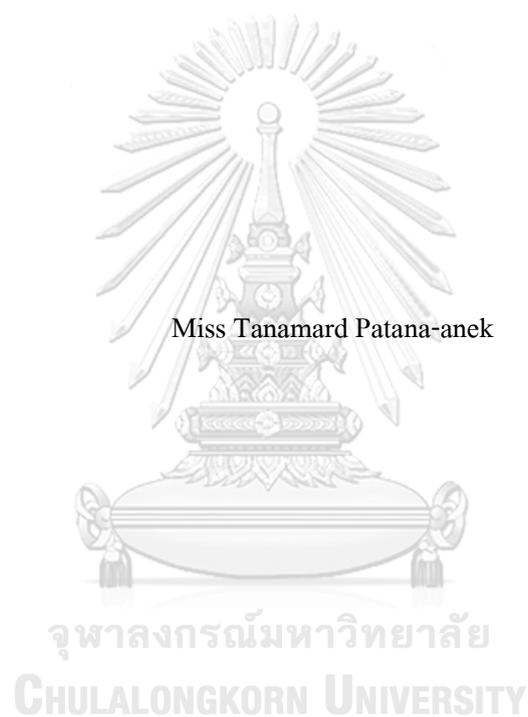


The Effects of Increased Transparency on Market Liquidity: Empirical Evidence from Thai Bond
Market



A Thesis Submitted in Partial Fulfillment of the Requirements
for the Degree of Master of Science in Finance
Department of Banking and Finance
FACULTY OF COMMERCE AND ACCOUNTANCY
Chulalongkorn University
Academic Year 2018
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ผลกระทบของการเพิ่มขึ้นของความโปร่งใสต่อสภาพคล่องในตลาด: หลักฐานเชิงประจักษ์จาก
ตลาดตราสารหนี้ไทย



วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรมหาบัณฑิต

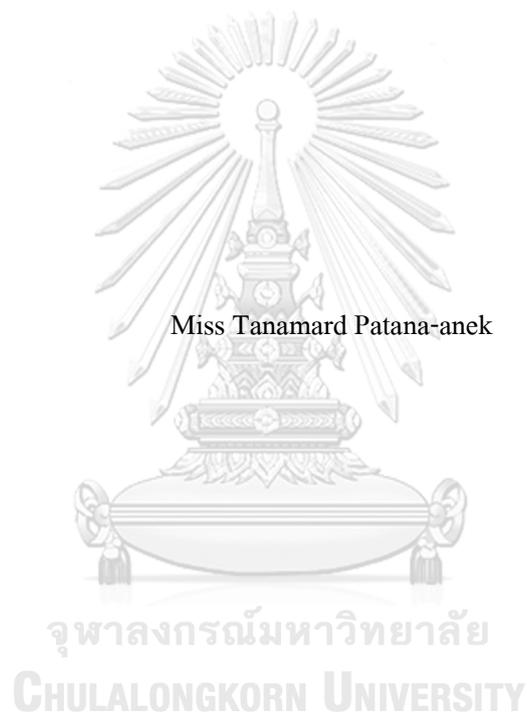
สาขาวิชาการเงิน ภาควิชาการธนาคารและการเงิน

คณะพาณิชยศาสตร์และการบัญชี จุฬาลงกรณ์มหาวิทยาลัย

ปีการศึกษา 2561

ลิขสิทธิ์ของจุฬาลงกรณ์มหาวิทยาลัย

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Thesis Title	The Effects of Increased Transparency on Market Liquidity: Empirical Evidence from Thai Bond Market
By	Miss Tanamard Patana-aneek
Field of Study	Finance
Thesis Advisor	Assistant Professor Tanakorn Likitapiwat, Ph.D.

Accepted by the FACULTY OF COMMERCE AND ACCOUNTANCY, Chulalongkorn University in Partial Fulfillment of the Requirement for the Master of Science

..... Dean of the FACULTY OF COMMERCE AND ACCOUNTANCY
(Associate Professor Pasu Decharin, Ph.D.)

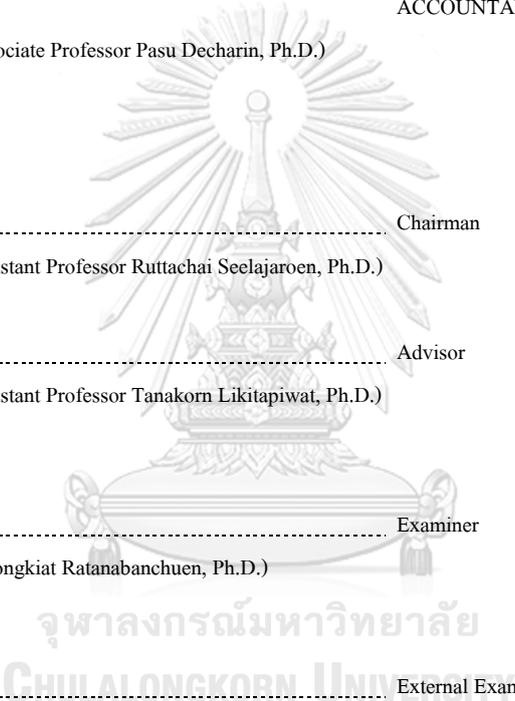
THEISIS COMMITTEE

..... Chairman
(Assistant Professor Ruttachai Seelajaroen, Ph.D.)

..... Advisor
(Assistant Professor Tanakorn Likitapiwat, Ph.D.)

..... Examiner
(Roongkiat Ratanabanchuen, Ph.D.)

..... External Examiner
(Assistant Professor Nattawut Jenwittayaroje, Ph.D.)



ธนาศ พัฒนะเอนก : ผลกระทบของการเพิ่มขึ้นของความโปร่งใสต่อสภาพคล่องในตลาด: หลักฐานเชิงประจักษ์จากตลาดตราสารหนี้ไทย. (The Effects of Increased Transparency on Market Liquidity: Empirical Evidence from Thai Bond Market) อ.ที่
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สมาคมตลาดตราสารหนี้ไทย (ThaiBMA) ได้ออกนโยบายและกฎระเบียบควบคุมการเปิดเผยข้อมูล และความล่าช้าในการส่งข้อมูลของดีลเลอร์เพื่อสนับสนุนให้ตลาดพันธบัตรไทยมีความโปร่งใสที่มากขึ้น โดยกำหนดให้สมาชิกจัดทำ และส่งข้อมูลการซื้อขายทั้งหมดในตลาดรองตามที่ได้กำหนดไว้ให้กับหน่วยงานเพื่อทำการเผยแพร่ภายในระยะเวลาไม่เกิน 30 นาทีหลังจากการซื้อขาย ทั้งนี้เพื่อต้องการพัฒนาความมีประสิทธิภาพของตลาด และเพิ่มกิจกรรมทางการตลาด นอกจากนี้ยังมีการออกบทลงโทษสำหรับดีลเลอร์ที่ส่งข้อมูลล่าช้า อย่างไรก็ตามการออกกฎของสมาคมตลาดตราสารหนี้ไทยเพื่อเพิ่มความโปร่งใสในตลาดนั้นนำไปสู่สภาพคล่องที่เพิ่มขึ้นในตลาด ดังนั้นงานวิจัยจึงมีจุดประสงค์เพื่อที่จะศึกษาถึงผลกระทบของการเพิ่มขึ้นของความโปร่งใสต่อสภาพคล่องในตลาดพันธบัตรไทย โดยสภาพคล่องในตลาดวัดจากค่าเฉลี่ยของส่วนต่างอัตราผลตอบแทนเสนอซื้อ (Bid) และเสนอขาย (Offer) เฉลี่ยรายวันของพันธบัตรรัฐบาล ผลการศึกษาชี้ให้เห็นว่าความโปร่งใสในการเปิดเผยข้อมูลของดีลเลอร์ในตลาดมีผลต่อสภาพคล่องในตลาดพันธบัตรไทยซึ่งวัดจาก Spread นอกจากนี้ยังมีวัตถุประสงค์เพื่อที่จะศึกษาผลกระทบของความล่าช้าในการส่งข้อมูลของดีลเลอร์ต่อสภาพคล่องในตลาด อย่างไรก็ตามไม่มีหลักฐานทางสถิติเพียงพอที่จะสนับสนุนถึงความแตกต่างของผลกระทบของความล่าช้าของเวลาต่อสภาพคล่องในตลาด ในช่วงเวลาก่อนและหลังการเพิ่มความโปร่งใสในตลาด

ภาควิชา ภาควิชาการธนาคารและการเงิน
 สาขาวิชา การเงิน
 ปีการศึกษา 2561

ลายมือชื่อนิติ
 ลายมือชื่อ อ.ที่ปริญญาวิทยานิพนธ์หลัก

5982965326 : MASTER OF SCIENCE

TRANSPARENCY, MARKET LIQUIDITY, BOND MARKET, GOVERNMENT BOND

Tanamard

Patana-aneek

:

The Effects of Increased Transparency on Market Liquidity: Empirical Evidence from Thai Bond Market.

ADVISOR: Asst. Prof. Tanakorn Likitapiwat, Ph.D.

To increase transparency, Thai Bond Market Association (ThaiBMA) issues the notification of disclosure of transaction information and control for post-trade deferred publication. Dealers are required to report all required trading information to ThaiBMA within 30 minutes after execution for public dissemination. The rules are issued for improved the market efficiency and increased customer activity. Moreover, ThaiBMA issues the penalty for Late Transaction to punish dealer. However, increasing transparency leads to an improvement on market liquidity. This paper examines the effect of post-trade transparency on market liquidity in the Thai bond market, measured by bid-offer quoted in terms of their yield to maturity (YTM) on government bonds. The result show that there is a significant difference between the impact of increased transparency on spread. Moreover, this study shall examine the effect of delayed time on the market liquidity. However, there is not enough statistical evidence to conclude that the impact of delay time on spread is significantly differences across periods.

Department:

Department of Banking and Finance

Student's Signature

Field of Study:

Finance

Advisor's Signature

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จุฬาลงกรณ์มหาวิทยาลัย
CHULALONGKORN UNIVERSITY

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Tanamard Patana-anek



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CHAPTER I INTRODUCTION

Background and motivation

Over the past few years the structure of the bond market has received increasing attention. Market transparency is one of the most important issues of a substantial amount of the researches in bond market. According to a survey of European capital markets' participants¹, nearly 100% of survey participants are supporting for increased post-trade transparency in the market. Respondents argue that MiFID II² transparency requirements will be beneficial to the European fixed income markets. The results of Forum survey also show that the impact of transparency enhancement under the setting of MiFID II on fixed income market liquidity is significant.

