

# The Effect of Corporate International Diversification on Stock Liquidity

## Abstract

In this paper, I examine the relationship between corporate international diversification and stock liquidity. With a sample of Japanese listed firms, I find that the firm's foreign subsidiaries ratio and foreign sales ratio are associated with greater stock liquidity. The results indicate that firms could improve the liquidity of their stocks by diversifying their operations internationally. In addition, the positive relationship remains unchanged, even after controlling for informed foreign investor, investment horizon, corporate governance, and market power which have significant effects on the sensitivity of international diversification on stock liquidity. It suggests a presence of other factors that determine the relationship between corporate international diversification and stock liquidity.

## 1. Introduction

This study investigates how corporate international diversification affects stock liquidity. A large number of studies examine the effects of corporate international diversification on various firm outcomes due to their importance in international business. Further, previous studies on stock liquidity insist its importance, suggesting that the level of stock liquidity has effects on stock return or firm value. Although both of corporate international diversification and stock liquidity have received substantial attention, empirical research for combining them has not been existed.

I predict the effect of corporate international diversification on stock liquidity, grounded in the effects of some determinants of liquidity. For the determinants, this study focuses informed investors, investment horizon, corporate governance, and product market power. The presence of informed investors has two conflicting effects. It may decrease stock liquidity by bringing information asymmetry problem and adverse selection risk, whereas it also could enhance the liquidity due to improved information efficiency driven by competition among the multiple informed investors. The length of investment horizon is associated with less stock liquidity, as short term investors trade more often to exploit their informational advantage. In addition, the stock liquidity declines by poor corporate governance, since firms with poor governance are likely to have higher information asymmetry (lower transparency). In contrast, the greater market power which reduces the volatility of cash flow and stock return has an increasing effect on stock liquidity.

Corporate international diversification may influence the firm's stock liquidity in different two ways, by affecting the aforementioned liquidity determinants. At first, a firm's international diversification increases a participation of foreign investors regarded as informed investors. Further, multinational firms are likely to have the greater market power due to its advantages in international market. However, they are related to poor corporate governance caused by greater information asymmetry and agency problem between parent and foreign subsidiaries. If corporate international diversification is associated with improved information efficiency obtained by the multiple foreign informed investors and greater market power, it could increase the stock liquidity. On the other hand, multinationals may face greater adverse selection risk and poor governance which reduce the liquidity of the firms' stocks.

I examine the effect of corporate international diversification on stock liquidity with the sample of Japanese listed firms from 2004 to 2014. For empirical analysis, I employ three measures of stock liquidity, Amihud's relative illiquidity, quoted spread and

effective spread. Corporate international diversification is measured by the foreign subsidiaries ratio and the foreign sales ratio. The regression results suggest that corporate international diversification is associated with greater stock liquidity, even after controlling for other determinants of stock liquidity. As a result, when firms diversify their operations internationally, their stocks experience higher liquidity.

In addition, I investigate what drives the positive relationship between corporate international diversification and stock liquidity. For additional analysis, I include interaction terms between international diversification measures and aforementioned determinants of liquidity. In the results, the interaction terms have significant impacts on the liquidity measures, but remaining the significantly positive relationship between international diversification and stock liquidity. Although the sensitivity of international diversification on stock liquidity is affected by the foreign informed investors, investment horizon, corporate governance, and market power, it seems that other factors omitted in this study influence the sensitivity as well.

This study makes several contributions. First, this study provides an empirical evidence that corporate international diversification has a significant impact on stock liquidity. It contributes to the on-going debate on the effect of corporate international diversification on various corporate outcomes, as the relationship between international diversification and stock liquidity has received less attention. Second, this study suggests that the relationship between international diversification and stock liquidity is significantly positive, even after controlling for greater firm size and growth opportunity which are considered as ordinary characteristics of multinational firms. It implies that the relationship may be driven by other characteristics as well. Finally, the positive relationship between corporate international diversification and stock liquidity survives, even after controlling for informed investor, investment horizon, corporate governance, and market power. The result allows estimation that there are other factors which determine greater stock liquidity of multinational firms.

The remainder of this paper is organized as follows. Chapter 2 reviews the literature and develops the hypotheses and chapter 3 describes the sample and variables for analysis. Chapter 5 presents the regression results. Finally, Chapter 6 offers concluding discussions.

## 2. Hypothesis Development

### 2.1. Determinants of stock liquidity

Stock liquidity is defined as the degree to which a security can be traded in the market without affecting its price. Wuyts (2007) provides a concept of liquidity that a market is liquid if traders can quickly buy or sell large numbers of shares without large price effects. Previous studies on the stock liquidity suggest evidences for several significant determinants of stock liquidity. This study focuses on some of the determinants, characteristics of investors (informed investor and investment horizon), corporate governance and product market power.

The characteristics of investors have a significant effect on stock liquidity. Financial institutions which are regarded as informed investors affect in two ways. On one hand, the presence of informed investors causes information asymmetry between informed and uninformed investors and adverse selection risk on uninformed investors. The information asymmetry and adverse selection risk reduce the trading motivation of uninformed investors. Thus, greater institutional ownership results in lower liquidity of the stock (higher bid-ask spread) (Glosten and Milgrom, 1985; Easley and O'Hara, 1987). On the other hand, competition among multiple institutions improves information efficiency related to stock price, thereby reducing the perceived uncertainty about the true value of the stock and leading to greater stock liquidity (Holden and Subrahmanyam, 1992; Mendelson and Tunca, 2004). Agarwal (2007) argues that the effect of institutional ownership on liquidity is depend on the net of these two effects and finds the existence of both of two effects, adverse selection and information efficiency.

The length of investment horizon is also an important determinant of stock liquidity. Amihud and Mendelson (1986) provide the evidence that asset with higher spreads are allocated in equilibrium to portfolios with longer horizon. Yan and Zhang (2009) suggest that short term investors trade more often due to their informational advantage. Empirical studies show that longer investment horizon is associated with less stock liquidity (Atkins and Dyl, 1997; Vovchak, 2014).

In agency theory, corporate governance influences stock liquidity. Chung et al. (2010) find that firms with better corporate governance have greater stock liquidity. They explain that good governance improves financial and operational transparency, which reduces information asymmetries between the insiders and outside owners/liquidity providers. A decrease in information asymmetry results in less adverse selection risk

which liquidity providers face. Therefore, firms with more effective governance have more liquid stocks. Other studies also show the positive relationship between corporate governance and stock liquidity (Chen, W. P et al., 2007; Prommin, P. et al., 2014).

Product market power is also one of determinants of stock liquidity. Peress (2010) suggests that greater product market power improves liquidity of the stocks. A firm with market power has ability to set prices and pass on productivity shocks to its customers, which reduces the volatility of the firm's cash flow and stock returns. The lower volatility of cash flow and stock returns enhance the precision of investor's information about stock price, resulting in its less sensitivity to order flow. Thus, a firm with greater market power is associated with lower price impact and more liquid stocks. Kale and Loon (2011) empirically test the prediction of Peress (2010) and provide an evidence of the positive relationship between product market power and stock liquidity.

## 2.2. Corporate international diversification and stock liquidity

As discussed above, previous studies identify the existence of several factors which determine the level of stock liquidity. This study explores a possibility of the effect of corporate international diversification on liquidity of stocks. If corporate international diversification influences those factors, it also could have effects on stock liquidity. Concerning about the effects of determinants of liquidity, I investigate the relationship between corporate international diversification and stock liquidity.

Corporate international diversification may have conflicting effects on stock liquidity because it influences the degree of the firm's informed investor, corporate governance and market power. International diversification is associated with an increase in foreign investors regarded as informed trader, poor corporate governance and greater market power. If international diversification improves the information efficiency about stock price by competition among the informed foreign investors and increases market power, it could enhance stock liquidity. In contrast, adverse selection risk due to informed investors and poor corporate governance of multinational firms may result in lower stock liquidity. In conclusion, the effect of international diversification on stock liquidity depends on both two conflicting effects. The details are as followed.

