	0.0496
RETSTD	3.9001	0.5173	7.5397	<0.0001
ln *MKV*	-0.0931	0.0128	-7.3006	<0.0001
Residual (e)	0.6390	0.9260	0.6901	0.4906
Adj R^2	0.8535			
Observations	364			

Panel B: Result of Hausman Test for composite basis T&D ranking in the model of adverse information component

	Estimated Coefficient	Standard Error	t-value	Pr > | t |
Intercept	-5.3562	2.1317	-2.5104	0.0124
ln *CFR*	-0.0078	1.0510	-0.0074	0.9941
ln *CLP*	0.6613	0.0196	33.7557	<0.0001
ln *DOLVOL*	0.0666	0.0287	2.3202	0.0209
ln *N*	-0.0691	0.0620	-1.1156	0.2653
RETSTD	5.1145	0.5897	8.6731	<0.0001
ln *MKV*	-0.1183	0.0145	-8.1341	<0.0001
Residual (e)	-0.2689	1.0557	-0.2547	0.7991
Adj R^2	0.8665			
Observations	364			

TABLE 3 (continued)

Panel C: Result of Hausman Test for annual basis T&D ranking in the model of effective spread

	Estimated Coefficient	Standard Error	t-value	Pr > | t |
Intercept	-3.5065	1.0171	-3.4572	0.0006
ln *AFR*	-0.6000	0.5978	-1.0037	0.3162
ln *CLP*	0.5619	0.0228	24.6324	<0.0001
ln *DOLVOL*	0.0081	0.0500	0.1624	0.8711
ln *N*	-0.0226	0.0708	-0.3188	0.7501
RETSTD	2.5766	1.2138	2.1229	0.0345
ln *MKV*	-0.0849	0.0173	-4.9197	<0.0001
Residual (e)	0.5852	0.5983	0.9781	0.3287
Adj R^2	0.8487			
Observations	364			

Panel D: Result of Hausman Test for annual basis T&D ranking in the model of adverse information component

	Estimated Coefficient	Standard Error	t-value	Pr > | t |
Intercept	-5.3637	1.1521	-4.6634	<0.0001
ln *AFR*	-0.0050	0.6772	-0.0074	0.9941
ln *CLP*	0.6615	0.0258	25.5984	<0.0001
ln *DOLVOL*	0.0661	0.0566	1.1673	0.2439
ln *N*	-0.0684	0.0802	-0.8536	0.3939
RETSTD	5.1035	1.3749	3.7118	0.0002
ln *MKV*	-0.1182	0.0195	-6.0477	<0.0001
Residual (e)	0.0294	0.6778	0.0433	0.9655
Adj R^2	0.8639			
Observations	364			

TABLE 4

Regression results of effective spread and adverse information component against composite basis S&P T&D final rankings and control variables.

Panel A and Panel B show the regression results of effective spread and adverse information component against composite basis T&D rankings. All variables except average daily dollar volume (DOLVOL) are in the direction that we predicted, and all coefficients except average daily number of trades (N) are significant at ordinary confidence level.

Panel A: the regression results of effective spread against composite basis T&D rankings.

$$\ln ESP_i = a_1 + a_2 \ln CFR_i + a_3 \ln CLP_i + a_4 \ln DOLVOL_i + a_5 \ln N_i + a_6 RETSTD + a_7 \ln MKV_i + e_i \quad (4)$$

	Prediction	Estimated Coefficient	Standard Error	t-value	Pr > | t |
Intercept		-3.8971	0.2203	-17.6978	<0.0001
ln *CFR*	—	-0.3070	0.0864	-3.5512	0.0004
ln *CLP*	+	0.5439	0.0160	33.8972	<0.0001
ln *DOLVOL*	—	0.0548	0.0238	2.3015	0.0219
ln *N*	—	-0.0865	0.0454	-1.9060	0.0575
RETSTD	+	3.7612	0.4762	7.8991	<0.0001
ln *MKV*	—	-0.0957	0.0122	-7.8501	<0.0001
Adj R^2	0.8537				
Observations	364				

Panel B: the regression results of adverse information component against composite basis T&D ranking.

$$\ln INF_i = b_1 + b_2 \ln CFR_i + b_3 \ln CLP_i + b_4 \ln DOLVOL_i + b_5 \ln N_i + b_6 RETSTD_i + b_7 \ln MKV_i + h_i \quad (5)$$

	Prediction	Estimated Coefficient	Standard Error	t-value	Pr > | t |
Intercept		-4.8170	0.2510	-19.1914	<0.0001
ln *CFR*	—	-0.2744	0.0985	-2.7859	0.0056
ln *CLP*	+	0.6595	0.0183	36.0801	<0.0001
ln *DOLVOL*	—	0.0689	0.0271	2.5420	0.0114
ln *N*	—	-0.0778	0.0517	-1.5050	0.1332
RETSTD	+	5.1729	0.5425	9.5353	<0.0001
ln *MKV*	—	-0.1172	0.0139	-8.4383	<0.0001
Adj R^2	0.8668				
Observations	364				

TABLE 5

Regression results of the effective spread and adverse information component on annual basis T&D rankings.