Market transparency define as the available information about trading process that market participants can be observed (O'Hara, 1995). In trading market, transparency can be divided into two parts which are pre-trade and post-trade transparency. Pre-trade transparency is about the inputs of the trade. It helps market participants and investors to trade with best price. Post-trade transparency relates to all recently completed transactions in the trading. Investors can trade by using this information to assess the quality of execution. (source: (Foucault, Pagano, & Roell, 2013))

There are many benefits from post-trade transparency. Post-trade transparency with appropriate of the delay time will give more information on actual market activity. Several researches have investigated the impact of transparency on market liquidity using price dispersion, trading volume and other liquidity measured as

¹ A survey in the annual MarketAxess and Trax European Capital Markets Forum, Andaz Hotel, Liverpool Street, London, on Thursday, 11 May 2017.

² Financial Instruments Directive (MiFID II) reporting requirements aim to boost investor protection by strengthening the transparency framework for the regulation of markets in financial instruments, including OTC markets. Under MiFID II, post-trade data must publish as close to real time as is technically possible (15mins limit)

proxies. Most regulators believe that greater transparency leads to the liquidity improvement in the market. It can improve the efficiency in securities and encourage investors to participate more in the market.

Mostly, trading cost is used as a proxy to examine the effects of increased transparency on market liquidity. liquidity provider can offer lower trading costs, measured by effective bid-offer spread, to uninformed traders in more transparent market. Moreover, transparency enhancement can decrease market maker's price for exchanging securities (Pagano & Roell, 1996). In contrast with this study, they argue that increased transparency can lower dealers' holding costs which could also reduce trading cost in a dealer market (Naik, Neuberger, & Viswanathan, 1999). Together with this study, they also argue that transparency can induce more traders to participate, hence enhances traders' advantage over dealer and reduce trading costs. (Chen & Zhong, 2012) Many theoretical analyses imply that spreads are declined in transparent market. (Edwards, Harris, & Piwowar, 2007) and (Goldstein, Hotchkiss, & Sirri, 2007) The results of most empirical findings conclude that the effects of increasing transparency depend on the structure of the market and its securities.

Globally, transparent regulations are varied in many countries. For Example, in Europe, Markets in Financial Instruments Directive II (MiFID II) imply government bond trades to publish within 15 minutes with caps. Another regulatory changed that occurs within initial years of the transparency associated with Trade Reporting and Compliance Engine (TRACE) is a decline in reporting time windows for dealers. Such as the papers , they find execution costs size reduced by half after the initiation of the transaction reporting for large insurance companies via the TRACE. Increase transparency lead to increase market liquidity.

In 2008, there has an improvement of post-trade information and disclosure in the Thai bond market. The Thai authorities assign post-trade deferred publication

regime which stated that dealers must report all trading information to the ThaiBMA for public dissemination with a 30 minutes delay. There are increasing numbers of traders who delay reporting of trades. Therefore, ThaiBMA issues the regulation as a penalty for Late Transaction to punish dealer.³ The rules come into force on and from April 2012. Consistent with this study, he argues that dealer can make a profit by not disclosing required trading information.(Madhavan, Porter, & Weaver, 2005)

Recently, US banks with some bigger asset managers and security regulators are argued about the delayed time. Most regulators are supporting in real time basis while US banks say that a small delay in reporting would improve liquidity in bond market. US banks are supporting for a delay in reporting corporate bond public trading transaction. It is interesting that why many dealers do not follow the reporting rules and why US Banks are supporting for a delay. Apparently, following question was raised several times: Does post-trade transparency is a good thing? Another question is why regulators try to shorten the delay time in reporting. Does smaller delay in reporting improve market liquidity? Therefore, the amount of time until investors can observe post announcement need to be focused on.

To answer the questions, this study shall investigate the effect of post-trade transparency on market liquidity by using trading cost which the measure of the efficiency of a financial market making structure. However, trading cost can be measured by simple method like bid-offer spreads which represent a market' s operational efficiency.

This study shall focus on the effect of post-trade transparency on market liquidity. Also, this study is first to estimate the Thai government bond spread using bid-offer quoted in terms of their yield to maturity (YTM) , controlling with the

³ Notification of the Board of Directors of the Thai Bond Market Association
Re: Administrative Sanctions concerning Reporting of Debt Instrument Trading
See http://www.thaibma.or.th/pdf/sro/announce/5_2_Administrativesanctions.pdf

externality's determinant of spread, bond characteristics and trading activities. Moreover, this study shall examine the effect of smaller delay in reporting on the market liquidity.

Objective and contributions

To acknowledge the effect of increased transparency on market liquidity, this study shall examine traders' trading costs using bid-offer quote spreads as proxies. Moreover, this study shall investigate the effect of delayed trade-reporting on market liquidity.

This study focuses on the post-trade transparency and defines transparency following the MiFID II transparency regime as the trading venue's ability to make public the price, volume, the execution and publication date and time, and security instruments' information as close to real time as possible. IOSCO states that "Investors can have an advantage over other unfair trading practices by accessing to trading information in real time basis"⁴ Indeed, increased transparency will inform market participants with the high potential level of transactions.

In Thai secondary bond market, institutional investors trade both government and corporate bonds over the counter (OTC). There is only the limited participation of retail investors in the market. All trading information are reported to ThaiBMA for public dissemination. While, there are more and more trading platform in Thai bond market, but most people are still trading over the counter.

In January 2008, the Board of Directors of the ThaiBMA intend to improve transparency in the domestic bond market by issuing the notification. The rules come into force on and from the 1st day of April 2008. Member dealers are required to

⁴ See IOSCO Objectives and Principles of Securities Regulation (September 1998, as amended October 2003) at page 40, available at: <http://www.iosco.org/pubdocs/pdf/IOSCOPD82-English.pdf>.

report trading information to the ThaiBMA for public dissemination with a 30 minutes delay. Transaction executed during 9:00 a.m. and 3:30 p.m. shall be reported within 30 minutes after execution (trade time). Transaction executed after trading period shall be reported within 9:30 a.m. on the next working day.⁵

The notification of The ThaiBMA in 2008 led to the post-trade transparency improvement in the OTC market. The changing in 2008 provides a natural experiment to examine the effect of increased post-trade transparency on bid-offer spreads in two periods of time, before and after changing the regulation in bond market.

The difference from prior researches is this study shall examine the effect of smaller delay in reporting on the market liquidity. As under the US TRACE system for bonds, trades are mostly reported in real time or 15-minute delayed time. Therefore, the post-trade deferred publication period will be phased in as the delay time in reporting.

This study measure trading cost by using bid-offer spread. Spread is the best indicator of market liquidity.(Fleming, 2003) He also argues that observing bid-offer spreads directly is very important. The difference between bid-offer is a measure of trading cost. The following study (H. Bessembinder, Maxwell, & Venkataraman, 2006) find that the bid-offer spread arises to compensate market makers for order processing, holding and adverse selection costs.

To sum up, spread is dealers' profit and investors' cost. By understanding the structure of spread, regulators will be able to make efficient policy for improving market quality. This study shall test the transparency effects on bond spreads.(Roll, 1984)

⁵ Notification of The Thai Bond Market Association

Re: Terms, Conditions and Procedure concerning Reporting of Debt Instrument Trading
See http://www.thaibma.or.th/pdf/sro/announce/announce29_08072014.pdf

Hypothesis development

Edward, Harris and Piwowar (2007) show the association between decreasing in investors' trading costs in corporate bonds with the initiation of transaction reporting. A study reports that liquidity is increasing as a result of increased public transparency in the Corporate Bond markets.

Following the approaches of the following study (Edwards et al., 2007), this paper will generate the evidences on the Bessembinder, Maxwell, and Venkataraman (2006) and Gravelle (1999) hypotheses to investigate the effect of increased post-trade transparency on the trading cost and market liquidity with cross sectional regression.

Therefore, the different point is this paper shall test the effect of shortening delay in the reporting on trading cost in transparent market. I apply the approaches of Bessembinder (2006) to set the hypothesis. This study also uses the unique data set of bid-offer in term of yield from Thai Bond Market Association (ThaiBMA) to estimate the spreads and set the hypotheses as details below.

- Hypothesis 1: Increased transparency leads to lower spreads.
- Hypothesis 2: The announcement of Notification of Board of Director of ThaiBMA leads to smaller delay time.
 - Hypothesis 2a: The announcement of reporting trading transactions notification leads to smaller delay time.
 - Hypothesis 2b: The announcement of penalty for late reporting trading transactions leads to smaller delay time.
- Hypothesis 3: Spreads decrease with the smaller delay in the reporting trades in transparent market.

CHAPTER II LITERATURE REVIEW

The impact of transparency on market liquidity

Several studies try to investigate the impact of transparency on market liquidity. The findings have both positive and negative effects. The effect of market transparency, especially on trading cost is still ongoing debate.

Liquidity providers narrow spreads and offer lower trading costs to uninformed traders in a transparent market. (Pagano & Roell, 1996) Also, improved transparency can decrease market making cost. Moreover, the following study (Flood, Huisman, Koedijk, & Mahieu, 1999) argue that pre-trade transparency reduces bid-offer spread and improves market liquidity

Chen and Zhong (2012) argue that traders have an information advantage over dealers. They apply the approach, used by (Hong & Warga, 2000) and (Chakravarty & Sarkar, 2003) to estimate the average effective spread of pre-trade transparent bonds. Their finding shows that the increasing of pre-trade information in corporate bond markets will reduce trading costs. Indeed, smaller bid-offer spreads lead to market liquidity enhancement and induce more traders to participate in the market.

Inconsistent with this finding, greater transparency may decrease market liquidity. They use the center point of the market bid and offer to calculate the market price in each trading round and find that price rapidly decrease in the transparent market. (Bloomfield & O'Hara, 1999)

Also, the study by Porter and Weaver (1998) on the Toronto Stock Exchange (TSE), they estimate effective spreads and the percentage bid-offer spread by using four levels of best bid and offer and its depth. The result show that spreads are

widened after the introduction of the available trading information up to four levels. They suggest that a decrease in liquidity is associated with transparency.

The evidences of effect for changing disclosure policy are mixed. Many studies of trade reporting suggest that spreads are narrow after the market becomes transparent, such as the papers by Bessembinder, Maxwell, and Venkataraman (2006), Edwards et al. (2007), and Goldstein et al. (2007) found evidences on a decline in investors' trading costs associated with the introduction of transaction reporting in corporate bonds.