At first, international diversification affects the firm's ownership structure. Foreign operation increases a participation of foreign investors. Dahlquist and Robertsson (2001) show that large export sales are positively correlated with foreign investors. Further, previous studies suggest that foreign investors are likely to invest in firms for which they are well informed (Kang and Stulz, 1997; Lin and Shiu, 2003) and foreign

institutional investors have an information advantage over domestic investors (Dvorak, 2005; Huang and Shiu, 2009). If foreign investors are more informed than domestic investors, they could influence a liquidity of stocks. Accordingly, international diversification accompanied by greater foreign ownership may have a significant effect on stock liquidity.

An increase in agency costs is risk of corporate international diversification. Agency problem of multinational firm is caused by not only a conflict between manager and shareholders, but also a conflict between parent and foreign subsidiaries which may result in a conflict between overall firm and the firm's shareholders. Geographical distance, difference in culture and language, and difference in legal system increase the information asymmetry between parent and foreign subsidiaries (Duru and Reeb, 2002). In addition, multinational firms have greater agency costs than domestic firms due to difficulty of monitoring managers of foreign subsidiaries (Lee and Kwok, 1988). Poor corporate governance caused by greater information asymmetry and agency costs is associated with less stock liquidity. Therefore, it is considered that as a firm becomes internationally diversified, liquidity of the firm's stock decreases.

On the other hand, global diversification has a benefit of improved market power. Grant (1987) argues that multinationality may confer the firm's market power by international scope. He suggests that multinational firms have advantage to breach entry barriers compared to surrounding similar industries in other countries and can use cross-subsidisation to prevail nationally-based rivals. As proved in Peress (2010) and Kale and Loon (2011), greater market power increases stock liquidity. As a result, multinational firm with market power is likely to have more liquid stocks.

As preceding discussion, there are two conflicting effects of corporate international diversification on stock liquidity. International diversification increases liquidity of the firm's stocks in respect to an increase in information efficiency and product market power. However, adverse selection risk and poor corporate governance reduce stock liquidity. As a result, the effect of corporate international diversification on stock liquidity may be determined by net effect of the effects. Thus, this study tests these conflicting hypotheses for the relationship between corporate international diversification and the liquidity of stocks.

H1.a. Corporate international diversification is associated with greater stock liquidity.

H1.b. Corporate international diversification is associated with less stock liquidity.

Next, this study investigates which factor determines the relationship between corporate international diversification and stock liquidity. I employ the degree of foreign ownership, corporate governance and product market power and examine how they influence the sensitivity of firm's international diversification on the liquidity of stocks. The length of investment horizon is additionally used because a change in ownership structure may influence investment horizon.

The hypotheses for this further analysis are as followed.

H2. a. The degree of foreign ownership has a significant effect on the sensitivity of corporate international diversification on stock liquidity.

H2. b. The degree of corporate governance has a significant effect on the sensitivity

H2. c. The degree of product market power has a significant effect on the sensitivity.

H2. d. The length of investment horizon has a significant effect on the sensitivity.

### 3. Data and Variables

#### 3.1. Sample Selection

This study uses data of all listed Japanese firms except financial industry from 2004 to 2014. I obtain the firm's financial information and foreign sales information from Nikkei Needs Financial Quest database, corporate governance information and information about foreign subsidiaries from Nikkei Needs-MT data. Then, I exclude samples without data for computing stock liquidity and winsorize all the variables including control variables at 1 percentage level to minimize the effects of outliers. The final dataset consists of 3,642 firms and 28,969 firm-year observations.

#### 3.2. Liquidity Measures

I use three types of illiquidity measures Amihud(2002)'s illiquidity measure, quoted spread and effective spread. I eliminate stocks traded less than 100 yen.

(1) The Amihud estimate

Amihud illiquidity measure is the average ratio of the daily absolute return to the trading volume on that day. It is calculated as

$$ILLIQ_{iy} = \frac{1}{D_{iy}} \sum_{t=1}^{D_{iy}} \frac{|R_{iyd}|}{VOLD_{ivy}}$$

where  $R_{iyd}$  is the return on stock  $i$  on day  $d$  of year  $y$ ,  $VOLD_{ivy}$  is the respective daily volume in yen, and  $D_{iy}$  is the number of days when data are available for stock  $i$  in year  $y$ .  $ILLIQ$  is a rough estimate of the daily price impact of the order flow and measures how much one yen of trading volume causes absolute price change. Then, I calculate the average relative illiquidity ( $RILLIQ$ ) for each year.  $RILLIQ$  is the ratio of illiquidity measure to the average market illiquidity across stocks in that year. It is calculated as

$$RILLIQ_{iy} = \frac{ILLIQ_{iy}}{\frac{1}{N_y} \sum_{t=1}^{N_y} ILLIQ_{iy}}$$

Where  $N_y$  is the number of stocks in year  $y$ . Since average illiquidity varies considerably over the years,  $ILLIQ$  is replaced by  $RILLIQ$  which is its mean-adjusted value (Amihud, 2002). We use  $RILLIQ$  as the measure of illiquidity<sup>1</sup>.

(2) Quoted spread

The quoted percentage spread of stock is defined as the difference between ask price and bid price divided by the mid-price of the quotes. I calculate the quoted spread as

$$\text{Quoted\_Spread}_{it} = \frac{\text{Ask}_{it} - \text{Bid}_{it}}{(\text{Ask}_{it} + \text{Bid}_{it})/2}$$

where  $\text{Ask}_{it}$  is the ask price for stock  $i$  at time  $t$ ,  $\text{Bid}_{it}$  is the bid price for stock  $i$  at time  $t$ . I compute the average spreads during each year. The quoted spread is the implicit trading cost for market orders when a trade occurs at the quoted price with no price improvement (Chung et al., 2010).

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<sup>1</sup> We obtain a consistent result from analysis using  $ILLIQ$ .



### (3) Effective spread

The effective percentage spread of stock is defined as the twice of the absolute value of the difference between the transaction price and the quote mid-price divided by mid-price of the quote. I calculate the effective spread as

$$\text{Effectiv\_Spread}_{it} = \frac{|P_{it} - (\text{Ask}_{it} + \text{Bid}_{it})/2| \times 2}{(\text{Ask}_{it} + \text{Bid}_{it})/2}$$

where  $P_{it}$  is the transaction price for stock  $i$  at time  $t$ . The effective spread measures the cost of trading when it occurs at prices inside the posted bid and ask quotes (Chung et al., 2010).

### 3.3. International Diversification Measure

The degree of internationalization is measured by the foreign subsidiaries ratio and the foreign sales ratio. I obtain the foreign subsidiaries ratio by dividing the number of foreign subsidiaries of the firm to the total number of subsidiaries. The foreign sales ratio is computed by dividing the firm's foreign sales to its total sales.

### 3.4. Other variables

To examine whether some determinants of liquidity affect the sensitivity of corporate international diversification on stock liquidity, I conduct interaction terms by multiplying the international diversification measures with each of the liquidity determinant measures (informed investors, investment horizon, corporate governance and product market power). Foreign ownership as the measure of informed investors is calculated by the ratio of shares hold by foreign investors to the number of total shares. For investment horizon, I employ Uno and Kamiyama (2010)'s investment horizon measure<sup>2</sup>. The level of corporate governance is estimated with two measures, the

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<sup>2</sup> Uno and Kamiyama (2010) compute a firm's investment horizon using four investor categories: foreigners, individuals, non-financial corporations, and financial institutions (trust banks, insurance companies, and banks). The following is the equation for an investor group  $j$ 's investment horizon in year  $t$ :

$$\text{Investment horizon}_t^j = \frac{(\text{portfolio market value}_t^j + \text{portfolio market value}_t^j) \times \frac{1}{2}}{\text{total yen trading volume}_t^j}$$

Then, they compute horizon for firm  $k$  in year  $t$  as follow:

number of directors and outside directors. The large number of them implies better governance. At last, I employ the Sale-based Herfindahl Index<sup>3</sup> as the measure of firm's market power.

