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Developing Investor Sentiment Index for Thailand

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# Discussion Paper:

## Developing Investor Sentiment Index for Thailand\*

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### Abstract

This paper discusses the potential of using principle component, proposed by Baker and Wurgler (2014), to construct investor sentiment index for Thailand. The top down approach does not require interviewing process which is costly and time consuming. This paper shows that the index from this approach has a potential to be used as a proxy for investor sentiment index for Thailand as it can indicate major market sentiment and has some predictive power over return on MAI market. The index has yet to be improved in terms of choice of proxies and control for fundamental movement.

## 1 introduction

Investors usually make their trading decisions based on both fundamental analysis and their sentiment. Their trading activities are concluded in stock market price, which reflects all information investors have used. Investor sentiment may drive stock market price away from its fundamental value<sup>1</sup>. Shiller (1981) recognizes that the fluctuations in the U.S. stock prices is too big relative to the fluctuation in fundamental values. Harrison and Kreps (1978) propose that overconfidence in the stock market causes speculative premium in asset prices. De Long, Shleifer, Summers and Waldmann (1990) suggest that the presence of sentimental traders creates inefficiency, which leads to price anomalies and excess price volatility. In addition, a great deal of recent empirical works (for example, Baker, Wurgler and Yuan (2012), Baker and Wurgler (2006), Lee, Jiang and Indro (2002) and Baker, Bradley and Wurgler (2010))

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\*Preliminary, please do not quote

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<sup>1</sup>The classical finance theory, for example the standard CAPM, assumes that investors are rational and perceive all available information in precisely the same manner. The market will adjust until the equilibrium price of an asset is equal to its rationally discounted value of expected cash flows or the true fundamental price. Investor sentiment have no impact on stock prices. Academics have challenged the assumptions of the classical finance theory since 1980s; particularly, the perfect rationality of investors, the irrelevance of irrational investors and the role of arbitrage activity. The break-down of assumptions of the classical finance theory induces a significant effect of investor sentiment on stock prices.

find that investor sentiment is significantly correlated with cross-section stock returns and stock price volatility in the major stock markets over the world. Mclean and Zhao (2014) find that investor sentiment has an impact on stock prices, and through this channel on the U.S. business cycle.

Literature suggests that investor sentiment plays an important role in the economy. Specifically, even though all information is acquirable, sentimental traders tend to slip from their fundamental valuations. Small degree of sentiment can create a positive trading environment. On the contrary, higher degree of sentiment can disturb market stability, making market more volatile. Investor sentiment may have a significant impact on stock market, and hence on the real economy. Identifying investor sentiment benefits to both investors and a regulator.

There is no official data series for investor sentiment in the Stock Exchange of Thailand (SET) available yet from neither government organization nor academic research center <sup>2</sup>. Measuring investor sentiment is not straightforward because the definition of investor sentiment itself is unclear. Currently, there are at least two approaches to make an investor sentiment index. The first approach is to conduct a direct survey from investors Brown and Cli (2004). Thus, it is widely used in many countries. However, this approach is costly and prone to interviewees bias. Another approach assumes that prices reflect investors' prospective; rational or irrational. Both in research and in practice, there are many market-based indicators used as a signal for investor sentiment. A composite index of market-based indicators as a measure of sentiment (Baker and Wurgler (2006)) would reduce investor's biases and reduce the survey cost and it is also the dominant measure used in many recent studies on investor sentiment (for example, Antoniou, Doukas, and Subrahmanya, (2013), Hribar and McInnis (2012), Stambaugh, Yu, and Yuan (2012a, 2012b), Baker, Wurgler and Yuan (2012) and Yu and Yuan (2011)).

