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Composite Index of Thailand's Bond Market Efficiency in Terms of Transparency and Liquidity

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ABSTRACT

The bond market offers an important investment alternative for retailand institutional investorswith excess financial resources. Thus, the Thai government exercises a number of policiesfor bond market efficiency to attract local and foreign investors. Since the measurement of bond market efficiency is an important indicator for investors, this research proposes a new composite bond market efficiency index for Thailand by considering two majors components: transparency and liquidity. Liquidity consists of the two subcomponents of tightness and depth. Sixty-four series of Thai government bonds from 2006 to 2015 have been used to examine efficiency. The results indicate that the most important efficiency criterion is transparency, followed by tightness and depth. The bond with a larger issue size is more efficient than the smaller. The bonds which maturity is up to 10 years are more efficient than the bonds which maturity is more than 10 years.Benchmark bonds accredited by the Thai Bond Market Association are highly efficient. This evidence indicates that the authorities should increase overall trading volume by stimulating new market participants.Investors shouldparticipate in benchmark bondswithalarge issue size and shorter tenor. Government should expand the size of outstanding bonds rather than issuing new bondssince large issue bondshave high liquidity, particularly with continuous trading volume resulting in lowerfundraising costsfor both the government and private sector.Moreover, market authorities should promote transparency in the Thai bond market.

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INTRODUCTION

The bond market plays an important role in the financial allocation of business and government sectors, according to Aquilina et al. (2015), Dixon and Holmes (1992), the Committee on the Global Financial System (1999), Borio (2000), Endo (2003), and Kapingura and Ikhide (2011) further explained that bond liquidity can encourage more fundraising at alower cost. In addition, liquidity can have a positive influence on the efficiency of monetary policies because the central bank uses bonds as a tool to absorb it.

The bond market is important because it offers an alternative investment and fundraising source for both the government and private sector. The private sector allocatessuch fundsfor business expansion and the government for national development. These funds enable the economic system to grow.Bond issuing is direct fundraising without intermediacy, resulting in lower financial cost compared to loan acquisition from financial institutions. Bonds issued by the government have lower risk compared to other bonds and this leads to investment confidence. If the bond market is efficient, it will positively affect the economic system.The bond market is important for Thailand's economic system because both the government and private sector use it for significant fundraising. In 2015, 97.39% of the total value of financial instruments issued in Thailand wasin thebond market. The growth rate of the average outstanding bondswas 21.53%per annum, resulting in a third place ranking in the East Asian emerging market from 2004 to 2015. The ratioof outstandingbondsto GDP in 2015 was 55.4%; the highest in the East Asian emerging market (Table 1). If the Thai bond market is efficient in bothtransparency and liquidity, fundraising costs are likely to be lower and market participants will have greater investment confidence,resulting in more fundraising.

Table 1 Average growth rate of outstanding bonds and percentage of outstanding bonds to GDP (% of GDP) in the East Asian emerging market

Country	Average Growth Rate (%) 2004–2015	Outstanding Bonds to GDP (%) in 2015
China	21.94	39.0
Hong Kong	4.86	39.2
Indonesia	4.19	13.0
Korea	3.29	53.9
Malaysia	4.87	52.9
Phillippines	5.80	29.7
Singapore	5.22	46.4
Thailand	21.53	55.4
Vietnam	22.14	19.8

Source: Asian Bonds Online (2016)

The Thai government has introduced diversity with new bond products such asinflation-linked bonds, floating bonds, andamortizing bondsin order to offer more options for investors. Furthermore, authorities have regulations to control the transparency and liquidity of the bond market withthe purpose of lowering trading cost and encouraging investor confidence.The measurement of bond market efficiency in previous studies have mainly focused on liquidity, and as suchdo not fully reflect the actual efficiency in the bond market. Investors and fundraisers in the bond market may therefore have incomplete information about its efficiency. The study by Backberg (2014) focused on the efficiency of the Finnish and Norwegian corporate bond market by considering the transparency and liquidity components. This concept can also be applied to measure efficiency in the Thai bond market.