### 3.5. Control variables

I include a number of control variables in empirical analysis for controlling the effects of other determinants of liquidity. They are the number of subsidiaries (Number of Subsidiaries), growth opportunity (Tobin Q), firm size (Ln Asset), cash flow ratio (CF Asset Ratio), asset tangibility (Tangible Ratio), firm leverage (Leverage), R&D intensity (R&D to Sales Ratio), company age (Ln Age), dividend yield (Dividend Yield).

I include Tobin's q as the measure of firm's growth opportunity, as high-growth firms is likely to attract more attention from investors. Firm size is measured by the natural logarithm of total asset. Larger firms may have greater liquidity due to its more available information and smaller adverse selection risk. I measure tangibility as the ratio of tangible asset to total asset and R&D intensity as the ratio of R&D expenditure to total sales. As tangible asset's payoffs are easier to observe, greater asset tangibility is expected to reduce asymmetric information problems and increase liquidity of the stocks. On the other hand, high R&D intensity could worsen asymmetric information problems because their payoffs are difficult to predict. Leverage is computed as the ratio of total debt to total assets. Firm age is determined as the period from the firm's initially listed year. Finally, I include dummy variables for industry and year.

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$$\text{Horizon}_t^k = \sum_{j=1}^4 w_{k,t}^j \times \text{Horizon}_t^j$$

Where j represents one of four investor categories,  $w_{k,t}^j$  is a firm j's ownership ratio, and  $\text{Horizon}_t^j$  is the market-wide investment horizon by investor group. Thus, they estimate the investment horizon based upon the firm's ownership structure.

<sup>3</sup> Sales-based Herfindahl Index is computed as the sum of the square of a firm's fractional sales in its industry sales across all firms in the industry.

## 4. Empirical Results

### 4.1. Descriptive Statistics

Panel A in Table 1 presents the summary statistics for the sample firms. The average foreign subsidiaries ratio and foreign sales ratio is 0.27 and 0.137, respectively. The sample firms' relative illiquidity (RILLIQ) averages 1.011, and their average quoted spread and effective spread are 1.489 and 1.164, respectively. Panel B and C compare the sample of domestic firms (which have foreign subsidiaries or sales) and multinational firms (which not have foreign subsidiaries or sales). It shows that, on average, the firms with foreign subsidiaries or sales have larger total assets and higher Tobin's q ratio than firms without foreign subsidiaries or sales. Therefore, multinational firms in the sample have greater firm size and growth opportunity compared to domestic firms.

Table 2 shows the correlation coefficients between all the variables. The liquidity measures are positively correlated with each other and especially the coefficient between quoted and effective spread is 0.987. The international diversification measures (foreign subsidiaries ratio and foreign sales ratio) are negatively correlated with each liquidity measures, suggesting that more internationally diversified firms are associated with greater stock liquidity.

### 4.2. Regression Results

#### 4.2.1. Corporate international diversification and Stock liquidity

To examine the relationship between corporate international diversification and stock liquidity, I analyze the pooled cross-sectional time-series data. The regression results are shown in Table 3. I use the tree types of liquidity measure, RILLIQ, Quoted Spread, and Effective Spread. Each liquidity measures are regressed in two ways, with only industry and year dummies, and adding all other control variables. Models 1 through 6 present the results of foreign subsidiaries ratio as the measure of international diversification, and models 7 through 12 present the results of foreign sales ratio.

The regression results suggest a positive relation between corporate international diversification and stock liquidity. In the results of foreign subsidiaries, across the all regression models including only dummy variables of industry and year as control

variables (model 1, 3, and 5), the sign of coefficients for international diversification measures are negative and statistically significant. The results remain unchanged after adding other control variables. The models where foreign sales ratio is the independent variable also exhibit the significantly negative coefficients of independent variable. The results in Table 3 imply that the degree of corporate international diversification is positively associated with the firm's stock liquidity, after controlling for other determinants of stock liquidity. It supports the hypothesis 1.a that corporate international diversification is associated with greater stock liquidity.

Control variables have significant effects on the stock liquidity. As shown in regression results, Tobin q ratio, firm size, cash flow ratio, and firm age are negatively related with liquidity measures, indicating that firms with greater growth opportunity, size, profitability, and age are associated with the greater stock liquidity. On the other hand, the number of subsidiaries and leverage have decreasing effects on liquidity of the stock. Inconsistent with the expectation, tangibility is negatively related with stock liquidity, where as R&D expenditure has a positive relationship with stock liquidity.

#### 4.2.2. The sensitivity of corporate international diversification and other determinants

To ascertain whether some determinants of liquidity influence the sensitivity of corporate international diversification on stock liquidity, I add interaction terms between international diversification measures and liquidity determinants measures (foreign investor, investment horizon, corporate governance, and market power) in my regressions. Each model includes all kinds of interaction terms. To examine the effect of corporate governance, I employ two types of governance measures, the number of directors and outside directors. Table 4 presents the regression results.

Regression results show that the interaction terms have significant effects on the stock liquidity. The interaction terms between diversification measure and foreign investor variable exhibit significantly positive coefficients. It means that an increase in foreign investors of firms with international diversification reduces the firms' stock liquidity, suggesting evidence for information asymmetry and adverse selection risk due to foreign informed investors. In addition, the coefficients of diversification and investment horizon interaction terms are also positive and significant, supporting a decreasing effect of the longer investment horizon of multinational firms on liquidity of the stocks. In contrast, the interaction terms between diversification and Sale-based Herfindahl Index are negatively related to stock liquidity measures, indicating that as the internationally diversified firm's market power becomes greater, the firm's stock

liquidity increases. For the diversification and corporate governance interaction terms, only the coefficients of interaction terms between the foreign subsidiaries ratio and the number of outside directors are negative and significant, whereas other interaction terms have positive coefficient. It implies the increasing effect of outside directors on liquidity due to improved corporate governance is realized only for firms with foreign subsidiaries.

Consistent with the results in Table 3, corporate international diversification is positively associated with stock liquidity. Even after controlling for other determinants including interaction terms, the coefficients of international diversification measures remain significantly negative. It means that the greater international diversification has an increasing impact on the liquidity of stocks excluding the effects of other determinants such as informed investor, investment horizon, corporate governance, and product market power. Thus, it is possible that the positive relationship between international diversification and stock liquidity is driven by other factors which are omitted in this study.

To robust the above results, I estimate the regressions in Table 4 using fixed effects method. Table 5 shows the results of fixed effects regressions. In the results, corporate international diversification with foreign subsidiaries increases the liquidity of stocks, consistent with the above results. The coefficients of foreign subsidiaries ratio are negative and significant in the models using the quoted and effective spread, whereas the foreign sales ratio exhibits not statistically significant coefficients. In addition, the coefficients of interaction terms including foreign investor variable also remain significantly positive, implying that greater foreign ownership of multinational firm reduces the firm's stock liquidity. As a result, the positive relationship between corporate international diversification and stock liquidity is holds, controlling for individual firm characteristics.

## 5. Conclusion

This study explores the relationship between corporate international diversification and stock liquidity. It is estimated that a firm's international diversification has two conflicting effects on the liquidity of stocks. Corporate international diversification can improve information efficiency and market power, thereby increasing stock liquidity. On the other hand, firms with greater international diversification may have less liquid stocks due to their poor governance and adverse selection risk. To test the estimations, I

investigate how corporate international diversification affects stock liquidity.