Based on the second approach, this paper aims to discuss the possibility to develop an investor sentiment index for SET by applying methodology and proxies which are suggested by Baker and Wurgler (2006). The methodology and proxies would be adjusted so that they fit with Thailand's economic conditions. The authors hope that investor sentiment index developed by this approach would show overall investor's opinions on the future movement of stock market. More information available may increase efficiency in the economy. Investors will have a better understanding of stock price movement. Policymakers will be able to implement a policy on the capital market development more effectively. In addition, the output of this paper (the constructed investor sentiment index) will open up opportunities for researchers to further investigate the role of investor sentiment on the financial market and the real economy.

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<sup>2</sup>Business Sentiment Index (BSI) is available. Bank of Thailand constructs the index by using the information from questionnaire sent to business firms. Investor sentiment index, on the contrary, would reflect stock investors' opinion.

## 2 Objectives

This paper is proposed to develop a composite index of investor sentiment in the Stock Exchange of Thailand. The sentiment index developed takes advantage of the methodology suggested by the literatures, signals used in practice as well as Thailand's data availability. Specifically, the objectives of this project are as follows.

1. To adapt the measure of investor sentiment index suggested by literature for Thailand's data
2. To develop the investor sentiment index from SET's database. The developed investor sentiment index would reflect SET investors's attitudes, emotions or viewpoints in each period of time. All SET investors may utilize information revealed by the developed sentiment index to increase effectiveness of their investment decision.

The investor sentiment index constructed by this project attempts to capture actual investor sentiment. Actual investor sentiment is unobservable. This project will follow the approach which is widely accepted in literature and take the advantage of data availability. However, there are no perfect proxies for investor sentiment. It is difficult or yet impossible to prove that the constructed investor sentiment index is the best.

## 3 Potential Investor Sentiment Proxies

In this paper, the main objective is to see the applicability and possibility to develop the index by this approach. Thus, the paper considers indicators for sentiment signals suggested by the literature, in particular, Baker and Wurgler (2006). They used six proxies to compute a composite investor sentiment index for the New York Stock Exchange. The composite index computed can capture historical bubbles as crashes during 1961 to 2002. Many recent studies (for example, Antoniou, Doukas, and Subrahmanya, (2013), Hribar and McInnis (2012), Stambaugh, Yu, and Yuan (2012a, 2012b), Baker, Wurgler and Yuan (2012) and Yu and Yuan (2011)). accepted the composite index suggested by Baker and Wurgler (2006) as an appropriate measure for investor sentiment. The six proxies are as follows.

**The closed-end fund discount,  $CEFD$ .**

$CEFD$  is defined as the average difference between the net asset value of closed-end stock fund shares and their market prices each month.

$$CEFD = \frac{\sum_i^n NAV_i - P_i}{n},$$

where

$$\begin{aligned} NAV_i &= \text{Net Asset Value of closed-end stock fund of the closed-end fund } i, \\ P_i &= \text{market price of the closed-end fund } i, \\ n &= \text{number of funds in the Stock Exchange of Thailand.} \end{aligned}$$

Closed end funds investors cannot redeem the value of the shares from the fund itself. Instead,

they can sell their shares in a closed end fund in the Stock Exchange. The price of shares in a closed end fund may be different from its net asset values. Investor sentiment may be behind the closed-end fund discount. Lee et al (1991) provide an empirical evidence that closed-end fund prices can be an indicator for investor sentiment. When investor sentiment is pessimistic, the closed end fund will be sold at a discount. Therefore, high *CEFD* indicates low sentiment. The relationship between *CEFD* and investor sentiment may be negative.

**The Stock Exchange turnover, *TURN*.**

*TURN* is defined as the ratio of reported share volume to average share listed in the Stock Exchange of Thailand.

$$TURN = \ln \left[ \frac{\text{Volume traded in the Stock Exchange of Thailand}}{\sum_{i=1}^n \frac{\text{value of share listed}_i}{m}} \right],$$

where

$m$  = number of stocks in the Stock Exchange of Thailand.

