Liquidity Effects in Thai Corporate Bond Spreads

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Proposal or Special Project Submitted in Partial Fulfillment of

The Requirements for the Degree of Master of Science in Finance

Faculty of Commerce and Accountancy

Chulalongkorn University

Academic Year 2013

Executive Summary

We analyze why yield spreads on corporate bonds are larger than what can be explained by credit risk. One possible explanation of this puzzle is the liquidity of corporate bonds. However, separating the effects of credit risk and liquidity on corporate bond yield is not straight forward. The common approaches studied by previous researches have shown that liquidity effects are correlated with credit risk effects on bond yield spreads. Consequently, proxies for liquidity may instead capture credit risk.

The approach used in this paper for evaluating liquidity effects while holding constant the effects of credit risk is to use matched pairs of bonds. By identifying pairs of bonds that have same credit risk (e.g. same issuer, same rating, and same time-to-maturity), the different spreads should explain the difference in liquidity level of two bonds in pair. Liquidity proxies, including Percentage of zero trading days, Bond issue size (Size), Bond age, Cumulative trading volume, Range, and Inter-Quartile Range (IQR) are used for measuring liquidity effects on bond yield spreads.

Results from trading data during March 2002 to December 2013 show that the best 2 proxies in explaining liquidity effects are inter-quartile range (IQR) and bond issuing size (Size). IQR should reflect trading cost as well as bid-ask spread. Investors who trade bond that has high IQR tend to require higher yield in order to compensate for higher round-trip cost. Moreover, one of the major considerations of bond investors is the issuing size (Size) which represents the searching cost. Therefore bond with small issuing size tend to trade at a higher yield. Lastly, both common approach with credit rating dummy and matched pair approach can

explain bond spread indifferently. During the time of crisis when liquidity dried up, credit rating may not have as much impact in determining the bond spread. Therefore in such circumstance, using matched paired model which does not include credit rating proxy may be more appropriate.

INTRODUCTION

Background and Significance of the problem

Credit spread or corporate bond spread is the difference between yields of government bond and yields of corporate bond at the same maturity. Such difference is attributable to the extra return to the investors for taking on more risks. On the other hand, credit spread can be considered as cost of issuing firm.

There are a number of literatures that investigate the determinants of corporate yield spreads and its relationship with credit risk. However, yield spreads on corporate bonds are larger than what can be explained by default risk—namely, the credit spread puzzle. One possible explanatory of this puzzle is the liquidity of corporate bonds. However, separating the effects of credit risk and liquidity on corporate bond yield can be highly challenging, especially since neither liquidity nor its risk is easily measured. Previously there were evidences that liquidity effects are correlated with credit risk effects on bond yield spreads. Consequently, proxies for liquidity may instead capture credit risk. So for us to distinguish the liquidity component from credit spread, this paper will test using a pair of bonds issued by the same firm that have same time to maturity and characteristics. These two bonds must have equal credit risk and experience the same market variations. Therefore their yields do not differ because of credit risk, taxes or market risk. Instead, the differences, if any, in the spreads of these bonds pair should reflect the liquidity components of the spreads.

Objectives

Accessing and managing impact of liquidity on corporate bond spread has been a major area of interest and concern to academics, practitioners and regulators. The majority of the papers on this subject mainly draw their sources from data samples in the Western world such as the U.S.A and the Euro zone but little researches have been published using data from the East where may show different dynamics to the developed markets. Impacts on credit spreads due to amount of liquidity in developing markets such as Thailand may be amplified as Thai market have different pools of investors with different experiences and varied investment styles which should yield a new set of interesting results. Financial literacy and ranges of financial products on offer as well as appetite for leverage are also at a less mature stage in Thailand thus it will be valuable to conduct a different set of studies here which will reflect a tailored impacts for developing countries.

