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Altering Tick Sizes, Liquidity, and Stock Return in Indonesia

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Abstract

This study aimed to investigate the effect of tick-size altering on liquidity and stock return using the 2000-2018 Indonesia stock market (IDX) data. IDX was used to alter the tick size regime five times during the sample period. The results showed that a decrease in absolute tick size increases the liquidity estimated by the effective spread. The zero-return transaction frequency decreases consistently with a decrease in absolute tick size. The size also negatively impacts the abnormal stock return. Therefore, Fama-MacBeth approaches using individual firms' data show consistent results as the time series methods after controlling characteristic factors.

Keywords : Tick size; Liquidity; Stock return.
JEL Classification : G120, G140

1. INTRODUCTION

A stock exchange alters tick or lot size regimes to make its market microstructure more attractive and reliable. This study separately or simultaneously alters absolute tick size, narrows or widens the same tick interval in multiple ticks, or changed the minimum lot transactions. Recent studies on altering the tick size regime have enlarged market characteristics, such as liquidity (Aitken & Comerton-Forde, 2005; Ikenberry & Weston, 2008; Cox et al., 2019; Griffith & Roseman, 2019), fee structure (Comerton-Forde et al., 2019), stock return distributions (La Spada et al., 2011; Münnix et al., 2010; O'Hara et al., 2019), and analyst coverage (Chen et al., 2021).

Previous examined liquidity and return distribution by focusing on tick size one-time regime shift (Aitken & Comerton-Forde, 2005; Ikenberry & Weston, 2008; Cox et al., 2019; Griffith & Ro seman, 2019, La Spada et al., 2011; Münnix et al., 2010; O'Hara et al., 2019). The Indonesia Stock Exchange (IDX) is a major emerging market that alters its tick size frequently. Before June 2000, it applied a single tick size with IDR 25 and reduced it to IDR 5 in July 2000. After three months in 2000, IDX adopted a scheme of three different absolute tick sizes based on the stock price level. In 2005, it changed the absolute tick size into four groups based on the stock price. It took five absolute tick size structures in 2007, adopted three groups, lowered the minimum lot trading in 2014, and retook five structures in 2016. Some stocks also altered their sizes when altering tick size in IDX.

Therefore, frequent tick size altering in IDX creates natural experiment data on the dynamics of liquidity changes and price diffusion in multiple regime shifts.
This study aims to examine the dynamics of tick size regime altering effects on liquidity and price diffusion in multiple fine-tuning processes to determine a suitable market microstructure. It also investigates the direct effects of the size on the stock return in each regime.

The contribution of this study is to investigate the dynamic effects of the tick size altering liquidity in different absolute tick sizes. When the market alters the regime, new absolute tick sizes are applied for some stocks with a certain price since IDX uses multiple regimes. Therefore, the altering effects on the whole market and on specific stocks under the new absolute tick size are not necessarily equivalent. Stocks under the same absolute tick size may be consistent with the previous regime. However, other stocks in the new regime indicate the effects of the changes in the tick size. This shows that the liquidity of specific stocks adopting a new absolute tick size decreases or increases with regime altering.

This study also contributes to investigating the effects of the absolute tick size on abnormal stock returns. Previous studies found the change in the return distributions, skewness, and the stock returns' volatility clustering (La Spada et al., 2011; Münnix et al., 2010; Onnela et al., 2009). Furthermore, bigger absolute tick size stocks outperform those with smaller sizes. The abnormal return difference between the biggest and smallest size reaches 28.08% annually based on the Fama French 5 factor model. The abnormal return size is significant statistically and economically after controlling liquidity factors.
Section 2 of this study presents the evolution of the tick regime in Indonesia from 2000 to 2018, while section 3 develops hypotheses based on related literature. Moreover, section 4 provides the data and the methodology. Section 5 presents descriptive statistics of the data and the results of the impact of altering tick size on liquidity and stock return.