The empirical results suggest that a firm with greater international diversification is associated with greater stock liquidity, even after controlling for other determinants of liquidity. It demonstrates that when firms become internationally diversified, they obtain an advantage of an improvement in their stock liquidity. It also implies that corporate international diversification is a significant determinant of stock liquidity. In additional analysis, I find that the relationship between international diversification and stock liquidity is influenced by some factors, foreign investor, investment horizon, corporate governance, and market power, and it remains significantly positive even after controlling for those factors.

Considering the results of additional analysis, it is possible that other factors determine the relationship between corporate international diversification and stock liquidity. As this study uses the sample of Japanese listed firms, the factors may be related with characteristics of Japanese multinational firms. For example, if international diversification of Japanese firm requires the disclosure of more information about the firm's operation, it could enhance transparency and stock liquidity. Further research is needed to reveal what factors drive the positive relationship between corporate international diversification and stock liquidity.

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**Table 1** Descriptive Statistics

## Panel A: Summary Statistics

|                              | All firm - years |        |        |        |        |         |
|------------------------------|------------------|--------|--------|--------|--------|---------|
|                              | Observations     | Mean   | Median | SD     | Min    | Max     |
| <b>Dependent Variables</b>   |                  |        |        |        |        |         |
| RILLIQ                       | 28,969           | 1.011  | 0.129  | 2.307  | 0.000  | 41.355  |
| Quoted Spread                | 28,969           | 1.489  | 0.818  | 1.818  | 0.129  | 14.133  |
| Effective Spread             | 28,969           | 1.164  | 0.669  | 1.421  | 0.076  | 12.066  |
| <b>Independent Variables</b> |                  |        |        |        |        |         |
| Foreign subsidiaries Ratio   | 28,969           | 0.270  | 0.128  | 0.319  | 0.000  | 1.000   |
| Foreign Sales Ratio          | 28,969           | 0.137  | 0.000  | 0.215  | 0.000  | 1.000   |
| <b>Control Variables</b>     |                  |        |        |        |        |         |
| Number of Subsidiaries       | 28,969           | 17.419 | 6.000  | 41.985 | 0.000  | 687.000 |
| Ln Asset                     | 28,969           | 10.623 | 10.480 | 1.575  | 5.271  | 17.043  |
| Tobin Q                      | 28,969           | 1.198  | 0.986  | 0.986  | 0.342  | 18.229  |
| CF Ratio                     | 28,969           | 0.081  | 0.077  | 0.068  | -0.750 | 0.449   |
| Tangible Ratio               | 28,969           | 0.287  | 0.271  | 0.180  | 0.000  | 0.922   |
| Leverage                     | 28,969           | 0.512  | 0.520  | 0.207  | 0.018  | 1.650   |
| R&D to Sales Ratio           | 28,969           | 0.020  | 0.004  | 0.144  | 0.000  | 15.269  |
| Ln Age                       | 28,936           | 4.295  | 4.220  | 0.257  | 3.761  | 4.736   |
| Dividend Yield               | 28,969           | 1.781  | 1.636  | 1.286  | 0.000  | 18.376  |
| Number of Directors          | 28,969           | 8.209  | 8.000  | 3.452  | 3.000  | 50.000  |
| Number of Outside Directors  | 28,969           | 0.761  | 0.000  | 1.148  | 0.000  | 13.000  |
| Investment Horizon           | 28,969           | 2.526  | 2.299  | 1.263  | 0.230  | 8.258   |
| Foreign Investors            | 28,969           | 0.090  | 0.045  | 0.110  | 0.000  | 0.750   |
| Sale-based Herfindahl Index  | 28,969           | 0.062  | 0.050  | 0.057  | 0.012  | 0.484   |

**Table 1** (Continued)

Panel B: Sample without Foreign Subsidiaries V.S. Sample with Foreign Subsidiaries

|                             | Firm - years without foreign subsidiaries |        |        |        | Firm - years with foreign subsidiaries |        |        |        | Industry Adjusted |     |
|-----------------------------|---|--------|--------|--------|--|--------|--------|--------|-------------------|-----|
|                             | Observations                              | Mean   | Median | SD     | Observations                           | Mean   | Median | SD     | Difference test   |     |
| RILLIQ                      | 12,327                                    | 1.545  | 0.389  | 2.937  | 16,642                                 | 0.615  | 0.054  | 1.583  | 30.82             | *** |
| Quoted Spread               | 12,327                                    | 1.946  | 1.160  | 2.086  | 16,642                                 | 1.152  | 0.620  | 1.503  | 37.61             | *** |
| Effective Spread            | 12,327                                    | 1.523  | 0.950  | 1.620  | 16,642                                 | 0.898  | 0.490  | 1.184  | 37.29             | *** |
| Foreign subsidiaries Ratio  | 12,327                                    | 0.000  | 0.000  | 0.000  | 16,642                                 | 0.470  | 0.444  | 0.289  | -166.04           | *** |
| Foreign Sales Ratio         | 12,327                                    | 0.017  | 0.000  | 0.079  | 16,642                                 | 0.226  | 0.163  | 0.239  | -67.98            | *** |
| Number of Subsidiaries      | 12,327                                    | 6.682  | 3.000  | 11.348 | 16,642                                 | 25.372 | 10.000 | 53.146 | -45.50            | *** |
| Ln Asset                    | 12,327                                    | 10.097 | 10.042 | 1.368  | 16,642                                 | 11.012 | 10.849 | 1.604  | -52.12            | *** |
| Tobin Q                     | 12,327                                    | 1.207  | 0.964  | 1.090  | 16,642                                 | 1.191  | 1.002  | 0.901  | -9.33             | *** |
| CF Ratio                    | 12,327                                    | 0.073  | 0.069  | 0.072  | 16,642                                 | 0.087  | 0.083  | 0.064  | -13.84            | *** |
| Tangible Ratio              | 12,327                                    | 0.304  | 0.276  | 0.207  | 16,642                                 | 0.275  | 0.268  | 0.156  | 18.07             | *** |
| Leverage                    | 12,327                                    | 0.537  | 0.553  | 0.212  | 16,642                                 | 0.493  | 0.497  | 0.201  | 6.85              | *** |
| R&D to Sales Ratio          | 12,327                                    | 0.010  | 0.000  | 0.160  | 16,642                                 | 0.027  | 0.011  | 0.131  | -1.63             |     |
| Ln Age                      | 12,306                                    | 4.242  | 4.159  | 0.248  | 16,630                                 | 4.334  | 4.291  | 0.257  | -9.77             | *** |
| Dividend Yield              | 12,327                                    | 1.806  | 1.669  | 1.395  | 16,642                                 | 1.763  | 1.619  | 1.199  | 3.82              | *** |
| Number of Directors         | 12,327                                    | 7.701  | 7.000  | 3.192  | 16,642                                 | 8.585  | 8.000  | 3.587  | -23.61            | *** |
| Number of Outside Directors | 12,327                                    | 0.686  | 0.000  | 1.074  | 16,642                                 | 0.816  | 0.000  | 1.196  | -14.66            | *** |
| Investment Horizon          | 12,327                                    | 2.673  | 2.519  | 1.320  | 16,642                                 | 2.417  | 2.160  | 1.208  | 17.54             | *** |
| Foreign Investors           | 12,327                                    | 0.057  | 0.019  | 0.087  | 16,642                                 | 0.115  | 0.076  | 0.119  | -44.26            | *** |
| Sale-based Herfindah Index  | 12,327                                    | 0.052  | 0.037  | 0.049  | 16,642                                 | 0.069  | 0.051  | 0.062  | 2.06              | **  |

Note: \*\*\*, \*\*, \* Significant at the 1 percent, 5 percent and 10 percent levels, respectively.

