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Do Liquidity Premiums Matter in Pricing Corporate Bonds? The Case of Korea

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Abstract

In this study, we examine how default risk, which is typically considered to be as one of the critical risk factors related to long-term investment risk as well as liquidity risk, can significantly explain corporate bonds yields in the Korean bonds market through time series analyses. The liquidity positions are estimated for the period of January 2002 to December 2010. We analyzed thoroughly, through a single-factor, a multi-factorial, and an Amihud (2002) analysis of time series regression. The results are sporadic, meaning that, in future research investigations should be conducted into the real liquidity indicators other than trading volumes and absolute returns.

Key words: bond pricing, liquidity risk, liquidity premium, default premium, term premium

I. Introduction

Liquidity of assets traded in financial markets and the size of transaction costs incurred are crucial in the sense that these factors directly affect return on investments as well as market equilibrium rates of return. Investors tend to participate in investment activities if entry into and exit from the market are not restricted to any specific asset in any way and as the level of liquidity rises.

Liquidity, in general, is defined as the voluminous and rapid trading ability of an asset without significantly affecting price level or incurring high transaction costs. Thus, highly liquid assets are traded very actively at prices that reflect their intrinsic levels of risk and rational rates of return. On the other hand, because relatively illiquid assets are not frequently traded, the prices may not fully reflect their intrinsic risks and values. Hence, when an investor wants to buy an asset with a low level of liquidity, a premium for low liquidity is required.

The impacts of expected illiquidity and liquidity risk in determining the price of an asset have been a major theme in recent academic research in which the level of liquidity is known to play a significant role in pricing assets.[1] While those studies contribute to progressively enhance our level of understanding of how the level of liquidity affects determination of asset prices, they have not yet answered the question of whether the liquidity effect is one of the major factors in determining corporate bond prices in cases where the corporate bond market has been less developed and relatively sparse in a country like Korea.

Theoretically speaking, the expected rate of return of an asset is closely related to the systematic risk linked to common factors. For a market to be in equilibrium, those assets whose returns are more sensitive to risk factors must provide higher rates of return commensurate with the levels of risk to compensate investors who hold the assets. Previous studies have argued that Fama-French factors well explain the rates of return on assets. It has

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1 Refer to Amihud (2002) and Acharya and Pederson (2005) among others.
2 For instance, refer to Fama and French (1992, 1993) and Gebhardt, Hvikajer, and Swaminthan (2005b).

been shown that firm sizes, book-to-market ratios and past rates of return possess significant predictive power on the cross-sectional returns on stocks, together with the market factor.[2] Other recent studies have argued that market-wide liquidity is another important factor in determining asset prices. Thus, liquidity should not be ignored because it seems to be a crucial characteristic in the investment environment.

Pastor and Stambaugh (2003) assert that the aggregate level of liquidity is the most important state variable in determining stock prices. Their study focused on a specific dimension of liquidity associated with temporary price fluctuations induced by order flows. The liquidity risk that they examined is not the one related to decreasing liquidity followed by investors trading requests, but rather the one of decreasing asset values due to deterioration of the aggregate level of liquidity. Empirical evidence shows that expected returns on stocks are positively related to the sensitivity of returns to the volatility of the cross-sectional aggregate level of liquidity.

Acharya and Pederson (2005) developed an equilibrium asset-pricing model that includes liquidity risk. Their model asserts that required rates of return on stocks along with the level of liquidity and market returns depend not only on the covariance between the proper stock returns and the level of liquidity, but also on the expected level of liquidity. They also discovered that the impact of the liquidity risk on the required rates of return on stocks is economically significant.

Lin, Wang and Wu (2008) found that expected yield on corporate bonds is closely cross-sectionally related to systematic liquidity risk. They argued that corporate bonds that are more sensitive to the aggregate level of liquidity should provide higher expected yields due to increased liquidity premiums. Furthermore, they found that the effect of the liquidity risk turned out to still be significant even after they controlled for bond characteristics as well as effects caused by other factors. They concluded from the evidence that liquidity risk is one of the major factors in determining required yields on corporate bonds.

However, Pastor and Stambaugh (2003) and Acharya and Pedersen (2005) did not investigate the effect of liquidity risk on the required yields of corporate bonds. Lin, Wang and Wu (2008) examined the effect of the liquidity risk in the U.S. bond market from 1994 to the first half of 2007. However, not many studies have been performed on the subject of liquidity of corporate bonds in the stock market in Korea. We did find a few studies that examined the risk premium on corporate bonds through cross-sectional analyses, but we failed to find any study that attempted to investigate the issue through time-series analyses.

In this study, we attempt to explore through time-series analyses whether liquidity risk plays an important role in determining prices of corporate bonds in the Korean bonds market. Our primary interest in pursuing this research lies on if the common notion that bond prices are determined mainly by the credit risk, term risk, as well as liquidity risk applies to the Korean bonds market. However, as the results indicate, the liquidity premium does not seem to be one of the prominent factors in pricing bonds in an emerging country like Korea. Even though the Korean bonds market is not a representative market in the world, it has definitely been one of the fast growing emerging markets. Based on the evidence we found, it could be concluded that there would be some difference between emerging markets and the advanced markets in pricing bonds depending upon what factors are more important than others.

This study is organized as follows. Section 2 describes the theoretical backgrounds and the liquidity risk measures with regard to corporate bonds. Section 3 discusses the data and empirical methodologies used in this study. Empirical results and analyses are presented in Section 4, and we investigate the time series of corporate bond yields through regression analyses. Finally, Section 5 summarizes our major findings derived from these results and offers our conclusions.

II. Literature Review and the Liquidity Risk Measure

II.1 Literature Review

Previous studies tried to determine whether the level of liquidity is one of the important factors in determining the prices of each financial asset by developing a new model by utilizing or transforming the existing Fama-French three-factor model. Amihud (2002) developed a measure of illiquidity, *ILLIQ*, by taking ratios of daily dollar trading volumes against daily absolute level of returns for a certain period traded at the New York Stock Exchange from 1964 through 1997.[3]

He showed that the illiquidity measure *ILLIQ* in the cross-sectional analyses would be positive, which coincides with the literature. He further suggested that, in the time-series analyses, the market illiquidity in the previous period would have a significantly positive effect on the ex-ante excess returns on stocks, but the unexpected market illiquidity could affect stocks negatively in the current period.

As the realized level of illiquidity increases, the expected level of illiquidity also increases. Thereby, it induces higher expected returns on stocks in the sequel by depressing stock prices. Thus, the unexpected level of illiquidity results in a negative effect on the stock prices. He suggested that the illiquidity effects on the excess returns on stocks seem prevalent even after taking into account both default premiums on low-rated corporate bonds and term premiums on long-term Treasury bonds. He also showed that the intensity of illiquidity effects were dependent on firm size, and the effect appeared greater as the firm size got smaller.

Acharya and Pederson (2005) analyzed the liquidity risk by expanding the standard CAPM to the liquidity-adjusted capital asset pricing model and utilizing the database of all common stocks listed on NYSE and AMEX for the period of July 1, 1962–Dec. 31, 1999.[4] They argued through cross-sectional regression analyses that the required rate of return on a stock would go up as the covariance between the unexpected illiquidity of the stock and the

[3] This illiquidity measure is closely related to the Amivest liquidity measure (Cooper et al., 1985; Khan and Baker, 1993), the ratio between the sum of daily trading volumes and the total absolute returns. This measure shows how well stocks or other assets can handle trading volumes without causing significant changes in prices. That is, as this ratio gets higher, it indicates that a large volume of stocks can be traded more efficiently without giving rise to any large price changes.

[4] Liquidity-Adjusted CAPM:

$$E_t\left(r_{t+1}^i\right) = r^f + E_t\left(c_{t+1}^i\right) + \lambda_t \frac{Cov_t(r_{t+1}^i, r_{t+1}^M)}{Var_t(r_{t+1}^M - c_{t+1}^M)} + \lambda_t \frac{Cov_t(c_{t+1}^i, c_{t+1}^M)}{Var_t(r_{t+1}^M - c_{t+1}^M)} - \lambda_t \frac{Cov_t(r_{t+1}^i, c_{t+1}^M)}{Var_t(r_{t+1}^M - c_{t+1}^M)} - \lambda_t \frac{Cov_t(c_{t+1}^i, r_{t+1}^M)}{Var_t(r_{t+1}^M - c_{t+1}^M)}$$

where $\lambda_t = E_t(r_{t+1}^M - c_{t+1}^M) - r^f)$.

unexpected market illiquidity increased, while it would go down as the covariance between the return on the stock and the unexpected market illiquidity increased. They also suggested that the required rate of return on a stock would decrease as the covariance between the stock illiquidity and the market rate of return increased, and they argued that their model clearly shows that the persistently positive impact on illiquidity is highly correlated with the current low return and the higher expected return in the future.

Lin, Wang, and Wu (2008) adopted the cross-sectional regression approach along with the portfolio approach because the cross-sectional regression approach possesses strong attributes in that it could extract more interesting elements of evidence and directly measure the marginal effect of the risk variable. They measured the significance of the liquidity factor by adopting Amihud (2002) liquidity beta coefficients and the Acharya-Pederson model. Then they analyzed the role of the liquidity risk in determining corporate bond prices.

They considered market-wide liquidity as the additional risk factor in the pricing model and investigated whether the level of sensitivity to the liquidity factor could affect the pricing of corporate bonds. Based on the evidence derived from both the portfolio approach and regression analyses, they argued that the liquidity beta coefficients are cross-sectionally related to the average corporate bond yields even after controlling for the default and term-structure betas as well as the effects of other characteristics. They showed that the liquidity risk premiums are positively correlated with the sensitivity level to the liquidity risk, and they concluded that the evidence matches common notions accepted in the financial markets.