2. EVOLUTION OF TICK SIZE REGIME IN INDONESIA

IDX altered tick size regimes several times in the last two decades. After adopting multiple regimes on 20 October 2000, it altered the size severally until 2016. Table 1 shows that the altering in IDX increases the price and decreases the absolute minimum tick size. This is consistent with the IDX announcement that altering increases liquidity and the stock market capitalization. The minimum and maximum relative tick sizes from each category decrease in each regime. Additionally, the size of the lower price range stocks is larger that for, the higher price range stocks.

Altering tick size and category adjustment does not occur equally in all stocks. For instance, the minimum size of IDR 500-2,000 decreased in 2005, but another price range is constant. The minimum size of IDR 2,000- 5,000 was altered only once in 2016. Relative tick size in 2012 was higher than in other stock exchanges, except for countries such as Canada (Weild et al., 2012). Additionally, the maximum size of most stock exchanges is less than 0.5% (Weild et al., 2012).

Table 1. Evolution of Tick Size Regime in IDX (2000-2018)

Stock Price (IDR)	**20 Oct. 2000**	**3 Jan. 2005**	**2 Jan. 2007**	**6 Jan. 2014***	**2 May 2016**
	Absolute/ Relative	Absolute/ Relative	Absolute/ Relative	Absolute/ Relative	Absolute/ Relative
< 200	5 / ≥ 1.00**	5 / ≥1.00	1 / ≥ 0.50	1 / ≥ 0.20	1 / ≥ 0.50
200 to < 500			5 / 1.00-2.50		2 / 0.40-1.00
500 to < 2,000	25 / 0.50-5.00	10 / 0.50-2.00	10 / 0.50-2.00	5 / 0.25-1.00	5 / 0.25-1.00
2,000 to < 5,000		25 / 0.50-1.25	25 / 0.50-1.25	25 / 0.50 ≤	10 / 0.20-0.50
≥ 5,000	50 / 1.00 ≤	50 / 1.00 ≤	50 / 1.00 ≤		25 / 0.50 ≤

* Minimum size of lot traction altered from 500 to 100 lot. **range of relative tick size is expressed in percentage.

Santoso et al. (2015) and Asmaranti et al. (2019) did not examine the uniqueness of the minimum altering of different absolute tick sizes. The studies treated all the stocks as though their minimum size was altered. The effects of changes in the IDX were considered more dynamic than those captured.

O'Hara et al. (2019) and Chao et al. (2019) used the US market data that only captures a time change of altering effects on liquidity and other factors. Frequent changes in minimum size and the rearrangement of category stocks facilitate observing the dynamics of stock liquidity and price diffusion for multi-time regime altering.

3. HYPOTHESIS DEVELOPMENT

Tick Size and Liquidity

Previous studies found that reducing tick size increases market liquidity. Bacidore et al. (2003) showed that altering from 1/16 to 1/100 at the NYSE decreased the quoted spread by 30%. Moreover, displayed liquidity dropped sharply, specifically for low-priced stocks. Liquidity may increase by reducing tick sizes for liquid and heavy-traded stocks by lowering transaction costs and increasing providers (Aitken & Comerton-Forde, 2005; Anderson & Peng, 2014; Maruyama & Tabata, 2022).

Pan et al. (2012) found that tick size reduction increases the liquidity of infrequently traded stocks. Bartlett & McCrary (2020), Cox et al. (2019), and Griffith & Roseman (2019) also showed that size has been negatively associated with liquidity while using tick size increase cases in US markets. Liquidity decreases when U.S. SEC increases the sof for small-capitalization stocks. Also, Xiao & Yamamoto (2020) reported a decrease in spread after decreasing tick size when pre-opening the Tokyo Stock Market.