However, increased transparency on dealer market may result in lower liquidity. For example, Goldstein et al. (2007) find that spreads decline on BBB-rated corporate bonds. Similarly, Edwards et al. (2005) find that transparent bonds' costs are lower for than for opaque ones. The results are not only inconsistent but also focus only on the impact of post-trade transparency on market performance. Few studies have focus on the effect of post-trade transparency on market liquidity.

Measuring market liquidity

For the measuring of trading cost, It is the differences between the trade price and an estimated bid quote of the same bond and same day to estimates effective spread as the round-trip transaction costs. (Schultz, 2001)

Bessembinder and Venkataraman (2009) argue that trading costs can be estimated based on trade prices. They use the difference between trade price to its midpoint at or before the time of the trade to calculate effective spread measures as a trading cost.

To identify important factors for explaining bond market liquidity, most study use bid-offer spread as a measure for capturing liquidity. (Fleming, 2003) Amihud and Mendelsohn (1980) determine that the bid-offer spread of bond represents as dealers'

income and related to the costs of adjusting inventory for dealers. Inventory models suggest that the bid-offer spread increases with the price and decreases with trading volume which referred to the trading activity. The following study also find that the bond price depends on maturity date liquidity. (Leland, 1994) For the bond age, Sarig and Warga (1989) find that bond with young age are more actively traded. While, Bloomberg (2015) using trade volume, bid- offer spread, price volatility as the input factors to classify bond liquidity. For turnover, it is associated with the bid-offer spread. Turnover is mostly increased with greater market size, which means higher turnover ratio and thus smaller bid-offer spreads. (Gravelle, 1999)

Edwards et al. (2007) also examined relationship between trading cost and bonds' market participants. They found that investors' investment decisions depend on their investment cost while issuers are considering the costs when deciding how to structure their bonds.

The impact of transparency on delayed time

For time delay, FINRA increase disseminated trade information parallel with reduce the time delay for reporting a transaction to increase transparency in the market. Time to report is overlap between bond's dissemination phases which criteria by the initial issue size and the credit rating. Previous works mostly study on Phase 1 and/or Phase 2 bonds. Bessembinder, Maxwell, and Venkataram (2006) find a reduction of trading costs after dissemination of Phase 1. Edwards, Harris, and Piwowar (2007) examine transaction costs for Phase 2 and find the evidence that TRACE reduces transaction costs.

The following study (H. Bessembinder, 2003) measure trading costs of NASDAQ and NYSE stocks with different trade lag which is the differences time between trade time and quote time. He finds that the effective half-spread with no lag

is less than spread with a thirty-second lag. He also finds a reduction in price dispersion.

The impact of delayed time on spread

Increased post-trade transparency can reduce informational disadvantage of clients relative to dealers as dealers' incentives to shop around are eliminated. Moreover, dealer will be loss from trading delays. (Duffie, 2014)

The study in dealer market suggests that dealer market structure combined with regulatory such as post-trade transparency offer lower transaction costs. (Collin-Dufresne, Benjamin, & Trolle, 2016)

Regulation of ThaiBMA

- The Notification of The Thai Bond Market Association Re: Terms, Conditions and Procedure concerning Reporting of Debt Instrument Trading ⁶requires information of transaction report and control post-trade deferred publication.

(This notification come into force on and from January 9, 2008)

Dealers are required to report all required trading information to ThaiBMA within 30 minutes after execution for public dissemination

- (1) Trade date
- (2) Issue symbol
- (3) Type of transaction (buy or sell)
- (4) Purpose of the transaction
- (5) Price
- (6) Volume in unit
- (7) Time of execution (Trade Time)
- (8) Settlement date

⁶ Under virtue of the provisions of Clause 2 of the Notification of the Office of Securities and Exchange Commission, No. Sor.Yor. 37/2005, concerning the reporting on the trading of securities, and Clause 15(3) of the Regulations of Thai Bond Market Association, file:///G:/2.5_Notification_Terms,%20Conditions%20and%20Procedure%20concerning_Jan%2008.pdf

(9) Trader ID

(10) Counterparty

- The Notification of the Board of Directors of the Thai Bond Market Association Re: Administrative Sanctions concerning Reporting of Debt Instrument Trading⁷ is the penalty for Late Transaction, Error Transaction, or Missing Transaction. (This Notification come into effect from April 24, 2012)

It states that dealer who report later than one working day, or not report transactions within the next working day, or report information trading without correction and cancelation of missing or error transaction shall be fined with different values.

Member may get any disciplinary actions as follows⁸;

- (1) Warning;
- (2) Probation;
- (3) Fine (The maximum level of the fine in each case shall not exceed 300,000 THB.)

Beside fine charge, if dealers are found to have intention not to report according to the Terms, Conditions, and Procedure concerning reporting of Debt Instrument Trading (the notification in 2008), a disciplinary committee shall comply penalty with the other disciplinary procedures. Dealer members will be barred from any member rights and terminated from membership.

⁷ Under virtue of Clause 20 (2) and Clause 68 of the Articles of Association of the Thai Bond Market Association, the Board of Directors of the Thai Bond Market Association, http://www.thaibma.or.th/pdf/sro/announce/announce40_jan2014.pdf

⁸ under Article 68 and 101 of the Securities and Exchange Act, B.E. 2535 (A.D. 1992), <http://www.thaibma.or.th/pdf/sro/announce/Codified2555.pdf>

CHAPTER III VARIABLES AND DEFINITION

Measuring bid-offer spreads

Spreads reflect the tightness of liquidity in the bond market. In practice, the lower the spread, the higher liquidity. Fleming (2003) finds that the bid-offer spread is a good liquidity measurement in the Treasury markets because its variations can capture the changes in market liquidity.

The bid-offer spread is the difference between the price at which dealers are willing to buy and the price dealers are willing to sell. The bid-offer spread directly measures the cost of executing trade, and being a major part of trading costs, it is commonly used as an indicator of the trading cost. The following study suggest that the bid-offer spread, the sum of buying cost and selling discount for immediate execution, is the measure of trading cost. (Amihud & Mendelson, 1991)

Most studies of trade trading costs are not able to find the available bid and offer quotation to measures of quoted and effective spreads. However, bid and offer on quotations are broadly in the term of yield for Thai bond markets. Following the time that ThaiBMA designates, primary dealer must have submitted quoted bid and offer yield in several times in one-day period.

This study shall estimate spreads of government bonds by averaging all of differences value between bid yield and offer quoted yield of each bond for every time in one-day window as follow equation.

$$\overline{spread}_{i,T} = \frac{\sum_{t=1}^n (bid_{i,t} - offer_{i,t})}{n}$$

Where, $\overline{spread}_{i,T}$ (%) is the average of spread of bond i on day T,

$bid_{i,t}$ is the quoted bid yield at time t of bond i,

$offer_{i,t}$ is the quoted offer yield at time t of bond i,

n is the quoting frequency of quoted yield in one day.

I calculate the differences between bid and offer yield on same quotation for every time t in one-day period and then calculate the sum of bid-offer spread on day T . After that dividing it with number of quoted by primary dealer (one-day period) to get the average daily spread of individual bond.

Liquidity component in bid-offer spreads

As the core of this study is the effect of greater transparency on bond market's liquidity. Liquidity cannot be measured by using just one factor, academic researchers have focused on using multiple factors as liquidity measure. Therefore, the relevant metrics of liquidity should be considered to clarify the effects of greater transparency on market liquidity.

Bond characteristics

For the bond characteristics, amount issued, age and time to maturity are defined as liquidity proxies.

- **Time to maturity and time since issuance**

Edwards, Harris and Piwowar (2007) find the positive and significant coefficients on time to maturity and time since issuance (age). Younger bonds and bonds with a shorter time to maturity are cheaper to trade than older bonds and bonds with a longer time to maturity. Bond liquidity tends to decrease with its age. Consistent with this study, they also find that on the run Treasury bonds are much more liquid than season bond. (Babbel, 2001)

- **Issue size**

Edwards, Harris and Piwowar (2007) provide evidence that large issues are cheaper to trade than small issues. Consistent with Chen and Zhong (2012), their results show that spreads have negative relationship with issue size.

Bond price

Since bid-offer spread of bond represents dealers' income and related to dealers' adjusting inventory costs. Naik, Neuberger, and Viswanathan (1999) show that transparency can decrease dealers' adjusting holding costs, which could also lower customers' trading costs.

Also, inventory models suggest that the bid-offer spread increases with the bond price. (Amihud & Mendelson, 1980)

This study measures bond price as follows equation.

$$\overline{price}_{i,T} = \frac{\sum_{i=1}^n (volume_{i,t} \times price_{i,t})}{\sum_{i=1}^n (volume_{i,t})}$$

Where, $\overline{price}_{i,T}$ is the weighted average price of bond i on day T,

$volume_{i,t}$ is the value of bonds i which traded at time t,

$price_{i,t}$ is the clean price of bond i at time t,

n is the trading frequency of bond i on day T.

Trading activity

- **Trading volume**

In general, trading volume is the measure of trading activity. The more value of these metrics refers to the more liquidity in bonds. Volume is expected to have a negative relationship with bid-offer spreads. Schultz (2001) finds that trading costs measured by an average bid offer spread decline with trade size. As

the higher level of demand for trades, the higher liquidity, the narrower the spread.

- **Turnover ratio**

The turnover ratio considers of total outstanding amount of bonds which computed by the amount of bonds outstanding at the end of the previous. D'Souza, Gaa, and Yang (2003) study on the brokered interdealer market and find that turnover in the government of Canada bond market is positively to bid-offer spread. Therefore, the higher turnover ratio reflects the more liquidity in the secondary market. This study measures turnover ratio as follows equation.

$$\mathit{turnover}_{i,T} = \frac{\mathit{volume}_{i,T}}{\mathit{outstanding\ volume}_i}$$

Where, $\mathit{turnover}_{i,T}$ is the turnover ratio of bond i at day T ,

$\mathit{volume}_{i,T}$ or $\sum_{t=1}^n(\mathit{volume}_{i,t})$ is the total value of bonds i which traded in day T ,

$$\mathit{outstanding\ volume}_i = \frac{\mathit{outstanding\ value}_i}{\mathit{current\ par}} \quad (\text{from bonds' information})$$

For bond i that already matured, I assume $\mathit{outstanding\ volume}_i$ equal to issue size of bond i .

