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Bond Market Liquidity in Thailand

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ABSTRACT

Bonds are an attractive investment choice. If the bond market has a high level of liquidity, it will attract both local and foreign investors. Therefore, identifying its liquidity level is vital to the decision-making process for investors. This study presents a method for measuring the liquidity in the Thai bond market by analyzing 64 monthly government bond series from 2006 to 2015. Liquidity is measured using two main components. The first is tightness, reflecting the trading cost, and the second is depth, reflecting the trading volume to outstanding bonds. The results show that bond market liquidity is high when taking trading cost into consideration. However, it can be low when taking account of the trading volume to outstanding bonds.

Bonds issued in large quantities have more liquidity. The short to medium term bonds have more liquidity than long-term, whereas benchmark bonds have more liquidity than non-benchmark. In order to increase liquidity in the Thai bond market, regulations should be put in place to stimulate trading volume in the secondary market, especially for non-benchmark, short and long-term bonds, and those issued in smaller quantities, by implementing attractive investment policies and increasing the series of outstanding bonds.

Keywords : Bond market liquidity, Tightness, Depth.

Introduction

After the 1997 Asian financial crisis, several countries emphasized the need for bond market development (Asian Bonds Online, 2003). The emerging market, consisting of Thailand, China, Hongkong, Indonesia, Korea, Malaysia, the Philippines, Singapore, and Vietnam, involved continuous fundraising through the issue of bonds. The average total growth rate of the outstanding values of bonds in these countries from 2004 to 2015 was between 13.0% to 82.1%.

The outstanding value of government and corporate bonds to GDP was between 13.0% to 55.4% and 0.7% to 78.6%, respectively as at the end of 2015 [Figure 1]

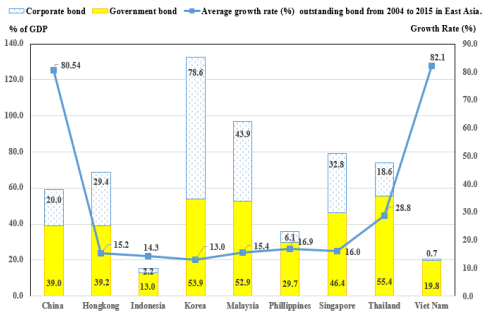

Figure 1. Percentage of outstanding bonds to GDP and average growth rate from 2004 to 2015 for countries in East Asia

Following the financial crisis, fundraising via the Thai bond market showed a significant increase (Chabchirchaidol and Panyanukul, 2005). The government sector shows higher growth than the private sector with 28.8% of the average growth rate from 2004 to 2015. In 2015, the total outstanding value of bonds to GDP in Thailand was 74.0% [Figure 1]. The outstanding values of government bonds were greater than those corporate bonds [Figure 2].

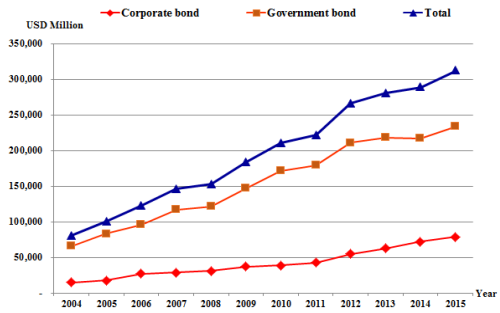

Figure 2. Outstanding values of government and corporate bonds

If the bond market has liquidity, its efficiency will improve because of low trading costs and active and rapid transactions (Darst, 1975, O'Hara, 1995, and Muranaga and Shimizu, 2000), facilitating easier access and affordability for public and private sector fundraising. This results in a reduction in the cost of funds and more efficient use of the Central Bank's monetary policies (Committee on the Global Financial System, 1999, Endo, 2003, and Kapingura, 2011).