Weild et al. (2012) stated that reducing trading costs by decreasing tick size might deteriorate the stock market infrastructure. Harris (1991) showed that a smaller size increases the negotiation costs and alleviates the benefits of increased liquidity. According to Pan et al. (2012), tick size reduction increases transaction costs that reduce liquidity. Anderson & Peng (2014) stated that the negative association between size reduction and liquidity in the Hong Kong stock market is caused by increased transaction costs. Tick size reduction may reduce the potential return and increase risk exposure for retail investors (Weild et al., 2012). Furthermore, Lee & Watts (2021) showed that size increase

reduces liquidity by decreasing algorithmic trading. Eaton et al. (2021) found that transaction costs of institutional investors are not significantly impacted by the size changes.

The effects of decreasing tick size may not be equivalent to all stocks. The liquidity of liquid stocks may increase with the smaller tick size, which worsens their illiquidity (Weild et al., 2012). Anderson & Peng (2014) showed that reducing trading activities after tick size decrease deteriorates the liquidity of small stocks. High frequent traders provide less liquidity for smaller than larger size stocks (O'Hara et al., 2019). Also, a tick size increase may increase limit orders but increase the risk of picking off (Yamamoto, 2020). The increase of limit orders and market-making may mediate liquidity and analyst coverage. Similarly, the increase in stocks' visibility attracts investors and increases the market volume (Buti et al., 2013). This contradicts Chen et al. (2021), which found no promotion effects by increasing analyst coverage by reducing tick size in the US stock markets.

Contradictive results showed that the effects of altering tick size to liquidity are not equivalent to all stocks in the same markets. This means the size reduction does not automatically increase the stock liquidity. Buti et al. (2013) found that stock liquidity increases when the size reduction increases the stock visibility. This also occurs when a stock that has satisfied certain conditions, such as heavy-treaded stock, where size reduction increases the stock liquidity.

H_1: Reducing absolute tick size positively affects liquidity, except for infrequently traded stocks.

Tick Size and Stock Return

Tick Size and Return Distribution

La Spada et al. (2011) stated that tick size influences the market microstructure and may affect price diffusion. Onnela et al. (2009) found that investors could adjust the stock price more precisely than a high effective size and a low absolute price. This distortion of return is strong when stocks have large effective sizes, increasing zero-return.

Using cross-listed in NYSE and TSE, Onnela et al. (2009) showed that zero returns increase with relative tick size. The zero return frequency is more related to effective tick-to-price ratio than absolute size in dollars. La Spada et al. (2011) used high-frequency data and found that size reduction diminishes the zero stock return frequency.

H_2: Decrease of tick size reduces zero returns.

Tick Size and Stock Return

Onnela et al. (2009) stated that a large effective tick size distorts the return distribution pattern. Stocks with a low tick-to-price ratio follow normal distribution than those of high effective size. The study also showed that the same stocks traded in different regimes indicate varied stock return distribution. Stocks traded with higher sizes are closer to a normal distribution than the lower size. However, the study found reverse empirical evidence of stock distribution.

Münnix et al. (2010) showed that altering tick size impacts the return distribution's tail shape. Large price change produces heavier tails in stock return distribution. This means that size reduction may redistribute stock return with less heavy tail distributions. La Spada et al. (2011) found that size reduction generates non-zero returns, making the

distribution less thick-tailed. Additionally, Curato & Lillo (2015) showed that tick-to-price ratio strongly impacts the clustering of return distribution for large size stocks in high-frequency data, while the effect is insignificant for small stocks.

These distributions of returns for different sizes may produce varied stock returns. This means that stock returns from higher sizes have big losses when they follow a more normal distribution (Onnela et al., 2009). Furthermore, they are frequently negatively skewed, meaning they have more returns than those with lower sizes.

H_3: Higher absolute tick size of a stock positively affects the stock return.

4. DATA AND METHODOLOGY

Data

This study obtained data from Capital IQ from 2000 to 2018. The Indonesia Stock Exchange (IDX) firms were used, except those with incomplete data on the daily and monthly frequency of stock price and trading value. Financial statement data were obtained from the same resources to calculate the Fama-French factors. After obtaining the daily frequency of stock price and value of transactions, firms were classified into five groups based on the tick size. Although each regime had 3 to 5 different group stocks, this study used 5 groups. This consistent stock grouping is convenient for observing the effects of altering on liquidity and stock price return.