Kwon and Park (1996) examined whether the liquidity level could affect the expected excess returns on stocks in the Korean stock market. As the beginning step in the analyses, they measured the liquidity costs as the liquidity indicator for all stocks listed on the Stock Market Division of the Korea Exchange for the period of 1986 through 1994. Based on those estimated liquidity costs, they investigated whether the level of liquidity could affect the expected returns on stocks. The empirical evidence shows that the liquidity premiums were significant in the stock returns in the Korean stock market during the sample period. They concluded that the level of liquidity in the Korean stock market is an independent determinant of stock pricing as is firm-size effect and the seasonality effect (e.g., the January effect) in addition to the beta coefficients that are the traditional risk measurement based on the Capital Asset Pricing Model (CAPM).

As mentioned earlier, research into bond liquidity has not been actively undertaken in Korea. Lee and Lim (2012) investigated the impact of the liquidity premiums on corporate bonds in Korea on the yield spreads on corporate bonds for the period between March 2009 and Sept. 13, 2010 through cross-sectional analyses and portfolio analyses.[5] They used the four variables of trading volumes, issue sizes, ages of bonds from the issued dates and yield

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5 $Y_{pt}^{i} = \alpha^{i} + \sum_{i=1}^{2} \beta_{jp}^{i} F_{jt} + \sum_{i=1}^{2} \gamma_{jp}^{i} C_{jpt}^{i} + \delta^{i} L_{pt}^{i} + \epsilon_{pt}^{i} \quad for\ p = 1,2$

where Y_{pt}^{i} denotes the spread at time *t* in portfolio *p*, calculated by subtracting the YTM on the 3-year Treasury note from the average YTM of corporate bonds included in portfolio *p* during two weeks after the time *t*. And we calculated credit rating factor C_{1pt}^{i} of portfolio p, and time-to-maturity factor C_{2pt}^{i} as taking averages of credit ratings as well as time-to-maturities of corporate bonds included in a specific portfolio. Meanwhile, F_{1t} denotes yield spread between long-term and short-term interest rates, and F_{2t} denotes corporate bond spread in the bond market. We calculated L_{pt}^{i} by taking averages of liquidity measures of corporate bonds included in a certain portfolio.

volatility as indicators of liquidity risk. The empirical results show that yield spreads become smaller for corporate bonds with larger trading volumes and greater issue sizes. Based on the results, they argued that yield spreads on corporate bonds decrease due to smaller liquidity premiums caused by relatively higher liquidity.

II.2 Liquidity Risk Measure

Studies on the impact of liquidity risk on required rates of return in the Korean financial market have mainly focused on the stock market simply because it has been relatively easy to collect the data. In Korea, stocks are traded more heavily on the exchange, unlike corporate bonds. Thus, the database on stocks is easily accessible by researchers.[6]

On the other hand, since most trading of corporate bonds has been executed in the over-the-counter (OTC) market, the appropriate database on liquidity is not readily available to researchers. Therefore, in the case of the bond market, in addition to the direct indexes indirect liquidity indicators such as issue amounts, listing matters, the existence of on-the-run bonds, and ages of bonds, volatility of yields have been widely used in examinations of the liquidity issue.[7]

Amihud (2002) defines the level of illiquidity as the average ratio of the absolute values of the daily percentage changes in returns compared to the dollar trading volumes on each trading day. This ratio represents daily impact on prices in relation to the trading flows.[8] In our study, we utilize the trading volumes among other liquidity indicators by referring to the Amihud model of illiquidity measures. More specifically, we first calculate the absolute values of the daily percentage changes in bond prices compared to the daily yields for each corporate bond in the sample. To be qualified, each bond should have been traded at least two times during the sample period. We then get the daily averages by dividing the values ($|R_{itd}|$) calculated in the first step by the daily trading volumes (VOL_{itd}). We add those values for each month and calculate the averages. Finally, we get the illiquidity indexes of bonds by taking natural logarithms on the previous results. The equation for the illiquidity index is shown below.

$$ILLIQ_{it} = \ln\left(\frac{1}{D_{it}}\sum_{d=1}^{D_{it}}\frac{|R_{itd}|}{VOL_{itd}}\right)$$

where $ILLIQ_{it}$: illiquidity measure on bond *i* at time *t*;
D_{it} : the total trading days on bond *i* observed in month *t*;
R_{itd} : daily percentage changes in prices on bond *i* in month *t*; and
VOL_{itd}: daily monetary trading volume on bond *i* in month *t*.

In this study, we use the illiquidity measures, calculated in the manner shown above, as proxies of the level of liquidity.[9] As shown in the equation above, because the daily trading

6 Quoted bid-ask spread, effective bid-ask spread, quoted size, trading size, and trading volume were used as the liquidity measures.

7 Refer to Lee and Lim (2012).

8 This follows the illiquidity concept, the price response to the order flows, proposed by Kyle (1985), and the illiquidity measure defined as the ratio of absolute price change compared to absolute excess demand for trading suggested by Silber (1975).

9 In this study, we express the liquidity index as Li_t rather than $ILLIQ_{it}$.

volumes are located in the denominator, large values of $ILLIQ_{it}$ indicate corporate bonds with a low level of liquidity. That is, as the change in bond returns become relatively small compared to the dollar trading volumes, the bond is considered to possess a low level of illiquidity. Therefore, in this case, we determine that the bond is very liquid.

III. Data and Research Methodology

III.1 Portfolio Formation

The monthly database of returns as well as indices provided by FnGuide and the KRX are used in this study. The firms in the sample were listed on the KRX Stock Market Division for the period of January 2002–December 2010.

Following Fama and French (1992), we form portfolios for each month based on firm sizes, book-to-market ratios and credit ratings. We utilize the market capitalizations for the period of *t* for the firm sizes and the ratio of the difference between the total capital and the preferred stock with the market capitalization for the period of *t-1* for the book-to-market ratios using accounting data.

We apply as the partitioning point the values of the 50th percentile for the firm sizes and the book-to-market ratios and form 16 portfolios using the credit ratings of AAA, AA, A and BBB and below.

III.2 Dependent Variables and Independent Variables

The dependent variable is the excess returns on corporate bonds (i.e., the difference between bond returns and the risk-free rate of return). The independent variables include three Fama-French factors[10], default premiums (*DEF*), term premiums (*TERM*) and illiquidity estimates (*ILLIQ*).

We calculate in this study the values of *SMB* and *HML* as follows:

$$SMB = \frac{1}{8}(p111 + p112 + p113 + p114 + p121 + p122 + p123 + p124) - \frac{1}{8}(p211 + p212 + p213 + p214 + p221 + p222 + p223 + p224)$$
$$HML = \frac{1}{8}(p121 + p122 + p123 + p124 + p221 + p222 + p223 + p224) - \frac{1}{8}(p111 + p112 + p113 + p114 + p211 + p212 + p213 + p214)$$

Then we form a total of 16 portfolios based on firm size, book-to-market ratio and credit rating. For instance, portfolio *p111* is the one with small size, low book-to-market ratio and a credit rating of BBB or below, while portfolio *p114* is the one with small size, low book-to-market ratio and a credit rating of AAA. Likewise, portfolio *p224* consists of firms of large size, high book-to-market ratio and a credit rating of AAA. For *SMB*, we subtract the arithmetic average return of large firms from the arithmetic average return of small firms, and we calculate *HML* by subtracting the arithmetic average return of firms with low book-to-market ratios from the arithmetic average return of firms with high book-to-market ratios.

For default premiums, we first calculate the differences between corporate bond returns for each category of credit ratings and government bonds with the same maturities and then determine the averages of those excess returns. Term premiums are the averages of differences

[10] The Fama-French three factors are the market returns (*MKT*), the firm size (*SMB*), and the book-to-market ratio (*HML*).

between corporate bond returns for each category of credit ratings and CD rates.

III.3 **Methodology**

For the preliminary investigation to determine whether bond liquidity is a determinant of time-series corporate bond returns, we perform regression analyses of monthly levels of illiquidity on those corporate bond excess returns for each of our 16 bond portfolios. The regression equation used is as follows:

$$R_{pt} - R_{ft} = \alpha_p + \beta_1 \ln(Li_t) + \varepsilon_{pt} \quad (1)$$

where $(R_{pt} - R_{ft})$ is the excess return for portfolio *p* at time *t*, (Li_t) is the illiquidity measure at time *t*, and ε_{pt} is the random error term. We hypothesized in this study that the liquidity coefficient β_1 would be statistically significant with a positive sign if the bond portfolio returns increase due to greater liquidity premium based on the higher level of liquidity risk.

To test whether the predictability of liquidity on corporate bond returns persists even when there are other risk factors, the risks should be controlled in the regression analyses. Thus, we use the following regression equation for the 16 portfolios (2):

$$R_{pt} - R_{ft} = \alpha_p + \beta_1 \ln(Li_t) + \beta_2 MKT_t + \beta_3 HML_t + \beta_4 SMB_t + \beta_5 DEF_t + \beta_6 TERM_t + \varepsilon_{pt} \quad (2)$$

where MKT_t is the market return at time *t*, one of the Fama-French three factors, and is calculated by summing the daily market returns. HML_t and SMB_t are the other estimates, of the Fama-French model, DEF_t is the default premium at time *t*, and $TERM_t$ is the term premium at time *t*.

If the market is efficient and the level of liquidity possesses significant explanatory power on the portfolio returns because it is considered as one of the determinants of bond returns, then the liquidity premium coefficient β_1 would be statistically significant with a positive sign in the regression equation (2) in which we control for all the other variables including Fama-French factors, default premiums and term premiums, as well as in the regression equation (1).

On the other hand, if the market is inefficient and the level of liquidity does not have any explanatory power or predictability on bond returns, then bond portfolio returns would show sporadic or irregular patterns of behavior.