Oxelheim and Rafferty (2004) mentioned that the measurement of bond market efficiencycontains many important elements. Fama (1970) and Oxelheim and Rafferty (2004) defined information efficiency as animportant element of marketefficiency. Megginson (1997) mentionedt hat both operation a land price efficiency should be included in the measurement. Additionally, Megginson (1997) and Oxelheim and Rafferty (2004) pointed out that allocative efficiency should also be considered. This paper proposes the use of a composite index to measure bond market efficiency in Thailand by considering two major components: transparency and liquidity. Transparency reflects informationand price efficiency. Liquidity is used to represen to perational efficiency.

This paper comprises four sections, the first of which consists of market efficiency concepts and reviews. The second demonst rates anew method for measuring bond market efficiency, and the third presents

the measurement results of bond market efficiency in Thailand. The final contains the conclusion and provides recommendations for improving bond market efficiency in Thailand.

MARKET EFFICIENCY CONCEPTS AND REVIEWS

The concept of market efficiency was introduced by Fama (1970). He defined the hypothesis of an efficient market in terms of information efficiency based on the assumption that every investor could access all available information free of charge. Such investors could equally analyze the value of securities and properly adjust their investment portfolio. Fama's concept is mainly used to measure the efficiency of the stock market. Black (1971) mentioned that an efficient stock market should have low trading costs, active transactions, and responsive stock trading execution. The trading price should be fair, for both minor and major investors. In addition, the movement of the stock price should change without direction. Therefore, investors cannot make accurate predictionsas to stock price. These concepts can be applied in measuring bond market efficiency (Hartzmark et al., 2011). An efficient market is one where the security price cannot be predicted and price movement has no direction. Therefore, investors cannot gain excess profit (Hall and Miles, 1992).

The efficient market hypothesis in terms of information can reflect market transparency. Oxelheim and Rafferty (2004) supported that easier access to information could increase information efficiency, applyinga degree of transparency to measure bond market efficiency.

Bessembinder et al. (2006) stated that market transparency could increase overall efficiency and reflect liquidity, resulting in lower trading cost. Biais et al. (2006) stated that transparency reduced information asymmetries and improved liquidity. Green et al. (2007) and Aquilina et al. (2015) supported that transparency could impact the behaviors of market participants since it createsa more competitive environment and reduces collusion.

Biais et al. (2006) argued that transparency reduces the number of market participants, causing a decline in competition. Edwards et al. (2007) supported that transparency could reduce competition and liquidity due to an increase in transaction cost. The Committee on the Global Financial System (1999) and Aquilina et al. (2015) purport thata market with low transparencyis more beneficial, enabling participants to become more informed and gain additional profits resulting in asymmetrical information. Nevertheless, Aquilina et al. (2015) pointed out that the previous literature could not provide a concrete conclusion on the advantages of transparency because of the characteristics of financial instruments, market structure, and the institutional arrangement of the market.

Burns (1979), O'Hara (1995), and Megginson (1997) defined an efficient market in terms of operational efficiency. Burns (1979) stated that operational efficiency consists of discipline, organizational management quality, and liquidity. Kapingura (2011) mentioned that market liquidity is significant in the bond market operational mechanism. If the bond market does not have liquidity, the bond price will fluctuate and the money supply controlled by the central bank via open market operation cannot function properly.

O'Hara (1995) stated that a liquid market is one where investors can execute security trading responsively. The loss occurring on the sale of securities is at the minimum level, as shown by the price changing slightly prior to the previous trading price. Oxelheim and Rafferty (2004) suggested thatfast response security trading should occur based on the market price. The challenge to market liquidity arises from transaction costs such as brokerage fees, order processing, or transaction tax, including losses from selling securities when the price decreases in the future.