In the past, the Thai government and its related departments have supported an

increase in Thai bond market liquidity with the issue of several types of bond as well as regulatory improvements in the bond trading process, and establishing a department to monitor bond trading, with the objective of attracting both local and foreign investors, as well as fundraisers. Thus, information on liquidity is important for investors and fundraisers during the decision-making process. Moreover, the government authorities controlling and developing the Thai bond market could use such information for future policy adjustment. According to Sarr and Lybek (2002), and Oxelheim and Rafferty, (2004), bond market liquidity has several components, and in order to measure it, certain factors should be considered to improve the credibility of the results during the measurement process. This paper proposes a method for measuring the liquidity in the bond market by considering two components simultaneously: trading cost and trading volume to outstanding bonds. The first section of this paper considers the concept of liquidity in the bond market. Secondly, an overview of the Thai bond market is presented, with the third section suggesting a research method for measuring bond market liquidity. The fourth section shows bond market liquidity results, with the conclusion and recommendations presented in the final section.

Market Liquidity Concept and Reviews

Darst (1975) and O'Hara (1995) defined the liquidity market as it offers rapid transactions and low trading costs. According to Harris (2003) and Sarr and Lybek (2002), trading costs related to explicit transactions such as broker trading fees, government tax, trading expenses, and the implicit transaction costs in relation to increased trading, resulting from volatility in the bond price, including inventory risk and asymmetric information.

Kyle (1985), Upper (1998), the Committee on the Global Financial System, (1999), and Gray and Talbot (2006) concluded that there are three components in the liquidity market: tightness, depth, and resilience. Tightness refers to the difference between the actual buying and selling price of securities. If the difference in value is narrow, the trading cost will be low. Market depth refers to the trading volume at a price sufficient for an active transaction to result in low changing values compared to a previous transaction. Resilience means the speed at which the price of the security is readjusted back to its original value in order to avoid volatility. However, Upper, (1998), Borio (2000), and D'Souza and Gaa (2004) added the

immediacy as a further component of the liquidity market, referring to the speed of trading transactions after the execution of an order.

This paper defines bond market liquidity as low transactional costs and active trading volume with less price fluctuation, in accordance with the concept of Darst (1975) and O'Hara (1995). Thus, the liquidity of the bond market is measured by considering the two components of tightness and depth. It then uses this information to generate a composite index for indicating the overall liquidity level of the bond market. The majority of previous studies measured liquidity by using only the tightness component. Sarr and Lybek (2002) mentioned the proper use of bid-ask spread when measuring trading cost since it can reflect the entire cost structure, whether in relation to trading, operations, or asymmetrical information. In addition, it can represent market structure. This means that if the bid-ask spread is low, the bond market will be relatively competitive. However, the negative impact of using a bid-ask spread is the limitation of trading quantities and the time period of the offer or bid. In order to measure liquidity in terms of depth, the executed trading volume can be measured by calculating its ratio of trading volume to outstanding bonds, in accordance with the concept presented by Sarr and Lybek (2002).

Overview of theThai Bond Market

In 1933, the Ministry of Finance issued its first bond with a ten-year maturity at a total value of THB 10 million, and the issue of long-term bonds continued to compensate for the budget deficit. The government needed the funds for infrastructure development in the industry sector. Since 1990, the government has not needed to issue any further bonds since they have a budget surplus. As a result, liquidity in the secondary market was lower, due to a lack of new issues. By law, financial institutions are required to hold bonds in reserve and the lack of supply is caused by holders not wishing to sell.

Subsequently, The Stock Exchange of Thailand (SET) issued the Securities and Exchange Act C.E. 1992 in order to increase the opportunity for private companies to raise funds directly from the general public by issuing stocks and corporate bonds. This led to an increase in the importance of corporate bonds for private sector fundraising.

Bonds used in Thai bond market trading are classified into two main types: government and corporate debt securities. The debt securities are issued by the public sector, including government bonds. Treasury bills are issued by the Ministry of Finance, state agency bonds by the Bank of Thailand,

and state-owned enterprise bonds by State Enterprises. Bonds with a maturity date of one year or longer are set to pay coupons periodically. The coupon payment is usually made semi-annually. In contrast, treasury bills and certain state agency bonds with a maturity date of one year or less do not pay coupons, and are therefore traded at less than face value which refers to discount bonds. The bonds issued by the private sector consist of discount bonds, and those with a periodical coupon payment. Figure 3 shows that outstanding values of government bonds achieve the highest ratio, followed by state agency bonds. The outstanding values of corporate bonds increase slightly each year. In 2015, a total of 132 companies issued corporate bonds, an increase of 42 from 2014. It can be clearly observed that the private sector has started to move funds toward the bond market.