CHAPTER IV DATA AND DESCRIPTIVE STATISTICS

This paper is mainly conducted to investigate the impact of increased post-trade transparency on bid-ask spreads by using the trading data executed in the Over-the-Counter (OTC) market. Government debt securities are the most actively traded securities, accounting for 90 % of total trade. The government debt securities consist of Loan bonds (LB) and Treasury bills (TB) which issued by the Ministry of Finance, State agency bonds and State-owned enterprise bonds.

Data structure

To test the hypothesis, I use Thai government bond constructed by the Thai Bond Market Association from January 2, 2003 to December 31, 2014. Loan Bond (LB) captures most of the market and issues for financing budget deficit. Therefore, Government Bond Indices in this study shall calculated from government Loan Bond. The data, including transaction data, quotation data and others bond information is extracted from ThaiBMA and ibond website.

Bond transaction data

This study uses the two-way transaction data committed by member dealers, including primary dealers. The intraday transaction data is comprised of bond ID, issue ID, bond symbol, trading purpose (Outright, Financing or other), bond price, Trade date and time, Report date and time, Volume (THB mln), dealer category (1; dealer member), dealer (dealer name; Local bank or Foreign bank or Security firm), counterparty category (1;dealers or 3;clients), counterparty name (dealer name or clients name; DCO = domestic company, FCO = foreign company, IND = individual investor, INSURE = insurance company, MFD = asset management companies,

NDL = financial institutions with no dealer licenses, OTH = other investors, match ID and match date and time.

Each trade in the dealer market is reported separately by both dealers participating in the trade. For match ID and match date and time, it is the id and matching date and time of transactions between dealer member and dealer member. Therefore, its value will show only for dealer to dealer transactions. Clients can not submit the trade as member dealer.

The outright transactions of government securities are the outright purchase and sale of securities. The Bank is usually adding reserves to the banking system through these available outright transactions. Therefore, I use only outright trading transaction.

For bond price, I shall use clean price because it reflects issuer risk and interest rates. Price is the percentage of par value on the settlement date.

Delay time is the delaying in the reporting trades, so information is not disseminated immediately after executed. It can be calculated from the differences between trade time and report time (minutes).

To clean the error data, I eliminate the obvious data errors such as the transaction that report date and time come before trade date and time. I remove trades executed on a day different from the reporting day, and I next eliminate trades without price data, trades with zero volume and trades with negative or zero price. MiFID II states that a transaction which takes place outside its normal trading hours, it should be made public before the opening of the next trading day. Following with MiFID II, I eliminate those trading transactions that trading outside trading hour (9.00 a.m. -3.30 p.m.)

Bond quotation data

ThaiBMA issues Code of Conduct ⁹ to enforce MOF Outright PD ¹⁰ to submit quoted bid-offer yield on every working day at the time that ThaiBMA designates. ThaiBMA use data to calculate Government Bond Yield Curve and Government Bond Index for dissemination to bond market participants. This study shall use quoted bid-offer yield of Government Loan Bonds (LB) submitted by MOF Outright PD to calculate as the spread.

The Data is comprised of issue ID, bond symbol, quoted date and time, bid quote (%) defined as the bid yield at the lowest quote from primary dealer, ask quote (%) defined as the ask yield at the highest quote from primary dealer. The cut-off time for daily quotation of Government bonds is 4:00 p.m.

Bonds' information

ThaiBMA provide information of registered government loan bonds that trade in OTC market. The data is comprised of bond symbol, issue size (THB mln), issue date, maturity date, registered date, bond outstanding value (THB mln), time to maturity (yrs.) and issue term (yrs.)

The outstanding value is the value of outstanding bond at the end of period. However, with the limitation of data, the outstanding value of expired bond are not available in database. Therefore, I shall assume the total value of each individual bond outstanding. I use maturity date of bond to calculate time to maturity and issuance date of bond to calculate bond age.

⁹ Code of conduct of the Thai Bond Market Association For Members Submitting Quoted bid-offer yield for the Calculation of Reference Yields

¹⁰ “MOF Outright PD” means A primary dealer (financial institutions) for the Ministry of Finance outright transactions that is a member of ThaiBMA and has a duty of submitting quoted bid-offer yield to ThaiBMA. See http://www.thaibma.or.th/pdf/sro/announce/Codeofconduct_ENG_Final.pdf

Sample selection

bid-offer data

I eliminate error data such as bid or offer that has value equal to zero and offer that larger than bid.

2-ways transaction data and bond's information

I use only transactions with outright purpose and transactions that report date, trade date is on the same date.

I merge 2-ways transaction data with Bond's information and eliminate error data such as trade volume that has value equal to zero, transaction that has missing (blank) data, transactions that report date occur before trade date and then; transactions that report time occur before trade time and transactions that trade after 4 pm.

For transaction that has match_id same as the issue_id of another transaction and those transaction have same price and different type of buy or sell, I will count it as the same transaction (it can be in different time but should be in the same price).

Transactions of bond I in one-day period

- Merging D2D transactions (same transaction)
- D2D transactions that have no match id
- D2C transactions

delayed time

This study does not consider for the repeating data of same transactions by 2-ways dealer.

Descriptive statistics

There are two increased transparency events tested in hypothesis 1. The first event is the issuing of notification on 9th January 2008. The second event is the issuing of notification on 24th April 2012.

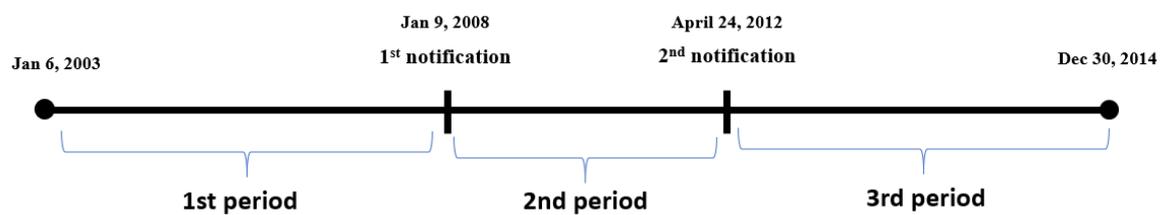


Table 1 and table 2 show all variables of hypothesis 1 in three sub periods.

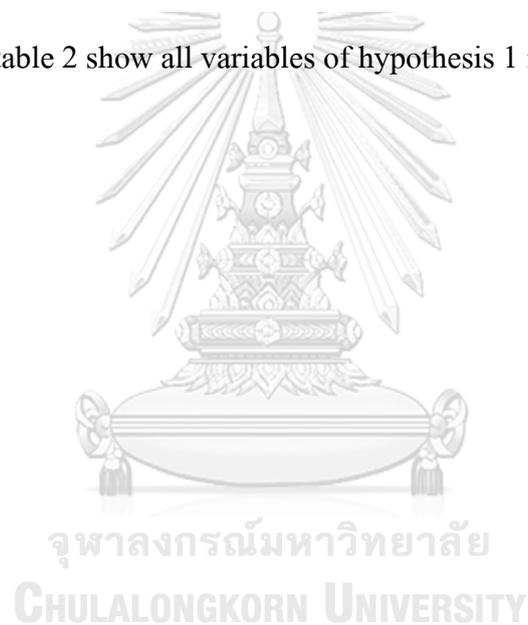


Table1. Descriptive statistics in hypothesis 1 (non-duplicate transaction)

		1 st period	2 nd period	3 rd period
spread	Mean	0.0890	0.0848	0.0535
	Median	0.0617	0.0844	0.0515
	Mode	0.05	0.1000	0.0400
	S.D.	1.1588	0.0221	0.0184
	Min	0.0117	0.0231	0.0174
	Max	65.2638	0.4411	0.1333
TTM	Mean	87.6582	84.1634	81.2059
	Median	77	72	61
	Mode	82	62	54
	S.D.	56.2512	62.6781	71.2205
	Min	0	0	1
	Max	244	603	589
age	Mean	26.5960	47.0992	56.3551
	Median	21	44	49
	Mode	1	46	31
	S.D.	21.9994	30.5258	32.9108
	Min	0	0	0
	Max	89	141	162
issue size	Mean	46069.6647	76355.8610	122718.6665
	Median	40000	52000	75000
	Mode	40000	40000	69000
	S.D.	18979.3809	62269.5024	85881.7224
	Min	10000	5000	10000
	Max	121035	306103.51	306103.51
turnover	Mean	7.4529	18.4838	10.1694
	Median	1.0067	4.4566	1.1429
	Mode	0.25	0.1614	0.7291
	S.D.	20.4951	31.3415	24.3054
	Min	0.0002	0.0003	0.0004
	Max	257.4081633	421.0100	295.2500
price	Mean	101.5357	107.7057	104.0059
	Median	100.6902	105.3275	101.8130
	Mode	100.8815	100.0156	100.9472
	S.D.	5.6513	10.6458	6.4801
	Min	36.8883	16.9769	73.9917
	Max	131.707195	341.7958	171.7128

This Table reports descriptive statistics of the all variables tested in Hypothesis1. For non-duplicate transaction data, it is all trading transaction data merged with the other two parts by its symbol bond and quoted date. Three periods are used in the study: For 1st period, it is the period before there has been an increased post-trade transparency in Thai bond market. The second period which started from January 9th, 2008 to April 23th, 2012 is the period after issuing the first notification but before issuing the second the notification. The last period is the period after issuing the second notification till the end of period. Descriptive statistics are provided for bond characteristics, bond price, liquidity and trading activity of sample bond. Measures of trading activities include turnover ratio. Liquidity measures include daily averaging spread (the differences value between bid yield and offer quoted yield) in Yield (%). Bond characteristics include the average time to maturity and age in month, and issue size of bonds.