Previous studies have mentioned that a clear conclusion cannot be reached as to the differences in liquidity market dimensions. Kyle (1985) and Mare (2002) pointed out that the two most important dimensions of market liquidity are tightness and depth. Tightness is the degree of trading transactions at low cost. When a new order is placed, the security price should be closed. Depth means that the trading volume has no effect on the securities priceand trading is active and consistent. Similarly, the Committee on the Global Financial System (1999) and Gray and Talbot (2006) indicated that market liquidity consists of three dimensions. The first dimension is tightness, which is the difference in the value of assets. For example, the gap between the quotedbid-ask price should be narrowor the deviation from the mid-market price low. In other words, the cost of trading must be low. The second dimension concerns the depth in which the trading amount has no impact on the market price. In general, a large numberof trading orders could influence the

balance and cause the price to deviate from the norm. Under a market with liquidity, the asset price will not be affected by a large number of trading orders. The third dimension is resiliency, which is the speed of response time taken to adjust the security price back to its regularlevel under normal circumstances. When the security price is affected by both internal and external factors, it will change. Therefore, if the price is immediately returned back to normal, market liquidity will prevail. Upper (2001) and Borio (2000) added another dimension, namely "immediacy" referringto the speed of transaction response after placing an order, meaning that the duration between the issue of a trading order, execution of the transaction, and the security settlement price must be short.

METHODOLOGY

Transparency and liquidity are the two major components in the composite index applied to measure bond market efficiency. Tightness and depth are subcomponents of liquidity. A transparent bond market enables investors to have adequate and fair information when setting their bond trading price. They can also reduce trading costs, according to Bessembinder et al. (2006). The observed yield error (OYE) is used to measure market transparency because it reflects the difference between the expected bond yield (Y^e) and actual bond yield (Y). OYE can be calculated by using equation (1) applied from Diaz and Skinner (2001). Small OYE means better prediction of the bond trading price.

$$OYE_{i,t} = \left|Y_{i,t} - Y^{e}{}_{i,t}\right| \quad (1)$$

$$MEI_{TR\ i,t} = 1 - \frac{(OYE_{i,t} - OYE_i^{min})}{(OYE_i^{max} - OYE_i^{min})} \quad (2)$$

$$MEI_{TR} = \sum_{i=1}^{N} \frac{MEI_{TR\ i,t}}{N} \quad (3)$$

where

$$OYE_i^{max} = \text{Max}\left|Y_{i,t} - Y^{e}{}_{i,t}\right|$$

$$OYE_i^{min} = \text{Min}\left|Y_{i,t} - Y^{e}{}_{i,t}\right|$$

$$i = 1, 2, 3, \ldots, N$$

$Y_{i,t}$ is the actual yield of bond i at time t.$Y^{e}{}_{i,t}$ is the expected yield of bond i at time t which is calculated from its yield curve. The OYE_i^{min} represents the minimum magnitude of the difference between the actual and expected yield calculated from the yield curve of bond i. The OYE_i^{max} refers to the largest difference between the actual and expected yield calculated from the yield curve of bond i. The $MEI_{TR\ i,t}$ represents the score for the transparency component of bond i at time t. N is the number of Thai government bonds issued (64 series). The $MEI_{TR\ i,t}$ is the score for the transparency component of bond i at time t, ranging from 0 to 1 whereas the term $(OYE_{i,t} - OYE_i^{min})/ (OYE_i^{max} - OYE_i^{min})$ is deducted from 1 to adjust the direction. The MEI_{TR} is the overall score for the transparency component. The higher MEI_{TR} value, the more transparency.

The liquidity componentconsists ofthe subcomponents tightness and depth. The Committee on the Global Financial System (1999), Fleming)2001), and Chabchitrchaidol and Panyanukul (2005) used the bid-ask spread to represent tightness because itmay reflect market liquidity. In practice,there are several ways to represent the bid-ask spread. Firstly,the quoted spread refers to the difference between the quoted bid and ask price. Secondly, the realized spread refers to the difference between the weight of the average bid and ask price for an executed transaction. Lastly, the effective spread refers to the difference between the price of the actual transaction and the quoted price. Sarr and Lybek (2002) stated that the spread is often measured via the interest rate instead of price. Fleming)2001) and Chabchitrchaidol and Panyanukul (2005) defined that the bid-ask spreadcould directly illustrate the cost of a transaction. Sarr and Lybek (2002) supported that the bid-ask spread covers the cost of the buying and selling process, the cost of asymmetrical information, and inventory carrying costs. However, Fleming)2001) argued that using the quoted bid offer could negatively

impacton the bid-ask spread. The bid and offer quotes are only good for limited quantities and time periods.