Stock turnover reflects the market liquidity. Baker and Stein (2004) states that when short-selling is limited, investors can make profit when the stock prices increase only. Therefore, sentimental investors are likely to trade more when they are optimistic. In addition, several literature on stock price bubbles (Smith, Suchanek, and Williams(1988), , find evidence that historical bubbles are associated with high turnovers. Hence, as *Turn* increases, investor sentiment increases. The relationship between *TURN* and investor sentiment may be positive. In general, *TURN* has a positive trend and is likely to be a non stationary variable. Thus, the first difference and five-year equal weighted moving averaged will be applied to remove the trend and will be referred to as *LDTURN*

**Number of IPOs stock. *NIPOM*.**

*NIPOM* is the number of IPO stocks traded each month.

Insiders and long-run shareholders have strong incentives to to issue new stocks when valuations are the greatest. This indicates that sentiment is the highest. Issuers need not care that much whether their firm's mis-valuation is due to firm-specification or investor sentiment. Therefore, the higher the *NIPOM*, the investor sentiment may be the higher.

**Average first day return on IPOs, *RIPOM*.**

$$RIPOM = \frac{\sum_i^{NIPOM} R_i}{NIPOM},$$

where

$R_i$ = return on IPOs

*NIPOM* = number of IPOs stock at that date

Percentage change of IPO stock open price to close price at the first day trade. When the sentiment is high, IPOs stock can be traded at a higher price than its IPO price. Return on IPOs is also an ex-post indicator of right market timing for both issuers and investors. Thus, the relationship between *RIPOM* and investor sentiment may be positive.

**The share of equity issues in total equity and debt issues,  $S$ .**

$$S = \frac{\text{gross equity issuance}}{\text{gross equity issuance} + \text{gross debt issuance}}.$$

The share of equity issues and debt issues indicates sentiment in financial market. High value of equity issues implies a low market return. Business can issue equity stocks with low market return when investors are optimistic. Investor sentiment may be positively related to the share of equity issues in total equity and debt issues.

**The dividend premium,  $P^{D-ND}$ .**

$$P^{D-ND} = \left( \frac{\text{market value}}{\text{book value}} \right)_{\text{stock that pays dividends}} - \left( \frac{\text{market value}}{\text{book value}} \right)_{\text{stocks that do not pay dividends}}.$$

Some stocks pay dividends from cash and earnings regularly. Their dividend payout are quite certain. Dividend-paying stocks is close to a bond since their income stream is quite predictable. T

The relative “premium” for dividend-paying stocks, therefore, indicates investor sentiment. When investors are optimistic, the dividend premium would be low. The dividend premium may be inversely related to sentiment.

Baker and Wurgler(2006) suggested six variables. However, closed end fund discount and dividend premium are not available at the time of writing this paper. Thus, they are dropped in this paper.

## 4 Methodology

This paper considers the four from six proxies as suggested by Baker and Wurgler (2006). All proxies will be used to form a composite sentiment index based on their first principal component. The first principal component technique allows us to consider the most important influences from all the proxies for investor sentiment at the same time. By this way, all proxies for investor sentiment will be concluded in only one composite index. In addition, all proxies for investor sentiment may contain much of systematic risk factors. Then, the sentiment index will be adjusted so that it is orthogonalized to several macroeconomic conditions. In particular, the transactions foreign portfolio investors usually have a significant impact on volatility of SET index (Wang (2007)). Systematic risk may arise from foreign transactions in the stock market and its effect must be removed from the constructed investor sentiment index. Since the main focus of this paper is to see the possibility to develop the index using this approach, the paper will concentrate the analysis only on constructing the index and it’s possible usages.

Follow Baker and Wurgler (2006), the first index is constructed by using the four proxies. The statistical approach allows us to identify the most important influences from all the four proxies. The steps are as follows.

**Step 1.** Find the first principal component of all six proxies and its lags (8 loadings). This is the “first stage index”,  $FSINDEX$ .