Table2. Descriptive statistics in hypothesis 1 (duplicate transaction)

		1 st period	2 nd period	3 rd period
spread	Mean	0.0764	0.0602	0.0354
	Median	0.04	0.0578	0.0344
	Mode	0.02	0.0578	0.0300
	S.D.	1.3936	0.0169	0.0081
	Min	0.0117	0.0231	0.0174
	Max	58.8463	0.3806	0.1078
TTM	Mean	94.1346	69.8050	66.7637
	Median	83	61	60
	Mode	83	61	57
	S.D.	40.4724	31.3041	29.7236
	Min	1	1	1
	Max	238	195	163
age	Mean	14.5384	19.6199	34.8286
	Median	11	13	32
	Mode	1	10	29
	S.D.	12.9449	17.8255	18.3549
	Min	1	1	5
	Max	89	139	157
issue size	Mean	52312.4987	136200.5961	229338.8182
	Median	43830	121035	218682.95
	Mode	40000	152572	218682.95
	S.D.	21348.0958	71952.1202	70138.1699
	Min	10000	10000	10000
	Max	121035	306103.51	306103.51
turnover	Mean	0.6037	0.4959	0.5403
	Median	0.3333	0.3305	0.4346
	Mode	0.25	0.3277	0.4573
	S.D.	1.2122	0.7519	0.8071
	Min	0.0010	0.0000	0.0003
	Max	46	34.6667	64.7727
price	Mean	106.0929	103.3044	101.5039
	Median	104.4070	101.9782	101.3188
	Mode	111.6087	101.8339	100.6785
	S.D.	7.0957	5.0919	1.9921
	Min	83.6545	89.5711	93.9236
	Max	141.812946	130.7984	121.8414

This Table reports descriptive statistics of the all variables tested in Hypothesis1. Data in this table is the combination of 3 data forms which are bid-offer quotation, bond's information and trading transaction. As it is two ways transaction, I duplicate transactions with same bond symbol, price, volume and issue ID. Three periods are used in the study: For 1st period, it is the period before there has been an increased post-trade transparency in Thai bond market. The second period which started from January 9th, 2008 to April 23rd, 2012 is the period after issuing the first notification but before issuing the second the notification. The last period is the period after issuing the second notification till the end of period. Descriptive statistics are provided for bond characteristics, bond price, liquidity and trading activity of sample bond. Measures of trading activities include turnover ratio. Liquidity measures include daily averaging spread (the differences value between bid yield and offer quoted yield) in Yield (%). Bond characteristics include the average time to maturity and age in month, and issue size of bonds.

According to table1, the number of observations in three sub periods are 26502, 68824 and 97502. Table 1 show that spread decreases with time. The mean value of spread in 3 periods are 0.0890, 0.0848 and 0.0535. Spreads reflect the tightness of liquidity in the bond market. In practice, the lower the spread, the higher liquidity. The mean value of spread in 3rd period is 0.0535 meaning that, on average, spread is lowest when the 3rd notification is announced. The average of issue size of bond in three periods are 46069.6647, 76355.8610 and 122718.6665. The value of bond's age in 3 periods are 26.5960, 47.0992 and 56.3551. For non-duplicated transaction, issue size of bond and bond' age increase when notifications are announced. While the mean value of time to maturity in three periods are 87.6582, 84.1634 and 81.2059, showing that, on average time to maturity decrease with time.

According to table 2, the number of observations in three sub periods are 10322, 23516 and 11815. Table 2 also show that spread decreases with time. The different value of average spread between pre-period and 2nd period is smaller than different value of spread between pre-period and 3rd period. As compared with the other two periods, liquidity indicator (spread) shows that the market has highest liquidity with lowest spread in 3rd period. The mean value of spread in 3 periods are 0.0764, 0.0602 and 0.0354. The mean value of spread is lowest in 3rd period, showing that, on average spread is lowest when the 2nd notification in 2012 is announced. The average of issue size of bond in three periods are 52312.4987, 136200.5961 and 229338.8182. The value of bond's age in three periods are 14.5384, 19.6199 and 34.8286. For non-duplicated transaction, issue size of bond and bond' age increase when notifications are announced. While mean value of time to maturity in three periods are 94.1346, 69.8050 and 66.7637, showing that, on average time to maturity decrease with time.

Table 1 and table 2 show that when sample in hypothesis 1 are sorted into three periods by notification's timeline, lower spread is associated with lower bonds' price, lower time to maturity of bond, higher age and issue size of bond in more transparent market. Non-duplicate transactions' size is 4 times greater than duplicate transactions' size. The observation of all non-duplicate transactions is 192828 while the observation of all duplicate transactions tested in hypothesis 1 is 45635.

To avoid multicollinearity in model 1, detecting multicollinearity using tolerance and Variance Inflation Factors (VIF) are required in this study. VIF value in model 1 for duplicated and non-duplicated transactions are not exceed 4. For non-duplicated transactions, VIF value of TTM, age, issue size, price, turnover, 1sttrans, 2ndtrans is 1.3726, 1.6037, 2.3798, 1.3858, 1.1264, 3.1210, and 3.5009, respectively. For duplicated transactions, VIF value of TTM, age, issue size, price, turnover, 1sttrans, 2ndtrans is 1.3520, 1.8194, 1.4901, 1.3482, 1.1721, 2.0165 and 2.4531, respectively. All of tolerance value in model 1 are more than 0.2 but not less than zero. No multicollinearity in model 1.

Table3, table 4 and table 5 show all variables tested in Hypothesis 2a, 2b and 3, respectively.

According to table 3 panel A, the mean value of delay time in pre-period is 28.3228. The mean value of delay in post-period is 7.3114. The mean value of delay in post-period is lower than the mean value of delay in pre-period, showing that, on average, delay time decrease when the 1st notification is announced. The mean value of volume in pre-period and post-period are 35202.74 and 54514.36, respectively. The mean value of bonds' age in pre-period and post-period are 15.3315 and 24.1793, respectively. Table 3 shows that lower delay is associated with higher value of average volume and bonds' age in more transparent market.

According to table 4 panel A, the mean value of delay time in pre-period and post-period are 10.8637 and 5.9047, respectively. The mean value of delay in post-period is lower than the mean value of delay in pre-period, showing that, on average, delay time decrease when the 2nd notification is announced. The mean value of volume in pre-period and post-period are 354479.0592 and 260945.8265, respectively. The mean value of bonds' age in pre-period and post-period are 28.9794 and 40.4946, respectively. Table 4 shows that lower delay is associated with lower value of average volume and higher value of bonds' age in more transparent market.

To avoid multicollinearity in model 2, detecting multicollinearity using tolerance and Variance Inflation Factors (VIF) are required in this study. VIF value in model 2a and 2b are not exceed 4.

For Model 2a, VIF value of vol, age, 2008 dummy is 1.0511, 1.1654, and 1.2026, respectively. For Model 2b, VIF value of vol, age, 2012 dummy is 1.0668, 1.2746, 1.2282. All of tolerance value in Model 2 are more than 0.2 but not less than zero.¹¹

¹¹ No multicollinearity in both model 2a and model 2b (Pedhazur, 1997)

Table3. Descriptive statistics and correlation between variables in hypothesis 2a

Panel A: Descriptive statistics in pre-event and post-event period

	pre-period			post-period		
	delay	volume	age	delay	volume	age
Observations	92884	92884	92884	152489	152489	152489
Mean	28.32288	35202.74	15.33152	7.311426	54514.36	24.17929
Standard Deviation	53.93856	76884.98	14.07394	22.23596	98603.85	21.15952
Minimum	0	4	1	0	4	1
Maximum	474	400000	89	465	5984075	140
Mode	0	10000	1	0	50000	12
Median	3	20000	11	2	30000	17
Standard Error	0.176982	252.2732	0.046179	0.056943	252.5077	0.054186

This Table reports descriptive statistics of the all variables tested in Hypothesis 2a. Two periods are used in the study: the pre-event period (less transparent period, January 4, 2003 to January 8, 2008) and post-event period (more transparent period, January 9, 2008 to April,2012). Descriptive statistics are provided for delayed time of submitted information, bond characteristics and trading activity of sample bond. Measures of trading activities include volume. Bond characteristics include bond age. Where, delay is the differences between trade time and report time for each trades of every bond.

Panel B: Correlation between variables

	delay	volume	age	Trans
delay	1	-0.03214	-0.06018	-0.26204
volume	-0.03214	1	0.08846	0.10239
age	-0.06018	0.08846	1	0.22260
Trans	-0.26204	0.10239	0.22260	1

This table shows correlation across all variable tested in hypothesis 2a. delay is daily average delay time of bond. Volume is total trading volume trade in one day period. Age is the number of months between the bond transaction date and its issuance date of each bond in one day period. Trans is dummy variable. Trans equal to 1, if the sample period is from January 9, 2008 to April,2012 (post-event period). Trans equal to zero, if sample period is from January 4, 2003 to January 8, 2008 (the pre-event period).

Table 4. Descriptive statistics and correlation between variables in hypothesis 2b

Panel A: Descriptive statistics in pre-event and post-event period

	pre-period			post-period		
	delay	volume	age	delay	volume	age
Observations	192975	192975	192975	173461	173461	173461
Mean	10.8637	354479.0592	28.9794	5.9047	260945.8265	40.4946
Standard Deviation	34.8742	1114102.3844	25.4801	34.5813	848066.9657	22.4731
Minimum	0	4	0	0	1	0
Maximum	716	30196000	141	617	58300000	162
Mode	0	50000	12	0	100000	31
Median	2	50000	21	2	87800	38
Standard Error	0.0794	2536.1479	0.0580	0.0830	2036.2412	0.0540

This table reports descriptive statistics of the all variables tested in Hypothesis 2b. Two sub-periods after the announcement of first notification are used in the study: the pre-event period the period from January 9, 2008 to April 23, 2012 and post-event period after issuing the penalty notification in 2012 (period from April 24, 2012 to December 31, 2014). Descriptive statistics are provided for delayed time of submitted information, bond characteristics and trading activity of sample bond. Measures of trading activities include volume. Bond characteristics include bond age. Where, delay is the differences between trade time and report time for each trades of every bond.

Panel B: Correlation between variables

	delay	volume	age	Trans
delay	1	0.0690	0.0421	-0.0137
volume	0.0690	1	0.2255	-0.0467
age	0.0421	0.2255	1	0.2327
Trans	-0.0137	-0.0467	0.2320	1

This table shows correlation across all variable tested in hypothesis 2a. delay is daily average delay time of bond. Volume is total trading volume trade in one day period. Age is the number of months between the bond transaction date and its issuance date of each bond in one day period. Trans is dummy variable. Trans equal to 1, if the sample period is from April 24, 2012 to December 31 (post-event period). Trans equal to zero, if sample period is from January 9, 2008 to April 23, 2012 (the pre-event period).