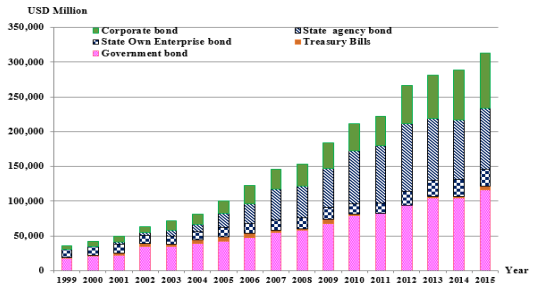

Figure 3. Outstanding bond values classified based on type

When the government has higher expenditure than income, it must find the necessary financial resources to compensate the budget deficit. The bond market presents an alternative to loans. From 2002 to 2015, the government raised funds nationally by issuing bonds for sale to the private sector and financial institutions. The average amount of funds raised through the bond market during that period was 20.57% of annual government expenditure [Figure 4].

Most trading in Thailand from 2002 to 2015 consisted of state agency bonds with maturity of one year or less, followed by government bonds with maturity more than one year. The majority of trades were carried out between dealers and their clients, including asset management organizations, foreign investors, and insurance companies. The highest average daily trading value in Thailand was USD 2,586.86 million in 2013 [Figure 5].

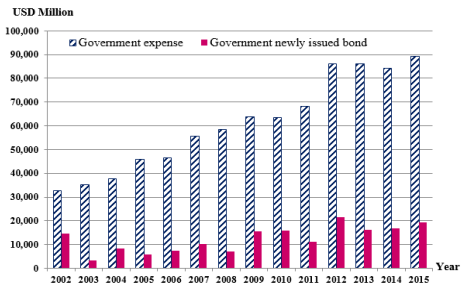

Figure 4. Government expenditure and fundraising income through the bond market

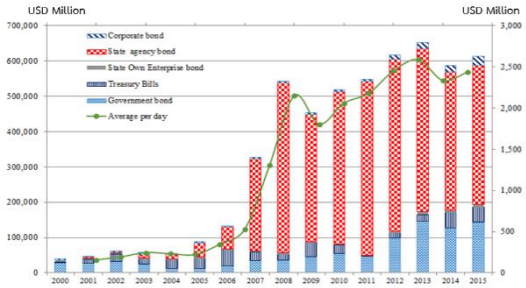

Figure 5. Bond trading volume in the secondary market

The government organization responsible for the Thai bond market consists of the Ministry of Finance, Bank of Thailand, and The Stock Exchange of Thailand. The Ministry of Finance's responsibility is to establish national financial management policies, manage the financial system, financial markets, and overall capital market, as well as generating income, organizing fundraising and controlling the assets and debts of the government. It has therefore become the largest issuer in Thailand's economic system. The Public Debt Management Office (PDMO) operates under the Ministry of Finance and controls the systematic issue of government bonds. The PDMO evaluates the appropriate period and size of the capital required in the issue of new bonds to ensure the value does not exceed the government's funding requirements and the debt can be properly repaid.

The Bank of Thailand (BOT) is responsible for setting interest rate policy, enabling the public and private sectors to acknowledge economic trends. In addition, the BOT operates as underwriter for government bonds and controls the money supply using several tools, one of which is the issue of bonds.

It is the responsibility of the Stock Echange of Thailand (SET) to direct and develop a national capital market in accordance with the Securities and Exchange Act C.E. 1992, to monitor the registration of newly issued security debt in the private sector. The Thai Bond Market Association (ThaiBMA) is appointed by the SET to monitor security debt in the secondary market.

Research Method

1. Data Collection

This study focuses only on government bond trading from 2006 to 2016. Emphasis is placed on 2006 since it was the year that Thai Bond Market Association and Bank of Thailand gained permission to operate and manage the security business and control bond trading in the secondary market. The data in this study is colled monthly by 64 series of government bonds. The information was collected from the Thai Bond Market Association and Bank of Thailand, including trading volume to outstanding bonds, and quoted bid-ask spread in terms of yield.

2. Methodology

As previously mentioned, the market liquidity indicator consists of two main components: tightness and depth. Tightness reflects the trading cost calculated from the quoted bid-ask spread in terms of yield applied from Borio, 2002, Sarr and Lybek, 2002, and Harris, 2003.