We perform the time-series analyses to test whether the results of the time-series analyses are robust by adopting the Amihud (2002) approach as follows:

$$(R_p - R_f)_m = \alpha_p + \beta_1 \ln(Li)_{m-1} + \beta_2 \ln(Li)_m^U + \beta_3 DEF_{m-1} + \beta_4 TERM_{m-1} + \varepsilon_{pm} \quad (3)$$

where $(R_p - R_f)_m$ represents the monthly returns on the bond portfolios in excess of the risk-free CD rates, and $\ln(Li)_{m-1}$ is the liquidity premium predicted by the level of illiquidity of the previous month. In addition, $\ln(Li)_m^U$ is the difference between the level of illiquidity including the unexpected portion that actually occurred in the current month and the predicted level of illiquidity occurred in the previous month. DEF_{m-1} and $TERM_{m-1}$

are default premiums and term premiums in the previous month respectively.

If liquidity risk is one of the major factors that determine the prices of corporate bonds, then the coefficient of $\ln(Li)_{m-1}$ is positive and statistically significant. In this case, the investors' required returns become higher as the liquidity risk increases. This phenomenon would drive bond prices down, resulting in a negative impact on the unexpected portion of liquidity risk, i.e., $\ln(Li)_m^U$. On the other hand, if the empirical results are insignificant and sporadic, then it would imply that the liquidity risks associated with corporate bonds could not be one of the determinants of corporate bond returns.

IV. Empirical Results

IV.1 Summary Statistics and the Correlation Analyses

Table 1 shows summary statistics of those variables used in this study for the period January 2002~December 2010. That is, it presents means, medians, minimum values, maximum values and standard deviations for all variables utilized in this study.

In the case of the AAA credit rating, the average *SMB* is 0.1260, and returns of smaller firms are higher than those of larger firms. The average *HML* is -0.3239, and firms with low book-to-market ratios show higher returns. Kurtosis with *HML* is -0.823, meaning that the tail of the distribution is skewed to the left.

Refer Table 1

The averages of the default premium and the term premium are 4.2810 and 1.8828, respectively. If maturities are equal, the returns increase as bond credit ratings drop. The longer are the maturities, the higher are the bond returns, *ceteris paribus*. The measures of illiquidity tend to be negative because we take the natural logarithm values of the outcomes of the absolute values of returns divided by the trading volumes. Averages are also negative regardless of the firm size as well as the book-to-market ratio. The degree of skewness is higher than 0.5, implying that the distribution of the data is skewed to the right, and the standard deviations also seem relatively high.

For those firms with a credit rating of AA, the averages of *SMB* and *HML* are -0.2049 and 0.5959, respectively, which are different from the results for the AAA ratings with respect to the signs. Standard deviations also are higher than those of any other variables for the same credit ratings. Default premium and term premium are 5.2260 and 1.7429, respectively. The results indicate that the lower is the credit rating, the higher is the return, when maturities are equal. It also implies that, holding other things constant, the returns tend to be higher on bonds with longer maturities. This result is the same as the one with the AAA rating mentioned above. This rating also shows a negative value for illiquidity measure.

The averages of *SMB* and *HML* for firms with a credit rating of A are 0.5545 and -0.3764, respectively. Because the signs of these values are the same as those of AAA firms, the meanings are the same as for AAA. However, the standard deviations for firms with a credit rating of A turn out to be higher.

Bonds with a credit rating of BBB or below show an average *SMB* of -2.2625 and an average *HML* of 5.1572. The results also show that returns tend to be higher for firms with large size and low book-to-market ratio. However, because in this case standard deviation is greater and skewness as well as kurtosis are higher than the normal distribution, the matter needs to be investigated further. The averages of *DEF* and *TERM* are higher than +1.0 both for groups of

A and BBB or below, indicating that bond investors seem to require higher returns as the default risk and term risk increase due to long-term investments.

The illiquidity measure becomes lower as the bond rating rises. That is, if the liquidity sensitivity is significantly positive, then it can be interpreted that smaller liquidity premiums are required on high-rated bonds.

Refer Table 2

Table 2 contains summary statistics associated with the dependent variable for various bond ratings. Regardless of the firm size or the book-to-market ratio, as the bond rating drops, the bond return and standard deviation increase. This evidence coincides with the common notion that the higher is the risk, the higher is the return. Furthermore, when the bond rating and the firm-size variables are controlled, then the average bond returns become higher for firms with higher book-to-market ratios.

When the focus is only on the firm size effect for the group of AAA after controlling the book-to-market ratio, no definitive patterns are observed. However, it is evident for the group of BBB or lower that the bond returns rise for small-sized firms compared to large-sized firms.

Refer Table 3

Table 3 shows correlations among variables. The absolute values of correlations among those variables for the group of AAA are sometimes below 0.5, except for the correlations between the term premiums and the illiquidity measures for firms with large size and low book-to-market ratio and the correlations between the illiquidity measures for firms with similar sizes.

For firms with the bond rating of AA, most correlations except the one between the illiquidity measures for firms with large sizes are below 0.5. Like other credit rating groups, the group with the A rating shows high correlations between the illiquidity measures for firms with large sizes. This group also shows that the correlations among firm size, book-to-market ratio and default premiums are higher than 0.5. It can be seen from the table that, for the group of credit ratings of BBB or below, the correlations between the illiquidity measures are higher than 0.5 regardless of the firm size or the book-to-market ratio.

IV.2 The Single-Factor Time-Series Analyses

In this section, we investigate how well the level of liquidity on corporate bonds can explain the bond returns using the regression equation (1). The results are shown in <Table 4> for the entire sample period of 2002–2010. As is shown in the table, only six of the total 16 portfolios, a group of AAA bonds with large size and high book-to-market ratio, a group of AA bonds with large size and high book-to-market ratio, a group of A bonds with small size and high book-to-market ratio, and three portfolios with credit ratings of BBB or below except a portfolio with large size and lower book-to-market ratio, show statistical significance at the 10% critical level, and the beta coefficients β_1 seem to have positively significant explanatory power.

Refer Table 4

We project that the sensitivities of bond prices to the level of liquidity would be positive. Eleven out of 16 portfolios have positive values of β_1, and only seven of those 11 are statistically significant. The evidence of the liquidity in bond pricing looks somewhat different from what we projected. Therefore, we perform regression analyses by separating the entire sample period into two subperiods, i.e., one before the 2008 financial crisis in the U.S. and the other one after the financial crisis, because we assume that the financial crisis might have affected the trading volumes in the Korean bond market. [11]

Table 5 and Table 6 report the testing results for the abovementioned two subperiods, i.e., 2002–2007 and 2008–2010. According to Table 5, which shows the results for the pre-crisis period of 2002–2007, the liquidity sensitivity coefficients to the bond returns, β_1, are positive on 11 out of 16 portfolios. Among those 11 portfolios, only four show statistical significance.

Refer Table 5
Refer Table 6

Table 6 summarizes the results for the post-crisis period of 2008–2010 and shows similar results, i.e., only four out of 16 portfolios have significantly positive liquidity sensitivity coefficients to the bond returns with the same signs. Compared to the results for the pre-crisis periods, the post-crisis results show higher sensitivities to the liquidity risk. However, it can be judged to be still too weak for the liquidity to have decisive explanatory power on corporate bond returns.

Thus, we move on to further investigate how the liquidity factor reacts when Fama-French three factors and default premiums (*DEF*) as well as term premiums (*TERM*) are controlled.

IV.3 Empirical Results on Multi-Factor Time-Series Analyses

To examine the exact behavioral patterns of the liquidity against the bond returns when there exist other forms of risk, we added the Fama-French three factors and default premiums (*DEF*) as well as term premiums (*TERM*) to the regression equation in order to control for other risks.

Refer Table 7

The testing results are shown in Table 7 for the entire sample period. According to the table, only seven out of 16 portfolios have positive coefficients, and just three among those seven portfolios show statistical significance, i.e., firms with credit ratings of AAA with large size and firms with credit ratings of BBB or below with large size and low book-to-market ratios. The results indicate that the liquidity risk has low explanatory power on corporate bond time-series returns in the Korean bond market even after controlling for other risks.

Refer Table 8
Refer Table 9

Table 8 and Table 9 present results derived from the multifactor time-series regression analyses for the two subperiods, i.e., pre-financial crisis period (2002–2007) and the post-financial crisis period (2008–2010). First, Table 8 for the pre-financial crisis period shows that seven portfolios out of 16 have positive coefficients that match the projections, but only three have statistically significant explanatory power. Those three portfolios consist of firms with credit ratings of AAA showing statistical significance at the 10% critical level.

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[11] After Lehman Brothers went bankrupt, phenomena such as the credit crunch and the liquidity crunch occurred in Korea due to resulting contamination to the soundness of many global financial institutions.

Table 9 for the post-financial crisis period also shows similar results. That is, seven out of 16 portfolios have projected positive signs. However, only two portfolios have statistical significance at 1% and 10% critical levels, respectively. One consists of firms with AAA ratings with small size and high book-to-market ratio and the other one consists of firms with BBB or lower ratings with large size and low book-to-market ratio. Relatively speaking, it seems that more sensitive results against the liquidity risk are shown for the post-financial crisis, but the coefficients β_1 do not show any consistent pattern of signs and instead look rather sporadic.

IV.4 Empirical Results on Amihud-Approach Time-Series Analyses

Because we could not find any statistical significance for the liquidity in determining corporate bond prices through either single-factor or multifactor time-series analyses, we decided to perform another method of time-series regression analyses using the method conducted by Amihud (2002).

Table 10 and Table 11 present the results using Amihud-approach time-series analyses for the entire sample period, the pre-financial crisis period and the post-financial crisis period, respectively. As can be seen in Table 10, in the case of credit rating AAA, the liquidity risk ($\ln{(Li)}_{m-1}$) coefficient β_1 turns out to be positive for most portfolios except those of firms with small size and low book-to-market ratio. However, only those portfolios of firms with large size and high book-to-market ratio were statistically significant at the 1% critical level.

