Marking the Close analysis in Thai Bond Market Surveillance using association rules

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ABSTRACT

This study investigates the opportunity of employing data mining techniques as a supplement to traditional techniques, such as economic modeling, to detect misconduct in the Thai Bond Market. In the study, association rules are used to detect "Mark the Close" conduct in the Thai Bond Market Association (ThaiBMA) surveillance system. The experiment was conducted on 54,334 trading transactions reported to the ThaiBMA in the year 2005. The result shows that association rules can be effectively used to provide a short list of traders who are likely to behave in such a way.

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1. Introduction

1.1. Background to Thai Bond Market Surveillance

The Thai Bond Market has been established and growing since November 1994. As of 2006, the size of the Thai Bond Market was 4085.26 THB billion which was 52.29% and 80.44% of the Thai GDP and stock exchange market capital, respectively. The development of the Bond Market in Thailand has been one of the important items on the agenda for policymakers since the 1997 financial crisis. Recently established by the Security Exchange Commission of Thailand in September 2005, the Thai Bond Market Association (ThaiBMA) is a self-regulatory organization that is responsible for overseeing and monitoring the conduct of its members in order to ensure fairness and efficiency in debt securities trading. Its main role is to provide the fair and efficient operation of the Bond Market and to be an information centre for the Thai Bond Market. It also supports Bond Market development and sets the market conventions and standards for bond trading in Thailand.

As part of being a self-regulatory organization, the ThaiBMA is responsible for performing market monitoring and surveillance to ensure that all trading activities comply with relevant laws and regulations, and acting as the front line in detecting any unfair trading practices. In order to perform this function efficiently, the ThaiBMA is implementing an automated surveillance system to help signal unusual trading in daily trade transactions so that the agency can conduct investigations which, in some cases, may lead to further reports and enforcement. The surveillance workflow is shown in Fig. 1.

As suggested in Fig. 1, trading transactions are monitored and analyzed in real time. If a trading transaction is "unusual" and war-rants further investigation, it will be examined to see whether there has been a breach in the code of conduct. If so, the agency shall report the breach and notify the regulator to enforce the regulation. The other elements of the surveillance system include the timely disclosure of information as well as education and procedure reviews. This study focuses on employing data mining techniques in trading analysis which is shown as a dotted rectangle in Fig. 1.

1.2. Trading analysis

One approach to trading analysis is based on the literature from financial econometrics. This approach compares the current trading price with the historical time series properties of the bond price process such as the GARCH model (Bollerslev, 1986). The idea is that if current trading diverges too far from the mean of past trading, it may be unusual and warrant further investigation. This approach may be suitable to a mature Bond Market where liquidity is sufficient but the turnover of the Bond Market in Thailand is relatively low compared to those of developed markets such as the US and European Bond Markets. In the case of the current market in Thailand, basing an analysis on price process models alone may not be an effective approach. So we have resorted to an additional approach, data mining, which focuses the analysis on trader behaviour that exists in historical trading transactions.[1] The signals from the two analyses are then integrated in order to issue a warning signal to the agency to further

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[1] Apart from economic related variables such as price and volume, a trade transaction also includes trader ID, trading time, and flagging which are not used in the economic analysis because the analysis does not incorporate human behavioural aspect into the modelling process.
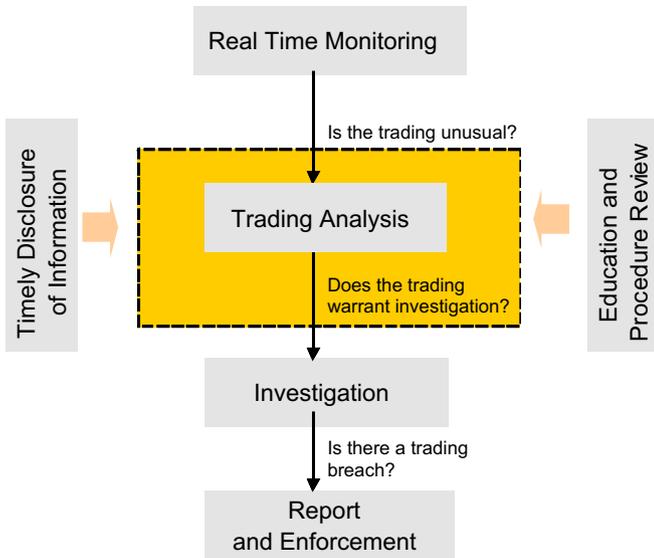
Fig. 1. Surveillance workflow of the ThaiBMA.

investigate the trading. The combination of the two approaches into the trading analysis is shown in Fig. 2.

