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Transaction Costs and Stock Market Behavior: Evidence from Thailand

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Abstract

This study empirically examines the relationship between transaction costs, measured by brokerage fees from securities trading, and market activity in the Stock Exchange of Thailand, focusing on trading value, turnover ratio, and the volatility of daily returns. It is the first to analyze the effects of brokerage fees on trading value disaggregated by three types of investors: local institutional investors, foreign investors, and local retail investors. Using monthly trading data from January 2013 to October 2022, the results reveal that higher transaction costs significantly reduce the overall average daily trading value. Local institutional investors are found to be sensitive to changes in brokerage fees over the long run, while foreign and local retail investors exhibit short-run sensitivity. Furthermore, an increase in transaction costs is associated with a reduction in the volatility of daily returns in the stock market over the long run.

Keywords: transaction costs, transaction tax, trading behavior, market volatility.

1. Introduction

One of the tax policies announced during the previous Thai government administration on November 29, 2022, was the imposition of a financial transaction tax (FTT) on securities sales on the Stock Exchange of Thailand (SET). The reasons often used by proponents of a financial transaction tax on securities trading include expanding the tax base and increasing revenue collection, as well as enhancing tax fairness and reducing income inequality. Additionally, it is believed that imposing a financial transaction tax could discourage short-term trading, reduce market volatility and speculation, and promote long-term investment in the capital market. On the other hand, opponents of a transaction tax, who emerged from various related sectors (e.g., the Thai capital market business council), argue that its implementation would severely impact the liquidity of the stock market. Furthermore, it would affect stock price volatility, increase the cost of fundraising for listed companies, and ultimately undermine the efficiency and competitiveness of the stock market. This could eventually lead to capital outflows and, in turn, have negative repercussions on the country's economy. As the timing coincided with an approaching election, on March 3, 2023, the Cabinet Secretariat decided to return the draft Royal Decree issued under the Revenue Code regarding the reduction of the specific business tax rate and the designation of exempted businesses to the Ministry of Finance for further review, indefinitely delaying the implementation of the financial transaction tax. Nonetheless, it is both interesting and worthwhile to study how the implementation of a financial transaction tax on securities trading might impact the Thai stock market. The findings from such a study would provide valuable insights for policymakers, aiding their decision-making should they consider implementing taxes on the capital market, such as a financial transaction tax, in the future.

Therefore, this study aims to examine the potential effects of implementing such a financial transaction tax on the Thai stock market. Since the financial transaction tax has not yet been enforced, it is not possible to use actual data occurring after the tax implementation for the analysis. Thus, the methodology employed is similar to that of Matheson (2014), which examines the relationship between trading/transaction costs, measured by the effective brokerage fees on securities trading, and trading values, stock turnover, and market volatility. The semi-elasticity coefficient of transaction costs is estimated and used as a reference to assess the potential impact of a financial transaction tax on securities trading on the Thai stock market. The key contribution of this study, making it different from previous studies, is that it is the first to examine the effects of brokerage fees on trading value disaggregated by three types of investors, i.e., local institutional investors, foreign investors, and local retail investors, which may yield differing results. In addition, monthly stock trading data in Thailand, a developing country, are used, where the results may differ from previous studies that primarily used data from developed countries.

In the following section, Section 2 presents a review of literature related to the measurement of market volatility and market liquidity, as well as the effects of financial transaction costs on the stock market. Section 3 presents the data and methods used in this study, including some stylized facts from the related data. Section 4 presents the empirical findings from the model. Finally, Section 5 presents the conclusions drawn from this study.

2. Literature Review

Market volatility is a key indicator of uncertainty in financial markets. It is commonly measured by using both direct statistical measures, such as the standard

deviation of returns, and econometric models, such as the Autoregressive Conditional Heteroskedastic (ARCH) model introduced by Engle (1982) and the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model developed by Bollerslev (1986). Additionally, realized volatility, as proposed by Andersen et al. (2001), is computed by summing intraday squared returns from high-frequency intraday data. It is shown to be arbitrarily close to the true integrated volatility and provides a more accurate estimation, particularly for analyzing short-term market fluctuations. Nonetheless, all these measures have been widely applied in the study of market volatility in both developed and emerging stock markets.

Market liquidity, on the other hand, is defined as the ability to trade assets quickly without affecting their prices. Sarr and Lybek (2002) provide a comprehensive framework for assessing liquidity in the financial markets. It comprises five key dimensions of market liquidity, namely, tightness (low transaction cost), immediacy (the speed at which the orders can be executed), depth (the presence of abundant buy and sell orders close to the market price), breadth (the ability to trade large volumes with minimal impact on prices), and resilience (the speed at which prices return to equilibrium after temporary imbalances). To quantify these dimensions, a range of indicators is employed, including bid-ask spreads, turnover ratios, and price impact measures, which together capture the cost, speed, and efficiency of trade execution in the market.

Previous studies examined the effect of financial transaction costs associated with securities trading on the volatility and liquidity of capital markets. And transaction taxes were the focus of many studies (e.g., Matheson, 2014). Taxes increase the financial transaction costs of securities trading, leading to a reduction in trading volume, particularly for stocks traded with high-frequency trading (HFT) strategies and short-term trading. This impacts market liquidity (liquidity effect) and the composition of the

market (composition effect). Studies by Stiglitz (1989) and Summers and Summers (1989) suggested that imposing taxes on securities trading can discourage short-term speculative trading and lead to less volatile markets while promoting long-term investment. Such a tax would enhance the efficiency of the economy. However, a study by Colliard and Hoffmann (2017) examined the introduction of a financial transaction tax on equity trading in France in August 2012 and found no evidence that such taxes improved market quality by altering the market composition. On the contrary, financial transaction taxes reduced trading volume, negatively affecting liquidity and market quality.

Other studies examining the impact on capital market liquidity also found similar results. Imposing or increasing financial transaction taxes on securities trading reduces stock prices and market liquidity. Westerholm (2003) found that the elasticity coefficients of turnover in response to transaction costs were between -0.906 and -1.002 for Sweden and between -1.27 and -1.39 for Finland. Hence, lower transaction costs cause significant increases in turnover. Additionally, Umlauf (1993) showed that the introduction of higher transaction taxes in Sweden in 1986 reduced stock price levels and turnover but caused capital outflows to overseas markets. In studies focusing on developing countries, mainly Chinese stock markets (e.g., Baltagi et al., 2006; Su & Zheng, 2011; Wang & Li, 2012), increasing transaction tax rates in China significantly reduced market liquidity. Baltagi et al. (2006) estimated the elasticity coefficient of turnover in response to transaction cost to be -1.00.