Sarr and Lybek (2002) mentioned that the measurement of bond market liquidity in terms of depth can be calculated by the bond turnover ratio. If the bond turnover ratio is high, market liquidity will also be high. This is because there is sufficient volume to enable buyers and sellers to trade easily.

$$MEI_{LI} = \alpha(MEI_{TI}) + (1 - \alpha)(MEI_{DE}) \quad (1)$$

$$MEI_{TI} = \frac{\sum_{t=1}^{T} MEI_{TLt}}{T} \quad (2)$$

$$MEI_{TI,t} = \frac{\sum_{i=1}^{N} (1 - \frac{BAS_{i,t} - BAS_i^{min}}{BAS_i^{max} - BAS_i^{min}})}{N} \quad (3)$$

$$MEI_{TI,t} = \frac{\sum_{i=1}^{N} (1 - \frac{BAS_i^{min} - BAS_{i,t}}{BAS_i^{max} - BAS_i^{min}})}{N} \quad (4)$$

$$BAS_{i,t} = Ybid_{i,t} - Yask_{i,t} \quad (5)$$

$$BAS_i^{max} = Max \left| Ybid_{i,t} - Yask_{i,t} \right|$$

$$BAS_i^{min} = Min \left| Ybid_{i,t} - Yask_{i,t} \right|$$

$$MEI_{DE} = \frac{\sum_{t=1}^{T} MEI_{DE,t}}{T} \quad (6)$$

$$MEI_{DE,t} = \frac{\sum_{i=1}^{N} (\frac{Tn_{i,t} - Tn_i^{min}}{Tn_i^{max} - Tn_i^{min}})}{N} \quad (7)$$

$$Tn_{i,t} = \left(\frac{V_{i,t}}{O_{i,t}}\right) \quad (8)$$

$$Tn_i^{max} = Max \left(\frac{V_{i,t}}{O_{i,t}}\right)$$

$$Tn_i^{min} = Min \left(\frac{V_{i,t}}{O_{i,t}}\right)$$

Where

MEI_{LI} is the total liquidity score in the bond market. MEITI and MEIDE refers to the total liquidity score in the bond market in terms of tightness and depth, respectively. $MEI_{LI,t}$ relates to a score which indicates liquidity in the bond market at time t. $MEI_{TI,t}$ and MEIDE,t refer to the liquidity in the bond market in terms of tightness and depth respectively. MEI_{LI}, MEI_{TI}, MEI_{DE}, $MEI_{LI,t}$, $MEI_{TI,t}$, and $MEI_{DE,t}$ scores range from 0 to 1. If these are high, liquidity, tightness, and depth values will also become higher. α is the weight of tightness and (1- α) is the weight of depth ($0 \leq \alpha \leq 1$). $BAS_{i,t}$ refers to the quoted bid-ask yield spread of bond i at time t. $Y_{bidi,t}$ and $Y_{aski,t}$ refer to the quoted bid and ask yields of bond i at time t respectively. BAS_i^{max} is the difference values between the average quoted bid-ask spread yield, with the

maximum value of bond i. BAS_i^{max} is the difference values between the average quoted bid-ask spread yield with the minimum value of bond i.

$Tn_{i,t}$ is the volume of trading to the outstanding bonds i at time t. $O_{i,t}$ is the outstanding bonds of bond i a time t and Tn_i^{min} represents the minimum bond

MEI_{LI}, MEI_{TI}, MEI_{DE}, $MEI_{LI,t}$, $MEI_{TI,t}$, and $MEI_{DE,t}$ are classified into five different levels : 0.0000 – 0.1999 is the lowest, 0.2000 – 0.3999 is low, 0.4000 – 0.5999 is moderate, 0.6000 – 0.7999 is high, and 0.8000 – 1.0000 is the highest.

Research Results

Table 1 shows the liquidity level reflecting the Thai bond market operation from 2006 to 2015, consisting of tightness and depth. Tightness refers to bond trading costs while depth represents bond trading volume. The result of this study shows that the Thai bond market had a high level of liquidity in term of tightness with an average score of 0.6630. In term of depth, the average score was 0.1170, which is classified as being in the lowest level. When tightness and depth are weighed equally, the liquidity of the Thai bond market is low.