Panel A and Panel B show the regression results of effective spread and adverse information component against annual basis T&D rankings respectively. For effective spread, the estimated coefficient of annual basis T&D ranking is in the direction that we predicted, but it reveals statistically insignificant. Unfortunately the estimated coefficient of annual basis T&D ranking is not only in the opposite direction, but also reveals statistically insignificant in the model of adverse information component.

Panel A: the regression results of effective spread against annual basis T&D rankings.

$$\ln ESP_i = g_1 + g_2 \ln AFR_i + g_3 \ln CLP_i + g_4 \ln DOLVOL_i + g_5 \ln N_i + g_6 RETSTD_i + g_7 \ln MKV_i + n_i \quad (6)$$

	Prediction	Estimated Coefficient	Standard Error	t-value	Pr > | t |
Intercept		-4.4915	0.1425	-31.5227	<0.0001
ln *AFR*	—	-0.0158	0.0247	-0.6391	0.5232
ln *CLP*	+	0.5463	0.0163	33.4787	<0.0001
ln *DOLVOL*	—	0.0509	0.0243	2.0984	0.0366
ln *N*	—	-0.0751	0.0461	-1.6282	0.1044
RETSTD	+	3.6645	0.4860	7.5400	<0.0001
ln *MKV*	—	-0.0966	0.0124	-7.7914	<0.0001
Adj R^2	0.8488				
Observations	364				

Panel B: the regression results of adverse information component against annual basis T&D ranking.

$$\ln INF_i = d_1 + d_2 \ln AFR_i + d_3 \ln CLP_i + d_4 \ln DOLVOL_i + d_5 \ln N_i + d_6 RETSTD_i + d_7 \ln MKV_i + u_i \quad (7)$$

	Prediction	Estimated Coefficient	Standard Error	t-value	Pr > | t |
Intercept		-5.4131	0.1612	-33.5828	<0.0001
ln *AFR*	—	0.0243	0.0279	0.8714	0.3841
ln *CLP*	+	0.6607	0.0185	35.7901	<0.0001
ln *DOLVOL*	—	0.0683	0.0274	2.4881	0.0133
ln *N*	—	-0.0711	0.0522	-1.3624	0.1739
RETSTD	+	5.1581	0.5498	9.3815	<0.0001
ln *MKV*	—	-0.1188	0.0140	-8.4680	<0.0001
Adj R^2	0.8642				
Observations	364				

TABLE 6

Variance inflation factors (VIF) and estimated parameters for our explanatory variables of each model.

Panel A : Variance inflation factors (VIF) and estimated parameters for original model				
Model	Eq.(4)	Eq.(5)	Eq.(6)	Eq.(7)
Varisbles	VIF/estimates	VIF/estimates	VIF/estimates	VIF/estimates
ln *CFR*	1.0881/-0.3070**	1.0881/-0.2744**		
ln *AFR*			1.0252/-0.0158	1.0252/0.0243
ln *CLP*	2.4973/0.5439**	2.4973/0.6595**	2.4982/0.5463**	2.4982/0.6607**
ln *DOLVOL*	16.6033/0.0548*	16.6033/0.0689**	16.6788/0.0509*	16.6788/0.0683**
ln *N*	13.1382/-0.0865	13.1382/-0.0778	13.1180/-0.0751	13.1180/-0.0711
RETSTD	1.6633/3.7612**	1.6633/5.1729**	1.6756/3.6645**	1.6756/5.1581**
ln *MKV*	5.4593/-0.0957**	5.4593/-0.1172**	5.4634/-0.0966**	5.4634/-0.1188**
Adj R^2	0.8537	0.8668	0.8488	0.8642
Panel B : Variance inflation factors (VIF) and estimated parameters for model excluding log value of average daily dollar volume(ln *DOLVOL*) and log value if average daily number of trades(ln *N*).				
Model	Eq.(4)	Eq.(5)	Eq.(6)	Eq.(7)
Varisbles	VIF/estimates	VIF/estimates	VIF/estimates	VIF/estimates
ln *CFR*	1.0032/ -0.3002**	1.0032/ -0.2721**		
ln *AFR*			1.0191/-0.0197	1.0191/0.0185
ln *CLP*	1.6831/0.5650**	1.6831/0.6860**	1.6825/0.5658**	1.6825/0.6864**
RETSTD	1.3800/3.8243**	1.3800/5.4785**	1.3989/3.7538**	1.3989/5.4922**
ln *MKV*	1.2702/-0.0875**	1.2702/-0.0953**	1.2695/-0.0870**	1.2695/-0.0948**
Adj R^2	0.8524	0.8649	0.8477	0.8622

* ：The estimated parameter is statistically significant at alpha = 0.05 level.