The impact of transaction taxes on market volatility can be either positive or negative. Taxes may reduce capital market efficiency, leading to larger price adjustments and increased market volatility. Conversely, such taxes could discourage noise trading, potentially reducing market volatility. Song and Zhang (2005), using a general equilibrium model with noise trading, showed that the effects of transaction

taxes on market volatility depend on market conditions and investor behavior. For example, in markets with low volatility and smaller noise trader participation, transaction taxes may help reduce market volatility. However, in highly volatile markets with larger noise trader participation, the opposite effect may occur.

Empirical studies investigating the relationship between transaction costs and capital market volatility found both types of effects. Studies finding a positive relationship include Baltagi et al. (2006) for China and Hau (2006) for France, which showed that increasing transaction costs significantly raised market return volatility. Similarly, Jones and Seguin (1997) found that lowering transaction costs increased trading volumes and subsequently reduced volatility of returns in the case of the United States. However, Umlauf (1993) and Westerholm (2003), using data from Sweden and Finland, found that transaction taxes did not reduce return volatility in the capital markets. In contrast, some studies found a negative relationship, such as Matheson (2014), who analyzed the effects of a low-rate transaction tax on large capitalization U.S. stock trading from 2001 to 2010. He found negative effects on both trading volume and volatility, particularly for the more heavily traded stocks within the S&P 500 after 2007. Su and Zheng (2011) and Wang and Li (2012), focusing on the Chinese stock market, reported that both increases and decreases in transaction taxes could result in a significant increase in market volatility. This suggests an ambiguous relationship between transaction costs and volatility in the capital market in the Chinese context.

Nonetheless, these previous studies illustrate that the effect of transaction costs on market volatility varies depending on the country, market conditions, and time period of study. Since previous studies have found different results, it is interesting to see how financial transaction taxes/costs on securities trading would affect the capital market in

Thailand, especially the impact on market liquidity and volatility, which will be presented next.

3. Data and Methods

3.1 Model Specification and Data

To examine the effect of transaction costs on securities trading, as measured by the effective brokerage fees, this study employs an extension of Matheson's (2014) model. The model specification is as follows:

$$\ln y_t = \beta_0 + \beta_1 \ln y_{t-1} + \beta_2 Fee_t + \beta_3 X_t + u_t \quad (1)$$

where y_t is the set of dependent variables of interest at time *t*, consisting of (1) trading value, as measured by the average daily trading value for each time period, (2) turnover ratio, as measured by the monthly trading volume divided by the number of listed shares (expressed as a percentage) for each time period, and (3) trading volatility, as measured by the average of the standard deviations of daily returns of the SET Index for each time period. y_{t-1} represents the lagged value of the dependent variable by one period. Fee is the effective brokerage fee, as measured by the ratio of collected brokerage fees to the trading value (expressed as a percentage) for each period. X_t represents the set of control variables identified in previous studies, including market capitalization (*Market Cap*), firm profitability, as measured by firms' revenue growth, and dividend yield. The macroeconomic variables included in the model are the interest rate, inflation rate, industrial production index, and real effective exchange rate. In addition, to control the potential effects of foreign stock markets on the Thai stock market, this study includes variables, namely the Dow Jones Index and trading value in the Dow Jones market, which have been employed in other studies (e.g., Westerholm, 2003).

Since the data used are time series, this study begins by conducting a stationarity test. The results of the Augmented Dickey–Fuller unit-root test (Dickey & Fuller, 1979) indicate that most variables are integrated of order 1, denoted by I(1), or a unit root process, meaning they follow a unit root process.[1] However, the industrial production index is found to be stationary at level, indicating that it does not require differencing to achieve stationarity. In addition, the results from the cointegration test using the method of Engle and Granger (1987) reveal that the error term derived from the equation is I(0), meaning that the relationship among the variables is cointegrated in the long run. Nonetheless, estimating long-run relationships using Ordinary Least Squares (OLS) with the level values of the variables, the first step of the Engle and Granger (1987) method for long-run relationship estimation, has limitations. These include the requirement to specify that the variables are I(1) and the inability to account for short-run dynamics, which may result in estimation bias (Banerjee et al., 1986). To address these issues, this study employs the Autoregressive Distributed Lag and Error Correction model (ARDL-ECM). The equation used for the estimation is as follows:

$$\Delta y_t = c_0 + c_1 t - \alpha(y_{t-1} - \theta x_t) + \sum_{i=1}^{p-1} \psi_{yi} \Delta y_{t-i} + \sum_{i=1}^{q-1} \psi'_{xi} \Delta x_{t-i} + \gamma' z_t + u_t \qquad (2)$$

where x_t denotes the set of exogenous variables included in the distributed lag specification. These variables comprise the brokerage fee, market capitalization, firms' revenue growth, dividend yield, interest rate, and inflation rate. z_t represents the set of other exogenous variables that are excluded from the distributed lag structure, which, in this study, includes the industrial production index, real effective exchange rate, Dow Jones Index, and the trading value in the Dow Jones market. Finally, t is a time trend-stationary variable.

[1] The results of the Augmented Dickey–Fuller unit-root test are available in Tables A1 in the Appendix.

It is worth noting that this study introduces monthly and COVID-19 dummy variables into the estimation model to capture potential seasonal effects (monthly) as well as the impact of the COVID-19 pandemic. The COVID-19 dummy variable equals 1 from January 2020 to October 2022 (pandemic period). Additionally, variables are transformed using the natural logarithm, except for the turnover ratio, brokerage fee, firms' revenue growth, dividend yield, interest rate, inflation rate, industrial production index, real effective exchange rate, and the Dow Jones Index, which are used in levels.

The selection of optimal lag orders (p,q) in the ARDL model is based on the Akaike Information Criterion (AIC). In this study, a maximum of six lags is specified for each variable. All possible combinations of lag orders within this range are estimated, and their corresponding AIC values are computed. The model with the lowest AIC value is then selected as the optimal specification, with the variable restricted to have at least one difference. For testing the long-run relationship between variables that are integrated, the study employs the Bounds test (Pesaran et al., 2001). This method has the advantage of not requiring prior determination of the integration order, whether I(0) or I(1). The results of the Bounds test indicate that the null hypothesis, which assumes no long-run relationship among the variables, can be rejected. Therefore, the ARDL model with error correction term is believed to be an appropriate estimation method in this study.