1.3. Marking the close analysis

The trading analysis covers a variety of misconduct such as Mark the Close, Price Manipulation, Volume Manipulation, Insider Trading, Series Trading, Matching Orders, Parking, Front Running, and Excessive Marking up/down. One of the types of misconduct that can be detected by behavioural model is "Mark the Close". Mark the Close is defined by the ThaiBMA as an activity intending to manipulate the closing price by dealing in a small lot of a specific bond just before the market closes. At present, the trading of bonds in Thailand is done over the counter and involves dealers having to report the trade transaction to the ThaiBMA within

30 min of the transaction's completion. All transactions have to be submitted to the ThaiBMA before 4 p.m., when the market closes. The closing price of each bond on a particular day is the price of the last transaction of that bond on that day according to trading time.

To prevent Mark the Close conduct, for the last three years, the ThaiBMA has been applying two additional rules in closing price calculation. Firstly, a government or a corporate bond transaction whose value is less than 5 or 1 THB million (based on PAR) respectively will be flagged as a "Small Lot" (SL) and will not be used in the closing price calculation. Secondly, a transaction whose price significantly deviates from the yield curve without a reasonable cause will be flagged as "Not in Line" (NL) and also will not be included in the closing price calculation.

2. Association rules

2.1. The association rule concept and application

The data mining technique that is used in Mark the Close analysis is the association rule. Discovering association rules is an important data mining problem (Agrawal, Imilienski, & Swami, 1993). There has been considerable research on using association rules in a variety of domains. One application of association rules in finance can be found in Liao, Ho, and Lin (2008) work where association rules are used to propose stock category association and possible stock category investment collections on the Taiwan Stock Market.

The Association rules concern whether a group of variables (mostly 2 variables are considered) is more significantly associated than we would normally expect or not (Berry & Linoff, 2004). It is rooted in analyzing point-of-sale transactions and the goal is to extract associations of the type "If A then B with x% confidence", which means "If customers buy product A, they also tend to buy product B, x% of the time". Association rules can be applied outside the retail industry to items such as those purchased together on a credit card, optional services purchased by telecommunication customers (call waiting, call forwarding), and banking services used by retail customers. Although, mostly applied to products,
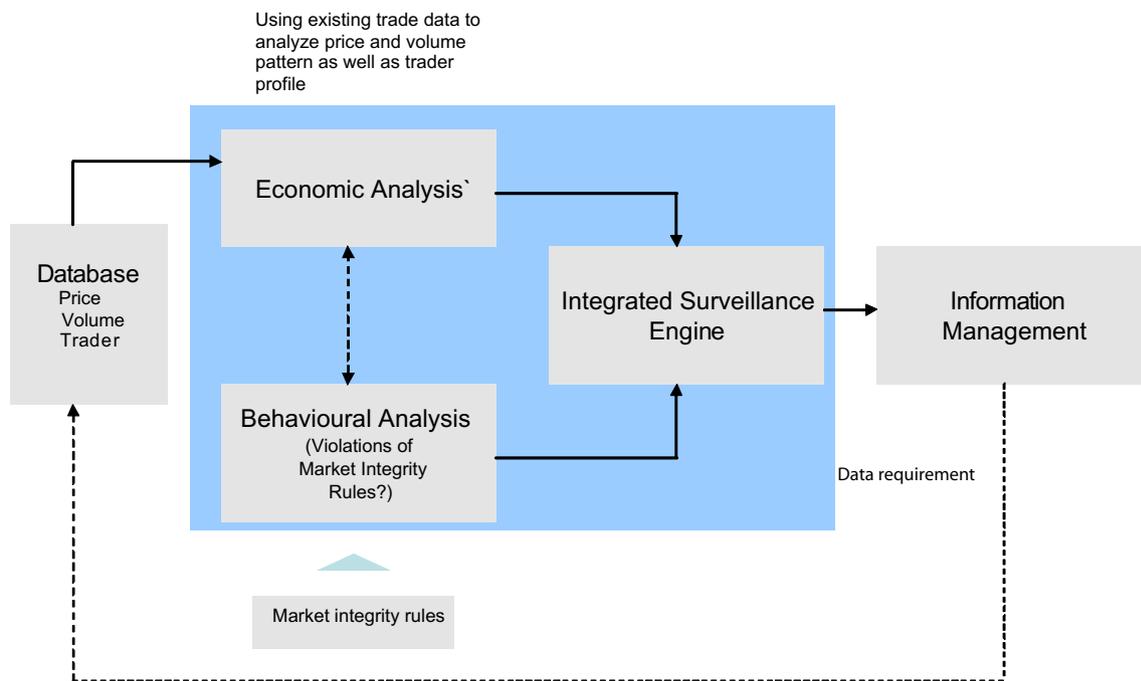

Fig. 2. The combination of the two analysis approaches into the trading analysis.