The Committee on the Global Financial System (1999) stated that depth can bemeasured bythe number of orders, volume trading, and amount per transaction. Sarr and Lybek (2002) mentioned that the depth component could bemeasured by the turnover ratio, calculated from the bond turnover ratio and outstanding value.

$$MEI_{LIi,\,t} = \beta(\,MEI_{TIi,\,t}\,) + (1-\beta)\,(\,MEI_{DEi,t}) \qquad (4)$$

Where $MEI_{LI\,i,t}$ representsthe score for liquidity component efficiency of bond i at time t, $MEI_{TI\,i,t}$ is the efficiency score for the tightness component of bond i at time t. The $MEI_{DEi\,,t}$ is the efficiency scorefor the depth component of bond i at time t. β is the weight of tightnessand (1- β) is the weight of depth. ($0 \leq \beta \leq 1$).

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

$$MEI_{TI\,i,t} = 1 - \frac{(BAS_{i,t} - BAS_i^{min})}{(BAS_i^{max} - BAS_i^{min})} \qquad (6)$$

$$MEI_{TI} = \sum_{i=1}^{N} 1\,\frac{MEI_{TI\,i,t}}{N} \qquad (7)$$

where

$$BAS_{max,i} = \text{Max}\,\left|Ybid_{i,t} - Yask_{i,t}\right|$$
$$BAS_{min,i} = \text{Min}\,\left|Ybid_{i,t} - Yask_{i,t}\right|$$
$$i = 1, 2, 3, \ldots, N$$

The $BAS_{i,t}$ refers to the quoted bid and ask yield spread of bond i at time t. The $Ybid_{i,t}$ refers to the quoted bid yield of bond i at time t and the $Yask_{i,t}$ indicates the quoted ask yield of bond i at time t. The BAS_i^{min} is the smallest magnitude of the difference between the average quoted bid-ask spread yield of bond i. The BAS_i^{max} is the maximumsize of the difference between the average quoted bid-ask spread yield of bond i. The $MEI_{TI\,i,t}$ can take a value ranging from 0 to 1, where as the term $(BAS_{i,t} - BAS_i^{min}) / (BAS_i^{max} - BAS_i^{min})$ is deducted from 1 to adjust direction. N is the number of Thai government bonds issued. The MEI_{TI} is the overall score for the tightness component. The higher the MEI_{TI} value, the higher the tightness.

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

$$MEI_{DE\,i,t} = \frac{(Z_{i,t} - Z_i^{min})}{(Z_i^{max} - Z_i^{min})} \qquad (9)$$

$$MEI_{DE} = \sum_{i=1}^{N} \frac{MEI_{DE\,i,t}}{N} \qquad (10)$$

where

$$Z_i^{max} = \text{Max}\left(\frac{V_{i,t}}{O_{i,t}}\right)$$
$$Z_i^{min} = \text{Min}\left(\frac{V_{i,t}}{O_{i,t}}\right)$$
$$i = 1, 2, 3, \ldots, N$$

The $Z_{i,t}$ is the turnover ratio of bond i at time t. The $V_{i,t}$ is the trading volume of bond i at time t. The $O_{i,t}$ is the outstanding bonds i at time t and the Z_i^{min} represents the minimum value of bond i turnover. The Z_i^{max} is the maximum value of bond i turnover. The $MEI_{DE\,i,t}$ ranges from 0 to 1. N is the number of Thai government bonds issued. MEI_{DE} is the overall score of depth component. The higher the MEI_{DE} value, the higher the depth. The MEI_C is the composite index of bond market efficiency, calculated by using equations (11) to (13) as follows:

$$MEI_{C,t} = \alpha\,(MEI_{TRi,t}) + (1-\alpha)\,(MEI_{LIi,\,t}) \quad (11)$$

$$MEI_{Ci,t} = \alpha(MEI_{TRi,t}) + (1-\alpha)\,(\beta(MEI_{TIi,\,t}) + (1-\beta)\,(MEI_{DEi,\,t})) \quad (12)$$

$$MEI_{C} = \sum_{i=1}^{N} \frac{MEI_{C\,i,t}}{N} \quad (13)$$

$$i = 1, 2, 3, \ldots, N$$

Where α is the weight of transparency and (1-α) is the weight of liquidity given by a representative agency, β is the weight of tightness, and (1- β) is the weight of depth given by the same representative agency. ($0 \leq \alpha \leq 1$ and $0 \leq \beta \leq 1$) MEI_C ranges from 0 to 1. The levels of bond marketefficiency (MEI_C) can bedivided into five as shown in Table 2.