Monthly data are used in this analysis, covering the period of January 2013 to October 2022 (a total of 118 months), prior to the announcement of the financial transaction tax. Data on trading values and other indicators are mainly obtained from the SET's trading database (SET Smart). The effective brokerage fees collected from securities trading are provided by the Securities and Exchange Commission (SEC) of Thailand. These brokerage fees are classified by investor types. Since transaction costs on securities trading may affect the stock market differently depending on the type of

investor, certain types of investors might be more sensitive to transaction costs arising from such a financial transaction tax than others. Therefore, this study estimates the relationship between brokerage fees and trading value by categorizing investors into three main types: local institutional investors, foreign investors, and local retail investors. It is hypothesized that the relationship will differ across these investor types. Notably, due to limitations in the available data, this study is able to disaggregate estimates by investor type only in the case of trading value. However, for trading volume, used to calculate the turnover ratio, the data are not classified by investor type. Consequently, the analysis of both the turnover ratio and trading volatility in this study cannot be segmented by investor type. The estimations, therefore, reflect overall securities trading in the stock market and are based on the effective brokerage fee.

3.2 Descriptive Statistics and Some Stylized Facts

The descriptive statistics of the trading data and all explanatory variables used in this study are presented in Table 1. From January 2013 to October 2022, the average daily trading value was 56,402 million THB. Local retail investors had the highest daily average trading value at approximately 25,651 million THB, followed by foreign investors at around 19,101 million THB, and local institutional investors at approximately 5,478 million THB. The average daily trading volume was 15,181 million shares, with the average monthly turnover rate at 0.7515. The overall effective brokerage fee collected from securities trading was 0.1197%, or 11.97 basis points (bps). Local institutional investors were charged the highest average brokerage fee of 0.1541%, followed by local retail investors, who were charged an average of 0.1438%. Foreign investors were charged the lowest effective transaction fee, which was only 0.0613%.

Table 1. Descriptive statistics of data from January 2013 to October 2022

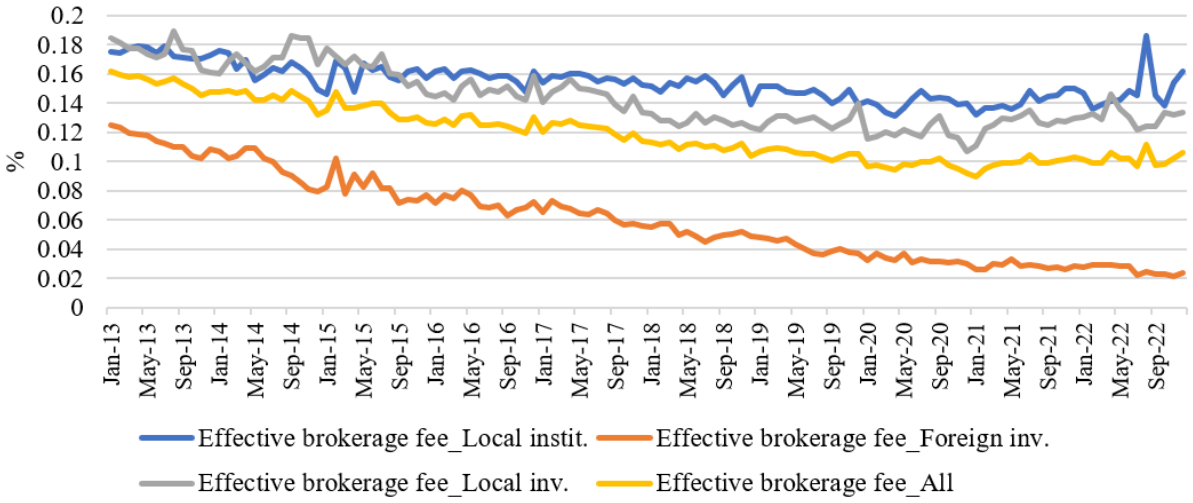
Variable	Obs	Mean	Std. Dev.	Min	Max
Trading value_SET (million THB)	118	56,400	17,400	27,000	103,000
Trading value_Local ins. (million THB)	118	5,470	1,280	3,170	9,130
Trading value_Foreign inv. (million THB)	118	19,100	9,660	7,390	43,900
Trading value_Local inv. (million THB)	118	25,700	8,120	13,300	48,300
Trading volume_SET (million shares)	118	15,200	7,270	4,730	36,900
Turnover rate_SET	118	0.7515	0.4019	0.3084	2.5100
SD_Closing Price_SET	118	22.56	15.97	4.06	131.28
SD_Closing Return_SET	118	0.8404	0.5106	0.2325	4.5123
Brokerage fee_Effective (basis points)	118	11.97	1.97	8.94	16.15
Brokerage fee_ Local ins. (basis points)	118	15.41	1.20	13.14	18.58
Brokerage fee_ Foreign inv. (basis points)	118	6.13	2.92	2.22	12.50
Brokerage fee_ Local inv. (basis points)	118	14.38	2.07	10.67	18.93
Market capitalization_SET (billion THB)	118	15,500	2,350	11,300	20,000
Revenue growth_SET (%)	118	0.22	1.38	-4.10	3.11
Dividend yield_SET (%)	118	3.00	0.41	2.10	4.40
1-year T-bill (%)	118	1.45	0.64	0.42	2.77
Core inflation (%)	118	1.10	1.69	-1.13	6.17
Industrial production index (based year 2000)	118	99.27	4.63	78.73	108.70
Real effective exchange rate	118	105.68	4.04	99.91	115.67
DJI (Dow Jones Industrial Average, monthly)	118	23,269	6,412	13,861	36,338
DJI (Dow Jones Industrial Average, monthly) trading volume (billion)	118	5.23	2.78	1.48	15.50

Data source: The Securities and Exchange Commission of Thailand and SET Smart dataset.