Measurement of the Variables

Effective Spread: Corwin & Schultz (2012) measured the effective spread using high and low prices of daily stock returns. The study assumed that the high-low price ratio shows the stock price variance and the spread. They separated the bid-ask spread using 2 days' high-low stock price as follows:

$$Spread = \frac{2(e^{\alpha}-1)}{1+e^{\alpha}} \qquad (1)$$

where $\alpha = \frac{\sqrt{2\beta}-\sqrt{\beta}}{3-2\sqrt{2}} - \sqrt{\frac{\gamma}{3-2\sqrt{2}}}$, $\beta = E\left\{\sum_{j=0}^{1}\left[ln\frac{H_{t+j}^{0}}{L_{t+j}^{0}}\right]^2\right\}$, $\gamma = \left[ln\frac{H_{t,t+1}^{0}}{L_{t,t+1}^{0}}\right]^2$,

$H_t^0 (L_t^0)$: the high (low) stock price for day t.

The monthly effective spread was estimated based on the daily stock price for individual stocks. The effective spread for each group was also calculated by weighing the individual effective spread equally based on the absolute tick size.

Illiquidity: Amihud illiquidity was measured according to the measurement proposed by Amihud (2002). It was estimated using two different approaches with the formula modified as follows: Amihud $= \frac{1}{N}\sum_{i=1}^{N}\frac{|r_i|}{Value_i}$, where r_i is the individual stock return, $Value_i$ is the price times number of traded stocks on that day, N is the number of the stocks that belong to the specified absolute tick size group.

Amihud illiquidity for an individual stock was estimated as Amihud $= \frac{1}{N}\sum_{i=1}^{N}\frac{|r_i|}{Value_i}$, where r_i is the individual stock return, $Value_i$ is the price times the number of stocks traded on that day, N is the number of trading days in that month.

Zero Rate: Zero rates are the number of non-trading stocks on a certain trading day. La Spada et al. (2011) showed that the absolute tick size decreases zero-trading and zero-return days. Zero rates are estimated by the day of non-trading to total trading days on that specific day because the stocks belong to the same absolute tick size group.

Stock Return: Stock returns were calculated with daily and monthly frequency using $r_t = (P_t/P_{t-1}) - 1$, where P_t is the stock price of a specific date. The equally weighted returns were calculated to determine each group's daily portfolio and return based on absolute tick size. Equally and value-weighted stock returns were calculated for the monthly portfolio return for each absolute tick size. Also, the individual monthly stock return was calculated for the Fama & MacBeth (1973) regression models.

Skewness: Skewness of the stock return was used to capture each tick size group (La Spada et al., 2011). The skewness of each month was calculated based on daily stock returns by $(r_i - \bar{r})^3/std^3$.

Momentum: Return $_{(-12,-2)}$ was calculated as a proxy for momentum factors using the summation of during 11 months by $\sum_{t=2}^{12}(r_t + 1)$.

Size: The firm's size was proxied by Log (mc), where mc is the market capitalization of the month.

Empirical Results

Descriptive Statistics

Panel A in Table 2 shows that in early 2000, stock prices less than IDR200 were dominant until 37% in the second period, except in the first period, until High tick stock, though their dominance decreases with time. The number of the stock from each tick size group evolves with time. The stock from IDR 200 to 500 and from 500 to 2,000 is approximately the same, though IDR 500 to 2,000 increases.