One of the most possible useful contributions of this research paper is to assist Thai corporate in finding the most appropriate timing for a bond issuance given ongoing market liquidity impacts as well as gaining the best possible pricing for its issuance. It should also assist the local regulator in gaining a better understanding of the key driving factors in the Thai bond market and provide a useful input for them to develop the secondary bond market here further. Hopefully it will also lead to further discussions and debates among the academics that can leverage on these new sets of data and analysis to come up with even more advanced and detailed studies

Research Hypothesis

Key questions of this research paper: Do corporate bond proxies explain the corporate yield spreads? And how much they represent on yield spreads?

The main hypothesis of this research is that there are relationships between corporate yield spreads using difference coefficient of each liquidity proxies by determining if the coefficient decline in magnitude when credit risk is held constant.

Conceptual Framework

Next section will be literature review, describes past researches about the determinants of credit spread, especially liquidity impacts. Then details of data and proxies used will be described. Next section will clarify about methodologies applied in this study. The last section will show conclusion of the results and the implication.

LITERATURE REVIEW

Collin-Dufresne, Goldstein, and Martin (2001) and Huang and Huang (2003) indicate that neither levels nor changes in the yield spread of corporate bonds over Treasury bonds can be fully explained by credit risk determinants proposed by structural form models. Longstaff, Mithal, and Neis (2005) suggest that illiquidity may be a possible explanation for the failure of these models to more properly capture the yield spread variation.

Elton et al. (2001) have shown that the spread can almost entirely be explained by three influences: the loss from expected defaults, state and local taxes which must be paid on corporate bonds but not on government bonds, and a premium required for bearing systematic risk. The result shows that expected default accounts for a surprisingly small fraction of the premium in corporate rates over treasuries. Delianedis and Geske (2001) conclude that credit risk and credit spreads are not primarily explained by default, leverage, firm specific risk, and recovery risk, but are mainly attributable to taxes, jumps, liquidity, and market risk factors. Huang and Huang (2012) use structural bond pricing model that consistent with historical default rates and losses, the model has low explanatory power on yield spread.

Collin-Defresne et al (2001) find that credit spread changes are principally driven by local supply/demand shocks that are independent of both credit-risk factors and liquidity such as number of quotes to the total number of reported prices, change in on-the-run and off-the-run treasuries yield, and difference between yields on swap index and Treasuries. Perraudin and Taylor (2003) find that liquidity premium is another important component of credit spreads by using quote frequency, bond age, and issue size as liquidity proxies. Driessen (2005) decomposes corporate bond yield spreads into tax, liquidity, interest rate risk and default risk premium. Whether tax effects combined with liquidity effects can explain the credit spread puzzle. Friewald et al (2012) find that the economic impact of the liquidity measures is significantly larger in periods of crisis, and for speculative grade bonds. Longstaff et al (2005) subtract off the credit risk portion of the spread and use the residual as the liquidity premium. They use credit risk component from CDS market by assuming no liquidity element and always smaller than the responding bond yield spreads. They assume that the difference between corporate bond spread and CDS premium represents non default component.

Recent studies (Chen, Lesmond and Wei (2007), Covitz and Downing (2007), Rossi (2009) and Kalimipalli and Nayak (2012)) find that liquidity effect always come together with credit risk effect on bond spreads.

Crabbe and Turner (1995) propose the use of a pair of bonds for controlling credit risk. They calculate the yield difference between medium term notes with the largest face value and the smallest face value, in order to study the relationship of issue size and yield. In 2012, Dick-Nielsen et al. define the liquidity component of bond spread as the difference in bond yield between a bond with average liquidity and a very liquid bond, in order to compare liquidity impact during financial crisis. Helwege, Huang and Wang (2013) use matched pair of bonds that have the same credit risk in order to eliminate credit effects on bond spreads. They use the difference of liquidity proxies of bonds in pair to explain difference spreads of the bonds. They find that price based liquidity proxy reports the highest explanatory power when credit risk is completely controlled.

Studies of corporate bond spread and its relationship with the liquidity are limited. He and Nasser (1999) used bond turnover as liquidity proxy to study about factors that influence liquidity in Thai bond market. They found that credit rating of the bonds is the most significant factor affecting the liquidity of the bonds. Putpongpithak (2004) studies the determinants of the credit spread changes using eight bonds to represent bond in each rating group. Market trading volume used in this study as liquidity proxies do not show significant power in explaining the credit spread change. Kongtoranin (2013) found that market liquidity and credit spread of the AA and A rating groups are found to be negatively correlated with the change of the credit spread using Markov switching model.