Figure 1 shows the monthly data of the effective brokerage fees collected from securities trading in the SET between January 2013 and December 2022. It was found that the overall effective brokerage fee significantly decreased, from 0.16148% to 0.1063%, representing a reduction of 34.1497% during this period. When the effective brokerage fees were categorized by investor type, it was observed that there was a decreasing trend in the effective brokerage fees for all investor groups, but the rate of decrease was not the same. The brokerage fee for local institutional investors decreased

from 0.1748% to 0.1617%, representing a reduction of 7.48%. Whereas the brokerage fee for foreign investors decreased from 0.1250% to 0.0236%, representing a reduction of 81.05%. Finally, the brokerage fee for local retail investors decreased from 0.1846% to 0.1336%, representing a reduction of 27.648%. Therefore, the effective brokerage fee for foreign investors decreased the most, followed by the brokerage fee for local retail investors and then local institutional investors, respectively.

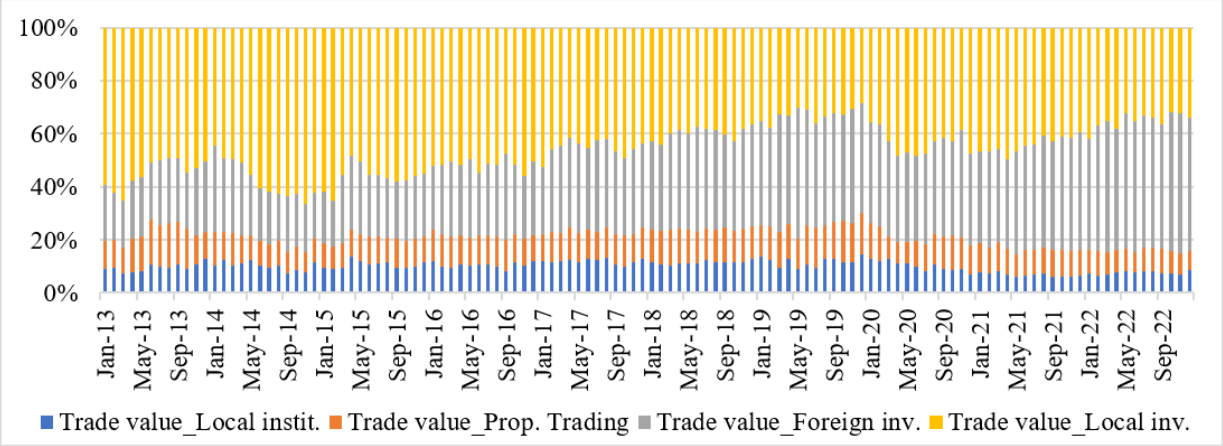
Figure 1. The effective brokerage fee for securities trading in the SET by investor type



Data source: The brokerage fee data are from the Securities and Exchange Commission of Thailand.

Figure 2 shows the share of trading value in the SET categorized by investor type. The proportion of trading value by local retail investors decreased from 59.29% in January 2013 to 33.83% in December 2022. In contrast, the proportion of trading value by foreign investors significantly increased, rising from 21.05% to 50.58% during this period. For local institutional investors and proprietary trading investors, the proportion of trading value remained relatively stable, with an average of around 10.05% and 11.05%, respectively, during the same period.

Figure 2. Share of trading value in the SET by investor type

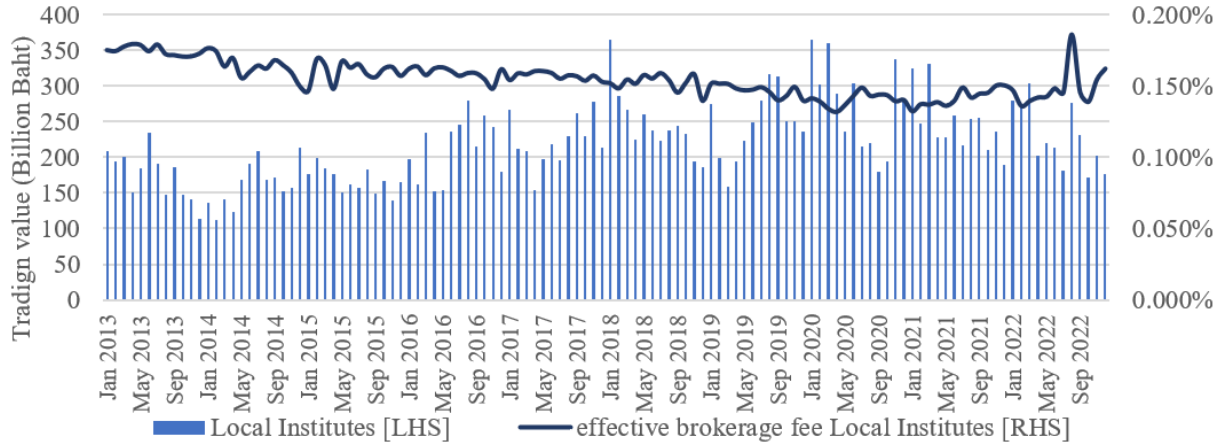


Data source: The SET Smart dataset.

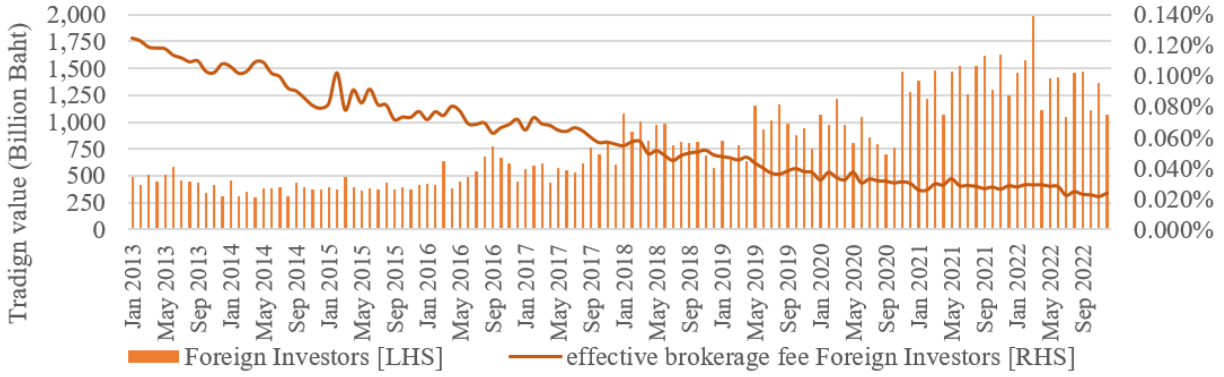
Figure 3 shows the relationship between monthly securities trading value and the effective brokerage fees, categorized by three types of investors. It can be observed that the effective brokerage fees collected from securities trading for all investor groups between January 2013 and December 2022 showed a declining trend, especially for foreign investors, where the brokerage fee decreased significantly. The monthly stock trading value for foreign investors showed a clear upward trend, while the monthly trading value for the other investor types showed a less distinct trend, making the relationship between monthly trading value and the effective brokerage fee unclear. Additionally, there may be other external factors influencing the stock trading value. Therefore, to accurately assess the relationship between trading/transaction cost (brokerage fee) and trading value, the results from the model estimations are crucial and presented in the following section.