Principal component matrix,  $P$  is defined as follows.

$$P = XW$$

where

$P = (T \times 8)$  matrix of twelve principal components.

$T =$  number of observations

$X = (T \times 8)$  matrix of six variables and its lags

$$(NIPOM_t, RIPOM_t, S_t, LDTURN_t, NIOPM_{t-12}, RIPOM_{t-12}, S_{t-12}, LDTURN_{t-12})$$

$$V = T^{-1}X'X$$

$W =$  the orthogonal matrix of Eigen values of  $V$ .

We use the “first” principal component. Eigen values are ranked from the largest to the smallest in  $V$ , therefore first principal component can explain the most of  $X$ 's variance. The proportion of this total variation that is explained by the first principal component is  $\frac{\lambda_1}{\sum_i \lambda_i}$ .  $\lambda_1$  is the largest Eigen value.

$$FSINDEX_t = w_{1,1}NIPOM_t + w_{2,1}RIPOM_t + w_{3,1}S_t + w_{4,1}LDTURN_t \\ + w_{5,1}NIPOM_{t-12} + w_{6,1}RIPOM_{t-12} + w_{7,1}S_{t-12} + w_{8,1}LDTURN_{t-12}.$$

**Step 2.** Find “correlation” between the “first stage index”,  $Sentiment_t$  with each proxy at time  $t$  and at time  $t - 1$ . Then, for each proxy we choose the proxy measured time  $t$  or the proxy measured at time  $t - 12$  depending on which measure has the higher correlation with the “first stage index”,  $FSINDEX$ . We now then have 4\* variables, ( $NIPOM^*(t \text{ or } t - 12)$ ,  $RIPOM^*(t \text{ or } t - 1)$ ,  $S(t \text{ or } t - 12)$ ,  $LDTURN^*(t \text{ or } t - 12)$ ).

**Step 3.** Find first principal component of the \* variables

$$P^* = X^*W^*$$

where

$P^* = (T \times 4^*)$  matrix of twelve principal components.

$T =$  number of observations

$X^* = (T \times 4^*)$  matrix of 4\* variables in step 2 ( $NIPOM^*(t \text{ or } t - 12)$ ,  $RIPOM^*(t \text{ or } t - 1)$ ,  $S(t \text{ or } t - 12)$ ,  $LDTURN^*(t \text{ or } t - 12)$ )

$$X^* = T^{-1}X'^*X^*$$

$W^* =$  the orthogonal matrix of Eigen values of  $V^*$ .

We use the “first” principal component. Eigen values are ranked from the largest to the smallest in  $V^*$ , therefore first principal component can explain the most of  $X^*$ 's variance. The proportion of this total variation that is explained by the first principal component is  $\frac{\lambda_1}{\sum_i \lambda_i}$ .  $\lambda_1$  is the largest Eigen value.

The **two-step composite investor sentiment index**,  $Sentiment$ , is calculated as follows.

$$Sentiment = w_{1,1}NIPOM_{(t \text{ or } t-12)}^* + w_{2,1}RIPOM_{(t \text{ or } t-1)}^* + w_{3,1}S_{(t \text{ or } t-12)} + w_{4,1}LDTURN_{(t \text{ or } t-12)}^*$$

This paper finds whether the calculated Investor sentiment index can predict returns in the Thai stock market, MAI or not. Also, an eyeball test will be implemented to see how well the investor sentiment index can explain the anecdotal accounts of bubbles and crashes.