DATA

The corporate bond data are obtained from The Thai Bond Market Association (ThaiBMA). Only quotes on straight bonds—non-callable, non-putable bonds will be used since the callability and putability of corporate bonds will strongly influence the credit spread changes (Dufee 1998). Bond with sinkable features also be eliminated from the sample to ensure that bonds in match pair have the same credit risk. Transaction observations are used for the period from March 2002 to December 2013 and only observations with actual quotes are used.

Government bond yields with equivalent maturity to bond studies in the sample are from Reuter's database. In order to calculate "corporate bond spread" which reflects the compensation that risk-averse investors demand for their money in risky security.

The goal is to identify pairs of bond with identical credit risk features but which vary in the degree of liquidity. Thus, bonds in each pair must be issued by the same firm and have the sane coupon type and credit rating. The pairs are required sufficiently close time-to-maturity and coupon rate. In order to create minimal differences in credit risk of two bonds, time to maturity and coupon difference are limited at 0.6 year and 1.5%, respectively. Bonds that are missing in data or liquidity-related variables are removed from the sample.

Proxy

In this study, the following six liquidities will be used by measuring based on prices, trading activities and bond features: *Percentage of zero trading days*, *Bond size*, *Bond age*, *Cumulative trading volume*, *Range* and *Inter-quartile Range* (*IQR*). The *Percentage of zero trading days* is defined as the number of zero return days in the previous month. The sources of liquidity estimate data comes from ThaiBMA.

The first group is liquidity proxies based on bond feature are *Size* and *Age* proposed by several researchers such as Crabbe and Turner (1995), Hong and Warga (2000), Alexander

(2000) and Goldstein (2007). The larger the bond issue (*Size*), the larger the number of investors who own the bond and therefore the lower the search costs.

Liquidity proxies based on trading activity used in this paper are *Cumulative trading volume* and *Percentage of zero trading days.* The *Percentage of zero trading day* is defined as the number of zero trade day of the bond in 30 days previous.

The last group of liquidity proxies is derived from bond price are *Range,* and *Inter-quartile Range*. Range is defined as follows:

$$Range_t^i = \frac{\frac{max_j(p_{j,t}^i) - min_j(p_{j,t}^i)}{\overline{p_t^i}} \times 100}{Q_j^i} \qquad (1)$$

Where $p_{j,t}^i$ is the price from trade j on day t for bond i; $\overline{p_t^i}$ is the average price of bond i on day t; and Q_j^i is the total trading volume of bond i on day t. The measure gives the volatility in price caused by a given volume of trades. The logic behind this is that less liquid bonds tend to have higher price volatility for a given level of trading volume.

The inter-quartile range *(IQR)* is defined as the difference between the 75th percentile and 25th percentile of prices for one day normalized by the average price on that day. That is,

$$IQR_t^i = \frac{p_t^{i,75th} - p_t^{i,25th}}{\overline{p_t^i}} \times 100 \qquad (2)$$

This measure should be affected more by the bid-ask spread than *Range* since price volatility is mostly a result of the bid-ask bounce when there is no information about fundamentals. Information about credit risk should lead to larger price movements, and this variation is more likely to be eliminated by using the 75th and 25th percentiles. This method is an indirect measure of bid-ask spread or roundtrip cost measure in Dick-Nielsen (2012). The data should be less sensitive to outliers than *Range* since *IQR* is less subjected to the influence of extreme value.