Figure 3. Trading value and effective brokerage fee by investor type

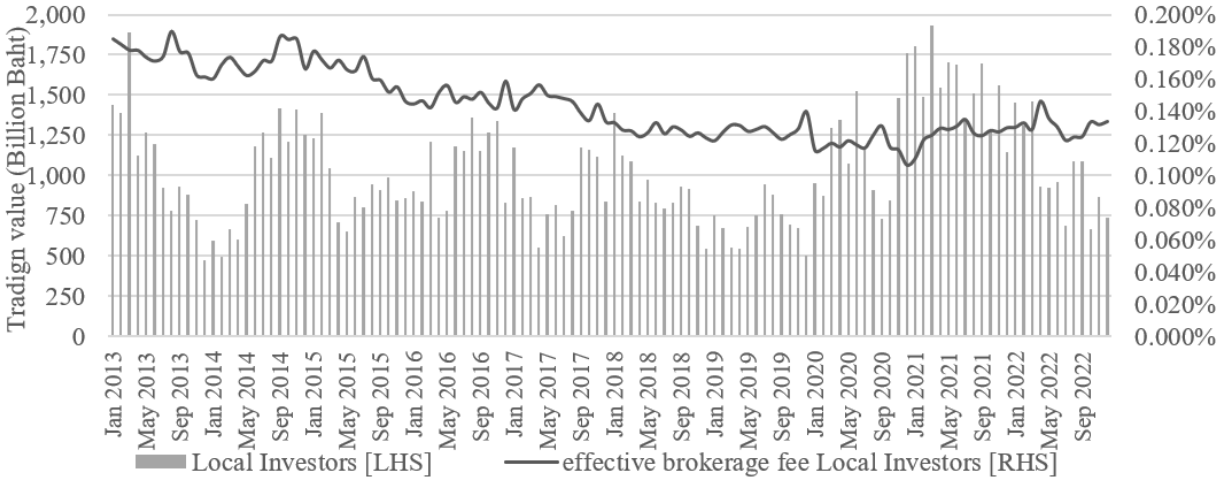
(a) Local institutional investors



(b) Foreign investors



(c) Local retail investors



Data source: The Securities and Exchange Commission of Thailand and SET Smart dataset.

4. Empirical Results

The estimation results from the ARDL-ECM approach are presented in Table 2. Equation (1) shows the results for the average daily trading value in the SET of all investor types. Equation (2) presents the results for the average daily trading value in the SET of local institutional investors. Equation (3) provides the results for the average daily trading value of foreign investors, and Equation (4) displays the results for the average daily trading value of local retail investors. Across all the estimated equations, the coefficients of the error correction terms are statistically significant and negative, falling within the range of 0 to -1. This confirms the adjustment of the variables toward long-run equilibrium.

Table 2. The relationship between the average daily trading value and brokerage fee by investor type

	D_ln Trading value_SET	D_ln Trading value_Local ins.	D_ln Trading value_Foreign inv.	D_ln Trading value_Local inv.
	(Eq. 1)	(Eq. 2)	(Eq. 3)	(Eq. 4)
Long-run specification				
Brokerage fee_X (basis points)	-0.277***	-0.209***	0.223	0.0455
(X={Effective,Local ins.,Foreign inv.,Local inv.})	(-3.04)	(-2.77)	(1.41)	(0.67)
ln(Market capitalization)	1.401	2.240**	2.110*	1.831*
	(1.51)	(2.25)	(1.97)	(1.69)
Revenue growth_SET	-0.0631	-0.00403	-0.0113	0.0012
	(-1.09)	(-0.07)	(-0.16)	(0.02)
Dividend yield_SET	-0.117	0.430**	0.257	0.253
	(-0.62)	(2.48)	(1.26)	(1.01)
1-year T-bill	-0.0464	-0.164	0.106	-0.139
	(-0.26)	(-0.85)	(0.59)	(-0.63)
Core inflation	0.0349	0.0255	-0.0715	-0.0490
	(0.63)	(0.44)	(-1.29)	(-0.85)
Short-run specification				
L1D_ln(Trading value_X)		-0.262**	-0.127	0.270**

	D_ln Trading value_SET	D_ln Trading value_Local ins.	D_ln Trading value_Foreign inv.	D_ln Trading value_Local inv.
	(Eq. 1)	(Eq. 2)	(Eq. 3)	(Eq. 4)
(X={SET,Local ins.,Foreign inv.,Local inv.})		(-2.30)	(-1.31)	(2.33)
L2D_ln(Trading value_X)		-0.206**		0.189
(X={SET,Local ins.,Foreign inv.,Local inv.})		(-2.20)		(1.60)
L3D_ln(Trading value_X)				0.348***
(X={SET,Local ins.,Foreign inv.,Local inv.})				(2.88)
L4D_ln(Trading value_X)				0.152
(X={SET,Local ins.,Foreign inv.,Local inv.})				(1.41)
D_Brokerage fee_X (basis points)	0.0192	0.0214	-0.116*	-0.0774**
(X={Effective,Local ins.,Foreign inv.,Local inv.})	(0.5)	(0.83)	(-1.80)	(-2.08)
L1D_Brokerage fee_X (basis points)			-0.102*	-0.0211
(X={Effective,Local ins.,Foreign inv.,Local inv.})			(-1.68)	(-0.60)
L2D_Brokerage fee_X (basis points)			-0.0644	-0.0166
(X={Effective,Local ins.,Foreign inv.,Local inv.})			(-1.11)	(-0.54)
L3D_Brokerage fee_X (basis points)			-0.0786	0.0271
(X={Effective,Local ins.,Foreign inv.,Local inv.})			(-1.57)	(0.98)
L4D_Brokerage fee_X (basis points)			-0.0511	
(X={Effective,Local ins.,Foreign inv.,Local inv.})			(-1.10)	
L5D_Brokerage fee_X (basis points)			-0.0854**	
(X={Effective,Local ins.,Foreign inv.,Local inv.})			(-2.32)	
D_ln(Market capitalization)	0.877	-0.791	0.134	0.338
	(1.22)	(-0.82)	(0.17)	(0.34)
L1D_ln(Market capitalization)		-0.822*		-0.249
		(-1.90)		(-0.28)
L2D_ln(Market capitalization)				0.109
				(0.13)
L3D_ln(Market capitalization)				-1.357
				(-1.59)
D_Revenue growth_SET	0.0211	0.0004	0.0138	-0.0116
	(0.65)	(0.01)	(0.39)	(-0.26)
L1D_Revenue growth_SET	0.0721**	0.0118	0.0677**	0.0598