Table5. Correlation between variables and descriptive statistics in hypothesis 3

Panel A: Correlation between variables

	spread	delay	TTM	age	issue size	volume	price	Turnover	delay*trans2	delay*trans1
spread	1	0.0022	0.0113	-0.0055	-0.0236	-0.0102	0.0006	0.0034	-0.0062	0.0041
delay	0.0022	1	0.0745	-0.0835	-0.1672	-0.0737	0.0984	0.0054	0.3104	0.3953
TTM	0.0113	0.0745	1	-0.2773	0.0825	-0.2798	0.1554	-0.1941	-0.0326	-0.0012
age	-0.0055	-0.0835	-0.2773	1	0.2942	0.2510	0.1752	0.1255	0.0955	-0.0684
issue size	-0.0236	-0.1672	0.0825	0.2942	1	0.1718	-0.2613	-0.2026	0.1423	-0.0697
volume	-0.0102	-0.0737	-0.2798	0.2510	0.1718	1	-0.1326	0.7366	0.0742	-0.0448
price	0.0006	0.0984	0.1554	0.1752	-0.2613	-0.1326	1	-0.0305	-0.0656	0.0300
Turnover	0.0034	0.0054	-0.1941	0.1255	-0.2026	0.7366	-0.0305	1	0.0000	-0.0095
delay*trans2	-0.0062	0.3104	-0.0326	0.0955	0.1423	0.0742	-0.0656	0.0000	1	-0.0407
delay*trans1	0.0041	0.3953	-0.0012	-0.0684	-0.0697	-0.0448	0.0300	-0.0095	-0.0407	1

This table shows correlation across all variable tested in hypothesis 3. Spread is daily average bid-offer spread of each bond, delay is daily average delay time of each bond. Time to maturity (TTM) is the average number of months between transaction date and its maturity date of each bond in one day period. Age is the average number of months between the bond transaction date and its issuance date of each bond in one day period. Price is the weighted average price of each bond in one day period. Issue size is the par value of initial amount issued of each bond. Turnover is the turnover ratio of each bond in one day period. Volume is total trading volume trade in one day period. Trans1 and Tran2 is dummy variable. Both Trans equal zero if the sample is from pre-period (1st period). The period is from January 4, 2003 to January 8, 2008 and Trans1 equals 1 and Trans2 equals zero if the sample is from January 9, 2008 to April 23, 2012 which is the period after issuing first notification (Increased transparency period from first notification; 2nd period) and Trans1 equals zero and Trans2 equals 1 if the sample is from April 24, 2012 to December 30, 2014 (Increased transparency period from issuing second notification in Thai bond market; 3rd period). Delay*trans1 is the interaction between delay and Trans1. Delay*trans2 is the interaction between delay and Trans2.

Panel B: Descriptive statistics in hypothesis 3

1 st period								
	spread	delay	TTM	age	issue size	volume	price	turnover
Mean	0.0764	27.4600	94.1335	14.5391	52312.4	28202.935	106.0925	0.6037
Median	0.04	1	83	11	43830	20000	104.4063	0.3333
Mode	0.02	0	83	1	40000	10000	111.6087	0.25
S.D.	1.3937	56.3952	40.4727	12.9451	21348.7	52265.3825	7.0958	1.2122
Min	0.0117	0	1	1	10000	40	83.6545	0.001
Max	58.8463	464	238	89	121035	1500000	141.8129	46
Count	26500	26500	26500	26500	26500	26500	26500	26500
2 nd period								
	spread	delay	TTM	age	issue size	volume	price	turnover
Mean	0.0602	5.8245	69.8050	19.6199	136200.59	52504.1639	103.3044	0.4959
Median	0.0577	0	61	13	121035	50000	101.9782	0.3305
Mode	0.0577	0	61	10	152572	50000	101.8339	0.3277
S.D.	0.0169	18.8818	31.3041	17.8255	71952	55385.6694	5.0919	0.7519
Min	0.0230	0	1	1	10000	5	89.5711	0.0000
Max	0.3805	465	195	139	306103.51	3000000	130.7984	34.6667
Count	68824	68824	68824	68824	68824	68824	68824	68824
3 rd period								
	spread	delay	TTM	age	issue size	volume	price	turnover
Mean	0.0354	4.3222	66.7632	34.8285	229337.24	96658.83	101.5039	0.5403
Median	0.0344	0	60	32	218682.95	100000	101.3188	0.4346
Mode	0.03	0	57	29	218682.95	100000	100.6785	0.4573
S.D.	0.0081	13.1793	29.7237	18.3551	70138.05	90946.57	1.9921	0.8071
Min	0.0174	0	1	5	10000	31	93.9236	0.0003
Max	0.1078	439	163	157	306103.51	2850000	121.8414	64.7727
Count	97500	97500	97500	97500	97500	97500	97500	97500

This table reports descriptive statistics of the all variables tested in Hypothesis 3. Three periods are used in the study: the 1st period, January 4, 2003 to January 8, 2008 (The pre-event period), 2nd period is the period after issuing the 1st notification (January 9, 2008 to April 23, 2012) and 3rd period is the period after issuing the 2nd notification. (period from April 24, 2012 to December 30, 2014) Descriptive statistics are provided for bond characteristics, bond price, liquidity delayed time¹² and trading activity of sample bond. Measures of trading activities include daily trading volume and turnover ratio. Liquidity measures include daily averaging spread (the differences value between bid yield and offer quoted yield) in Yield (%). Bond characteristics include the average time to maturity and age in month, and issue size of bonds.

¹² Delay is the differences between trade time and report time for each trades of bond i on day T.

According to table 5 panel A, spread is positively related to delay with correlation of 0.0022. Spread is also positively related to delay with correlation of 0.0041 in 2nd period. However, spread is negatively related to delay with correlation of 0.0062 in 3rd period. Table 5 panel A shows that delay decrease with smaller spread when 1st notification is announced. However, delay decrease with larger spread when 2nd notification is announced.

According to table 5 panel B, the number of observations in three sub periods are 26500, 68824 and 97500. The mean value of spread in 1st period, 2nd period and 3rd period is 0.0764, 0.0602 and 0.0354, respectively. The mean value of delayed time in 1st period, 2nd period and 3rd period is 27.4600, 5.8245 and 4.3222, respectively. Table 5 shows that spread and delayed time decreases with time. liquidity indicator (spread) shows that the market has highest liquidity with lowest spread in 3rd period. The mean value of spread is lowest in 3rd period, showing that, on average spread is lowest when the 2nd notification in 2012 is announced. The mean value of average delayed time and spread is largest in the 1st period. While the mean value of average delayed time and spread is smallest in the 3rd period. The average time to maturity of bond in three periods are 94.1335, 68.8050 and 66.7632. The mean value of bonds' price in three periods are 106.0925, 103.3044 and 101.5039. Bonds' price and time to maturity of bond decrease with time. The average of issue size of bond in three periods are 52312.4987, 136200.5961 and 229338.8182. The value of bond's age in three periods are 14.5384, 19.6199 and 34.8286. while issue size and bonds' age increase with transparency.

Table 5 show that when sample in hypothesis 3 are sorted into three periods by notification's timeline, lower spread is associated with lower delayed time, lower price, lower time to maturity of bond, higher volume, age and issue size of bond in more transparent market.

To avoid multicollinearity in model 3, detecting multicollinearity using tolerance and Variance Inflation Factors (VIF) are required in this study. VIF value of delay, time to maturity, age, issue size, volume, price, turnover, delay*1st trans and delay*2nd trans is 1.45260, 1.32023, 1.45047, 1.82448, 3.07481, 1.29739, 2.95839, 1.21800 and 1.23546, respectively which not exceed 4. The value of their tolerance is 0.68842, 0.75744, 0.68943, 0.54810, 0.32522, 0.77078 ,0.33802, 0.82102 and 0.80942 (more than 0.2 but not less than zero)



CHAPTER V METHODOLOGY

Regression analysis

This study shall focus on effect of increased transparency on market liquidity. In addition, the study uses cross-sectional analyses to control for additional bond characteristics, trading activity and other liquidity proxies which affecting spreads. (Harris and Piwowar (2005), Alexander et al (2000) and (Huang & Stoll, 1997))

Hypothesis 1: Increased transparency leads to lower spreads.

Increasing market transparency will foster competition amongst dealers and increase number of buyer and seller. Moreover, it can increase the efficiency of the price discovery process, which opening the information to all kinds of investors, reduce bid-ask spreads, reduce search cost for investors.

There has a transparency enhancement in the Thai bond market. Thai authorities are issuing two notifications for improving the market efficiency and increased customer activity which provide natural experiment to investigate the effect of increased post-trade transparency on market liquidity in two periods of time, before and after issuing the notifications in Thai bond market.

- The first notification is for maintain data accuracy & completeness for develop data integrity. The Notification of The Thai Bond Market Association Re: Terms, Conditions and procedure concerning reporting of debt instrument trading come into force on and from 9th January 2008.¹³
- The second notification is the penalty for Late Transaction, Error Transaction, or Missing Transaction. The Notification of the Board of Directors of the Thai

¹³ See

http://www.thaibma.or.th/pdf/sro/announce/2.5_Notification_Terms,%20Conditions%20and%20Procedure%20concerning_Jan%2008.pdf

Bond Market Association Re: Administrative Sanctions concerning Reporting of Debt Instrument Trading come into force on and from 24th April 2012.¹⁴

	1 st period	2 nd period	3 rd period
1 st Trans dummy	0	1	0
2 nd Trans dummy	0	0	1

Chen and Zhong (2012) find that traders will get benefit in transparent market as they become more patient in OTC trading. For dealer side, to induce and keep trader to trade with them, they decrease offer price, increase bid price for trader. As the result, spread become narrower in transparent market.

To investigate the effect of post-trade transparency enhancement on market liquidity measured by bid-offer spreads, this study shall include the control variables following this following study. (Griffiths, Smith, Turnbull, & White, 2000) The control variables are time to maturity, age, price, initially issued amount and turnover ratio of bonds. These externalities determinant is considered to measure the effect of increased transparency on spread.

$$\overline{spread}_{i,T} = \beta_0 + \beta_1 TTM_{i,T} + \beta_2 age_{i,T} + \beta_4 price_{i,T} + \beta_5 issuesize_i + \beta_6 1st\ Trans_T + \beta_7 2nd\ Trans_T$$

The model is developed as an alternative approach to examine the effect of transparency on spread (Hypothesis 1).

$$H_0: \beta_6, \beta_7 = 0 \text{ vs. } H_1: \beta_6, \beta_7 < 0$$

Where, $\overline{spread}_{i,T}$ (%) is the average bid-offer spread of bond i in day T,

$TTM_{i,T}$ is the number of months between the bond transaction date and its maturity date of bond i on day T,

¹⁴ See http://www.thaibma.or.th/pdf/sro/announce/5_2_Administrativesanctions.pdf

$age_{i,T}$ is the number of months between the bond transaction date and its issuance date of bond i on day T ,

$\overline{price}_{i,T}$ is the weighted average price of bond i on day T ,

$issue\ size_i$ is the par value of initial amount issued of bond i ,

$turnover_{i,T}$ is the turnover ratio of bond i on day T and,

$1st\ trans_T$ and $2nd\ trans_T$ are dummy variables.