Table 1: Summary statistics about bonds in the full sample

Variable	Mean	Std Dev	P10	P25	P50	P75	P90
Panel A: Full sample (n = 3,622)							
Yield to maturity (%)	3.80	1.02	2.60	3.17	3.70	4.35	5.30
Coupon (%)	4.63	1.31	3.30	3.70	4.40	5.25	6.00
Corporate bond spread (%)	0.83	0.66	0.25	0.43	0.66	1.02	1.72
Bond age (yr)	1.58	1.33	0.23	0.58	1.27	2.25	3.29
Issue size (฿ m.)	5434	4916	1200	2000	4000	7000	10000
Range (%)	0.02	0.28	0.00	0.00	0.00	0.00	0.01
IQR (%)	0.04	0.16	0.00	0.00	0.00	0.02	0.07
Zero trading days (%)	0.90	0.10	0.77	0.87	0.93	0.97	1.00
Cumulative trading volume (฿ m.)	55.83	105.20	1.50	5.00	20.00	60.00	130.00
Panel B: Sample omitted zero-range and zero-IQR (n = 908)							
Yield to maturity (%)	3.99	1.08	2.65	3.35	3.90	4.60	5.65
Coupon (%)	4.87	1.44	3.33	3.95	4.60	5.79	6.17
Corporate bond spread (%)	0.92	0.70	0.29	0.47	0.73	1.10	1.98
Bond age (yr)	1.51	1.24	0.22	0.62	1.19	2.07	3.35
Issue size (฿ m.)	4413	4217	1000	1800	3000	5500	10000
Range (%)	0.05	0.24	0.00	0.00	0.00	0.01	0.06
IQR (%)	0.08	0.25	0.00	0.01	0.02	0.06	0.18
Zero trading days (%)	0.90	0.11	0.73	0.87	0.93	1.00	1.00
Cumulative trading volume (฿ m.)	57.68	96.91	2.20	10.00	28.00	60.00	121.00

Table 1 shows summary statistic about bond in the sample. In panel A reports figures for the whole sample of bonds that used to matched pairs result in 3,622 bonds. The typical yield spread is 0.66% and the mean spread is 0.82%. The median issue size is THB 4,000 million. Most of bonds were issued within 1.27 years. Cumulative trading volume in previous 30 days is quite low, with a median value at 20 million Baht and mean value at 55.83 million Baht. More than half of bonds have zero value of *Range* and *IQR*. This means that most of bonds in the sample have only one transaction on each trading day.

For more meaningful results, bonds that have more than 2 trades per day are used. Panel B reports figures for the same sample of bonds as in panel A but dropped the bonds that have zero value of *Range* and *IQR*. As result in panel B, 908 bonds show higher median Cumulative trading volume from THB 20 million to THB 28 million.

Table 2: Summary statistics about bonds in the matched pair sample

Variable	Mean	Std Dev	P10	P25	P50	P75	P90
Panel A: All bond pairs (n = 1811)							
Age diff.	-0.13	1.28	-1.35	-0.59	0.00	0.44	1.00
Size diff.	-320	3662	-3500	-1100	0.00	1000	3000
Range diff.	0.00	0.17	0.00	0.00	0.00	0.00	0.01
IQR diff.	0.01	0.22	-0.03	0.00	0.00	0.01	0.05
Zero trading days diff.	-0.01	0.11	-0.13	-0.07	0.00	0.03	0.10
Cumulative trading volume diff.	7.14	155.61	-83.20	-19.50	0.00	30.00	110.00
Panel B: Absolute value of all bond pairs (n = 1811)							
Abs (Age diff.)	0.81	1.00	0.00	0.15	0.50	1.01	1.91
Abs (Size diff.)	2085	3027.	0.00	160	1000	2800	5000
Abs (Range diff.)	0.02	0.16	0.00	0.00	0.00	0.00	0.02
Abs (IQR diff.)	0.05	0.20	0.00	0.00	0.00	0.03	0.11
Abs (Zero trading days diff.)	0.07	0.07	0.00	0.03	0.07	0.10	0.20
Abs(Cum. trade volume diff)	71.98	138.13	0.60	5.00	20.60	73.60	194.40