	D_ln Trading value_SET	D_ln Trading value_Local ins.	D_ln Trading value_Foreign inv.	D_ln Trading value_Local inv.
	(Eq. 1)	(Eq. 2)	(Eq. 3)	(Eq. 4)
	(2.25)	(0.3)	(2.1)	(1.42)
L2D_Revenue growth_SET	0.00548	-0.0052	0.0235	-0.0193
	(0.18)	(-0.14)	(0.74)	(-0.46)
L3D_Revenue growth_SET	0.0137	0.008	0.0126	-0.0091
	(0.52)	(0.26)	(0.44)	(-0.22)
L4D_Revenue growth_SET	0.0605**	0.0489*	0.0949***	-0.00348
	(2.45)	(1.68)	(3.65)	(-0.10)
L5D_Revenue growth_SET	0.0369	0.0591**	0.0691***	0.0757**
	(1.56)	(2.06)	(2.79)	(2.52)
D_Dividend yield_SET	0.048	-0.362	0.0175	-0.160
	(0.27)	(-1.56)	(0.09)	(-0.63)
L1D_Dividend yield_SET				-0.154
				(-0.66)
L2D_Dividend yield_SET				0.218
				(0.93)
L3D_Dividend yield_SET				-0.415*
				(-1.81)
L4D_Dividend yield_SET				0.0765
				(0.59)
L5D_Dividend yield_SET				-0.388***
				(-3.03)
D_1-year T-bill	-0.436*	-0.735***	-0.648***	0.0849
	(-1.95)	(-2.91)	(-2.84)	(0.30)
L1D_1-year T-bill	0.345			
	(1.34)			
L2D_1-year T-bill	0.161			
	(0.67)			
L3D_1-year T-bill	-0.574**			
	(-2.39)			
L4D_1-year T-bill	0.283			

	D_ln Trading value_SET	D_ln Trading value_Local ins.	D_ln Trading value_Foreign inv.	D_ln Trading value_Local inv.
	(Eq. 1)	(Eq. 2)	(Eq. 3)	(Eq. 4)
	(1.26)			
D_Core inflation	0.0503	0.108**	0.036	0.0848
	(1.29)	(2.16)	(0.85)	(1.40)
L1D_Core inflation	-0.0654	-0.0752		
	(-1.62)	(-1.50)		
L2D_Core inflation	0.0608	0.0592		
	(1.51)	(1.19)		
Other controlled variables				
Industrial production index	0.0008	0.0062	0.0020	0.0060
	(0.15)	(0.86)	(0.36)	(0.87)
D_Real effective exchange rate	0.0222*	0.0186	0.0137	0.0145
	(1.87)	(1.17)	(1.03)	(0.82)
D_DJI	-0.00003	-0.00001	-0.000003	-0.00003*
	(-2.09)	(-0.50)	(-0.22)	(-1.73)
D_ln(DJI trading volume)	-0.0097	0.0847	-0.0096	-0.0378
	(-0.15)	(1.08)	(-0.13)	(-0.44)
COVID-19 dummy	0.296***	0.0479	0.0900	0.430***
	(3.16)	-(0.42)	(0.91)	(3.37)
Trend	-0.0097***	-0.0067***	0.0121*	-0.0067*
	(-3.08)	(-2.78)	(1.97)	(-1.70)
ECT_{t-1}	-0.481***	-0.549***	-0.452***	-0.539***
	(-6.08)	(-4.79)	(-5.38)	(-5.50)
Constant	-3.801	-14.74	-13.5	-11.96
	(-0.50)	(-1.52)	(-1.65)	(-1.22)
No. of observations	112	112	112	112
Adjusted R2	0.5303	0.5316	0.5102	0.4962
Pesaran, Shin, and Smith (2001) Bounds test				
F-Statistic	6.141***	4.700**	4.866**	6.084***
t-Statistic	-6.082***	-4.794**	-5.376***	-5.497***

	D_ln Trading value_SET	D_ln Trading value_Local ins.	D_ln Trading value_Foreign inv.	D_ln Trading value_Local inv.
	(Eq. 1)	(Eq. 2)	(Eq. 3)	(Eq. 4)
Semi-elasticity of brokerage fee (LR)	-0.2419***	-0.1886***	0.2498	0.0466

Notes: t-statistics are in the parentheses. *, **, and *** denote the significance at the 10%, 5%, and 1% levels, respectively. D = first difference; L1 = first lag period; L2 = second lag period; L3 = third lag period; L4 = fourth lag period. L5 = fifth lag period. In all specifications, monthly dummy variables are included but not reported in the table.

In the long-run relationship, market capitalization and dividend yield in the SET appear to have a significant influence on the average daily trading value. An increase in market capitalization is associated with a positive change in average daily trading across all investor types, as shown in Equations (2) to (4) of Table 2. Likewise, an increase in the dividend yield is associated with a higher average daily trading value for local institutional investors. However, this relationship is not statistically significant for the other investor types. Notably, the remaining variables do not exhibit significant relationships in the long-run specification.

The estimated coefficients of the short-run variables in the distributed lag specification, as well as those controlled variables excluded from the lag structure, vary and depend upon the type of investor under investigation. For instance, an increase in the first lag period of trading value has a positive effect on the average daily trading value of local retail investors, whereas it has a negative effect in the case of local institutional investors. The interest rate, measured by the one-year Thai treasury bill yield, appears to have a statistically significant negative impact on the average daily trading value for most investor types, except for local retail investors, where the impact is not statistically significant. It is worth noting that the estimated coefficient of the time trend variable indicates a downward trend in both the overall average daily trading value on the SET, as well as in the average daily trading value of both local institutional and local retail investors. In contrast, an upward trend is observed in the case of foreign

investors. Surprisingly, the COVID-19 period is found to have a positive impact on both the overall average daily trading value and the average daily trading value of local retail investors. In contrast, the impact appears to be statistically insignificant for local institutional and foreign investors.