Refer Table 10

The coefficient β_2 of the unexpected liquidity risk, $\ln{(Li)}_m^U$, is hypothesized to be negative. Portfolios composed only of firms with small size and high book-to-market ratio show proper signs but still are not statistically significant at the 10% critical level.

In the case of AA bond portfolios, the coefficients β_1 of the expected liquidity risk due to occurrence during the previous period, $\ln{(Li)}_{m-1}$, are mostly positive as projected except for portfolios of firms with small size and high book-to-market ratio. Only bond portfolios with large size and high book-to-market ratio show statistical significance at the 1% critical level.

The coefficients β_2 of the unexpected liquidity risk, $\ln{(Li)}_m^U$, are correctly negative only for portfolios of firms with small size, but do not show statistical significance at any critical level.

In the case of bond portfolios with the credit rating A, the coefficients β_1 of the expected liquidity risk due to occurrence during the previous period, $\ln{(Li)}_{m-1}$, are negative, which is different from the projected sign. They are correctly positive only for portfolios of firms with small size and high book-to-market ratio and are statistically significant at 5% critical level.

The coefficients β_2 of the unexpected liquidity risk, $\ln{(Li)}_m^U$, show statistical significance at the 1% critical level but with opposite signs for portfolios of firms with small size and high book-to-market ratio. However, they are correctly negative as projected for portfolios of firms with large size and high book-to-market ratio and show statistical significance at the 5% critical level.

Refer Table 11

In the case of credit rating BBB or lower, not a single portfolio shows the correct sign as hypothesized for the coefficients β_1 of the illiquidity $\ln(Li)_{m-1}$ during the pre-financial crisis (20022007). However, with respect to the coefficient β_1 of $\ln(Li)_{m-1}$ that is considered as a liquidity indicator, 14 out of 16 portfolios have correct signs, and seven portfolios show statistical significance.

Refer Table 12

Still, not even a single portfolio shows the correct sign of coefficients as hypothesized for $\ln(Li)_{m-1}$ and $\ln(Li)_m^U$ during the post-financial crisis (2008–2010). With respect to the coefficient β_1 of $\ln(Li)_{m-1}$ that is considered as a major liquidity indicator, four out of 16 portfolios have correct positive signs, and only one portfolio shows statistical significance at the 1% critical level. The results from Amihud-approach time-series regression analyses are on average similar to those derived from the multifactor time-series analyses in that signs of coefficients seem sporadic or random, with no consistent pattern.

Based on these results, it can be said that the expected liquidity risk, $\ln(Li)_{m-1}$, does not have sufficient explanatory power on corporate bond returns, and the unexpected liquidity risk, $\ln(Li)_m^U$, does not have significant impact on bond returns. This implies that the liquidity risk, measured as the ratio of trading volume against the volatility of corporate bond return, may not be a major risk factor on the time-series of corporate bond returns in Korea.

V. Concluding Remarks

Though corporate bonds as well as stocks are all tradable securities, it is relatively difficult to trade corporate bonds, unlike listed stocks. There are not many bond traders who supply liquidity to the bond market by placing limit orders. Moreover, it is not easy to find bond dealers who hold corporate bonds to form the market. As a result, it may be difficult to trade corporate bonds at the desired levels of price and volume. Therefore, corporate bond market participants may have to account for liquidity risk when they invest. Thus, relatively illiquid corporate bonds would be discounted by the liquidity premiums, with the result being that firms incur additional costs when they raise needed capital.

Even though the corporate bond market in Korea was relatively underdeveloped before the foreign currency crisis in 1997, it still seemed to have played a major role in Korean bond markets. However, in the 1990s after the crisis, the corporate bond market could not expand enough in terms of issuing volumes due to various scandals[12], and the trading volumes also have been lackluster.

On the other hand, the issuing volumes as well as the trading volumes of government bonds increased a lot due to strategic support and enhanced demand for issuing by the government. Thus, the issuing volumes and trading activities associated with corporate bonds in Korea have been meager compared to government bond activity in the early half of the 2000s.

Due to such circumstances, we try to find a convincing empirical answer to how well premium impact caused by liquidity risk can explain determination of corporate bond returns along with default risk as well as term risk principally caused by long-term investment. To

[12] The corporate bond market largely has shrunk because of the repurchase measure and the workout on corporate bonds issued by Dae Woo in August, 1999, the ownership dispute on Hyun Dai, the workout on Sae Han, and the bankruptcy of Dae Woo Motor Company in 2000.

accomplish this objective, we formed 16 corporate bond portfolios based upon credit rating, firm size and book-to-market ratio and calculated liquidity indexes using daily trading volumes as well as daily absolute value changes of bonds.

We then performed single-factor regression analyses, multifactor regression analyses controlling for default premiums (DEF) and term premiums (TERM), and Amihud (2002) approach time-series regression analyses. The results derived from the abovementioned three time-series regression analyses show that, during the sample period, the coefficients of the liquidity premiums appeared sporadic or even random in sign and were not statistically significant.

We therefore divided the entire sample period into two subperiods, one being the period before the financial crisis (2002–2007), and the other being the period after the financial crisis (2008–2010) because the financial crisis affected the level of liquidity in the entire financial market as well as trading volumes of corporate bonds. This examination was performed to determine if there was any noticeable difference in results between the pre-financial crisis period and the post-financial crisis period. Results show that the post-financial crisis period was more sensitive to the liquidity risk than the pre-financial period, but was not statistically significant. It can be concluded, based on the evidence from the time-series analyses with the listed corporate bonds, that the liquidity risk factor calculated by the ratio of trading volumes to the volatility of bond returns in the Korean bond markets could not be a decisive determinant of the pricing of corporate bonds.

In this study, we try to examine through time-series analyses whether liquidity risk plays an important role in determining prices of corporate bonds in the Korean bonds market. In the literature, there is a common belief that bond prices are determined mainly by the credit risk, term risk, as well as liquidity risk. However, as the empirical evidences indicate, the liquidity premium does not seem to be one of the prominent factors in pricing bonds in an emerging country like Korea. Even though the Korean bonds market is not a representative market in the world, it has been one of the fast growing emerging markets. Based on the evidence we found, it could be concluded that there would be some difference between emerging markets and the advanced markets in pricing bonds depending upon what factors are more important than others.

References

Alexander, G., Edward, A., and Ferri, M., "The Determinants of Trading Volume of High-yield Corporate Bonds," *Journal of Financial Markets* 3, 2000, pp.177-204.

Acharya, V. V. and Pedersen, L. H., "Asset Pricing with Liquidity Risk," *Journal of Financial Economics* 77, 2005, pp.375-410.

Amihud, Y., and Mendelson, H., "Asset Pricing and the Bid–Ask Spread," *Journal of Financial Economics* 17, 1986, pp.223–249.

Amihud, Y., Mendelson, H., and Wood, R., "Liquidity and the 1987 Stock Market Crash," *Journal of Portfolio Management* 16, 1990, pp.65–69.

Amihud, Y., Mendelson, H., "Liquidity, Maturity and the Yields on U.S. Government Securities", *Journal of Finance* 46, 1991a, pp.1411–1426.

Amihud, Y., "Illiquidity and Stock Returns: Cross-Section and Time-Series Effects," *Journal of Financial Markets* 5, 2002, pp.31-56.

Cooper, S. K., Goth, J. C., and Avera, W. E., "Liquidity, Exchange Listing and Common Stock Performance," *Journal of Economics and Business* 37, 1985, pp.19-33.

Fama, E. F. and French, K. R., "The cross-section of expected stock returns," *Journal of*

Finance 47, 1992, pp.680-692.
Fama, E. F. and French, K. R., "Common Risk Factors in the Returns", *Journal of Financial Economics* 33, 1993, pp.3-56.
Fisher, L., "Determinants of Risk Premiums on Corporate Bonds", *Journal of Political Economics* 67, 1959, pp.217-247.
Gebhardt, W. R., Hvidkjaer, S., and Swaminathan, B., "Stock and Bond Market Interaction: Does Momentum Spill Over?", *Journal of Financial Economics* 75, 2005b, pp.651-690.
Lee, K. B. and Im, H. J., "Analysis and Implication of the Corporate Bond Liquidity Premium," Working Paper, *Korea Institute of Finance*, 2012.
Lin, H., Wang, J., and Wu, C., "Liquidity Risk and the Cross-Section of Expected Corporate Bond Returns," *Journal of Financial Economics* 99, 2008, pp.628-650.
Merton, R., "On the Pricing of Corporate Debt: the Risk Structure of Interest Rates," *Journal of Finance* 29(2), 1974, pp.449-470.
Khan, W. A., Baker, H. K., and Edelman, R. B., "Competition versus Consolidation of Order Flow: Common Stock Listing on Dual Domestic Exchanges," *Quarterly Journal of Business and Economics* 34(4), 1995, pp.81-98.
Khan, W.A., and Baker, H.K., "Unlisted Trading Privileges, Liquidity and Stock Returns," *Journal of Financial Research* 16, 1993, pp.221–236.
Kim, B. S. and Jung, H. J., "Reality and Theory of the Korean Bond Market," Working Paper, *Korea Bond Web*, 2009.
Kwon, T. H. and Park, J. W., "The Study on Liquidity Premium in the Korean Stock Market," *Asian Review of Financial Research* 13, 1997, pp.223-259.
Kyle, A., "Continuous Auctions and Insider Trading," *Econometrica* 53, 1985, pp.1315–1335.
Pastor, L. and Stambaugh, R. F., "Liquidity Risk and Expected Stock Returns," *Journal of Political Economics* 111, 2003, pp.642-685.
Saring O. and Warga, A., "Bond Price Data and Bond Market Liquidity," *Journal of Financial and Quantitative Analysis* 24(3), 1989, pp.367-378.
Silber, W.L., "Thinness in Capital Markets: the Case of the Tel Aviv Stock Exchange", *Journal of Financial and Quantitative Analysis* 10, 1975, pp.129–142.
Schultz, P., "Corporate Bond Trading Costs and Practices: A Peek behind the Curtain," *Journal of Finance* 56(2), 2001, pp.677~698.
Yang, Dae-Sung, "The Feature and Cause of the Korean Bond Market Recently," *The Bank of Korea Financial Market*, 2008.