Variable	Mean	Std Dev	P10	P25	P50	P75	P90
Panel C: Bond pairs omitted zero-Range and zero-IQR (n = 454)							
Age diff.	-0.12	1.23	-1.15	-0.56	0.00	0.37	1.00
Size diff.	-761	3985	-5000	-1500	0.00	800	3000
Range diff.	0.00	0.28	-0.02	0.00	0.00	0.00	0.03
IQR diff.	0.01	0.32	-0.07	-0.01	0.00	0.02	0.10
Zero trading days diff.	-0.01	0.13	-0.13	-0.07	0.00	0.03	0.10
Cumulative trading volume diff.	-0.76	3.99	-5.00	-1.50	0.00	0.80	3.00

Panel D: Absolute value of bond pairs omitted zero-Range and zero-IQR (n = 454)							
Abs (Age diff.)	0.73	1.00	0.00	0.04	0.44	1.00	1.50
Abs (Size diff.)	2386	3280	0.00	180	1005	3190	7000
Abs (Range diff.)	0.06	0.28	0.00	0.00	0.00	0.01	0.09
Abs (IQR diff.)	0.09	0.31	0.00	0.00	0.02	0.06	0.16
Abs (Zero trading days diff.)	0.07	0.08	0.00	0.00	0.07	0.10	0.20
Abs(Cum. trade volume diff)	53.31	84.55	0.30	7.00	25.00	65.00	130.00

Table 2 shows statistics related to the matching process. The panel A and B report figures of 1,811 pairs of bond that passes matching criteria. Panel A reports difference value of each liquidity proxies within a pair, while panel B reports absolute value of them. Panel C and D report difference value and absolute difference of 454 matched pairs from sample after dropped bonds with zero Range and IQR.

METHODOLOGY

The approach used in this paper for evaluating liquidity effects while holding constant the effects of credit risk is using matched pairs of bonds. By identify pairs of bonds from the same issuer with the same time to maturity, same coupon (level, type and coupon frequency), and same credit rating. In matching process, bond will be drawn from the sample and used only once if the bond match with others using matching criteria. Data from actual quotes are used in order to compare the spreads of 2 bonds in pair. Thus, the difference between the spreads is exactly the difference in the bonds' liquidity premiums. This methodology is essentially a pairwise difference model that removes unobservable factors (credit risk) which are common to each bond in the matched pair. The comparison of the liquidity-proxy coefficients of the following two models:

$$Bond\_Spread_{jt} = \alpha + X \times Credit\ rating\ dummies + \beta \times Liquidity\_proxy_{jt} + \varepsilon_{jt} \quad (3)$$

$$Diff\_Spread_{it} = \alpha + \beta \times Diff\_Liquidity_{it} + \varepsilon_{it} \quad (4)$$

$Diff\_Spread_{it}$ is the difference in spreads of bond pair i on day t, and $Diff\_Liquidity_{it}$ is the difference in illiquidity proxies of bond pair i on day t. While credit risk proxies are included in Eq (3), they do not perfectly measure the impact of default risk on the bond spread. In Eq (4), the credit risk is completely eliminated; the coefficient on $Diff\_Liquidity_{it}$ should be an unbiased estimate of β and thus should isolate the effects of liquidity on corporate spreads without effect from credit risk effects. This paper will investigate whether the two estimates of β are the same, and therefore how well liquidity proxies measure the liquidity component of the yield spread using the six liquidity proxies mentioned earlier.

EMPIRICAL TESTS

This empirical approach focuses on two main tests. In order to study whether liquidity proxies are affected by credit risk, this paper uses pooled regression comparing coefficient estimates from Eq (3) and Eq (4). Moreover comparing R-square from models of each proxy alone allow us to us to determine which of these variables best captures the liquidity component of bond spreads.

Table 3 shows the estimated effects of liquidity on bond spreads obtained from pooled regression based on Eq. (3). This test shows marginal effect of each liquidity proxies as well as all proxies together in order to perform horse race between models. Credit rating dummy alone, in Model 1 as the base case, can explain bond spreads about 30.56%. The coefficients of each rating dummy increase as they decrease in credit qualities (AAA, AA, A, BBB and BB, respectively). Model 2 to Model 8 show regressions of bond spreads on each liquidity proxies together with credit rating dummy. For individual proxy performance, *Size* (Model 3) results in significant coefficient and highest adjusted R-square at 33.69%. Following by *IQR* (Model 5) and *Percentage of zero trading days* (Model 6), they explain bond spreads for 32.20% and 31.20%, respectively. These three proxies are from bond characteristic base, price base and trading activity base with correct signs.