Where, $Trans$ denotes transparency dummy,

- Both $Trans$ equal zero if the sample is from pre-period (1st period). The period is from January 4, 2003 to January 8, 2008 and,
- $1st\ trans_T$ equals 1 and $2nd\ trans_T$ equals zero if the sample is from January 9, 2008 to April 23, 2012 which is the period after issuing first notification (Increased transparency period from first notification; 2nd period) and,
- $1st\ trans_T$ equals zero and $2nd\ trans_T$ equals 1 if the sample is from April 24,2012 to December 30, 2014 (Increased transparency period from issuing second notification in Thai bond market; 3rd period).

Data in model 1 is the combination data of 3 parts which are bid-offer quotation, bond's information and trading transaction.

For duplicate transaction data, I firstly divided transactions into two segments. The first transaction segment is the unique one. The second segment is the transactions that have matching ID (only duplicate transactions reported by both sides of dealers (i.e. one buy and one sell) with same bond symbol, price, volume and issue id will have matching ID). I separate the 2nd segment into buy side and sell side and, duplicate them into one column then, equally random buy and sell in to column by using uniform. After that, I merge two segments of transactions into one. Finally, I

merge the 3 parts of data forms together by its bond symbol and quoted date. The data that not exist when joined 3 tables together will be eliminated.

For non-duplicate transaction data, it is all trading transaction data merged with the other two parts by its symbol bond and quoted date.

Hypothesis 2: The announcement of Notification of Board of Director of ThaiBMA leads to smaller delay time.

There are two announcements of Notification of Board of Director of ThaiBMA that issued for transparency propose in controlling dealer's behavior.

The notifications are issued for improved the market efficiency and increased customer activity. Goldstein, Hotchkiss, and Sirri (2007) find that transparency can improve dealers' ability to share risks allowing them to disclose trades in smaller delay time. Therefore, increased post-trade transparency in OTC markets may improves dealers' behavior to report in real-time. (Dealers have smaller delayed time in submitting their trading information to ThaiBMA)

For the control variable, bond age and Volume¹⁵ are the parameters required in this hypothesis. When a large trade is revealed to the market, it may induce other large trades. Since dealers are responsible for accurately reporting all information in trade reports. Therefore, if dealers are not reported information in timely basis, singular trades can cause double size of volume.¹⁶

Data in model 2 is the combination data of two parts which are bond's information and trading transaction. As it is two ways transaction data but buyer and seller from same match id can trade and report transaction in the different time.

¹⁵ Given the illiquid nature of Off the Runs, a TRACE-like 15 minutes delay in reporting Price, Time & Volume would have limited market impact.

¹⁶ The evidence from Treasury Securities by Brandon Becker, Andre E. Owens and Iram Huq.

Therefore, to capture the impact of increased transparency on delayed time. I shall use all trading transactions and then merging them with bonds' information by its symbol and quoted date.

- **Hypothesis 2a: The announcement of reporting trading transactions notification leads to smaller delay time.**

The Notification of The Thai Bond Market Association Re: Terms, Conditions and procedure concerning reporting of debt instrument trading on January 9, 2008 specify the required information of transaction report and control post-trade deferred publication regime. Dealers must report all required trading information (price, volume and trade purpose etc.,) to ThaiBMA within 30 minutes after execution for public dissemination.

$$\overline{delay}_{i,T} = \beta_0 + \beta_1 volume_{i,T} + \beta_2 age_{i,T} + \beta_3 2008_T$$

This multiple Linear Regression is used to investigate the relationship between transparency, determinants of liquidity, and delay time by test One-sided T-test. (Hypothesis 2a)

$$H_0: \beta_3 = 0 \text{ vs. } H_1: \beta_3 < 0$$

Where, $\overline{delay}_{i,T}$ is the average delayed time (minutes) of bond i on day

This study measures the average delayed time as following equation.

$$\overline{delay}_{i,T} = \frac{\sum delay_{i,t}}{\text{no. of transactions(one day period)}}$$

Where, $delay_{i,t}$ is the differences between trade time and report time for each trades of bond i on day T.

Where, 2008_T is a dummy variable.

- 2008 equals one if the sample is from post-period is period from January 9, 2008 to April 23, 2012 and
- 2008 equals zero if the sample is from pre-period is the period from January 6, 2003 to January 8, 2008.

The definition of $volume_{i,T}$, $age_{i,T}$ are the same as in the hypothesis 1.

- **Hypothesis 2b: The announcement of penalty for late reporting trading transactions leads to smaller delay time.**

The Notification of the Board of Directors of the Thai Bond Market Association Re: Administrative Sanctions concerning Reporting of Debt Instrument on April 24, 2012 is a penalty for Late submitted trading transaction. ThaiBMA is design this notification to control dealers' obligation and support their trading regulation in 2008.

I investigate how the announcement of penalty for late reporting trading transactions in 2012 affect dealers' behavior. The period of data is from January 9, 2008 to December 31, 2014 (after announcement of rule in 2008). I divide data into two periods to capture the effects of transparency on delayed time.

$$\overline{delay}_{i,T} = \beta_0 + \beta_1 volume_{i,T} + \beta_2 age_{i,T} + \beta_3 2012_T$$

This multiple Linear Regression is used to investigate the relationship between transparency, determinants of liquidity, and delay time by test One-sided T-test. (Hypothesis 2b)

$$H_0: \beta_3 = 0 \text{ vs. } H_1: \beta_3 < 0$$

Where, 2012_T is a dummy variable.

- 2012 equals one if the sample is from post-period is period from April 24, 2012 to December 31, 2014 and

- 2012 equals zero if the sample is from pre-period is the period from January 9, 2008 to April 23, 2012.

The definition of $volume_{i,T}$, $age_{i,T}$ are the same as in the hypothesis 1.

Hypothesis 3: Spreads decrease with the shortening delay in the reporting of trades in transparent market.

Bessembinder (2003) measure trading costs of NASDAQ and NYSE stocks with different trade lag. Lag is the number of seconds deducted from the trade report time before comparing to quotes. He finds that the effective half-spread with no lag is less than spread with a thirty-second lag. Moreover, he finds a reduction in price dispersion. According to the finding of prior researches, the reduction of price dispersion reflects a decrease in transaction costs.

Regarding to previous studies, trading in the market with longer time delays will have the greatest increase in transaction costs. Time delays leads to higher transaction costs for investors. It allows a market maker to facilitate investors' demands to buy and sell, without exposing them to adverse price movements. (Green, 2006)

$$\begin{aligned} \overline{spread}_{i,T} = & \beta_0 + \beta_1 TTM_{i,T} + \beta_2 age_{i,T} + \beta_3 volume_{i,T} + \beta_4 \overline{price}_{i,T} + \beta_5 issuesize_i \\ & + \beta_6 turnover_{i,T} \\ & + \beta_7 \overline{delay}_{i,T} + \beta_8 \overline{delay}_{i,T} \times 1stTrans_T + \beta_9 \overline{delay}_{i,T} \times 2ndTrans_T \end{aligned}$$

I examine whether the impact of delay time on spread is significant after increased transparency in bond market by test One-sided T-test. (Hypothesis 3)

$$H_0: \beta_8, \beta_9 = 0 \text{ vs. } H_1: \beta_8, \beta_9 > 0$$

Where, $\overline{delay}_{i,T}$ is the average delayed time (minutes) of bond i on day

$\overline{delay}_{i,T} \times 1stTrans_T$ is the interaction between $\overline{delay}_{i,T}$ and $1stTrans_T$

$\overline{delay}_{i,T} \times 2ndTrans_T$ is the interaction between $\overline{delay}_{i,T}$ and $2ndTrans_T$

The definition of

$\overline{spread}_{i,T}$, $TTM_{i,T}$, $age_{i,T}$, $volume_{i,T}$, $\overline{price}_{i,T}$, $amt\ issued_i$, $turnover_{i,T}$,

$1stTrans_T$ and $2ndTrans_T$ are same as in the hypothesis 1.

Data in model3 is the combination data of three parts which are bid-offer quotation, bond's information and trading transaction. To capture the impact of increased transparency on delayed time. I shall use all trading transaction data merged with the other two parts by its symbol bond and quoted date.



CHAPTER VI EMPIRICAL RESULTS AND DISCUSSION

The effect of transparency on spread

Model 1 is developed as an alternative approach to investigate the effect of post-trade transparency enhancement on market liquidity measured by bid-offer spreads.

$$\overline{spread}_{i,T} = \beta_0 + \beta_1 TTM_{i,T} + \beta_2 age_{i,T} + \beta_4 \overline{price}_{i,T} + \beta_5 issue_{size}_i + \beta_6 1st\ Trans_T + \beta_7 2nd\ Trans_T$$

Table 6: Result of multiple linear regression analysis with spread as dependent variable and time to maturity, age, issue size, price, turnover, 1stTrans, and 2ndTrans as independent variables.

Variables	Model 1			
	Duplicate transactions		Non-duplicate transactions	
	Coefficients	P-value	Coefficients	P-value
intercept	0.09639** (0.03207)	0.00265	0.28353** (0.03109)	0.00000
time to maturity	0.00019** (0.00005)	0.00004	0.00022** (0.00004)	0.00000
age	0.00022** (0.00011)	0.04708	0.00053** (0.00007)	0.00000
issue size	0.00000 (0.00000)	0.06734	0.00000** (0.00000)	0.00021
price	-0.00026 (0.00033)	0.43204	-0.00219** (0.00030)	0.00000
turnover	0.00000 (0.00010)	0.97906	0.00023 (0.00145)	0.87235
1 st Trans dummy	-0.00387 (0.00733)	0.59719	-0.01344** (0.00434)	0.00195
2 nd Trans dummy	-0.03381** (0.00923)	0.00025	-0.04278** (0.00552)	0.00000
R Square	0.001206		0.001372	
Observations	45653		192828	

This table show the association between spread and transparency period dummy variable identifying whether spread is narrower in more transparent market. Time to maturity, age, issue size, price and turnover are used as control variables.

For model 1, the results of regression analysis using duplicate transactions data show that overall model is significant, but not with all predictors.

Time to maturity, age and 2nd trans dummy are significant in predicting spread. It is shown that the significance values of each variables are less than 0.05. When controlling for the transparency effect, price, turnover and both transparency dummy was found to be negatively related to the probability of spread while time to maturity, age and issue size have positive impact on the probability of spread.