**Table 1** (Continued)

Panel C: Sample without Foreign Sales V.S. Sample with Foreign Sales

|                             | Firm - years without foreign sales |        |        |        | Firm - years with foreign sales |        |        |        | Industry Adjusted |     |
|-----------------------------|------------------------------------|--------|--------|--------|---------------------------------|--------|--------|--------|-------------------|-----|
|                             | Observations                       | Mean   | Median | SD     | Observations                    | Mean   | Median | SD     | Difference test   |     |
| RILLIQ                      | 16,847                             | 1.326  | 0.254  | 2.699  | 12,122                          | 0.573  | 0.047  | 1.505  | 24.88             | *** |
| Quoted Spread               | 16,847                             | 1.747  | 0.985  | 2.015  | 12,122                          | 1.131  | 0.615  | 1.425  | 30.52             | *** |
| Effective Spread            | 16,847                             | 1.371  | 0.816  | 1.573  | 12,122                          | 0.875  | 0.485  | 1.115  | 30.30             | *** |
| Foreign subsidiaries Ratio  | 16,847                             | 0.128  | 0.000  | 0.242  | 12,122                          | 0.467  | 0.478  | 0.310  | -65.28            | *** |
| Foreign Sales Ratio         | 16,847                             | 0.000  | 0.000  | 0.000  | 12,122                          | 0.327  | 0.288  | 0.220  | -133.42           | *** |
| Number of Subsidiaries      | 16,847                             | 9.797  | 4.000  | 22.902 | 12,122                          | 28.012 | 11.000 | 57.366 | -30.24            | *** |
| Ln Asset                    | 16,847                             | 10.260 | 10.178 | 1.455  | 12,122                          | 11.126 | 10.940 | 1.597  | -39.03            | *** |
| Tobin Q                     | 16,847                             | 1.226  | 0.971  | 1.123  | 12,122                          | 1.158  | 1.006  | 0.752  | -8.07             | *** |
| CF Ratio                    | 16,847                             | 0.077  | 0.071  | 0.073  | 12,122                          | 0.087  | 0.084  | 0.061  | -10.27            | *** |
| Tangible Ratio              | 16,847                             | 0.296  | 0.268  | 0.204  | 12,122                          | 0.276  | 0.273  | 0.139  | 0.00              | *** |
| Leverage                    | 16,847                             | 0.528  | 0.537  | 0.209  | 12,122                          | 0.489  | 0.496  | 0.202  | 7.31              | *** |
| R&D to Sales Ratio          | 16,847                             | 0.010  | 0.000  | 0.104  | 12,122                          | 0.033  | 0.020  | 0.185  | -2.93             | *** |
| Ln Age                      | 16,822                             | 4.237  | 4.159  | 0.244  | 12,114                          | 4.375  | 4.413  | 0.254  | -17.73            | *** |
| Dividend Yield              | 16,847                             | 1.853  | 1.711  | 1.397  | 12,122                          | 1.681  | 1.555  | 1.106  | 7.60              | *** |
| Number of Directors         | 16,847                             | 7.818  | 7.000  | 3.194  | 12,122                          | 8.752  | 8.000  | 3.715  | -19.52            | *** |
| Number of Outside Directors | 16,847                             | 0.734  | 0.000  | 1.110  | 12,122                          | 0.797  | 0.000  | 1.197  | -15.77            | *** |
| Investment Horizon          | 16,847                             | 2.632  | 2.459  | 1.308  | 12,122                          | 2.379  | 2.104  | 1.182  | 14.07             | *** |
| Foreign Investors           | 16,847                             | 0.066  | 0.026  | 0.094  | 12,122                          | 0.123  | 0.087  | 0.122  | -39.56            | *** |
| Sale-based Herfindahl Index | 16,847                             | 0.053  | 0.041  | 0.048  | 12,122                          | 0.074  | 0.051  | 0.067  | 0.26              |     |

Note: \*\*\*, \*\*, \* Significant at the 1 percent, 5 percent and 10 percent levels, respectively.

**Table 2** Correlation Matrix

|                                | 1      | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     | 11     | 12     | 13     | 14     | 15    | 16     | 17     | 18    | 19    |  |
|--------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|--------|--------|-------|-------|--|
| 1 RILLIQ                       | 1.000  |        |        |        |        |        |        |        |        |        |        |        |        |        |       |        |        |       |       |  |
| 2 Quoted Spread                | 0.627  | 1.000  |        |        |        |        |        |        |        |        |        |        |        |        |       |        |        |       |       |  |
| 3 Effective Spread             | 0.644  | 0.987  | 1.000  |        |        |        |        |        |        |        |        |        |        |        |       |        |        |       |       |  |
| 4 Foreign subsidiaries Ratio   | -0.068 | -0.055 | -0.059 | 1.000  |        |        |        |        |        |        |        |        |        |        |       |        |        |       |       |  |
| 5 Foreign Sales Ratio          | -0.134 | -0.149 | -0.155 | 0.528  | 1.000  |        |        |        |        |        |        |        |        |        |       |        |        |       |       |  |
| 6 Number of Subsidiaries       | -0.133 | -0.192 | -0.196 | -0.040 | 0.285  | 1.000  |        |        |        |        |        |        |        |        |       |        |        |       |       |  |
| 7 Ln Assets                    | -0.401 | -0.466 | -0.481 | -0.021 | 0.282  | 0.571  | 1.000  |        |        |        |        |        |        |        |       |        |        |       |       |  |
| 8 Tobin Q                      | -0.092 | -0.127 | -0.118 | -0.008 | -0.011 | -0.014 | -0.102 | 1.000  |        |        |        |        |        |        |       |        |        |       |       |  |
| 9 CF Ratio                     | -0.236 | -0.206 | -0.219 | 0.090  | 0.099  | 0.035  | 0.126  | 0.261  | 1.000  |        |        |        |        |        |       |        |        |       |       |  |
| 10 Tangible Ratio              | -0.067 | -0.055 | -0.066 | -0.071 | -0.026 | 0.038  | 0.227  | -0.180 | 0.077  | 1.000  |        |        |        |        |       |        |        |       |       |  |
| 11 Leverage                    | 0.081  | 0.071  | 0.077  | -0.206 | -0.087 | 0.143  | 0.170  | -0.054 | -0.227 | 0.203  | 1.000  |        |        |        |       |        |        |       |       |  |
| 12 R&D to Sales Ratio          | -0.022 | -0.023 | -0.022 | 0.072  | 0.087  | 0.010  | -0.018 | 0.080  | -0.149 | -0.046 | -0.080 | 1.000  |        |        |       |        |        |       |       |  |
| 13 Ln Age                      | -0.211 | -0.214 | -0.238 | -0.028 | 0.202  | 0.286  | 0.515  | -0.202 | -0.050 | 0.267  | 0.135  | -0.014 | 1.000  |        |       |        |        |       |       |  |
| 14 Dividend Yield              | -0.026 | 0.054  | 0.041  | 0.013  | -0.083 | -0.050 | -0.024 | -0.259 | 0.150  | -0.045 | -0.154 | -0.049 | -0.034 | 1.000  |       |        |        |       |       |  |
| 15 Number of Directors         | -0.207 | -0.234 | -0.243 | -0.051 | 0.108  | 0.320  | 0.545  | -0.057 | 0.078  | 0.164  | 0.105  | -0.023 | 0.309  | -0.020 | 1.000 |        |        |       |       |  |
| 16 Number of Outside Directors | -0.077 | -0.122 | -0.121 | -0.028 | 0.068  | 0.229  | 0.197  | 0.069  | 0.024  | -0.017 | 0.028  | 0.039  | 0.062  | -0.047 | 0.174 | 1.000  |        |       |       |  |
| 17 Investment Horizon          | 0.031  | 0.057  | 0.049  | -0.076 | -0.107 | -0.124 | -0.006 | -0.110 | -0.003 | 0.080  | 0.056  | -0.044 | 0.078  | 0.026  | 0.065 | 0.081  | 1.000  |       |       |  |
| 18 Foreign Investors           | -0.240 | -0.319 | -0.323 | 0.103  | 0.332  | 0.378  | 0.557  | 0.144  | 0.220  | -0.061 | -0.158 | 0.032  | 0.173  | -0.071 | 0.238 | 0.241  | -0.292 | 1.000 |       |  |
| 19 Sale-based Herfindahl Index | -0.053 | -0.052 | -0.060 | 0.092  | 0.186  | 0.141  | 0.170  | -0.088 | 0.028  | 0.203  | 0.083  | 0.012  | 0.240  | 0.007  | 0.089 | -0.009 | 0.059  | 0.035 | 1.000 |  |

Note: All coefficients are statistically significant at least 10 percent level.