Though *Size, IQR* and *Percentage of zero trading days* are individually significant, including all three proxies in Model 9 shows adjusted R-square 35.74%. Model 8, including only *Size* and *IQR*, report adjusted R-square at 35.76% with similar sign as expected. Coefficient of Size and IQR are – 0.15 and 0.415, respectively. For every 1 log value of bond issue size increase, the spread should decrease 0.15%. When bond issue size is THB 5,000 million, log value is 9.47; bond spread should decrease for 1.42%.

Model 10 is the regression of bond spreads with credit dummy and all liquidity proxies using data sample omitting zero-*Range* and zero-*IQR*. While Model 12 uses full sample data (before dropping zero-*Range* and zero-*IQR*). The results show that after dropping the missing data of price, adjusted R-square improves almost double from 18.52% to 35.94%. The Model 10 gives the highest explanatory power for bond spreads.

Table 4 shows the results of regressions (Eq.4) from matched pairs—namely pairwise. Model 13 to Model 18 show regression of each liquidity proxy alone after credit risk is completely controlled. The coefficient of *IQR* (Model 16) and *Size* (Model 14) alone are significant with outstanding adjusted R-square at 16.08% and 6.82%, respectively. When combined these two proxies in Model 19, the coefficient of both proxies are significant with correct sign and yield 20.54% of adjusted R-square. When eliminating credit effects, price base and bond characteristic information can explain bond spread significantly

Model 22 regresses bond spreads with all liquidity proxies using data sample omitting zero-*Range* and zero-*IQR*. While Model 22 uses full sample data (before dropping zero-*Range* and zero-*IQR*). Adjusted R-square from Model 21 at 20.34% jumped from 6.82% of Model 22. The pattern is similar to that seen in table 3 which is more complete in price information of data sample helps improve explanatory power of the model.

In comparing between pooled regression and pairwise regressions, Model 8 and Model 19 were chosen to be the representative of each regression equation. The coefficients of *Size* and *IQR* from pairwise regression are not difference between these two models. For example, the coefficients of the *Size* are -0.14 and -0.18.

Table 3:The marginal effect of liquidity proxies on pooled regression model (Eq. 3)

	Model1	Model2	Model3	Model4	Model5	Model6	Model7	Model8	Model9	Model10	Model11	Model12
Constant	0.544**	0.548**	1.687**	0.541**	0.532**	0.0113	0.489**	1.752**	1.610**	1.145**	0.531**	1.087**
	(0.05)	(0.058)	(0.18)	(0.05)	(0.05)	(0.181)	(0.13)	(0.17)	(0.21)	(0.36)	(0.02)	(0.18)
Rating AA_Dummy	0.284**	0.282**	0.335**	0.285**	0.265**	0.325**	0.281**	0.319**	0.312**	0.335**	0.260**	0.266**
	(0.06)	(0.07)	(0.06)	(0.06)	(0.06)	(0.07)	(0.06)	(0.06)	(0.06)	(0.06)	(0.03)	(0.03)
Rating A_Dummy	0.359**	0.359**	0.381**	0.355**	0.339**	0.389**	0.359**	0.359**	0.362**	0.375**	0.342**	0.331**
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.02)	(0.02)
Rating BBB_Dummy	1.89**	1.890**	1.857**	1.868**	1.853**	1.922**	1.892**	1.811**	1.814**	1.825**	1.477**	1.411**
	(0.09)	(0.10)	(0.09)	(0.10)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.06)	(0.06)
Rating BB_Dummy	2.629**	2.628**	2.565**	2.623**	2.545**	2.620**	2.632**	2.466**	2.474**	2.489**	2.768**	2.522**
	(0.41)	(0.41)	(0.4)	(0.41)	(0.40)	(0.41)	(0.41)	(0.39)	(0.39)	(0.39)	(0.25)	(0.24)
Age		-0.002								0.019		-0.012
		(0.01)								(0.02)		(0.01)
Log Size			-0.14**					-0.15**	-0.156**	-0.148**		-0.063**
			(0.02)					(0.02)	(0.02)	(0.023)		(0.01)
Range				0.141						0.128		0.009
				(0.08)						(0.08)		(0.03)
IQR					0.370**			0.415**	0.420**	0.398**		0.515**
					(0.07)			(0.07)	(0.07)	(0.07)		(0.06)
Percentage of zero trade days						0.560**			0.155	0.256		0.262
						(0.18)			(0.19)	(0.20)		(0.11)
Log volume							0.005			0.028		-0.027**
							(0.01)			(0.01)		(0.01)
Adj. R-square	30.56%	30.48%	33.69%	30.72%	32.20%	31.20%	30.49%	35.76%	35.74%	35.94%	15.62%	18.52%
Obs	908	908	908	908	908	908	908	908	908	908	3622	3622