Table 1 Summary Statistics of the Variables

AAA								
	SMB	HML	DEF	TERM	ln(Li)_SL	ln(Li)_SH	ln(Li)_BL	ln(Li)_BH
Mean	0.1260	-0.3239	4.2810	1.8826	-14.3712	-14.9706	-14.2381	-14.7240
Median	0.0847	-0.2353	4.1789	1.7642	-15.2383	-15.3009	-15.1199	-15.0846
Maximum	1.8530	1.1231	6.4635	4.5678	-7.9895	-9.4926	-7.4361	-8.3871
Minimum	-1.9673	-2.4806	2.5626	0.1673	-16.9166	-18.3518	-16.6866	-16.6072
Std.	0.6679	0.6487	0.6727	0.8605	1.9276	1.1731	2.0440	1.4293
Skewness	-0.1583	-0.8253	0.4603	0.9299	1.3333	1.5688	1.6749	2.0198
Kurtosis	0.4763	1.0464	0.5439	0.8846	0.8720	4.7832	2.1721	5.2506
AA								
	SMB	HML	DEF	TERM	ln(Li)_SL	ln(Li)_SH	ln(Li)_BL	ln(Li)_BH
Mean	-0.2049	0.5959	5.2260	1.7429	-13.1052	-12.6724	-13.5470	-12.9075
Median	-0.0058	0.0602	4.8556	1.7779	-13.0611	-12.5472	-13.6899	-12.6828
Maximum	13.9597	16.1505	12.2644	2.6648	-9.0480	-8.2036	-7.2955	-7.0274
Minimum	-14.6092	-8.0798	3.3538	0.3736	-15.8228	-15.4314	-16.5651	-16.2323
Std.	2.9277	2.9540	1.2926	0.5157	1.3241	1.4627	1.5622	1.6695
Skewness	-0.5046	3.2951	2.2999	-0.4235	0.0539	0.3942	0.8594	0.2326
Kurtosis	13.9622	14.3531	8.0418	-0.2085	-0.2649	-0.0217	1.6613	0.1008
A								
	SMB	HML	DEF	TERM	ln(Li)_SL	ln(Li)_SH	ln(Li)_BL	ln(Li)_BH
Mean	0.5545	-0.3764	5.7752	1.3049	-12.5556	-12.2819	-12.6795	-12.5874
Median	-0.2731	-0.1516	5.4476	1.3712	-12.5908	-12.2772	-12.5376	-12.6158
Maximum	23.4748	6.8867	15.9492	2.5912	-6.6662	-3.8808	-7.3258	-9.7204
Minimum	-3.2383	-19.6735	3.8577	0.0000	-15.5768	-15.5958	-15.6269	-15.7232
Std.	3.9768	2.5640	1.6420	0.5034	1.4650	1.7575	1.6006	1.4282
Skewness	4.5918	-4.7971	4.7086	-0.3676	0.6575	0.8791	0.3067	-0.0935
Kurtosis	21.4677	33.8306	25.4598	0.2230	1.7282	3.8358	0.4181	-0.8576
BBB or below								
	SMB	HML	DEF	TERM	ln(Li)_SL	ln(Li)_SH	ln(Li)_BL	ln(Li)_BH
Mean	-2.2625	-5.1572	13.6524	1.5753	-11.3595	-11.4450	-10.9737	-10.8308
Median	-0.3524	0.0534	7.1438	1.5436	-11.4685	-11.0331	-10.8642	-11.0530
Maximum	82.1167	70.8643	134.6527	2.7618	-4.8124	-7.1853	-5.9485	-5.9485
Minimum	-116.7434	-117.0479	4.8098	0.0200	-15.8068	-15.5104	-15.0204	-16.0190
Std.	25.1922	24.1799	17.2929	0.5021	1.8293	1.8906	1.6045	1.8868
Skewness	-0.7589	-1.4159	4.0393	-0.0542	0.6437	-0.2028	0.4168	0.2598
Kurtosis	6.2958	6.3158	22.5589	-0.1407	1.8053	-0.5564	0.7174	-0.0325

(note) The variables are book-to-market ratios(*HML*), firm sizes(*SMB*), default premiums(*DEF*), term premiums(*TERM*), credit ratings(AAA, AA, A, and BBB or below), and illiquidity measures(ln((*Li*)). The symbols S and B attached to the illiquidity measure represent small and large with respect to the firm size, respectively. The symbols L and H denote low and high with respect to the book-to-market ratio, respectively.

Table 2 Summary Statistics of Bond Yields

Credit Rating	AAA	AA	A	BBB
Small Size, Low B/M				
Mean Return	4.4671	5.1847	6.4033	16.2901
Standard Deviation	0.7903	1.4043	6.3113	38.9804
Small Size, High B/M				
Mean Return	3.9388	5.7495	5.8578	8.7530
Standard Deviation	0.8855	4.0686	3.0342	11.6574
Big Size, Low B/M				
Mean Return	4.1366	5.3591	5.6813	16.1727
Standard Deviation	0.5801	3.9724	1.0627	32.7819
Big Size, High B/M				
Mean Return	4.0173	5.9937	5.4996	13.3955
Standard Deviation	0.9946	4.6966	0.9690	26.5456

Table 3 Correlation Analyses

AAA									
	MKT	SMB	HML	DEF	TERM	In(Li)_SL	In(Li)_SH	In(Li)_BL	In(Li)_BH
MKT	1.0000	-0.0150	0.2363	-0.0639	-0.2485	0.0295	0.1249	-0.1302	0.0150
SMB		1.0000	-0.0827	0.0805	-0.0386	0.0981	0.2425	-0.1339	-0.0062
HML			1.0000	0.3093	-0.3521	-0.4366	-0.2255	-0.3068	-0.1324
DER				1.0000	0.0913	-0.2834	-0.2234	-0.1228	0.0572
TERM					1.0000	0.3391	0.0726	0.6637	0.4820
In(Li)_SL						1.0000	0.7084	0.4786	0.3307
In(Li)_SH							1.0000	0.1416	0.1680
In(Li)_BL								1.0000	0.6670
In(Li)_BH									1.0000
AA									
	MKT	SMB	HML	DEF	TERM	In(Li)_SL	In(Li)_SH	In(Li)_BL	In(Li)_BH
MKT	1.0000	0.2599	-0.0788	0.0699	-0.1248	-0.0757	-0.0702	-0.0239	-0.0303
SMB		1.0000	0.0896	0.0643	-0.0639	0.0699	-0.0012	0.0513	0.0636
HML			1.0000	0.6152	0.0664	0.3462	0.1884	0.3608	0.4957
DER				1.0000	-0.1468	0.4607	0.2436	0.4819	0.4841
TERM					1.0000	0.2170	0.3700	-0.1360	-0.1971
In(Li)_SL						1.0000	0.7069	0.0824	0.3398
In(Li)_SH							1.0000	0.0287	0.2880
In(Li)_BL								1.0000	0.6473
In(Li)_BH									1.0000
A									
	MKT	SMB	HML	DEF	TERM	In(Li)_SL	In(Li)_SH	In(Li)_BL	In(Li)_BH
MKT	1.0000	0.0101	0.0482	-0.0662	0.1578	0.0556	0.0963	-0.0990	-0.0531
SMB		1.0000	-0.6481	0.7911	-0.0079	0.3010	0.2797	0.2474	0.3125
HML			1.0000	-0.4865	0.0818	-0.1578	-0.0400	-0.2581	-0.3975
DER				1.0000	-0.1004	0.2804	0.2294	0.1965	0.3094
TERM					1.0000	-0.1881	-0.0579	-0.2664	-0.2647
In(Li)_SL						1.0000	0.4205	0.2608	0.3244
In(Li)_SH							1.0000	0.1264	0.2239
In(Li)_BL								1.0000	0.6196
In(Li)_BH									1.0000
BBB or below									
	MKT	SMB	HML	DEF	TERM	In(Li)_SL	In(Li)_SH	In(Li)_BL	In(Li)_BH
MKT	1.0000	-0.2106	0.1806	-0.1492	0.0853	-0.2489	-0.0286	-0.1125	-0.0824
SMB		1.0000	0.0041	0.0330	0.0172	0.0527	0.1074	0.1959	0.1748
HML			1.0000	-0.4800	-0.1218	0.0695	0.1475	-0.0997	0.0229
DER				1.0000	0.2366	-0.1607	-0.2067	-0.0055	-0.0949
TERM					1.0000	0.2229	0.1451	0.0292	-0.1178
In(Li)_SL						1.0000	0.6325	0.5196	0.6104
In(Li)_SH							1.0000	0.4036	0.5584
In(Li)_BL								1.0000	0.6935
In(Li)_BH									1.0000

(note) The variables above represent market yields (*MKT*), firm sizes (*SMB*), the book-to-market ratios (*HML*), default premiums (*DEF*), term premiums (*TERM*), and the illiquidity measures (ln(*Li*)). Sixteen bond portfolios are formed based on the bond rating, firm size, and the book-to-market ratio. The portfolios are then regrouped for the same bond rating to perform intragroup correlation analyses.