***Table* 2.** Tick Size Altering and Change of Stock Proportion

Panel A: Distribution of Stock's Proportion based on Tick Size and Time

	Period 1	**Period 2**	**Period 3**	**Period 4**	**Period 5**	**Period 6**	**Average**
High Tick (<IDR 200)	0.112	0.372	0.350	0.286	0.259	0.263	107
2 (IDR 200 to <IDR 500)	0.277	0.256	0.232	0.228	0.216	0.254	94
3 (IDR 500 to <IDR 2,000)	0.426	0.249	0.264	0.283	0.297	0.292	116
4 (IDR 2,000 to IDR 5,000)	0.098	0.056	0.074	0.102	0.119	0.110	38
Low Tick (≥IDR 5,000)	0.088	0.067	0.080	0.100	0.108	0.080	35

Panel B: Contribution of Each Tick Size to the Market Capitalization

	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Average
High Tick (<IDR 200)	0.066	0.118	0.030	0.019	0.017	0.021	0.022
2 (IDR 200 to <IDR 500)	0.080	0.081	0.032	0.042	0.042	0.054	0.047
3 (IDR 500 to <IDR 2,000)	0.259	0.237	0.219	0.155	0.159	0.164	0.164
4 (IDR 2,000 to IDR 5,000)	0.211	0.287	0.293	0.193	0.200	0.306	0.238
Low Tick (≥IDR 5,000)	0.384	0.277	0.427	0.591	0.583	0.455	0.529

*Period 1 is before 20 Oct 2000, period 2 is 1 from 20 October 2000 to 30 December 2004, period 3 is from 3 Jan 2005 to 28 Dec 2006, period 4 is from 3 Jan 2007 to 5 Jan 2014, period 5 is from 6 Jan 2014 to 29 April 2016, and period 6 is 29 Apr 2016 to Dec 2018.

However, the proportion of stock between IDR 200 to IDR 500 is stagnant. These two stock price ranges account for more than 50% of the composition of the stock price level in IDX within each period. In Panel B in Table 2, High Tick size firms account for only 2.2% of the market capitalization. Stocks with a price less than IDR 500 comprise more than 50% of the total number of stocks, but their contribution to the market capitalization is approximately 6% on average. Additionally, in IDX, two high tick size groups of stocks account for 75% of the market capitalization.

Tick Size Altering and Liquidity

Tick Size Altering and Effective Spread

Panel A in Table 3 shows that effective spreads following Corwin & Schultz's (2012) method vary over time. Effective tick size is directly related to the stocks' relative size. An increase in absolute tick size increases the effective spread. The difference in effective spread between the high and low tick groups is significant at 1% for all periods.

Table 3. Tick Size Altering and Effective Spread

Panel A: Tick Size Altering and Effective Spread

	Period 1	**Period 2**	**Period 3**	**Period 4**	**Period 5**	**Period 6**	**Average**
High Tick (< IDR 200)	0.0364	0.0207	0.0147	0.0103	0.0116	0.0136	0.0147
2 (IDR 200 to <IDR 500)	0.0156	0.0069	0.0066	0.0117	0.0068	0.0103	0.0095
3 (IDR 500 to <IDR 2,000)	0.0093	0.0104	0.0060	0.0092	0.0073	0.0087	0.0088
4 (IDR 2,000 to IDR 5,000)	0.0061	0.0046	0.0053	0.0078	0.0053	0.0069	0.0063
Low Tick (≥IDR 5,000)	0.0044	0.0039	0.0041	0.0066	0.0056	0.0061	0.0055
Average	0.0133	0.0126	0.0090	0.0097	0.0079	0.0100	0.0100
Difference High-Low	-0.0320*** (23.69)	-0.0168*** (66.06)	-0.0106*** (38.67)	-0.0037*** (37.74)	-0.0060*** (47.86)	-0.0075*** (58.19)	-0.0093*** (67.01)