Next, the analysis turns to the relationship between brokerage fees and daily trading value. The long-run coefficient estimates reveal that effective brokerage fees from securities trading are negatively associated with the average daily trading value in the SET. However, a statistically significant relationship is observed in the equation for the overall average daily trading value, with the estimated long-run semi-elasticity coefficient of -0.2419.[2] This indicates that a 1 basis point increase in the effective brokerage fees would lead to a 24.19% decrease in the average daily trading value. When analyzing the coefficients of brokerage fees by investor type, local institutional investors are found to be significantly sensitive to changes in the effective brokerage fee, with a semi-elasticity of -0.1886. In contrast, the estimated coefficients for both foreign and local retail investors are positive but not statistically significant in the long-run specifications. Short-run coefficient estimates, however, reveal a negative and statistically significant relationship between the brokerage fees collected from securities trading and the average daily trading value in the SET for foreign investors and local retail investors.

The relationships between the turnover ratio, volatility of daily returns, and brokerage fees, estimated using the ARDL-ECM approach, are presented in Table 3. Equation (1) in Table 3 presents the estimation result that shows the relationship between the brokerage fees and the monthly turnover ratio of trading stocks in the SET. Similar to the findings in Table 2, the coefficients of the error correction terms are

[2] The semi-elasticity is derived from a log-linear model and is calculated as exp(β)-1. For example, the semi-elasticity coefficient of -0.2419 is derived from exp (–0.277) – 1.

negative and statistically significant, confirming that the variables adjust toward long-run equilibrium.

Table 3. The relationship between turnover ratio, volatility of daily returns, and brokerage fees

	D_Turnover rate_SET	D_ln SD_Return_SET
	(Eq. 1)	(Eq. 2)
Long-run specification		
Brokerage fee_Effective (basis points)	0.0613	-0.615***
	(0.48)	(-3.42)
ln(Market capitalization)	-0.413	-4.892**
	(-0.28)	(-2.59)
Revenue growth_SET	-0.134	-0.273***
	(-1.57)	(-2.82)
Dividend yield_SET	-0.345	-1.021**
	(-1.13)	(-2.63)
1-year T-bill	1.312***	-0.0492
	(4.16)	(-0.16)
Core inflation	-0.151**	0.227**
	(-2.11)	(2.42)
Short-run specification		
D_Brokerage fee_Effective (basis points)	0.021	-0.0335
	(0.66)	(-0.32)
D_ln(Market capitalization)	1.169	0.367
	(1.67)	(0.19)
L1D_ln(Market capitalization)	1.823***	-1.208
	(2.84)	(-1.40)
L2D_ln(Market capitalization)	0.735	
	(1.15)	

	D_Turnover rate_SET	D_ln SD_Return_SET
	(Eq. 1)	(Eq. 2)
L3D_ln(Market capitalization)	0.988*	
	(1.75)	
L4D_ln(Market capitalization)	2.246***	
	(3.89)	
L5D_ln(Market capitalization)	0.755**	
	(2.46)	
D_Revenue growth_SET	0.0026	0.0717
	(0.09)	(1.12)
L1D_Revenue growth_SET	0.0802***	
	(2.82)	
L2D_Revenue growth_SET	0.0058	
	(0.2)	
L3D_Revenue growth_SET	0.0235	
	(0.84)	
L4D_Revenue growth_SET	0.0699***	
	(3.11)	
L5D_Revenue growth_SET	0.0972***	
	(4.4)	
D_Dividend yield_SET	0.007	0.456
	(0.04)	(0.97)
L1D_Dividend yield_SET	0.325*	
	(1.92)	
L2D_Dividend yield_SET	-0.0191	
	(-0.11)	
L3D_Dividend yield_SET	0.123	

	D_Turnover rate_SET	D_ln SD_Return_SET
	(Eq. 1)	(Eq. 2)
	(0.8)	
L4D_Dividend yield_SET	0.284*	
	(1.78)	
D_1-year T-bill	-0.33	0.298
	(-1.60)	(0.56)
L1D_1-year T-bill	0.0326	
	(0.15)	
L2D_1-year T-bill	-0.0447	
	(-0.20)	
L3D_1-year T-bill	-0.285	
	(-1.30)	
L4D_1-year T-bill	-0.435**	
	(-2.12)	
D_Core inflation	0.101**	-0.0428
	(2.65)	(-0.41)
Other controlled variables		
Industrial production index	-0.007	0.0284**
	(-1.46)	(2.17)
D_Real effective exchange rate	0.0027	0.00544
	(0.22)	(0.17)
D_DJI	-0.00003*	-0.000014
	(-1.98)	(-0.37)
D_ln(DJI trading volume)	0.0195	0.452**
	(0.32)	(2.63)
COVID-19 dummy	0.231***	0.490**

	D_Turnover rate_SET	D_ln SD_Return_SET
	(Eq. 1)	(Eq. 2)
	(2.68)	(2.11)
Trend	0.0072**	-0.0155**
	(2.63)	(-1.99)
ECT_{t-1}	-0.296***	-0.615***
	(-4.61)	(-6.50)
Constant	1.89	53.82**
	(0.25)	(2.61)
No. of observations	112	116
Adjusted R2	0.5049	0.4329
Pesaran, Shin, and Smith (2001) Bounds test		
F-Statistic	6.132***	6.303***
t-Statistic	-4.606**	-6.500**
Semi-elasticity of brokerage fee (LR)	0.0632	-0.4594

Notes: t-statistics are in the parentheses. *, **, and *** denote the significance at the 10%, 5%, and 1% levels, respectively. D = first difference; L1 = first lag period; L2 = second lag period; L3 = third lag period; L4 = fourth lag period; L5 = fifth lag period. In all specifications, monthly dummy variables are included but not reported in the table.

In the long-run specification, only the interest rate and inflation rate exhibit a significant relationship with the turnover ratio. Surprisingly, the results indicate that an increase in the interest rate is associated with a higher turnover ratio, while a rise in the inflation rate has a negative effect. In the short-run distributed lag specification, the estimated coefficients indicate that the first lag of market capitalization, firms' revenue growth, and dividend yield each have a positive relationship with the turnover ratio.