Table 4 Results on the **Single-Factor** Time-Series Analyses
(for the total sample period, **2002-2010**)

	Size Small / BM Low	Size Small / BM High	Size Big / BM Low	Size Big / BM High
AAA				
ln(Li)	0.0116	-0.0266	0.0414	0.1129
	(0.3)	(-0.4)	(1.5)	(1.7)*
e	4.6581	3.5277	4.7373	5.6635
	(8.1)***	(3.2)***	(12.2)***	(5.5)***
Adj. R^2	-0.0900	-0.0083	0.0130	0.0167
Obs.	108	108	108	108
AA				
ln(Li)	-0.1799	-0.4057	0.3413	0.5688
	(-1.7)*	(-1.5)	(1.3)	(2.1)**
e	2.8224	0.6138	9.9913	13.3445
	(2.0)**	(0.2)	(2.9)***	(3.7)***
Adj. R^2	0.0182	0.0106	0.0074	0.0306
Obs.	108	108	108	108
A				
ln(Li)	0.0675	0.5228	0.0177	-0.1569
	(0.2)	(3.2)***	(0.3)	(-2.4)***
e	7.3249	12.2823	5.9239	3.5260
	(1.4)	(6.0)***	(7.2)***	(4.2)***
Adj. R^2	-0.0096	0.0805	-0.0091	0.0419
Obs.	108	108	108	108
BBB or below				
ln(Li)	7.5655	1.8692	-0.1789	2.6085
	(3.7)***	(3.1)***	(-0.1)	(1.9)*
e	101.7460	30.1688	11.5324	41.7874
	(4.4)***	(4.4)***	(0.7)	(2.8)***
Adj. R^2	0.1114	0.0784	-0.0097	0.0243
Obs.	108	108	108	108

(note) *** : significant at 1% critical level; ** : significant at 5% critical level; * : significant at 10% critical level.

Table 5 Results on the **Single-Factor** Time-Series Analyses
(for 2002-just **before the financial crisis**)

	Size Small BM Low	Size Small BM High	Size Big BM Low	Size Big BM High
AAA				
In(Li)	0.0337	-0.0100	0.0272	0.1078
	(0.7)	(-0.1)	(1.0)	(1.2)
e	4.8976	3.7315	4.6542	5.4451
	(7.0)***	(2.9)***	(11.7)***	(4.2)***
Adj. R^2	-0.0085	-0.0150	-0.0008	0.0072
Obs.	72	72	72	72
AA				
In(Li)	-0.0702	-0.3558	0.3894	0.7504
	(-0.5)	(-0.9)	(1.2)	(2.0)**
e	4.6348	2.2292	11.1193	16.4526
	(2.5)**	(0.4)	(2.5)**	(3.4)***
Adj. R^2	-0.0114	-0.0027	0.0053	0.0432
Obs.	72	72	72	72
A				
In(Li)	0.1839	0.6625	-0.0302	-0.1313
	(0.3)	(3.1)***	(-0.4)	(-1.5)
e	9.3347	14.2675	5.2104	3.7940
	(1.3)	(5.4)***	(4.7)***	(3.3)***
Adj. R^2	-0.0137	0.1132	-0.0132	0.0184
Obs.	72	72	72	72
BBB or below				
In(Li)	8.3138	1.0915	2.0362	6.1586
	(2.0)*	(1.5)	(0.9)	(2.6)**
e	113.6779	20.6552	38.0471	86.2763
	(2.2)**	(2.2)**	(1.4)	(3.1)***
Adj. R^2	0.0411	0.0162	-0.0028	0.0812
Obs.	72	72	72	72

(note) *** : significant at 1% critical level; ** : significant at 5% critical level; * : significant at 10% critical level.

Table 6 Results on the **Single-Factor** Time-Series Analyses
(for the period **after the financial crisis**)

	Size Small / BM Low	Size Small / BM High	Size Big / BM Low	Size Big / BM High
AAA				
In(Li)	0.6194	1.0932	0.0450	0.1158
	(2.0)**	(2.5)**	(0.8)	(1.4)
e	14.2930	21.1950	4.5668	5.9788
	(3.0)***	(3.1)***	(5.4)***	(5.0)***
Adj. R²	0.0796	0.1274	-0.0111	0.0281
Obs.	36	36	36	36
AA				
In(Li)	-0.2840	-0.2387	-0.3215	-0.3798
	(-3.0)***	(-2.3)**	(-2.3)**	(-4.2)***
e	0.7885	0.8512	0.0094	-0.6420
	(0.7)	(0.7)	(0.0)	(-0.5)
Adj. R²	0.1879	0.1105	0.1072	0.3268
Obs.	36	36	36	36
A				
In(Li)	-0.2409	-0.1900	0.0053	-0.3209
	(-2.0)**	(-1.4)	(0.0)	(-2.4)**
e	2.4682	3.0245	5.9399	1.7187
	(1.6)	(1.8)*	(4.0)***	(1.1)
Adj. R²	0.0792	0.0255	-0.0294	0.1184
Obs.	36	36	36	36
BBB or below				
In(Li)	10.8611	5.2690	-4.4335	0.9882
	(4.4)***	(2.5)**	(-1.9)*	(0.5)
e	128.6384	63.3489	-31.7736	21.3183
	(5.2)***	(3.1)***	(-1.4)	(1.1)
Adj. R²	0.3422	0.1339	0.0720	-0.0226
Obs.	36	36	36	36

(note) *** : significant at 1% critical level; ** : significant at 5% critical level; * : significant at 10% critical level.

Table 7 Results on the **Multifactor** Time-Series Analyses
(for the total sample period, **2002-2010**)

Size	BM	MKT	SMB	HML	In(Li)	DEF	TERM	e	Adj. R²	Obs.
AAA										
Size Small	BM Low	-0.0146	0.1627	-0.5840	-0.0131	0.7582	0.0174	0.8057	0.5170	108
		(-1.4)	(1.9) *	(-5.7) ***	(-0.4)	(8.4) ***	(-1.3)	(1.4)		
Size Small	BM High	0.0070	0.6379	0.6565	0.0377	0.6461	-0.0259	1.9181	0.8215	108
		-(1.0)	(10.7) ***	(9.6) ***	(1.1)	(10.5) ***	(-0.5)	(3.6) ***		
Size Big	BM Low	0.0077	-0.3268	-0.3459	0.0510	0.6593	-0.1045	2.1661	0.5874	108
		(1.1)	(-5.7)***	(-5.2) ***	(2.1) *	(10.9) ***	(-1.7) *	(4.8) ***		
Size Big	BM High	-0.0212	-0.8387	0.4130	0.1511	0.7720	-0.1305	3.4382	0.7465	108
		(-2.2) *	(-10.7) ***	(4.5) ***	(3.8) ***	(9.4) ***	(-1.7) *	(4.6) ***		
AA										
Size Small	BM Low	-0.0215	0.0009	0.1159	-0.0674	0.5513	-0.0538	1.4577	0.4625	108
		(-1.1)	(0.0)	(2.6) **	(-0.8)	(5.3) ***	(-0.3)	(1.2)		
Size Small	BM High	-0.0712	0.2703	0.3700	-0.0533	1.5183	0.1551	-3.2281	0.4887	108
		(-1.3)	(2.6) **	(2.9) ***	(-0.3)	(5.1) ***	(0.3)	(-1.0)		
Size Big	BM Low	-0.0710	-0.7245	-0.6303	0.0153	1.5278	0.1459	-2.3787	0.4623	108
		(-1.3)	(-7.0) ***	(-4.8) ***	(0.1)	(5.2) ***	(0.3)	(-0.7)		
Size Big	BM High	-0.0202	-1.0005	1.1176	-0.0406	0.5649	-0.0389	1.7163	0.9519	108
		(-1.1)	(-27.0) ***	(24.7) ***	(-0.6)	(5.4) ***	(-0.2)	(1.5)		
A										
Size Small	BM Low	0.0225	0.9949	-1.0390	-0.1289	0.1960	-0.3390	3.1623	0.9806	108
		(1.4)	(23.6) ***	(-23.1) ***	(-2.2) **	(2.2)* *	(-1.9) *	(3.5) ***		
Size Small	BM High	0.0328	0.8603	0.7779	-0.1848	0.3630	-0.2599	1.6481	0.9331	108
		(2.3) **	(22.2) ***	(19.1)***	(-3.8)****	(4.6) ***	(-1.6)	(2.1) **		
Size Big	BM Low	0.0275	-0.1791	-0.2478	0.0135	0.3603	-0.2608	4.1145	0.3443	108
		(1.8) *	(-4.5)***	(-5.7) ***	(0.3)	(4.3) ***	(-1.5)	(4.3) ***		
Size Big	BM High	0.0175	-0.0021	-0.0470	-0.1175	0.1745	-0.2259	3.2789	0.1570	108
		(1.1)	(-0.1)	(-1.0)	(-1.8)*	(1.9) *	(-1.2)	(3.4) ***		
BBB or below										
Size Small	BM Low	-0.4888	0.7328	-0.3616	-0.5695	1.5407	-1.0356	-8.8796	0.9034	108
		(-2.1) **	(12.5) ***	(-5.6) ***	(-0.8)	(18.6) ***	(0.4)	(-0.9)		
Size Small	BM High	0.1839	0.2326	0.1926	1.2468	0.1998	2.6088	17.1676	0.3417	108
		(-2.1)**	(12.5) ***	(-5.6)****	(0.8)	(18.6)***	(-0.4)	(-0.9)		
Size Big	BM Low	0.2509	-0.7673	-0.8214	1.4163	0.2135	2.2660	18.8113	0.8380	108
		(1.4)	(-17.4)***	(-16.0)****	(2.4)***	(3.3) ***	(1.2)	(2.5) **		
Size Big	BM High	-0.4798	-0.2769	0.6478	-0.9690	1.5608	-0.8856	-13.3710	0.7973	108
		(-2.1) **	(-5.0) ***	(10.0) ***	(-1.5)	(18.7)***	(-0.4)	(-1.5)		

(note) *** : significant at 1% critical level; ** : significant at 5% critical level; * : significant at 10% critical level.