In Eq.3 bond spreads are regressed with credit rating dummy and liquidity proxies. Rating AAA is omitted as the constant. Associated standard errors appear beneath each liquidity proxy's coefficient estimate. '*' and '**' denote values are significantly difference from zero at 5% and 1%, respectively.

Table 4: The marginal effect of liquidity proxies on pairwise difference model (Eq. 4)

	Model13	Model14	Model15	Model16	Model17	Model18	Model19	Model20	Model21
Constant	0.084**	0.062**	0.084**	0.078**	0.087**	0.084**	0.060**	0.062**	0.013
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)
Age	-0.005							0.007	-0.002
	(0.01)							(0.01)	(0.01)
Log Size		-0.179**					-0.146**	-0.151**	-0.080**
		(0.03)					(0.03)	(0.03)	(0.01)
Range			0.187					0.118	-0.071
			(0.07)					(0.07)	(0.055)
IQR				0.574**			0.534**	0.516**	0.409**
				(0.06)			(0.06)	0.061	(0.04)
Percentage of zero trading days					0.25			0.003	0.062
					(0.19)			(0.18)	(0.09)
Log volume						0.010		0.017	-0.021**
						(0.01)		(0.01)	(0.01)
Adj. R-square (%)	0.02%	6.82%	1.10%	16.08%	0.13%	0.09%	20.54%	20.34%	6.82%
Obs	454	454	454	454	454	454	454	454	1811

In Eq.4 bond difference spreads are regressed with difference of liquidity proxies in matched pairs. Associated standard errors appear beneath each liquidity proxy's coefficient estimate. '*' and '**' denote values are significantly difference from zero at 5% and 1%, respectively.

CONCLUSION

This paper aims to study about liquidity impact on bond spreads of Thai corporate. This is achieved by using pairs of bonds which have the same credit risks in order to eliminate the effects of credit on spreads. Coefficients of matched pair model are quite similar to that of pooled regression model. Both approaches should explain bond spread indifferently. During the time of crisis when liquidity dried up, credit rating may not have as much impact in determining the bond spread. Therefore in such circumstance, using matched paired model which does not include credit rating proxy may be more appropriate. Results also show that price based proxy (*IQR*) and bond features based proxy (*Issue Size*) give the highest significant explanatory power for both pooled regression and matched pair regression.

The possible explanations of the result are that, first, issuing size (*Size*) is one of the main considerations for bond investors. When searching costs are in concern, the seller passes on this cost in selling price. Second, *IQR* is similar to roundtrip costs according to Dick-Nielsen (2012). Since there are limited number of corporate bond market participants in Thailand. The institutional investors who have large trading volume dominate the market. When dealers execute sizable trades, they pay some costs which reflect in bond spreads.

This research has shown how liquidity may have a meaningful impact on corporate bond spreads. The results should prove useful to bond investors and dealer who can use the proxy's coefficient to make a more calculated estimation of the impact when purchasing or selling a bond in relation to varied liquidity information. The findings in this paper should also assist regulators when they monitor market liquidity and important movements and changes. This should also contribute to Thai academic for further study about the liquidity impact in corporate bond market.

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