The quoted bid-ask yield spread equals 7.62 basis points (bps.) (1 basis point = 0.01%). If it becomes narrow, trading costs will be low. On the contrary, if it widens, trading costs will be high. The trading volume to outstanding bonds equals to 0.1170. This means that if 100 bond units are issued, 11.7 of these will be traded in the secondary market.

Table1. Thai Bond Market Liquidity Score, 2006–2015

Year	Bid Ask Spread (bps.) Z(bps.)	MEI_{TI} score	Turnover Ratio (time)	MEI_{DE} score	MEI_{LI} score
2006	5.55	0.7869	0.0908	0.1979	0.4924
2007	6.65	0.7158	0.0853	0.1538	0.4348
2008	9.11	0.5593	0.0647	0.1465	0.3529
2009	9.22	0.5538	0.0709	0.1529	0.3533
2010	8.32	0.5825	0.0688	0.1216	0.3521
2011	8.61	0.6078	0.0541	0.0722	0.3400
2012	7.80	0.7162	0.0763	0.0993	0.4078
2013	6.02	0.7235	0.0721	0.0949	0.4092
2014	8.69	0.7306	0.0552	0.0787	0.4046
2015	8.28	0.7055	0.0715	0.0854	0.3954
Total	**7.62**	**0.6630**	**0.0939**	**0.1170**	**0.3286**

Source : Calculated by author, using data from the Thai Bond Market Association

Figure 6 shows the tightness, depth, and overall liquidity of the Thai bond market when taking the weight of each component equally into account. Trading costs sharply decrease before increasing slightly, and finally becoming stable. The trading volume to outstanding bonds marginally increases after dropping initially. The overall liquidity gradually decreases at the beginning and remains stable before increasing and showing a constant pattern at the end.

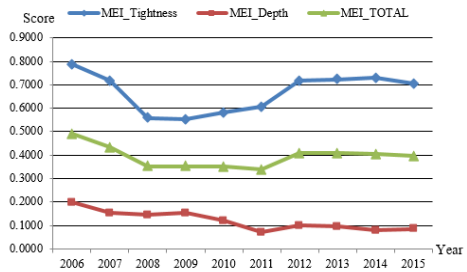

Figure 6. Bond market liquidity in Thailand

Table 2 shows the overall market liquidity of the different weights of each component. Given $0.1 \leq \alpha \leq 0.9$, the model can be used to simulate market liquidity in nine cases. When focusing on the weight of trading cost rather than trading volume ($\alpha >$ 0.5), the overall liquidity will be at the moderate to high level. On the other hand, if the trading volume is equal to or less than the trading cost ($\alpha \leq 0.5$), overall liquidity will be low to lowest.

Table 2. Bond market liquidity showing different weights for each component

α Weight	MEI_{TI} score	MEI_{DE} score	MEI_{LI} score	Liquidity level
$\alpha = 0.1$	0.0663	0.1053	0.1716	lowest
$\alpha = 0.2$	0.1326	0.0936	0.2262	low
$\alpha = 0.3$	0.1989	0.0819	0.2808	low
$\alpha = 0.4$	0.2652	0.0702	0.3354	low
$\alpha = 0.5$	0.3315	0.0585	0.3900	low
$\alpha = 0.6$	0.3978	0.0468	0.4446	moderate
$\alpha = 0.7$	0.4641	0.0351	0.4992	moderate
$\alpha = 0.8$	0.5304	0.0234	0.5538	moderate
$\alpha = 0.9$	0.5967	0.0117	0.6084	high

Note : Weight of tightness component is α

The liquidity of the Thai bond market as shown in Table 5 can be classified into three groups: issue size, tenor bond and benchmark bond, and non-benchmark bond, given as α = 0.5 (1 - α = 0.5). Bonds with issues larger than USD 1,500 million have more liquidity than those of USD 1,500 million or less.

Bonds with maturity dates of ten years or less have more liquidity than those with maturity more than 10 years. Benchmark bonds have more liquidity than non-benchmark.

In identifying Thai bond market liquidity according to issue size, the quote bid-ask spread in bond issues larger than USD 1,500 million was found to be less than those of USD 1,500 million or smaller. The trading volume to outstanding bonds in issues larger than USD 1,500 million is higher than those of USD 1,500 million or smaller. Therefore, large issue bonds have greater liquidity than small.