Table 8 Results on the **Multifactor** Time-Series Analyses
(for 2002-just **before the financial crisis**)

		MKT	SMB	HML	In(Li)	DEF	TERM	E	Adj. R²	Obs.
					AAA					
Size Small	BM Low	-0.0289	-0.0129	-0.6747	0.0689	1.0426	0.0035	0.6405	0.5746	72
		(-2.0) **	(-0.1)	(-5.3) ***	(1.7) *	(8.3)***	(0.0)	(1.0)		
Size Small	BM High	0.0061	0.7370	0.7962	-0.0540	0.5125	-0.0098	1.2401	0.8842	72
		(0.8)	(11.6)***	(10.9) ***	(-1.5)	(7.1)***	(-0.2)	(2.5) **		
Size Big	BM Low	-0.0010	-0.2715	-0.2135	0.0753	0.6128	-0.1413	2.9247	0.6098	72
		(-0.1)	(-4.9) ***	(-3.1) ***	(2.9) ***	(9.3)***	(2.2) **	(6.29) ***		
Size Big	BM High	-0.0309	-0.9707	0.2541	0.1714	0.9917	-0.1444	2.6934	0.7850	72
		(-2.3) **	(-10.2) ***	(2.1) **	(3.4) ***	(9.0)***	(-1.4)	(2.8) ***		
					AA					
Size Small	BM Low	-0.0417	0.0106	0.1425	0.0304	0.3936	-0.3574	4.3140	0.4211	72
		(-1.4)	(0.3)	(2.7) ***	(0.3)	(2.9)***	(-1.2)	(2.3) **		
Size Small	BM High	-0.1125	0.2895	0.3127	0.0387	1.5485	0.0669	-1.6084	0.4304	72
		(-1.2)	(2.2) **	(1.9) *	(0.1)	(3.6)***	(0.1)	(-0.3)		
Size Big	BM Low	-0.1119	-0.7137	-0.6865	-0.0076	1.5425	0.0866	-2.2083	0.4542	72
		(-1.2)	(-5.5)***	(-4.1) ***	(0.0)	(3.6)***	(0.1)	(-0.4)		
Size Big	BM High	-0.0419	-0.9936	1.1420	-0.0220	0.3986	-0.3207	3.5388	0.9579	72
		(-1.4)	(-23.3) ***	(21.5) ***	(-0.3)	(2.9)***	(-1.1)	(2.1) **		
					A					
Size Small	BM Low	0.0376	0.9842	-1.1002	-0.08403	0.1521	-0.3268	3.8693	0.9883	72
		(1.8) *	(20.6) ***	(-23.6) ***	(-1.3)	(1.5)	(-1.6)	(3.9) ***		
Size Small	BM High	0.0371	0.9573	0.8417	-0.2268	0.2160	-0.5133	2.1129	0.9638	72
		(2.1) **	(23.7)***	(21.4) ***	(-4.6) ***	(2.6) **	(-3.1) ***	(2.5) **		
Size Big	BM Low	0.0242	-0.0785	-0.1936	-0.0286	0.1694	-0.3603	4.6347	0.3044	72
		(1.2)	(-1.7)*	(-4.3) ***	(-0.4)	(1.8) *	(-1.8) *	(3.7) ***		
Size Big	BM High	0.0358	0.0088	-0.0957	-0.1416	0.0953	-0.2399	3.2974	0.2352	72
		(1.7) *	(0.2)	(-2.1) **	(-1.7) *	(0.9)	(-1.2)	(2.9) ***		
					BBB or below					
Size Small	BM Low	-0.7865	0.8679	-0.2115	-1.2854	1.6401	1.7315	-22.4771	0.9342	72
		(-2.9) ***	(14.4)***	(-2.9) ***	(-1.0)	(20.9) ***	(0.6)	(-1.3)		
Size Small	BM High	0.2513	0.1840	0.0771	0.9547	0.1532	-0.2551	18.1219	0.1937	72
		(1.1)	(3.7) ***	(1.3)	(1.3)	(2.4) **	(-0.1)	(1.9) *		
Size Big	BM Low	0.2899	-0.8208	-0.9249	0.3865	0.1733	-0.3456	10.7304	0.8839	72
		(1.3)	(-16.0)***	(-15.4) ***	(0.5)	(2.7)***	(-0.2)	(1.0)		
Size Big	BM High	-0.6956	-0.1417	0.7830	-0.5965	1.6376	0.9409	-12.7659	0.8821	72
		(-2.6) **	(-2.3) **	(10.9) ***	(-0.6)	(20.2)***	(0.4)	(-12.8)***		

(note) *** : significant at 1% critical level; ** : significant at 5% critical level; * : significant at 10% critical level.

Table 9 Results on **the Multifactor** Time-Series Analyses
(for the period **after the financial crisis**)

Size	BM	MKT	SMB	HML	In(Li)	DEF	TERM	e	Adj. R^2	Obs.
					AAA					
Size Small	BM Low	-0.0093	0.4205	-0.7127	-0.0638	0.5772	-0.0374	0.9955	0.7298	36
		(-0.9)	(3.8)***	(-4.4)***	(-0.3)	(6.0)***	(-0.4)	(0.3)		
Size Small	BM High	0.0099	0.6628	0.7001	1.0059	0.6496	-0.0132	16.8929	0.8032	36
		(0.9)	(5.5)***	(3.8)***	(4.4)***	(6.1)***	(-0.1)	(4.6)***		
Size Big	BM Low	0.0181	-0.2832	-0.5715	0.0065	0.7454	-0.0005	0.7915	0.5635	36
		(1.2)	(-1.8)*	(-2.6)**	(0.1)	(5.5)***	(0.0)	(0.9)		
Size Big	BM High	-0.0145	-0.5688	0.3539	0.0681	0.5462	-0.0906	3.2211	0.7503	36
		(-1.4)	(-5.4)***	(2.3)**	(1.5)	(5.9)***	(-1.0)	(3.7)***		
					AA					
Size Small	BM Low	-0.0227	0.5413	-0.7417	-0.2569	0.8003	-0.0345	-2.6005	0.6666	36
		(-1.6)	(3.5)***	(-4.7)***	(-3.9)***	(6.2)***	(-0.2)	(-2.8)***		
Size Small	BM High	-0.0474	0.5462	0.6057	-0.0805	0.5540	-0.3250	1.1494	0.6502	36
		(-2.9)***	(2.9)***	(3.5)***	(-1.1)	(3.9)***	(-1.5)	(1.0)		
Size Big	BM Low	-0.0459	-0.1952	-0.6370	-0.3635	0.5184	-0.3451	-2.6398	0.7446	36
		(-3.5)***	(-1.4)	(-4.3)***	(-4.3)***	(4.5)***	(-2.0)*	(-2.1)**		
Size Big	BM High	-0.0245	-0.3248	0.1791	-0.2106	0.8041	0.0522	-2.2103	0.6684	36
		(-1.6)	(-1.8)*	(1.0)	(-2.9)****	(5.6***	(0.3)	(-2.1)**		
					A					
Size Small	BM Low	0.0078	0.7769	-0.1206	-0.0338	0.7952	-0.1647	1.0890	0.6510	36
		(0.4)	(4.5)***	(-1.1)	(-0.4)	(4.9)***	(-0.6)	(0.8)		
Size Small	BM High	-0.0056	0.3419	0.6765	-0.0709	0.6967	0.2863	0.4895	0.5055	36
		(-0.2)	(1.4)	(4.7)***	(-0.6)	(3.2)***	(0.7)	(0.2)		
Size Big	BM Low	-0.0081	-0.6431	-0.3419	-0.0436	0.7388	0.1821	0.7637	0.6313	36
		(-0.3)	(-2.7)**	(-2.3)**	(-0.5)	(3.6)***	(0.5)	(0.4)		
Size Big	BM High	0.0112	-0.2182	0.9268	0.0705	0.8646	-0.1709	1.9774	0.7569	36
		(0.6)	(-1.3)	(8.3)***	(0.8)	(5.6)***	(-0.6)	(1.5)		
					BBB or below					
Size Small	BM Low	-0.0713	0.3504	-0.7036	1.5152	1.2600	-2.1007	18.3920	0.8980	36
		(-0.2)	(2.4)**	(-7.3)***	(1.1)	(3.3)***	(-0.4)	(1.2)		
Size Small	BM High	0.0860	0.2335	0.4100	1.8341	0.5488	7.2776	11.8363	0.5742	36
		(0.3)	(1.8)*	(4.6)***	(1.1)	(1.6)	(1.7)	(0.7)		
Size Big	BM Low	0.2194	-0.7635	-0.6701	3.0038	0.3691	8.6014	23.3591	0.7245	36
		(0.8)	(-6.2)***	(-6.6)***	(1.8)*	(1.1)	(2.0)*	(1.4)		
Size Big	BM High	-0.2242	-0.5997	0.3706	-2.2245	1.5241	-2.1972	-20.0797	0.4335	36
		(-0.6)	(-4.3)***	(3.1)***	(-1.0)	(3.6)***	(-0.5)	(-0.8)		

(note) *** : significant at 1% critical level; ** : significant at 5% critical level; * : significant at 10% critical level.