Panel B: Tick Size Altering and Change of Effective Spread

	Period 2 Minus Period 1	**Period 3 Minus Period 2**	**Period 4 Minus Period 3**	**Period 5 Minus Period 4**	**Period 6 Minus Period 5**
High Tick (<IDR 200)	-0.016*** (11.20)	-0.006*** (17.17)	-0.004*** (16.02)	0.001*** (8.72)	0.002*** (12.17)
2 (IDR 200 to < IDR 500)	-0.009*** (15.82)	0.000** (2.0)	0.005*** (30.10)	-0.005*** (38.5)	0.004*** (28.6)
3 (IDR 500 to < IDR 2,000)	0.001*** (3.31)	-0.004*** (30.9)	0.003*** (25.98)	-0.002*** (18.3)	0.001*** (13.5)
4 (IDR 2,000 to IDR 5,000)	-0.002*** (4.99)	0.001*** (4.00)	0.003*** (16.10)	-0.003*** (20.94)	0.002*** (13.85)
Low Tick (≥IDR 5,000)	-0.001*** (2.73)	-0.004*** (23.87)	0.001*** (5.06)	-0.002*** (14.90)	0.002*** (17.21)
Average Change of Effective Spread	-0.0008 (0.48)	-0.0036*** (11.67)	0.0007** (1.95)	-0.0018*** (8.74)	0.0022*** (11.98)

*Period 1 is before 20 October 2000, period 2 is 1 from 20 October 2000 to 30 December 2004, period 3 is from 3 January 2005 to 28 December 2006, period 4 is from 3 January 2007 to 5 January 2014, period 5 is from 6 January 2014 to 29 April 2016, and period 6 is 29 April 2016 to Dec 2018.

Effective spread is estimated using daily frequency data following the method of Corwin and Schultz (2012). t-statistics in parentheses, * p<0.10, ** p<0.05, *** p<0.01

Panel B in Table 3 shows that effective spread decreases from Period 1 to Period 2, except stock price range IDR 500 to IDR200. Altering the regime from Period 1 to 2 decreases the size of the Low group. In contrast, the effective spread of the Low group decreases significantly by 1%. When absolute size decreases by altering the regime from Period 4 to 5 for the group to 2 (IDR200 ~IDR500), 3 (IDR500~ IDR2,000), and Low Tick (≥IDR5,000), the relative spread of these groups decreases significantly by 1%. These results are consistent with Aitken & Comerton-Forde (2005), Anderson & Peng (2014), and Maruyama & Tabata (2022). However, altering from Period 4 to Period 5 changes the size and the minimal lot transaction. The whole decrease of the effective spread cannot be interpreted as the result of altering. The increase in the effective spread in Period 6 is hard to explain, except in stocks belonging to IDR200~IDR500, because their size increases twice.

Tick Size Altering and Illiquidity

Panel A in Table 4 shows that stock illiquidity increases with the relative tick size. Amihud illiquidity between High and Low tick size groups is significantly different by 1%. This pattern does not change even when the regime tick size alters. Moreover, the change of the Amihud illiquidity over time shows a reverse U-shape. The illiquidity of period 4 from 2007 to 2014 is the lowest among different tick size regimes. These results contradict the previous liquidity measures, zero transactions, and effective spread, perhaps due to the diminishing zero transactions. When Amihud illiquidity is estimated, the number of zero trading decreases per day for each group while illiquidity increases.

Table 4. Tick Size Altering and Illiquidity

Panel A: Tick Size Altering and Amihud Illiquidity

	Period 1	**Period 2**	**Period 3**	**Period 4**	**Period 5**	**Period 6**	**Average**
High Tick (<IDR200)	0.8058	5.7796	5.1026	2.3660	14.6472	13.3897	6.3984
2 (IDR200 to <IDR500)	0.6175	0.6185	0.7728	0.7196	3.9188	5.9447	1.8250
3 (IDR500 to <IDR 2,000)	0.2385	0.2036	0.1126	0.1981	0.8121	1.4593	0.4443
4 (IDR 2,000 to IDR 5,000)	0.0591	0.0498	0.0332	0.0528	0.2706	0.3289	0.1159
Low Tick (≥IDR 5,000)	0.0269	0.0211	0.0104	0.0146	0.0935	0.1434	0.0439
Average	0.3496	1.3345	1.2063	0.6702	3.9484	4.2532	1.9604
Difference	-0.779***	-5.759***	-5.092***	-2.351***	-14.55***	-13.246***	-6.355***
High-Low	(6.966)	(21.351)	(16.786)	(39.386)	(32.096)	(54.761)	(53.328)