**Table 3** The relationship between corporate international diversification and stock liquidity

|                                   | Model 1                      | Model 2                      | Model 3                      | Model 4                      | Model 5                      | Model 6                      | Model 7                      | Model 8                      | Model 9                      | Model 10                     | Model 11                     | Model 12                     |
|-----------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| Variable                          | RIILIQ                       |                              | Bid Ask Spread               |                              | Effective Spread             |                              | RIILIQ                       |                              | Bid Ask Spread               |                              | Effective Spread             |                              |
| <b>Foreign subsidiaries Ratio</b> | <b>-0.575</b> ***<br>(0.045) | <b>-0.470</b> ***<br>(0.042) | <b>-0.418</b> ***<br>(0.039) | <b>-0.404</b> ***<br>(0.035) | <b>-0.312</b> ***<br>(0.030) | <b>-0.305</b> ***<br>(0.027) |                              |                              |                              |                              |                              |                              |
| <b>Foreign Sales Ratio</b>        |                              |                              |                              |                              |                              |                              | <b>-1.830</b> ***<br>(0.065) | <b>-0.231</b> ***<br>(0.064) | <b>-1.956</b> ***<br>(0.054) | <b>-0.499</b> ***<br>(0.049) | <b>-1.515</b> ***<br>(0.042) | <b>-0.383</b> ***<br>(0.038) |
| <b>Number of Subsidiary</b>       |                              | <b>0.007</b> ***<br>(0.000)  |                              | <b>0.005</b> ***<br>(0.000)  |                              | <b>0.004</b> ***<br>(0.000)  |                              | <b>0.008</b> ***<br>(0.000)  |                              | <b>0.005</b> ***<br>(0.000)  |                              | <b>0.004</b> ***<br>(0.000)  |
| <b>Tobin Q</b>                    |                              | <b>-0.260</b> ***<br>(0.017) |                              | <b>-0.192</b> ***<br>(0.011) |                              | <b>-0.145</b> ***<br>(0.008) |                              | <b>-0.261</b> ***<br>(0.017) |                              | <b>-0.191</b> ***<br>(0.011) |                              | <b>-0.144</b> ***<br>(0.008) |
| <b>Ln Assets</b>                  |                              | <b>-0.724</b> ***<br>(0.015) |                              | <b>-0.647</b> ***<br>(0.009) |                              | <b>-0.503</b> ***<br>(0.007) |                              | <b>-0.724</b> ***<br>(0.016) |                              | <b>-0.639</b> ***<br>(0.009) |                              | <b>-0.497</b> ***<br>(0.007) |
| <b>CF Assets Ratio</b>            |                              | <b>-3.256</b> ***<br>(0.322) |                              | <b>-1.687</b> ***<br>(0.173) |                              | <b>-1.492</b> ***<br>(0.133) |                              | <b>-3.323</b> ***<br>(0.324) |                              | <b>-1.696</b> ***<br>(0.173) |                              | <b>-1.498</b> ***<br>(0.133) |
| <b>Tangible Ratio</b>             |                              | <b>0.460</b> ***<br>(0.097)  |                              | <b>0.649</b> ***<br>(0.065)  |                              | <b>0.447</b> ***<br>(0.050)  |                              | <b>0.489</b> ***<br>(0.097)  |                              | <b>0.651</b> ***<br>(0.065)  |                              | <b>0.448</b> ***<br>(0.050)  |
| <b>Leverage</b>                   |                              | <b>1.183</b> ***<br>(0.072)  |                              | <b>0.799</b> ***<br>(0.051)  |                              | <b>0.656</b> ***<br>(0.039)  |                              | <b>1.261</b> ***<br>(0.072)  |                              | <b>0.848</b> ***<br>(0.051)  |                              | <b>0.692</b> ***<br>(0.039)  |
| <b>R&amp;D to Sales Ratio</b>     |                              | <b>-0.489</b> ***<br>(0.142) |                              | <b>-0.293</b> ***<br>(0.097) |                              | <b>-0.241</b> ***<br>(0.079) |                              | <b>-0.498</b> ***<br>(0.153) |                              | <b>-0.282</b> ***<br>(0.106) |                              | <b>-0.232</b> ***<br>(0.085) |
| <b>Ln Age</b>                     |                              | <b>-0.426</b> ***<br>(0.062) |                              | <b>-0.366</b> ***<br>(0.046) |                              | <b>-0.357</b> ***<br>(0.036) |                              | <b>-0.347</b> ***<br>(0.062) |                              | <b>-0.312</b> ***<br>(0.046) |                              | <b>-0.317</b> ***<br>(0.036) |
| <b>Dividend Yield</b>             |                              | <b>-0.056</b> ***<br>(0.017) |                              | <b>0.007</b> ***<br>(0.009)  |                              | <b>-0.010</b> ***<br>(0.007) |                              | <b>-0.056</b> ***<br>(0.017) |                              | <b>0.004</b> ***<br>(0.009)  |                              | <b>-0.013</b> *<br>(0.007)   |
| <b>Industry_Dummies</b>           | Yes                          | Yes                          | Yes                          | Yes                          | Yes                          | Yes                          | Yes                          | Yes                          | Yes                          | Yes                          | Yes                          | Yes                          |
| <b>Year_Dummies</b>               | Yes                          | Yes                          | Yes                          | Yes                          | Yes                          | Yes                          | Yes                          | Yes                          | Yes                          | Yes                          | Yes                          | Yes                          |
| <b>Adjusted R2</b>                | 0.026                        | 0.238                        | 0.080                        | 0.337                        | 0.083                        | 0.345                        | 0.039                        | 0.235                        | 0.109                        | 0.335                        | 0.111                        | 0.343                        |
| <b>Number of Observations</b>     | 28,969                       | 28,936                       | 28,969                       | 28,936                       | 28,969                       | 28,936                       | 28,969                       | 28,936                       | 28,969                       | 28,936                       | 28,969                       | 28,936                       |

Note: \*\*\*, \*\*, \* Significant at the 1 percent, 5 percent and 10 percent levels, respectively.

**Table 4** The sensitivity of corporate international diversification on stock liquidity and other determinants of liquidity