Table 10 Results on **Amihud Approach** Time-Series Analyses
(for the total sample period, **2002-2010**)

		In(Li)	In(Li)^U	DEF	TERM	E	Adj. R²	Obs.
AAA								
Size Small	BM Low	-0.0059 (-0.2)	0.0439 (0.9)	0.5406 (5.2)***	0.2364 (2.8)***	1.6350 (2.5)**	0.2912	108
Size Small	BM High	0.0950 (1.6)	-0.0216 (-0.3)	0.9139 (9.4)***	-0.1654 (-2.2)**	1.7869 (1.9)*	0.4503	108
Size Big	BM Low	0.0579 (1.6)	0.0282 (1.0)	0.4497 (6.1)***	0.0952 (1.2)	2.8560 (4.6)***	0.3194	108
Size Big	BM High	0.2405 (3.2) ***	0.0485 (0.7)	0.7101 (5.6)***	-0.2725 (-2.4)**	5.0136 (3.7)***	0.2713	108
AA								
Size Small	BM Low	0.0012 (0.0)	-0.0754 (-0.8)	0.5271 (5.4)***	-0.0742 (-0.3)	2.5646 (1.6)	0.2246	108
Size Small	BM High	-0.1244 (-0.5)	-0.3855 (-1.6)	1.9710 (7.7)***	0.3991 (0.6)	-6.7724 (-1.8)*	0.3660	108
Size Big	BM Low	0.4425 (1.4)	0.3832 (1.5)	1.1854 (4.1)***	0.0978 (0.1)	4.9952 (1.0)	0.1299	108
Size Big	BM High	0.7132 (2.5)**	0.3382 (1.1)	1.4666 (4.5)***	0.1193 (0.1)	7.3099 (1.5)	0.1905	108
A								
Size Small	BM Low	0.3254 (0.70)	0.1757 (0.5)	2.0534 (6.4)	-1.7919 (-1.7)*	1.0088 (0.2)	0.2922	108
Size Small	BM High	0.4746 (2.5)**	0.5389 (3.4)***	0.6466 (3.9)***	-1.3578 (-2.6)**	9.8051 (3.4)***	0.2401	108
Size Big	BM Low	-0.0343 (-0.4)	0.0713 (1.1)	0.1919 (3.2)***	-0.2579 (-1.2)	4.5011 (3.7)***	0.1035	108
Size Big	BM High	-0.0426 (-0.6)	-0.1252 (-2.0)**	0.3183 (6.4)***	-0.2639 (-1.5)	3.4808 (3.3)***	0.3120	108
BBB or below								
Size Small	BM Low	6.0281 (2.7)***	5.9510 (2.2)**	0.7126 (3.2)***	6.3599 (0.9)	65.5349 (2.2)**	0.1922	108
Size Small	BM High	1.4167 (2.1)**	2.1604 (2.7)***	0.0775 (1.1)	1.2461 (0.6)	22.1476 (2.5)**	0.0726	108
Size Big	BM Low	0.8301 (0.5)	-1.0297 (-0.6)	0.3551 (2.6)**	1.7691 (0.4)	14.9839 (0.8)	0.0528	108
Size Big	BM High	1.6812 (1.1)	2.7939 (1.5)	0.2303 (1.4)	7.7706 (1.5)	16.6879 (0.8)	0.0460	108

(note) *** : significant at 1% critical level; ** : significant at 5% critical level; * : significant at 10% critical level.

Table 11 Results on **Amihud Approach** Time-Series Analyses
(for the period of 2002-just **before the financial crisis**)

Size	BM	In(Li)	In(Li)^{U}	DEF	TERM	E	Adj. R²	Obs.
				AAA				
Size Small	BM Low	0.0373	0.0749	0.5977	0.3450	1.6836	0.2858	72
		(0.7)	(1.3)	(4.1)***	(3.2)***	(2.0)*		
Size Small	BM High	0.1530	0.0095	0.9433	-0.2003	2.5072	0.4480	72
		(2.0)**	(0.1)	(7.2)***	(-2.2)**	(2.2)**		
Size Big	BM Low	0.0886	0.0435	0.3862	0.0098	3.8262	0.2097	72
		(2.1)**	(1.1)	(4.3)***	(0.1)	(5.4)***		
Size Big	BM High	0.2542	0.0458	0.7988	-0.2621	4.6955	0.2676	72
		(2.6)**	(0.5)	(4.5)***	(-1.6)	(2.6)**		
				AA				
Size Small	BM Low	0.2062	0.0531	0.4920	-0.1754	5.8398	0.1786	72
		(1.3)	(0.4)	(3.9)***	(-0.5)	(2.4)**		
Size Small	BM High	0.0063	-0.4359	2.0303	0.4035	-5.0919	0.3279	72
		(0.0)	(-1.2)	(5.8)***	(0.4)	(-0.9)		
Size Big	BM Low	0.4870	0.4416	1.2054	0.1739	5.4098	0.0899	72
		(1.2)	(1.3)	(2.9)***	(0.2)	(0.7)		
Size Big	BM High	0.9504	0.4838	1.3702	-0.1483	11.5670	0.1561	72
		(2.3)**	(1.1)	(2.9)***	(-0.1)	(1.6)		
				A				
Size Small	BM Low	0.1218	0.2285	2.2613	-2.6727	-1.6173	0.3127	72
		(0.2)	(0.4)	(5.5)***	(-1.8)*	(-0.2)		
Size Small	BM High	0.5815	0.7197	0.6839	1.6171	11.2607	0.2513	72
		(2.3)**	(3.4)***	(3.1)***	(-2.2)**	(3.0)***		
Size Big	BM Low	-0.1339	-0.0259	0.2371	-0.3503	2.8818	0.2542	72
		(-1.2)	(-0.3)	(4.4)***	(-1.7)	(1.7)*		
Size Big	BM High	-0.0697	-0.1299	0.3236	-0.3068	3.0692	0.4089	72
		(-0.7)	(-1.8)*	(6.7)***	(-1.7)*	(-2.2)**		
				BBB or below				
Size Small	BM Low	3.7910	8.7015	0.6256	6.4840	41.5960	0.0952	72
		(0.7)	(1.9)*	(2.3)**	(0.7)	(0.6)		
Size Small	BM High	0.8261	1.0637	0.0606	-1.3383	18.7748	-0.0161	72
		(0.9)	(1.2)	(0.9)	(-0.6)	(1.5)		
Size Big	BM Low	4.9728	1.0888	0.3751	3.3530	61.7281	0.1209	72
		(2.0)*	(0.5)	(2.4)**	(0.6)	(2.0)**		
Size Big	BM High	6.6077	5.1250	0.1929	9.5804	74.3340	0.1101	72
		(2.3)**	(2.0)*	(0.9)	(1.4)	(2.0)*		

(note) *** : significant at 1% critical level; ** : significant at 5% critical level; * : significant at 10% critical level.

Table 12 Results on **Amihud Approach** Time-Series Analyses
(for the period **after the financial crisis**)

		ln(Li)	ln(Li)^U	DEF	TERM	E	Adj. R²	Obs.
AAA								
Size Small	BM Low	-0.0299	-0.1368	0.7430	-0.1448	1.1913	0.5944	36
		(-0.1)	(-0.5)	(6.5)***	(-1.3)	(0.2)		
Size Small	BM High	0.3978	0.0946	0.6839	0.0846	7.2225	0.4646	36
		(0.8)	(0.3)	(4.0)***	(0.6)	(0.9)		
Size Big	BM Low	-0.0827	-0.0512	0.7345	0.1149	-0.6600	0.6033	36
		(-1.4)	(-1.4)	(5.8)	(0.9)	(-0.6)		
Size Big	BM High	0.1394	0.0206	0.3743	-0.0190	4.7877	0.1831	36
		(1.3)	(0.3)	(2.3)**	(-0.1)	(2.6)**		
AA								
Size Small	BM Low	-0.4071	-0.2869	0.3013	-0.6040	-1.1832	0.3331	36
		(-3.6)***	(-3.3)***	(1.7)	(-2.3)**	(-0.8)		
Size Small	BM High	-0.3313	-0.2495	0.1699	0.0783	-1.1944	0.1129	36
		(-2.4)**	(-2.2)**	(0.7)	(0.2)	(-0.6)		
Size Big	BM Low	-0.2391	-0.3013	0.6410	-0.6766	-0.6514	0.3748	36
		(-1.5)	(-2.3)**	(3.6)***	(-2.6)**	(-0.3)		
Size Big	BM High	-0.4537	-0.3656	0.3465	-0.6270	-2.1447	0.4739	36
		(-4.3)***	(-3.8)***	(1.8)*	(-2.4)**	(-1.6)		
A								
Size Small	BM Low	-0.1930	-0.2731	-0.2877	-0.3990	5.2281	0.0744	36
		(-1.1)	(-2.2)**	(-1.2)	(-0.9)	(2.3)**		
Size Small	BM High	-0.4804	-0.1635	0.4756	-0.0874	-3.0167	0.4549	36
		(-3.0)***	(-1.7)	(2.4)**	(-0.2)	(-1.3)		
Size Big	BM Low	-0.1343	0.1133	0.0114	-0.3908	4.8222	-0.0335	36
		(-0.9)	(0.8)	(0.0)	(-0.6)	(1.8)*		
Size Big	BM High	-0.1813	-0.2135	0.2526	-0.2657	2.3585	0.0966	36
		(-1.0)	(-1.4)	(0.9)	(-0.5)	(1.0)		
BBB or below								
Size Small	BM Low	7.8956	1.9241	1.7481	4.3570	68.9946	0.6852	36
		(3.1)***	(0.8)	(3.7)***	(0.6)	(2.4)**		
Size Small	BM High	3.0519	4.7275	0.2526	9.0664	24.3293	0.2122	36
		(1.1)	(2.5)**	(0.9)	(1.6)	(0.9)		
Size Big	BM Low	-5.6728	-4.2861	0.1561	0.2433	-46.5503	-0.0088	36
		(-1.7)*	(-1.7)*	(0.4)	(0.0)	(-1.3)		
Size Big	BM High	-0.2099	2.2404	-0.2839	4.4738	7.1394	-0.0205	36
		(-0.1)	(1.0)	(-1.0)	(0.7)	(0.2)		

(note) *** : significant at 1% critical level; ** : significant at 5% critical level; * : significant at 10% critical level.

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