Next, the estimated coefficient of the time trend variable suggests an overall upward trend in the turnover ratio over time. Notably, the COVID-19 period appears to

have had a positive impact on the turnover ratio in the SET. For the variable of interest, the estimated coefficient of effective brokerage fees is not significant in both short-run and long-run specifications. Therefore, the results do not provide empirical evidence of a relationship between brokerage fees and the monthly turnover ratio of trading stocks in the SET.

The estimation results for stock market volatility, measured by the monthly standard deviation of daily returns of the SET Index, are presented in Equation (2) of Table 3.[3] The results from the long-run specification suggest that market capitalization, firms' revenue growth, and dividend yield are negatively related to the volatility of daily returns. More specifically, an increase in market capitalization, firms' revenue growth, or dividend yield will lead to a decrease in market volatility. In contrast, inflation is positively related to the volatility of daily returns in the stock market. None of the estimated coefficients for the short-run variables in the distributed lag specification are statistically significant. Nonetheless, the estimated coefficient of the time trend variable indicates a downward trend in the stock market volatility over time. Additionally, market volatility in the SET is found to increase during the COVID-19 period.

For the variable of interest, the effective brokerage fees from securities trading, the long-run relationship shows a negative and significant relationship with the volatility of daily returns. The estimated semi-elasticity indicates that a 1 basis point (bps) increase in the brokerage fees will lead to a reduction of approximately 45.94% in the volatility of daily returns in the stock market in the long run. Regarding the short-run relationship, brokerage fees are not found to have a statistically significant impact on stock market return volatility. Overall, the findings support the idea that the

[3] The semi-elasticity is derived from a log-linear model and is calculated as exp(β)-1. For example, the semi-elasticity coefficient of -0.2419 is derived from exp (–0.277) – 1, which is slightly less than -1, indicating over-adjustment in the short-run dynamics back toward long-run equilibrium. Such a result can raise concerns about model specification and stability. To mitigate these issues, this study transformed the variable using the natural logarithm, which resulted in a more reasonable ECT coefficient within the expected range.

implementation of a financial transaction tax on securities trading may help reduce the volatility of daily returns in the capital market, but only in the long run.

5. Conclusion

This study empirically examined the relationship between transaction costs on securities trading and stock market behavior in Thailand by using monthly trading data from January 2013 to October 2022. The transaction costs were measured using effective brokerage fees, categorized by three types of investors: local institutional investors, foreign investors, and local retail investors. The semi-elasticity coefficients of brokerage fees were estimated. The estimation results from this study align with those findings from other countries that showed the negative impact of transaction costs on trading activities. The overall average daily trading value of securities in the SET will significantly decrease in the long run if the brokerage fees collected from securities trading are increased.

When analyzing the estimated coefficients of brokerage fees by investor type, only local institutional investors are found to be sensitive to changes in the effective brokerage fee in the long-run specification. In contrast, the results from the short-run specifications show a negative and statistically significant relationship between brokerage fees and the average daily trading value of securities for both foreign and local retail investors. Both the short-run and long-run findings suggest that an increase in brokerage fees negatively affects average daily trading value. However, the nature of the impact, whether short run or long run, depends crucially on the type of investor under consideration.

Regarding the relationship between brokerage fees and the monthly turnover ratio of trading stocks in the SET, this study finds no statistically significant evidence

of a correlation. The analysis then examines the impact of transaction costs on stock market volatility, measured by the monthly standard deviation of daily returns in the SET. The estimation results suggest that an increase in transaction costs leads to a reduction in the volatility of daily returns over the long run.

In summary, the findings of this study suggest that the implementation of a financial transaction tax on securities trading would have a significant negative impact on the average daily trading value in both the short run and the long run. Nevertheless, the volatility of daily returns in the capital market is expected to decrease over the long run. Overall, the findings from this study provide valuable evidence highlighting both the positive and negative effects of increased transaction costs on stock market behavior. Consequently, policymakers who consider the implementation of a financial transaction tax in the Thai capital market should carefully evaluate the trade-off between reducing market volatility and the potential negative impact on market activity, particularly the balance between promoting market stability and sustaining trading activity.

Nonetheless, this study has certain limitations that affect the extent to which its findings can be used as a reference and, therefore, should be interpreted with caution. While the results suggest that the Thai stock market could be significantly impacted, particularly in terms of trading value, which is expected to decrease drastically, if a financial transaction tax on securities trading is implemented. The estimated magnitude of the impact, derived from the semi-elasticity of brokerage fees, may not be appropriate, especially in cases where the change in transaction costs is substantial. This is because the semi-elasticity is based on point elasticity, which may not be suitable for estimating the effects of large changes in transaction costs. Finally, for future research, it would be valuable to examine alternative methods and measures, such as those for market volatility and market liquidity, to help validate the findings of this

study. Such research could, additionally, provide deeper insights into the potential impacts on the Thai stock market across multiple dimensions.

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Appendix

Table A1. The results of the Augmented Dickey–Fuller unit-root test

Variable	Test statistic	Critical value	Level of significance	Order of integration
ln(Trading value_SET)	-12.217	-3.51	1%	I(1)
ln(Trading value_Local ins.)	-15.394	-3.51	1%	I(1)
ln(Trading value_Foreign inv.)	-15.646	-3.51	1%	I(1)
ln(Trading value_Local inv.)	-11.073	-3.51	1%	I(1)
Turnover rate_SET	-14.111	-3.51	1%	I(1)
ln(SD_Return_SET)	-14.225	-3.51	1%	I(1)
Brokerage fee_Effective	-16.404	-3.51	1%	I(1)
Brokerage fee_ Local ins.	-16.377	-3.51	1%	I(1)
Brokerage fee_ Foreign inv.	-18.455	-3.51	1%	I(1)
Brokerage fee_ Local inv.	-14.43	-3.51	1%	I(1)
ln(Market capitalization)	-10.74	-3.51	1%	I(1)
Revenue growth_SET	-10.363	-3.51	1%	I(1)
Dividend yield_SET	-9.535	-3.51	1%	I(1)
1-year T-bill	-5.334	-3.51	1%	I(1)
Core inflation	-7.817	-3.51	1%	I(1)
Industrial production index	-3.09	-2.89	5%	I(0)
Real effective exchange rate	-8.434	-3.51	1%	I(1)
DJI	-12.454	-3.51	1%	I(1)
ln(DJI trading volume)	-14.385	-3.51	1%	I(1)