Panel B: Tick Size Altering and Change of Amihud Illiquidity

	Period 2 Minus Period 1	**Period 3 Minus Period 2**	**Period 4 Minus Period 3**	**Period 5 Minus Period 4**	**Period 6 Minus Period 5**
High Tick (<IDR 200)	4.974***	-0.677*	-2.737***	12.281***	-1.258**
	(17.05)	(-1.67)	(8.85)	(26.83)	(-2.445)
2 (IDR 200 to <IDR 500)	0.001	0.154***	-0.053	3.199***	2.026***
	(0.02)	(2.67)	(-0.94)	(24.03)	(11.89)

Panel B: Tick Size Altering and Change of Amihud Illiquidity

	Period 2 Minus Period 1	Period 3 Minus Period 2	Period 4 Minus Period 3	Period 5 Minus Period 4	Period 6 Minus Period 5
3 (IDR 500 to <IDR 2,000)	-0.035*	-0.091***	0.086***	0.614***	0.647***
	(-1.92)	(-7.36)	(8.57)	(19.31)	(16.07)
4 (IDR 2,000 to IDR 5,000)	-0.009	-0.017***	0.020***	0.218***	0.058***
	(-1.36)	(-3.19)	(4.77)	(15.66)	(3.62)
Low Tick (≥IDR 5,000)	-0.006	-0.011***	0.004***	0.079***	0.050***
	(-1.53)	(-5.10)	(2.75)	(13.87)	(6.66)
Average Change of Illiquidity	0.9850***	-0.1282	-0.5361*	3.2782***	0.3048
	(3.31)	(-0.312)	(-1.71)	(6.86)	0.561

*Period 1 is before 20 October 2000, period 2 is 1 from 20 October 2000 to 30 December 2004, period 3 is from 3 January 2005 to 28 December 2006, period 4 is from 3 January 2007 to 5 January 2014, period 5 is from 6 January 2014 to 29 April 2016, and period 6 is 29 April 2016 to Dec 2018. Amihud monthly illiquidity is estimated after estimating individual stock illiquidity based on daily stock price change and value transactions, then making a simple average in each group for each month. t-statistics in parentheses, * p<0.10, ** p<0.05, *** p<0.01

Tick Size Altering and Stock Return

Tick Size Altering and Zero Transactions

Panel A in Table 5 shows that the number of non-trading stocks diminishes with time. Non-trading stocks increase with size in each regime, but zero-trading stocks do not decrease monotonically. IDR500 ~IDR2000 has the biggest zero-trading stocks in almost all regimes. Also, low tick stocks have relatively high zero trading days compared to the IDR2000 ~IDR5000. The differences in the zero-transactions between relative High Tick stocks and relative Low Tick are statistically significant by 1%. However, Period 1 has a relatively small number of observations, where stocks belonging to the High Tick have higher non-trading days than Low Tick stocks. This means that Indonesia's low tick size stocks are more liquid.

Table 5. Tick Size Altering and Zero Transactions

Panel A: Tick Size Altering and Zero Transactions

	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Average
High Tick (<IDR 200)	0.0324	0.1564	0.1697	0.1127	0.0678	0.0223	0.1088
2 (IDR 200 to <IDR 500)	0.0793	0.1040	0.1248	0.0788	0.0606	0.0175	0.0798
3 (IDR 500 to <IDR 2,000)	0.1399	0.1097	0.1041	0.1032	0.0730	0.0211	0.0927
4 (IDR 2,000 to IDR 5,000)	0.0362	0.0252	0.0210	0.0339	0.0339	0.0094	0.0277
Low Tick (≥IDR 5,000)	0.0489	0.0420	0.0404	0.0328	0.0363	0.0090	0.0339
Average	0.0930	0.1163	0.1207	0.0862	0.0603	0.0182	0.0819
Difference High-Low	-0.0164*** (-18.572)	0.1145*** (65.296)	0.1293*** (89.508)	0.0799*** (66.482)	0.0314*** (39.474)	0.0133*** (14.575)	0.0749*** (83.924)