When looking at the results of model analysis with non-duplicate transactions data, the overall model still significant together with the predictors except for turnover. Transparency dummy and price were found to be negatively related to the probability of spread while time to maturity, age, turnover and amount issue have positive impact on the probability of spread. This finding is consistent with the studies of Amihud and Mendelson (1980), Pagano and Roell (1996), Edwards, Harris et al. (2007).

In conclusion, the impact of increased transparency on spread are significant for both duplicate transactions and non-duplicate transactions. The null hypothesis (hypothesis 1), which hypothesizes that the coefficient of both transparency dummy variable is equal to zero, the 1st transparency dummy cannot be rejected at 95 percent confidence for duplicate transactions in most of the model. There are no significant differences between the impact of increased transparency from the first notification on spread. Since non-duplicate transactions' size is more than duplicate transactions by four times. Therefore, during post periods, market is more likely to be indifferent. Meanwhile, the impact of increased transparency from the second event on spread are significant for duplicate transactions. There is significant difference between the impact of increased transparency on spread from the second event for duplicate transactions.

For non-duplicate transactions, the null hypothesis (hypothesis 1) which hypothesizes that the coefficient of both transparency dummy variable is equal to zero can be rejected at 95 percent confidence. There is significant difference between the impact of increased transparency on spread.

Table 6 shows that the impact of 2nd increased transparency event in 2012 on spread is more significant than the impact of the first event. This can imply that the spread of bonds that traded in the 3rd period is lower than the spread of bonds that traded in the 2nd period.

I find that depending on bond age, increased transparency has positive effect on market liquidity, as measured by estimated bid-ask spreads while time to maturity of bond show relative decrease on spread. This is consistent with the “on-the-run” effect faced by corporate bonds. This finding is consistent with the evidence from Edwards, Harris and Piwowar (2005). They find the positive and significant coefficients on time to maturity and time since issuance (age). A younger bond is more liquid than an older bond and has a smaller bid-ask spread. Measures of trading activity, such as turnover ratio, show no relative increase for both duplicate transactions and non-duplicate transactions, indicating that increased transparency does not lead to greater trading interest in three sample periods.

The relationship between issue size and bid-offer spread seems to be mixed. Issue size has either a negative and positive effect on market liquidity. The following study (Harris, 2007) provide evidence that bond with large issues size are cheaper to trade than small issues size. Depending on bond price, increased transparency has a negative effect on market liquidity. This finding is consistent with the idea of stock’s liquidity. If the price of security is low, the bid-ask spread will tend to be large. The number of low-priced securities that can be traded will be limited because most of them have small size, making the them less liquid.

The effect of transparency on delayed time

Model 2 is developed as an alternative approach to investigate the relationship between transparency, determinants of liquidity, and delayed time.

$$\overline{\text{delay}}_{i,T} = \beta_0 + \beta_1 \text{volume}_{i,T} + \beta_2 \text{age}_{i,T} + \beta_3 \text{2008}_T \quad (2a)$$

$$\overline{\text{delay}}_{i,T} = \beta_0 + \beta_1 \text{volume}_{i,T} + \beta_2 \text{age}_{i,T} + \beta_3 \text{2012}_T \quad (2b)$$

Table 7: Result of multiple linear regression analysis with delayed time as dependent variable and volume, age, and Trans dummy as independent variables.

<i>Variables</i>	Model 2a		Model 2b	
	<i>Coefficients</i>	<i>P-value</i>	<i>Coefficients</i>	<i>P-value</i>
Intercept	28.45080 (0.14007)	0	21.45895** (1.10705)	0.00000
volume	0.00000 (0.00000)	0.00733	0.00000** (0.00000)	0.00000
age	-0.00321 (0.00404)	0.4275541	0.05631** (0.00261)	0.00000
Trans dummy	-20.93987 (0.16082)	0	-1.81728** (0.12698)	0.00000
R Square	0.06870		0.00619	
Observations	245373		366436	

This table show the association between delayed time and transparency period dummy variable identifying whether delayed time is smaller in more transparent market. Volume and age are used as control variables.

Model 2 is the regression models for the relationship between delayed time and transparency. For model 2a, it is shown that volume is significant in contributing to the model and in predicting the delayed trade reporting probability in Thai bond market. Age and transparency dummy are negatively related to the probability of delayed time. While, Volume is positively related with spared. This evidence supports Grossman and Stiglitz (1980) and Kyle (1989), Rindi (2002), who argue that increased transparency requirements, by requiring dealers to disclose information, will reduce market makers' incentive in liquidity provision. Therefore, they may not disclose information in real time basis or choose not to disclose information at the first place.

For model 2b, the results show that overall model is significant. All predictors are significant in contributing to the model and in predicting the delayed trade reporting probability. The notification designed to control dealers to submit trading information quickly. It is shown that the significance values of each variables are less than 0.05. When controlling for the transparency effect and transparency dummy were found to be negatively related to the probability of delayed time while age and trading volume have positive impact on the probability of delay.

For hypothesis 2b, which hypothesizes that the coefficient of transparency dummy variable is equal to zero, the null hypothesis can be rejected. This is due to the rule of Thai BMA that require dealers to submit all trading information within 30 minutes after execution for public dissemination. Delayed time is considered affected by the transparency period. The transparency effects on spread are found to be negative. Goldstein, Hotchkiss, and Sirri (2007) also focus on the changing in the immediate time surrounding dissemination of U.S. corporate bonds, they find that transparency can improve dealers' ability to share risks allowing them to disclose trades in shorter delay time.

I find that depending on bond age and trading volume, increased transparency has positive effect on delayed time. This finding is consistent with the evidence from Treasury Securities by Brandon Becker, Andre E. Owens and Iram Huq. When a large trade is revealed to the market, it may induce other large trades. Since dealers are responsible for accurately reporting all information in trade reports. Therefore, if dealers are not reported information in real time basis, singular trades can cause double size of volume.

The effect of spread on delayed time

Model 3 is developed as an alternative approach to investigate whether the impact of delay time on spread is significant after increased transparency in bond market.

$$\begin{aligned} \overline{spread}_{i,T} = & \beta_0 + \beta_1 TTM_{i,T} + \beta_2 age_{i,T} + \beta_3 volume_{i,T} + \beta_4 \overline{price}_{i,T} + \beta_5 issue_{size}_{i,T} \\ & + \beta_6 turnover_{i,T} \\ & + \beta_7 \overline{delay}_{i,T} + \beta_8 \overline{delay}_{i,T} \times 1stTrans_T + \beta_9 \overline{delay}_{i,T} \times 2ndTrans_T \end{aligned}$$

Table 8: Result of multiple linear regression analysis with spread as dependent variable and delay, time to maturity, age, issue size, volume, price, turnover, delay*1stTrans dummy and delay*2ndTrans dummy as independent variables.

Model 3		
Variables	Coefficients	P-value
Intercept	0.20315** (0.03023)	0.00000
delay	-0.00007 (0.00005)	0.16964
time to maturity	0.00028** (0.00004)	0.00000
age	0.00032** (0.00007)	0.00001
issue size	0.00000** (0.00000)	0.00000
volume	0.00000** (0.00000)	0.02198
price	-0.00147** (0.00030)	0.00000
turnover	0.00350 (0.00236)	0.13837
delay*1 st Trans dummy	0.00019 (0.00014)	0.08740
delay*2 nd Trans dummy	-0.00007 (0.00011)	0.57946
R Square	0.00095	
Observations	192824	

This table show the association between spread and delayed time identifying whether spread is narrower with smaller delayed time in more transparent market. Delay, time to maturity, age, issue size, volume, price and turnover are used as control variables.

For model 3, the results show that overall model is significant. Five predictor variables which are time to maturity, age, issue size, volume and price are significant in predicting spread. On the other hand, the two interaction terms between delay and transparency dummy (delay*1st Trans dummy and delay*2nd Trans dummy), delayed time and turnover in model are not significant in predicting spread.

For the null hypothesis (hypothesis 3) which hypothesizes that the coefficient of both interaction terms between delay and transparency dummy variables are equal to zero cannot be rejected at 95 percent confidence in most of the model. The average daily spread in Thai bond market is not associated with delay time in three periods of time (pre-period, period after issuing first notification and period after issuing the second notification). This evidence supports that that near immediate and full transparency of submitting the information in real time basis hurt liquidity as market makers faced increased risks from disclose their positions. (Ganley, 1998) There is not enough statistical evidence to conclude that the impact of delay time on spread is significantly differences across transparency periods.

CHAPTER VII CONCLUSION

The purpose of this paper is to examine the effect of increased transparency on market liquidity. I study liquidity proxy variables, such as spread, bond issued amount factor, bond trading volume factor, bond trading turnover factor and bond age factor, and try to find the impact of increased post-trade transparency on government bond spread. Following the approaches of the Edward, Harris and Piwowar (2005), this paper will generate the evidences on the Bessembinder, Maxwell, and Venkataraman (2006) and Gravelle (1999) hypotheses to investigate the effect of increased post-trade transparency on spread and market liquidity with cross sectional regression. I apply the approaches of Bessembinder (2003) to test the effect of shortening delay in the reporting on trading cost in transparent market.

The results show that the average daily spread is negatively related to transparency dummy period significantly at 95% confidence. This can imply that if post-trade transparency increase, the average daily spread of overall bond in Thai bond market will decrease. This evidence supports Edwards, Harris and Piwowar (2007), Chen and Zhong (2012) who argue that traders' trading costs are decreasing in transparent market.

Increasing market transparency will increase the efficiency of the price discovery process opening the information to all kinds of investors, reduce bid-ask spreads, reduce search cost for investors and foster competition amongst dealers. Most low spread of overall bonds in Thai bond market are the result of the transparency enhancement by Thai authority in 2012.

When focusing on the relationship between transparency and delayed time on each time interval, the result imply that dealers tend to follow the rule (submit the trading information with timely basis) after the announcing penalty for late reporting

trading transactions in 2012. This evidence supports Madhavan (2005) who argues that market makers will have high risks from disclose their positions. Therefore, they may not disclose information in real time basis or choose not to disclose information at the first place and use it to reduce price competition and make a profit.



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จุฬาลงกรณ์มหาวิทยาลัย
CHULALONGKORN UNIVERSITY

VITA

NAME Tanamard Patana-aneek

DATE OF BIRTH 12 June 1992

PLACE OF BIRTH Bangkok

INSTITUTIONS ATTENDED Chulalongkorn University

HOME ADDRESS 73 Amornchai1 Rama2 Rd. soi 36 Bangmod Jomthong Bangkok Thailand,
10150

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