Table 2 Levels of efficiency in the Thai bond market

MEI_C	Level
0.0000 – 0.1999	Lowest
0.2000 – 0.3999	Low
0.4000 – 0.5999	Moderate
0.6000 – 0.7999	High
0.8000 – 1.0000	Highest

Data

Thailand's bond market efficiency is measured by 64 series of Thai government bonds obtained from the Thai Bond Market Association and the Bank of Thailand during the trading process from 2006 to 2015. The variables include trading volume, bonds outstanding, actual yield, quoted bid-ask spread, and yield calculated from the yield curve to create the composite index of bond market efficiency.

RESEARCH RESULTS

Table 3 shows the level of Thai bond market efficiency in terms of transparency, tightness, and depth. Transparency reflects both information and price efficiency when investors have the appropriate information toprecisely estimatethe bond price close to the actual bond price. Operational efficiency is represented by market liquidity, consisting of tightness and depth. Tightness refers to low transaction costs while depth represents the trading volume. The empirical evidence shows that bond market transparency in Thailand is at the highest level witha score of 0.8763, followed by tightness at 0.6630 and depth at 0.1170.

Table 3 Thaibond market efficiency scoresfrom2006–2015

Year	MEI_{TR}		MEI_{TI}		MEI_{DE}	
	OYE (bps.)	Score	Bid-Ask Spread (bps.)	Score	Ratio*(time)	Score
2006	4.77	0.9015	5.55	0.7869	0.0908	0.1979
2007	5.83	0.8779	6.65	0.7158	0.0853	0.1538
2008	8.16	0.8451	9.11	0.5593	0.0647	0.1465
2009	7.22	0.8651	9.22	0.5538	0.0709	0.1529
2010	6.35	0.8752	8.32	0.5825	0.0688	0.1216
2011	5.77	0.8727	8.61	0.6078	0.0541	0.0722
2012	4.15	0.9029	7.80	0.7162	0.0763	0.0993
2013	5.61	0.8699	6.02	0.7235	0.0721	0.0949
2014	5.00	0.8788	8.69	0.7306	0.0552	0.0787
2015	6.97	0.8843	8.28	0.7055	0.0715	0.0854
Total	6.03	0.8763	7.62	0.6630	0.0939	0.1170

Remark: Ratio* means the trading volume to outstanding bonds

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

The OYE equals 6.03 basis points (bps.)[1], and the quoted bid-ask spread equals 7.62 bps. The transaction costs in the bond market are low when the quoted bid-ask spread is narrow. The volume of trading bonds to outstanding bonds equals 0.0939.

Figure 1 shows that the level of transparency is relatively stable and has the highest value compared to other dimensions. Bond market efficiency in Thailand has a low trading cost; whereas, the trading cost drastically change sat the beginning before remaining stable. The ratio of trading volume to outstanding bonds slightly declines and then increases marginally; however, the overall efficiency measured in terms of depth is generally at a low level.