Bonds with ten-year maturity or less have a smaller quoted bid-ask spread than those with maturity more than 10 years. The trading volume to outstanding bonds with a ten-year maturity date or less is higher than those with maturity more than 10 years. It can be seen that short-term bonds have greater liquidity than long-term.

The quoted bid-ask spread of a benchmark bond is less than the non-benchmark. The trading volume to outstanding bonds in benchmark bonds is higher than non-benchmark. Hence, the benchmark bond has greater liquidity than the non-benchmark.

Table 3. Liquidity of the Thai bond market classified by issue size, length of time to maturity, benchmark, and non-benchmark

Bond	Bid-Ask spread (bps.)	MEI_{TI} score	Turnover Ratio (time)	MEI_{TI} score	MEI_{LI} score
1. Issue size (USD million)					
Issue size > 1,500	7.23	0.6663	0.1419	0.1663	0.4163
Issue size ≤ 1,500	7.98	0.6526	0.0488	0.0725	0.3626
Difference	-0.74	0.0137	0.0930	0.0938	0.0538
2. Tenor (year)					
Tenor ≤ 10 Years	8.36	0.6908	0.4538	0.1315	0.4112
Tenor > 10 Years	8.71	0.6083	0.0988	0.0854	0.3469
Difference	-0.35	0.0825	0.3550	0.0461	0.0643
3. Benchmark and Non-benchmark					
Benchmark	6.88	0.6691	0.2196	0.2486	0.4589
Non-benchmark	8.10	0.6576	0.0692	0.0752	0.3664
Difference	-1.21	0.0115	0.1504	0.1734	0.0925

Remark : Given α - 0.5 and Turnover Ratio refers to the ratio of trading volume to outstanding bonds

Table 4 shows that when different weights are given for each component in bond issues of more than USD 1,500 million, and the weight of trading costs are equal to or more than the weight of trading volume to outstanding bonds ($\alpha \geq 0.5$), the overall liquidity of the bond market was found to be at the moderate to high level. However, bond issues of USD 1,500 million or less were found to be at the moderate level when the given weight of trading costs equals to 0.7 or more ($\alpha \geq 0.7$).

Table 4. Thai bond market liquidity when different weights are given for each component classified by issue size

α Weight	Issue size > USD 1,500 Million		Issue size ≤ USD 1,500 Million		Difference
	MEI_{LI} score	Liquidity level	MEI_{LI} score	Liquidity level	
α = 0.1	0.2163	low	0.1260	lowest	0.0904
α = 0.2	0.2663	low	0.1794	lowest	0.0869
α = 0.3	0.3163	low	0.2329	low	0.0834
α = 0.4	0.3663	low	0.2864	low	0.0799
α = 0.5	0.4163	moderate	0.3626	low	0.0538
α = 0.6	0.4663	moderate	0.3933	low	0.0730
α = 0.7	0.5163	moderate	0.4468	moderate	0.0695
α = 0.8	0.5663	moderate	0.5003	moderate	0.0660
α = 0.9	0.6163	high	0.5537	moderate	0.0625

Table 5 shows that the overall liquidity level of the market when bonds have a ten year maturity date or less, is moderate to high when the given weight of trading costs more than or equals to 0.4 ($\alpha \geq 0.4$). The overall liquidity level of the bond market when bonds with maturity more than ten years is moderate, and the given weight of trading costs is more than 0.6 ($\alpha \geq 0.6$).

Table 5. Thai bond market liquidity when different weights are given for each component, classified by the maturity term

α Weight	Tenor ≤ 10 Years		Tenor > 10 Years		Difference
	MEI_{LI} score	Liquidity level	MEI_{LI} score	Liquidity level	
α = 0.1	0.2906	low	0.1199	lowest	0.1707
α = 0.2	0.3327	low	0.1797	lowest	0.1530
α = 0.3	0.3747	low	0.2394	low	0.1353
α = 0.4	0.4168	moderate	0.2992	low	0.1176
α = 0.5	0.4589	moderate	0.3469	low	0.0925
α = 0.6	0.5009	moderate	0.4186	moderate	0.0822
α = 0.7	0.5429	moderate	0.4784	moderate	0.0645
α = 0.8	0.5850	moderate	0.5381	moderate	0.0469
α = 0.9	0.6270	high	0.5979	moderate	0.0292

Table 6 shows that when the given weight of trading costs for benchmark bonds is more than or equals to 0.4 ($\alpha \geq 0.4$), the liquidity level in the bond market is moderate to high. However, when the given weight of trading costs in non-benchmark bonds more than or equals to 0.6 ($\alpha \geq 0.6$), the liquidity level in the bond market is moderate.