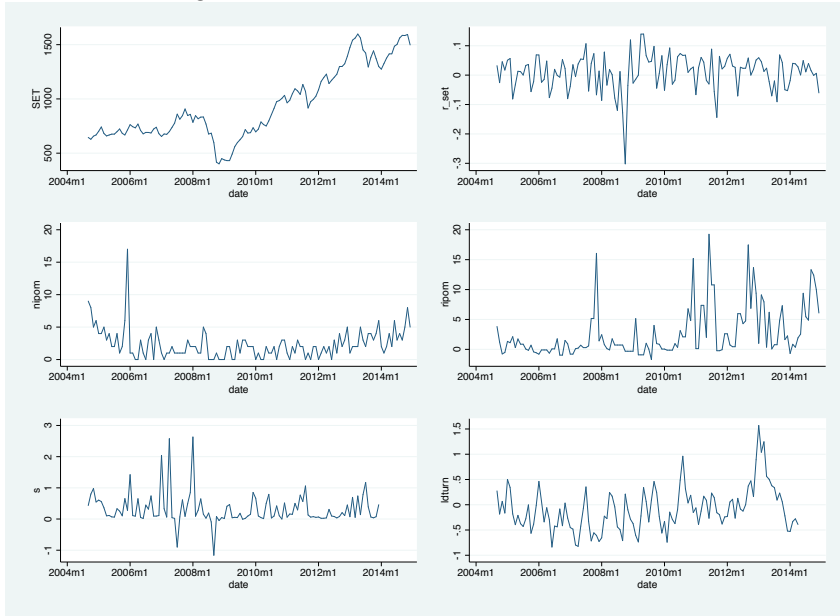
## 5 Sources of the Data

The main source of the data is the Stock Exchange of Thailand. Exception is for the value of gross debt issue and macroeconomics variables. The value of gross debt issue is obtained from the Securities and Exchange Commission Thailand.

## 6 Results

Figure 1 plots time series of monthly return of stock exchange of Thailand and all sentiment proxies. The first row plots SET index and its monthly return. The other columns show the time series of proxies. Noted that, since IPOs are not issued every month, *RIPOM* are missing in some months. The missing value of *RIPOM* is filled by the last available data. All variables, except *S*, are stationary.

Figure 1: Time Series of Factors and Stock Market Return



The first round index is formed by using unrotated principle component to correlation of  $NIPOM_t$ ,  $RIPOM_t$ ,  $S_t$ ,  $LDTURN_t$ ,  $NIPOM_{t-12}$ ,  $RIPOM_{t-12}$ ,  $S_{t-12}$ ,  $LDTURN_{t-12}$ . The first round sentiment index,  $FSINDEX_t$  is given by,



$$\begin{aligned}
FSINDEX_t = & 0.4227NIPOM_t + 0.4119RIPOM_t - 0.0368S_t + 0.4448LDTURN_t \\
& + 0.2520NIPOM_{t-12} + 0.2545RIPOM_t - 0.2510S_{t-12} + 0.5111LDTURN_{t-12}.(1)
\end{aligned}$$

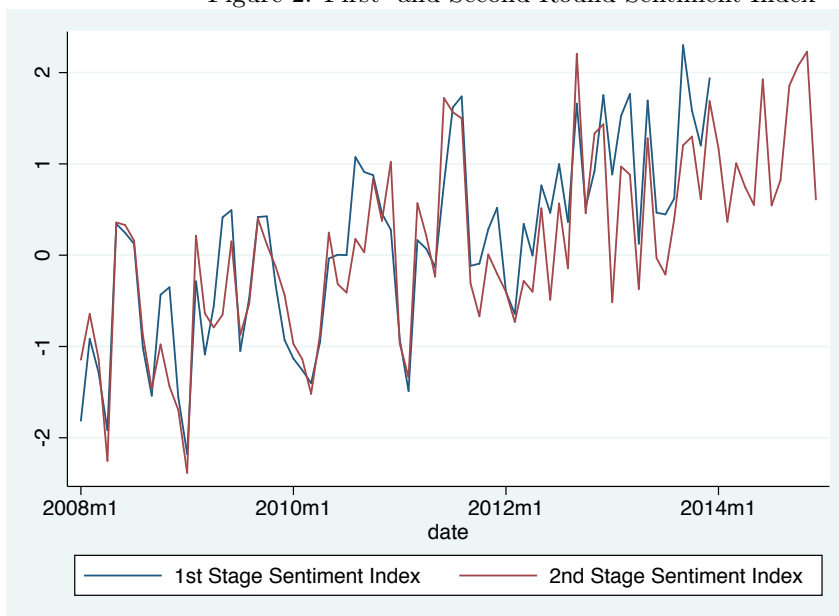
All proxies in the above equation are standardized to have zero mean and unit variance. They all have the correct loading sign except  $S_t$  and  $S_{t-12}$ . The first principle component above can explain 20.56 percent of sentiment variables' variance<sup>3</sup>.