| Variable   | Model 1       |     | Model 2       |     | Model 3          |     | Model 4       |     | Model 5       |     | Model 6          |     |
|--|---------------|-----|---------------|-----|------------------|-----|---------------|-----|---------------|-----|------------------|-----|
|  | RIILIQ        |     | Quoted Spread |     | Effective Spread |     | RIILIQ        |     | Quoted Spread |     | Effective Spread |     |
| Foreign subsidiaries Ratio                             | <b>-1.004</b> | *** | <b>-0.836</b> | *** | <b>-0.623</b>    | *** |               |     |               |     |                  |     |
|  | ( 0.119 )     |     | ( 0.081 )     |     | ( 0.063 )        |     |               |     |               |     |                  |     |
| Foreign Sales Ratio                                    |               |     |               |     |                  |     | <b>-2.093</b> | *** | <b>-1.707</b> | *** | <b>-1.276</b>    | *** |
|  |               |     |               |     |                  |     | ( 0.160 )     |     | ( 0.121 )     |     | ( 0.093 )        |     |
| Foreign subsidiaries Ratio×Foreign Investors           | <b>3.250</b>  | *** | <b>1.417</b>  | *** | <b>1.076</b>     | *** |               |     |               |     |                  |     |
|  | ( 0.258 )     |     | ( 0.192 )     |     | ( 0.148 )        |     |               |     |               |     |                  |     |
| Foreign subsidiaries Ratio×Investment Horizon          | <b>0.151</b>  | *** | <b>0.169</b>  | *** | <b>0.128</b>     | *** |               |     |               |     |                  |     |
|  | ( 0.023 )     |     | ( 0.019 )     |     | ( 0.015 )        |     |               |     |               |     |                  |     |
| Foreign subsidiaries Ratio×Number of Directors         | <b>0.028</b>  | *** | <b>0.011</b>  | *   | <b>0.007</b>     |     |               |     |               |     |                  |     |
|  | ( 0.008 )     |     | ( 0.006 )     |     | ( 0.005 )        |     |               |     |               |     |                  |     |
| Foreign subsidiaries Ratio×Number of Outside Directors | <b>-0.061</b> | *** | <b>-0.046</b> | *** | <b>-0.037</b>    | *** |               |     |               |     |                  |     |
|  | ( 0.019 )     |     | ( 0.017 )     |     | ( 0.013 )        |     |               |     |               |     |                  |     |
| Foreign subsidiaries Ratio×Sale-based Herfindahl Index | <b>-4.541</b> | *** | <b>-2.327</b> | *** | <b>-1.789</b>    | *** |               |     |               |     |                  |     |
|  | ( 1.138 )     |     | ( 0.631 )     |     | ( 0.493 )        |     |               |     |               |     |                  |     |
| Foreign Sales Ratio×Foreign Investors                  |               |     |               |     |                  |     | <b>6.791</b>  | *** | <b>4.375</b>  | *** | <b>3.362</b>     | *** |
|  |               |     |               |     |                  |     | ( 0.338 )     |     | ( 0.244 )     |     | ( 0.190 )        |     |
| Foreign Sales Ratio×Investment Horizon                 |               |     |               |     |                  |     | <b>0.262</b>  | *** | <b>0.171</b>  | *** | <b>0.114</b>     | *** |
|  |               |     |               |     |                  |     | ( 0.032 )     |     | ( 0.025 )     |     | ( 0.019 )        |     |
| Foreign Sales Ratio×Number of Directors                |               |     |               |     |                  |     | <b>0.083</b>  | *** | <b>0.048</b>  | *** | <b>0.037</b>     | *** |
|  |               |     |               |     |                  |     | ( 0.008 )     |     | ( 0.006 )     |     | ( 0.005 )        |     |
| Foreign Sales Ratio×Number of Outside Directors        |               |     |               |     |                  |     | <b>-0.013</b> |     | <b>0.046</b>  | **  | <b>0.033</b>     | **  |
|  |               |     |               |     |                  |     | ( 0.024 )     |     | ( 0.020 )     |     | ( 0.016 )        |     |
| Foreign subsidiaries Ratio×Sale-based Herfindahl Index |               |     |               |     |                  |     | <b>-6.504</b> | *** | <b>-4.221</b> | *** | <b>-3.230</b>    | *** |

|                               |            |            |            |            |            |            |           |           |
|-------------------------------|------------|------------|------------|------------|------------|------------|-----------|-----------|
|                               |            |            |            |            |            | ( 1.494 )  | ( 0.838 ) | ( 0.668 ) |
| <b>Number of Subsidiary</b>   | 0.008 ***  | 0.005 ***  | 0.004 ***  | 0.007 ***  | 0.005 ***  | 0.004 ***  |           |           |
|                               | ( 0.000 )  | ( 0.000 )  | ( 0.000 )  | ( 0.000 )  | ( 0.000 )  | ( 0.000 )  | ( 0.000 ) | ( 0.000 ) |
| <b>Tobin Q</b>                | -0.267 *** | -0.192 *** | -0.144 *** | -0.273 *** | -0.199 *** | -0.151 *** |           |           |
|                               | ( 0.018 )  | ( 0.011 )  | ( 0.008 )  | ( 0.018 )  | ( 0.011 )  | ( 0.009 )  | ( 0.009 ) | ( 0.009 ) |
| <b>Ln Assets</b>              | -0.770 *** | -0.667 *** | -0.518 *** | -0.773 *** | -0.670 *** | -0.521 *** |           |           |
|                               | ( 0.017 )  | ( 0.010 )  | ( 0.007 )  | ( 0.016 )  | ( 0.009 )  | ( 0.007 )  | ( 0.007 ) | ( 0.007 ) |
| <b>CF Assets Ratio</b>        | -3.487 *** | -1.820 *** | -1.592 *** | -3.506 *** | -1.809 *** | -1.580 *** |           |           |
|                               | ( 0.327 )  | ( 0.176 )  | ( 0.135 )  | ( 0.330 )  | ( 0.179 )  | ( 0.137 )  | ( 0.137 ) | ( 0.137 ) |
| <b>Tangible Ratio</b>         | 0.583 ***  | 0.718 ***  | 0.498 ***  | 0.616 ***  | 0.736 ***  | 0.511 ***  |           |           |
|                               | ( 0.098 )  | ( 0.066 )  | ( 0.050 )  | ( 0.097 )  | ( 0.066 )  | ( 0.050 )  | ( 0.050 ) | ( 0.050 ) |
| <b>Leverage</b>               | 1.280 ***  | 0.828 ***  | 0.678 ***  | 1.370 ***  | 0.915 ***  | 0.745 ***  |           |           |
|                               | ( 0.074 )  | ( 0.052 )  | ( 0.040 )  | ( 0.074 )  | ( 0.052 )  | ( 0.040 )  | ( 0.040 ) | ( 0.040 ) |
| <b>R&amp;D to Sales Ratio</b> | -0.470 *** | -0.276 *** | -0.228 *** | -0.495 *** | -0.282 **  | -0.233 **  |           |           |
|                               | ( 0.129 )  | ( 0.088 )  | ( 0.071 )  | ( 0.169 )  | ( 0.117 )  | ( 0.094 )  | ( 0.094 ) | ( 0.094 ) |
| <b>Ln Age</b>                 | -0.447 *** | -0.374 *** | -0.363 *** | -0.407 *** | -0.349 *** | -0.346 *** |           |           |
|                               | ( 0.062 )  | ( 0.047 )  | ( 0.036 )  | ( 0.062 )  | ( 0.046 )  | ( 0.036 )  | ( 0.036 ) | ( 0.036 ) |
| <b>Dividend Yield</b>         | -0.046 *** | 0.012      | -0.006     | -0.051 *** | 0.007      | -0.010     |           |           |
|                               | ( 0.017 )  | ( 0.009 )  | ( 0.007 )  | ( 0.017 )  | ( 0.009 )  | ( 0.007 )  | ( 0.007 ) | ( 0.007 ) |
| <b>Industry_Dummies</b>       | Yes        | Yes        | Yes        | Yes        | Yes        | Yes        |           |           |
| <b>Year_Dummies</b>           | Yes        | Yes        | Yes        | Yes        | Yes        | Yes        |           |           |
| <b>Adjusted R2</b>            | 0.243      | 0.339      | 0.347      | 0.245      | 0.342      | 0.350      |           |           |
| <b>Number of Observations</b> | 28,936     | 28,936     | 28,936     | 28,936     | 28,936     | 28,936     |           |           |

Note: \*\*\*, \*\*, \* Significant at the 1 percent, 5 percent and 10 percent levels, respectively.