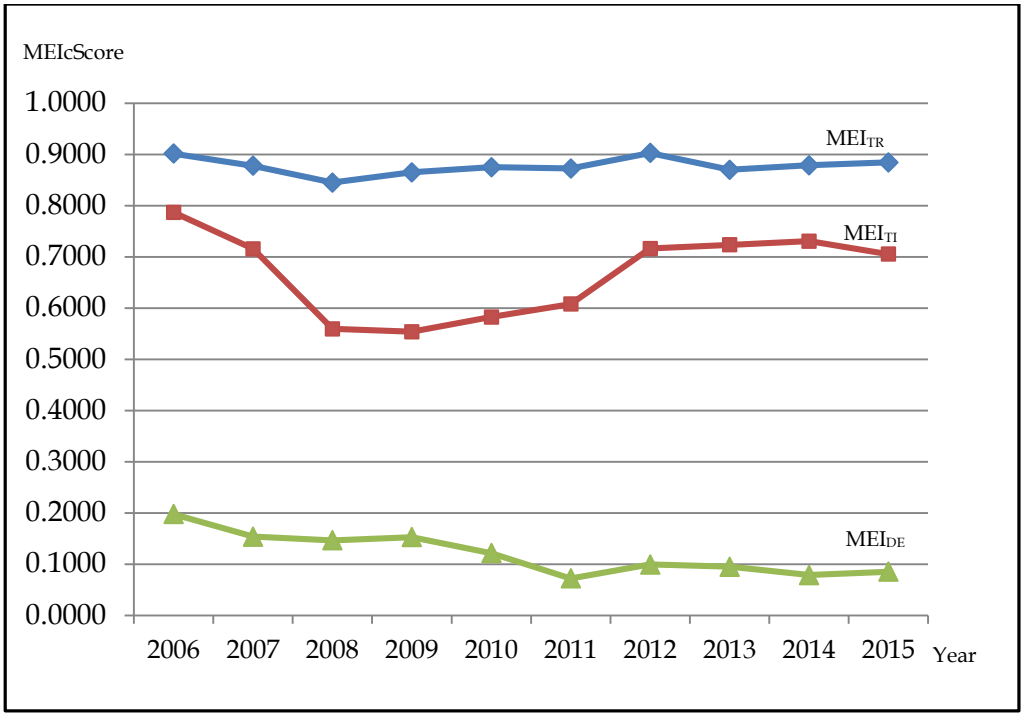

Figure 1 Bond market efficiency in Thailand

Table 4 illustratesthe overall market efficiency when each component and sub componentis given adifferent weight according to equation (12). Given$0.1 \leq \alpha \leq 0.9$ and $0.1 \leq \beta \leq 0.9$, the model can be used to simulate bond market efficiency in 81 cases, and 48.15% of Thai bond market efficiency is at the high level. In general, Thai bond market efficiency is most likely tobe atthe high level; 27.16% of simulated results are at the moderate efficiency level; 14.81% of simulated results are at the highest efficiency level, and 9.88% of the results at the low.When $\alpha = 0.9$, the Thai bond market is always at the highest efficiency level. When $\alpha = 0.5$ and $\beta = 0.5$, the Thai bond market is ata high efficiency level.

Table 4 Efficiency of the bond market when different weights are given for each component

α	β								
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0.1	low	low	low	low	moderate	moderate	moderate	moderate	high
0.2	low	low	low	moderate	moderate	moderate	moderate	high	high
0.3	low	moderate	moderate	moderate	moderate	moderate	high	high	high
0.4	moderate	moderate	moderate	moderate	moderate	high	high	high	high
0.5	moderate	moderate	moderate	high	high	high	high	high	high
0.6	moderate	high	high	high	high	high	high	high	high
0.7	high	high	high	high	high	high	high	high	high
0.8	high	high	high	high	high	high	highest	highest	highest
0.9	highest	highest	highest	highest	highest	highest	highest	highest	highest

Note: The weight of the transparency component isαand that of the liquidity component 1- α. The weight of the tightness component isβ and that of depth is 1 – β.

[1] 1 basis point (bp.) = 0.01%

The different classifications for Thai bond market efficiency are shown in Table 5. There are three entities: (a) issue size, (b) tenor of bond, and (c) benchmark and non-benchmark bonds. When $\alpha = 0.5$ and $\beta = 0.5$ to calculate the composite market efficiency index (MEI_C), the bond with an issue size larger than USD1,500 million is more efficient than one ofless than or equal to USD1,500 million. The bond with a tenor of less than or equal to 10 years is more efficient than one of 10 years'tenor or more. The benchmark bond is more efficient than the non-benchmark.

When considering the issue size of a bond, the OYEand quoted bid-ask spread for bond issues larger than USD1,500 million are less efficient than those withan issue size of less than or equal to USD1,500 million. The ratio of bond trading volume to outstanding bonds with an issue size larger than USD1,500 millionis more efficient than those less than or equal to USD1,500 million. Thus, larger issue bondsare more efficient than smaller in terms of transparency, tightness, and depth.