** ：The estimated parameter is statistically significant at alpha = 0.01 level.

TABLE 7

Heteroskedasticity-robust regression results of the effective spread and adverse information component on composite basis T&D rankings.

The value of White's Heteroskedasticity-Consistent Standard Errors (HCSEs) and corresponding t-values and p-values are reported in the parentheses

Panel A: Heteroskedasticity-robust regression results of effective spread against composite basis T&D rankings.

	Prediction	Estimated Coefficient	Standard Error (HCSE)	t-value	Pr > | t |
Intercept		-3.8423	0.2181	-17.62	<0.0001
			(0.1769)	(-28.56)	(<0.0001)
ln *CFR*	—	-0.3002	0.0866	-3.47	0.0006
			(0.0850)	(-3.53)	(0.0005)
ln *CLP*	+	0.5650	0.0132	42.7	<0.0001
			(0.0142)	(39.68)	(<0.0001)
RETSTD	+	3.8243	0.4357	8.78	<0.0001
			(0.4638)	(8.24)	(<0.0001)
ln *MKV*	—	-0.0875	0.0059	-14.81	<0.0001
			(0.0055)	(-15.77)	(<0.0001)
Adj R^2	0.8524				
Observation	364				

Panel B: Heteroskedasticity-robust regression results of adverse information component against composite basis T&D rankings.

	Prediction	Estimated Coefficient	Standard Error (HCSE)	t-value	Pr > | t |
Intercept		-4.7826	0.2492	-19.19	<0.0001
			(0.1962)	(-31.09)	(<0.0001)
ln *AFR*	—	-0.2721	0.0990	-2.75	0.0063
			(0.0962)	(-2.83)	(0.0049)
ln *CLP*	+	0.6856	0.0151	45.35	<0.0001
			(0.0154)	(44.45)	(<0.0001)
RETSTD	+	5.4785	0.4978	11.01	<0.0001
			(0.5379)	(10.18)	(<0.0001)
ln *MKV*	—	-0.0953	0.0068	-14.11	<0.0001
			(0.0061)	(-15.55)	(<0.0001)
Adj R^2	0.8649				
Observations	364				

TABLE 8

Heteroskedasticity-robust Regression results of the effective spread and adverse information component on annual basis T&D rankings.

The value of heteroskedasticity-robust standard errors and corresponding t-values and p-values are reported in the parentheses

Panel A: Heteroskedasticity-robust regression results of effective spread against annual basis T&D rankings.

	Prediction	Estimated Coefficient	Standard Error (HCSE)	t-value	Pr > | t |
Intercept		-4.42926	0.1333	-33.22	<.0001
			(0.0757)	(-74.39)	(<.0001)
ln *CFR*	—	-0.0197	0.0247	-0.80	0.4255
			(0.0238)	(-0.83)	(0.4092)
ln *CLP*	+	0.56583	0.0134	42.11	<.0001
			(0.0144)	(39.30)	(<.0001)
RETSTD	+	3.75383	0.4456	8.42	<.0001
			(0.4886)	(7.68)	(<.0001)
ln *MKV*	—	-0.08702	0.0060	-14.51	<.0001
			(0.0057)	(-15.15)	(<.0001)
Adj R^2	0.8477				
Observation	364				

Panel B: Heteroskedasticity-robust regression results of adverse information component against annual basis T&D rankings.

	Prediction	Estimated Coefficient	Standard Error (HCSE)	t-value	Pr > | t |
Intercept		-5.3739	0.1515	-35.48	<.0001
			(0.0824)	(-81.14)	(<.0001)
ln *AFR*	—	0.0185	0.0281	0.66	0.5100
			(0.0287)	(0.65)	(0.5193)
ln *CLP*	+	0.6864	0.0153	44.97	<.0001
			(0.0156)	(44.09)	(<.0001)
RETSTD	+	5.4922	0.5062	10.85	<.0001
			(0.5497)	(9.99)	(<.0001)
ln *MKV*	—	-0.0948	0.0068	-13.92	<.0001
			(0.0062)	(-15.4)	(<.0001)
Adj R^2	0.8622				
Observations	364				