The second round index is introduced to reduce the loading variables. For each proxy, either the level or it's lag is chosen if it has a higher correlation to  $FSINDEX_t$ . The sentiment index,  $Sentiment_t$ , is formed by using first principle component to those proxies as shown in equation (2). Notice that the loading factors (coefficients) have the same sign and similar magnitudes.

$$Sentiment_t = 0.5973NIPOM_t + 0.6113RIPOM_t - 0.2428S_t + 0.4589LDTURN_{t-12} \quad (2)$$

Figure 2 compares the first round sentiment index,  $FSINDEX_t$ , and the second round sentiment index,  $Sentiment_t$ . Since the loading factors are similar, the first- and the second-round index are similar. Thus sentiment index  $Sentiment_t$ , which is the second-round index, can deliver the same information as the first-round index but using half of variables.

Figure 2: First- and Second-Round Sentiment Index

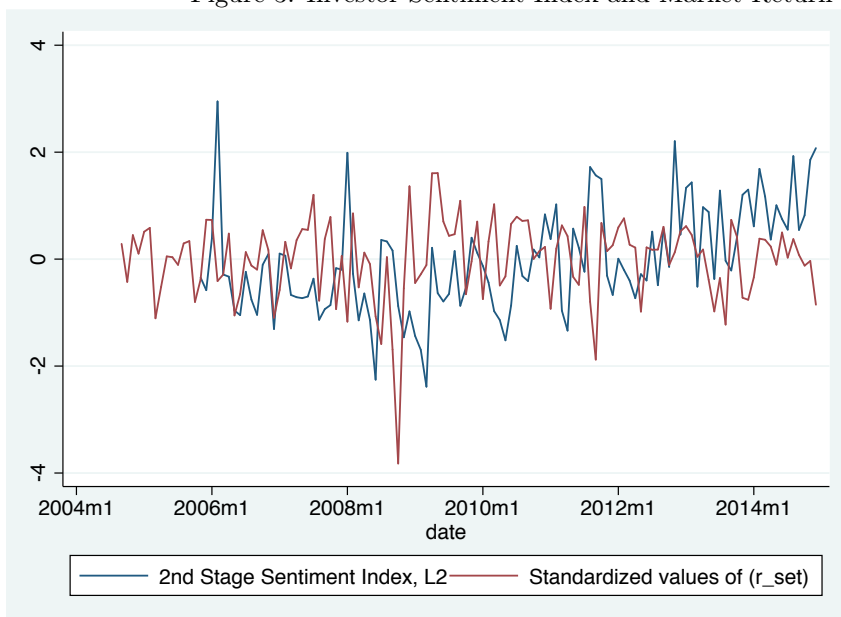


After getting the investor sentiment index, it is interesting to see if the sentiment have any effects on market return. Figure 3 compares the investor sentiment index,  $Sentiment_t$ , and market return,  $r_{set}$ . It shows that the two series have the same trend. Interestingly,  $Sentiment_t$  can explain the market return during the major events such as the hamburger crisis and the riots in Thailand around

<sup>3</sup>The similar set of variables can explain about 49 percent of the sentiment variable for NYSE market.