**Table 5** The sensitivity of corporate international diversification on stock liquidity and other determinants of liquidity (Fixed-effects regression)

| Variable   | Model 1                       | Model 2                       | Model 3                       | Model 4                     | Model 5                       | Model 6                       |
|--|-------------------------------|-------------------------------|-------------------------------|-----------------------------|-------------------------------|-------------------------------|
|  | RILLIQ                        | Bid Ask Spread                | Effective Spread              | RILLIQ                      | Bid Ask Spread                | Effective Spread              |
| Foreign subsidiaries Ratio                             | <b>-0.231</b><br>( 0.218 )    | <b>-0.352</b> **<br>( 0.151 ) | <b>-0.273</b> **<br>( 0.116 ) |                             |                               |                               |
| Foreign Sales Ratio                                    |                               |                               |                               | <b>0.088</b><br>( 0.352 )   | <b>0.010</b><br>( 0.263 )     | <b>0.035</b><br>( 0.201 )     |
| Foreign subsidiaries Ratio×Foreign Investors           | <b>1.296</b> ***<br>( 0.447 ) | <b>1.382</b> ***<br>( 0.348 ) | <b>1.016</b> ***<br>( 0.275 ) |                             |                               |                               |
| Foreign subsidiaries Ratio×Investment Horizon          | <b>0.039</b><br>( 0.044 )     | <b>0.050</b><br>( 0.034 )     | <b>0.033</b><br>( 0.027 )     |                             |                               |                               |
| Foreign subsidiaries Ratio×Number of Directors         | <b>0.000</b><br>( 0.009 )     | <b>0.004</b><br>( 0.009 )     | <b>0.003</b><br>( 0.007 )     |                             |                               |                               |
| Foreign subsidiaries Ratio×Number of Outside Directors | <b>-0.007</b><br>( 0.036 )    | <b>0.035</b><br>( 0.025 )     | <b>0.030</b><br>( 0.019 )     |                             |                               |                               |
| Foreign subsidiaries Ratio×Sale-based Herfindahl Index | <b>-1.863</b><br>( 1.337 )    | <b>0.896</b><br>( 0.808 )     | <b>0.598</b><br>( 0.633 )     |                             |                               |                               |
| Foreign Sales Ratio×Foreign Investors                  |                               |                               |                               | <b>0.857</b> *<br>( 0.514 ) | <b>0.885</b> **<br>( 0.393 )  | <b>0.687</b> **<br>( 0.298 )  |
| Foreign Sales Ratio×Investment Horizon                 |                               |                               |                               | <b>0.113</b><br>( 0.084 )   | <b>0.003</b><br>( 0.046 )     | <b>-0.017</b><br>( 0.036 )    |
| Foreign Sales Ratio×Number of Directors                |                               |                               |                               | <b>-0.010</b><br>( 0.008 )  | <b>-0.016</b> *<br>( 0.009 )  | <b>-0.012</b> *<br>( 0.007 )  |
| Foreign Sales Ratio×Number of Outside Directors        |                               |                               |                               | <b>0.029</b><br>( 0.041 )   | <b>0.080</b> ***<br>( 0.026 ) | <b>0.068</b> ***<br>( 0.020 ) |
| Foreign Sales Ratio×Sale-based Herfindahl Index        |                               |                               |                               | <b>-0.645</b>               | <b>-1.172</b>                 | <b>-0.933</b>                 |



|                               |            |            |            |            |            |            |  |            |  |            |
|-------------------------------|------------|------------|------------|------------|------------|------------|--|------------|--|------------|
|                               |            |            |            |            |            | ( 0.878 )  |  | ( 0.949 )  |  | ( 0.768 )  |
| <b>Number of Subsidiary</b>   | 0.000      | -0.001 *** | -0.001 *** | 0.000      | -0.001 *** | 0.000      |  | -0.001 *** |  | -0.001 *** |
|                               | ( 0.000 )  | ( 0.000 )  | ( 0.000 )  | ( 0.000 )  | ( 0.000 )  | ( 0.000 )  |  | ( 0.000 )  |  | ( 0.000 )  |
| <b>Tobin Q</b>                | -0.164 *** | -0.043 *** | -0.034 *** | -0.163 *** | -0.041 *** | -0.033 *** |  | -0.041 *** |  | -0.033 *** |
|                               | ( 0.022 )  | ( 0.010 )  | ( 0.008 )  | ( 0.021 )  | ( 0.010 )  | ( 0.008 )  |  | ( 0.010 )  |  | ( 0.008 )  |
| <b>Ln Assets</b>              | -0.154 **  | -0.200 *** | -0.176 *** | -0.153 **  | -0.189 *** | -0.168 *** |  | -0.189 *** |  | -0.168 *** |
|                               | ( 0.069 )  | ( 0.039 )  | ( 0.031 )  | ( 0.068 )  | ( 0.038 )  | ( 0.030 )  |  | ( 0.038 )  |  | ( 0.030 )  |
| <b>CF Assets Ratio</b>        | -3.870 *** | -1.915 *** | -1.550 *** | -3.855 *** | -1.870 *** | -1.516 *** |  | -1.870 *** |  | -1.516 *** |
|                               | ( 0.362 )  | ( 0.202 )  | ( 0.157 )  | ( 0.363 )  | ( 0.201 )  | ( 0.157 )  |  | ( 0.201 )  |  | ( 0.157 )  |
| <b>Tangible Ratio</b>         | 0.174      | 0.130      | 0.068      | 0.178      | 0.108      | 0.048      |  | 0.108      |  | 0.048      |
|                               | ( 0.258 )  | ( 0.161 )  | ( 0.128 )  | ( 0.258 )  | ( 0.162 )  | ( 0.129 )  |  | ( 0.162 )  |  | ( 0.129 )  |
| <b>Leverage</b>               | 0.557 ***  | 0.344 ***  | 0.318 ***  | 0.530 **   | 0.314 **   | 0.298 ***  |  | 0.314 **   |  | 0.298 ***  |
|                               | ( 0.210 )  | ( 0.128 )  | ( 0.098 )  | ( 0.210 )  | ( 0.128 )  | ( 0.097 )  |  | ( 0.128 )  |  | ( 0.097 )  |
| <b>R&amp;D to Sales Ratio</b> | -0.418 **  | -0.164     | -0.147     | -0.430 *** | -0.169     | -0.152 *   |  | -0.169     |  | -0.152 *   |
|                               | ( 0.173 )  | ( 0.119 )  | ( 0.093 )  | ( 0.165 )  | ( 0.113 )  | ( 0.088 )  |  | ( 0.113 )  |  | ( 0.088 )  |
| <b>Ln Age</b>                 | -2.656 **  | -4.259 *** | -1.685 *** | -2.434 *   | -3.941 *** | -1.437 **  |  | -3.941 *** |  | -1.437 **  |
|                               | ( 1.281 )  | ( 0.721 )  | ( 0.568 )  | ( 1.296 )  | ( 0.724 )  | ( 0.569 )  |  | ( 0.724 )  |  | ( 0.569 )  |
| <b>Dividend Yield</b>         | -0.071 *** | -0.035 *** | -0.036 *** | -0.072 *** | -0.036 *** | -0.036 *** |  | -0.036 *** |  | -0.036 *** |
|                               | ( 0.020 )  | ( 0.010 )  | ( 0.008 )  | ( 0.020 )  | ( 0.010 )  | ( 0.008 )  |  | ( 0.010 )  |  | ( 0.008 )  |
| <b>Industry_Dummies</b>       | No         | No         | No         | No         | No         | No         |  | No         |  | No         |
| <b>Year_Dummies</b>           | Yes        | Yes        | Yes        | Yes        | Yes        | Yes        |  | Yes        |  | Yes        |
| <b>Adjusted R2</b>            | 0.041      | 0.180      | 0.189      | 0.041      | 0.179      | 0.189      |  | 0.179      |  | 0.189      |
| <b>Number of Observations</b> | 28,936     | 28,936     | 28,936     | 28,936     | 28,936     | 28,936     |  | 28,936     |  | 28,936     |

Note: \*\*\*, \*\*, \* Significant at the 1 percent, 5 percent and 10 percent levels, respectively.