Considering the time to maturity or tenor, the OYE, and quoted bid-ask spread of bonds with a tenor of less than or equal to 10 years are less efficient than those with more than 10 years' tenor. The ratio of bond trading volume to outstanding bondswith a tenor of less than or equal to 10 yearsis more efficient for bonds with more than 10 years' tenor.Therefore,bonds with a shorter time to maturityaremore efficient than those with a longertime period to maturity with respect to transparency, tightness, and depth.

Forbenchmark andnon-benchmarkbonds, the OYE and quoted bid-ask spread for benchmark bonds are found to be less efficient thanthose of non-benchmark. The ratio of trading volume to outstanding bonds in the benchmark group is more efficient than the non-benchmark. As a result,the benchmark bond is more efficient than non-benchmark in terms of transparency, tightness, and depth. Given all other constant factors, investors should buy bonds with a large issue size, shorter time to maturity, and favor benchmark bonds because they are more efficient.

Table 5 Efficiency of the Thaibond market classified byissue size, tenor, and benchmark and non-benchmark

Bond	MEI_{TR}		MEI_{LI}				MEI_c*
			MEI_{TI}		MEI_{DE}		
	OYE (bps.)	Score	Bid-Ask Spread (bps.)	Score	Ratio(time)	Score	
1. Issue size (USD million)							
Issue size > 1,500	5.59	0.8837	7.23	0.6663	0.1419	0.1663	0.6500
Issue size ≤ 1,500	6.97	0.8748	7.98	0.6526	0.0488	0.0725	0.6323
Diff.	-1.39	0.0089	-0.74	0.0137	0.0930	0.0938	0.0177
2. Tenor (year)							
Tenor ≤ 10	5.97	0.8824	8.36	0.6908	0.4538	0.1315	0.7290
Tenor > 10	6.25	0.8639	8.71	0.6083	0.0988	0.0854	0.6747
Diff.	-0.28	0.0185	-0.35	0.0825	0.3550	0.0461	0.0543
3. Benchmark and Non-benchmark							
Benchmark	5.59	0.8827	6.88	0.6691	0.2196	0.2486	0.6560
Non-benchmark	5.63	0.8532	8.10	0.6578	0.0692	0.0752	0.6246
Diff.	-0.04	0.0295	-1.21	0.0115	0.1504	0.1734	0.0314

Remark: MEI_c* given $\alpha = 0.5$ and $\beta = 0.5$

CONCLUSION

This paper proposes an ewcomposite index form easuring bond market efficiency in Thailand, including the two major components of transparency and liquidity. Liquidity consists of two subcomponents: tightness and depth. The results indicate that the Thai bond market has higher degree of information and price efficiency than operational efficiency. Operational efficiency is at the high level when considering bond trading cost; however, it is lowin terms of the trading volume ratio to outstanding bonds. Since investors place more weight on transparency and trading cost, the bond market tends to be more efficient.

Transparency, transaction cost, and the ratio of trading volume to large issue outstanding bonds are more efficient than those of small. Moreover, short to medium term bond saremore efficient long-term. Lastly, the benchmark bond is more efficient than the non-benchmark.

The evidence from the ratio of low trading volume to outstanding bonds suggests that policy authorities should increase trading volume by encouraging a greater number of market participants. In order to increase the number of market participants, authorities should develop new government bond products to improve the options for investors and provide the necessary information to create more transparency in the bond market

and gain the confidence of participants. Authoritie sshould encourage investment in short to medium term large issue benchmark bonds, and the issuers should expand the size of outstanding bondsi n this category as they have high liquidity, particularly concerning continuous trading volume, resulting in lowering fundraising costs both for the government and private sector. Furthermore, expansion of the issue size is a critical factor positively affecting trading volume in the secondary market)Chabchitrchaidol and Panyanukul, 2005). Ultimately, authorities should promote the Thai bond market as being highly transparent. Although the scope of this research highlights only the efficiency measurement of government bonds, the concept and method can be applied to measure the efficiency of the corporate bond market because government and corporate bondsare similar in terms of fixed income but involve different risks. One bond is issued by the government and the other by the private sector. Thus, the risk factor is included when considering the efficiency of the corporate bond market.

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