2008 and 2009, when trading atmosphere were bad, the sentiment were negative. This low sentiment index indicated the lack of confident of the investors. Also, it is interesting to see that the market sentiment was positive during the launching of QE3 in late 2012 indicating that the policy contributed to Thai investors as well. Lastly, the index dropped around the end of 2013 at the another time of riots in Bangkok.

Figure 3: Investor Sentiment Index and Market Return



The index is further tested if it could be a leading indicator for market movement. The index and its difference squared are used to explain four market returns; MAI SET SET50 and SET100. The traders in a smaller market, like MAI, are more prone to market sentiment, while ones in bigger market, like SET100, are not. Thus the index is expected to have some prediction power over return on MAI. The four market returns are regressed on  $Sentiment_t$  and  $D(Sentiment_t)^2$ . Table 1 reports the regression result where other lags combination of the index are also test. This is to see how many period ahead that the index have impact on the market return. As expected, the index has some predictive power only MAI market.  $Sentiment_t$  and  $Sentiment_{t-6}$  can statistically explained return on MAI market, meaning that the current index explains the current return and next 6 months return.

## 7 Conclusion

This paper uses the first principle component analysis to form an investor sentiment index for Thailand stock market. The methodology and the variables are similar to Baker and Wurgler (2006). However some variables are not available in Thailand case. This paper found that index,  $Sentiment_t$ , has potential to capture the investor sentiment index. The approach uses market available variables which can be obtained easily. This will reduced the interviewing process as the standard market sentiment survey does. In addition, the index could be used to monitor the market return as it has some predictive power over a small market like MAI and in the short run. However, the results are still not concrete.

Table 1: Investor Sentiment Index as a Leading Indicator

VARIABLES	Lag(0)				Lag(3)			
	r_mai	r_set50	r_set100	r_set	r_mai	r_set50	r_set100	r_set
sindex2_12	0.0156* (0.00829)	-0.000807 (0.00864)	-0.000773 (0.00877)	-0.000512 (0.00820)	0.00491 (0.00905)	-0.00583 (0.00928)	-0.00632 (0.00942)	-0.00626 (0.00881)
D.sindex2_12	-0.000417 (0.00866)	0.00831 (0.00901)	0.00866 (0.00915)	0.00860 (0.00856)	-0.00948 (0.00878)	0.00431 (0.00900)	0.00415 (0.00914)	0.00381 (0.00855)
Constant	0.0122 (0.00741)	0.00808 (0.00771)	0.00850 (0.00783)	0.00894 (0.00732)	0.0137* (0.00753)	0.00831 (0.00771)	0.00877 (0.00783)	0.00925 (0.00733)
Observations	84	84	84	84	84	84	84	84
R-squared	0.053	0.012	0.013	0.015	0.014	0.005	0.006	0.006

VARIABLES	Lag(6)				lag(9)			
	r_mai	r_set50	r_set100	r_set	r_mai	r_set50	r_set100	r_set
sindex2_12	0.0157* (0.00904)	0.00598 (0.00940)	0.00563 (0.00955)	0.00537 (0.00894)	-0.00366 (0.00934)	-0.00399 (0.00957)	-0.00459 (0.00972)	-0.00521 (0.00909)
D.sindex2_12	-0.0142 (0.00876)	-0.00276 (0.00911)	-0.00251 (0.00926)	-0.00281 (0.00867)	-0.00518 (0.00894)	0.000820 (0.00916)	0.000851 (0.00930)	0.00143 (0.00870)
Constant	0.0143* (0.00741)	0.00822 (0.00771)	0.00863 (0.00783)	0.00911 (0.00733)	0.0136* (0.00756)	0.00779 (0.00775)	0.00818 (0.00787)	0.00859 (0.00736)
Observations	84	84	84	84	84	84	84	84
R-squared	0.044	0.005	0.004	0.004	0.012	0.002	0.003	0.004

Standard errors in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

Rather than the current set of sentiment proxies, there might be better variables that can be used to capture Thailand market sentiment. In addition, the index might also be able to explain market volatility as well.

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