Table 6. Thai bond market liquidity when different weights are given for each component classified by benchmark and non-benchmark bonds

α Weight	Benchmark Group		Non-benchmark Group		Difference
	MEI_{LI} score	Liquidity level	MEI_{LI} score	Liquidity level	
α = 0.1	0.1875	lowest	0.1377	lowest	0.0497
α = 0.2	0.2434	low	0.1900	lowest	0.0534
α = 0.3	0.2993	low	0.2423	low	0.0570
α = 0.4	0.3552	low	0.2946	low	0.0606
α = 0.5	0.4112	moderate	0.3469	low	0.0643
α = 0.6	0.4671	moderate	0.3992	low	0.0679
α = 0.7	0.5230	moderate	0.4514	moderate	0.0716
α = 0.8	0.5789	moderate	0.5037	moderate	0.0752
α = 0.9	0.6348	high	0.5560	moderate	0.0788

Conclusion

The objective of this paper is to measure the liquidity of the Thai bond market by considering the two main components which are tightness and depth. Tightness indicates trading cost and depth refers to trading volume to outstanding bonds. Thai bond market liquidity is found to be high when considering trading costs. Thus, it is at a moderate to high level when investors put more weight on trading costs rather than the trading volume to outstanding bonds.

Larger issue bonds have more liquidity than the smaller. The short to medium term bond has more liquidity than the long-term, whereas the benchmark bond has more liquidity than the non-benchmark. The study results indicate that there is low trading volume to outstanding bonds so the authorities should develop policies to increase trading volume support via the expansion of market participants: both local and foreign. Furthermore, investors should be encouraged by issuing policies to support large bond issues.

References

Asian Bonds Online. (2003). Online : https://asianbondsonline.adb.org/.

Borio, C., (2000). Market liquidity and stress: selected issues and policy implications, Bank for International Settlements Quarterly Review.

Chabchitrchaidol, A. and Panyanukul, S., (2005). **Key Determinants of Liquidity in the Thai Bond Marke**t. Bank of Thailand.

Committee on the Global Financial System, (1999). **Market Liquidity: Research Findings and Selected Policy Implications**. Bank for International Settlements.

Darst, D.M., (1975). **The Complete Bond Book. A Guide to All Kinds of Fixed-Income Securities**. pp 35–53.

D'Souza, C. and Gaa, C., (2004). **The Effect of Economic News on Bond Market Liquidity**.Bank of Canada. Working Paper.

Endo, T., (2003). **Developing Efficient Market Infrastructure and Secondary Market of Government Bonds in Developing Countries.** The World Bank.

Gray, S.T, and Talbot, N., (2007**). Developing financial markets. The Centre for Central Banking Studies,** Bank of England.

Harris, L., (2003). **Trading and Exchanges Microstructure for Practitioners**. Oxford University Press.

Kapingura, F. and Ikhide, S., (2011). **Econometric Determinants of Liquidity of the Bond Market: Case Study of South Africa**. The African Economic.

Kyle, A.S., (1985). Continuous auctions and and insider trading. Econometrica, vol 53, no 6.

Muranaga, J. and Shimizu, T., (2000). Market microstructure and market liquidity. Bank of Japan.

O'Hara, M., (1995). Market Microstructure Theory. Oxford: Basil Blackwell Publishers.

Oxelheim, L. and Rafferty, M., (2005). On the Static Efficiency of Secondary Bond Markets. Journal of Multinational Financial Management. Vol. 15, No. 2

Sarr, A. and Lybek, T, 2002. Measuring Liquidity in Financial Markets. International Monetary Fund, IMF Working Paper Series.

Upper, C., 2001. How safe was the "Safe Haven"? Financial market liquidity during the 1998 turbulences. Deutsche Bundesbank.