Panel B: Tick Size Altering and Change of Zero Transactions

	Period 2 Minus Period 1	Period 3 Minus Period 2	Period 4 Minus Period 3	Period 5 Minus Period 4	Period 6 Minus Period 5
High Tick (<IDR 200)	0.124***	0.013***	-0.057***	-0.045***	-0.045***
	(65.83)	(5.75)	(29.36)	(31.71)	(27.11)
2 (IDR 200 to <IDR 500)	0.025***	0.021***	-0.046***	-0.018***	-0.043***
	(10.55)	(20.1)	(44.36)	(23.1)	(34.7)
3 (IDR 500 to <IDR 2,000)	-0.030***	-0.006***	-0.001	-0.030***	-0.052***
	(22.81)	(7.0)	(1.02)	(36.9)	(35.4)
4 (IDR 2,000 to IDR 5,000)	-0.011***	-0.004***	0.013***	0.000	-0.025***
	(21.98)	(11.82)	(36.60)	(0.09)	(36.35)
Low Tick (≥IDR 5,000)	0.023***	0.004***	-0.034***	-0.026***	-0.042***
	(48.57)	(13.63)	(126.5)	(113.9)	(66.77)
Average Change of Zero Transactions	0.023***	0.004***	-0.035***	-0.026***	-0.042***
	(8.52)	(2.23)	(18.37)	(24.09)	(24.05)

*Period 1 is before 20 October 2000, period 2 is 1 from 20 October 2000 to 30 December 2004, period 3 is from 3 January 2005 to 28 December 2006, period 4 is from 3 January 2007 to 5 January 2014, period 5 is from 6 January 2014 to 29 April 2016, and period 6 is 29 April 2016 to Dec 2018. Zero-transaction ratios are calculated as the sum of zero transactions per day from each group during one month to total stocks times the number of transaction days during that month. t-statistics in parentheses, * p<0.10, ** p<0.05, *** p<0.01

Panel B in Table 5 shows that every altering increases the market liquidity by reducing non-trading stocks, except in early 2000. Regime altering and the number of investors in stock markets affect the zero transactions. However, when relative tick size decreases, the stocks in that group increase their liquidity. For instance, stocks in the High Tick group decrease the absolute size from IDR 5 to IDR 1 at the beginning of period 4, while the zero-transaction ratio decreases significantly. At the beginning of period 5, each size decreases for groups 3 (IDR500 ~ IDR2000) and 5 (Low Tick) from IDR10 to 5 and from 50 to 25. The liquidity of the stocks in each group also increases. Altering the minimum lot from 500 to 100 in Period 6 diminishes zero transaction of the stocks. Furthermore, the stocks in group 2 (IDR200- IDR500) increase the size from IDR1 to IDR2. The effect of the diminishing lot size is more influential than the size increase. In line with this, La Spada et al. (2011) stated that altering influences price diffusion. Therefore, altering diminishes the distortion of stock return shown by decreasing zero-return (La Spada et al., 2011; Onnela et al., 2009).

Tick Size and Stock Return

Table 6 shows that the return of the high absolute tick size group is lower than that of the low absolute tick size group. This pattern is repeated from raw returns and 3 abnormal returns of three asset pricing models. Also, value and equality weighted returns show the same tendency. Based on alpha from Fama-French 5 factors model (Fama & French, 2015), relatively smaller tick size stocks yield a 23.04% higher return than stocks with a relatively bigger absolute tick size. This result is consistent with Onnela et al. (2009), which stated that higher absolute tick size follows normal distributions. Also, the tick size influences the distribution of higher absolute stock returns. Different return distribution of the stocks influenced by tick size gives arbitrage transaction opportunities between higher and lower absolute tick size groups. However, this difference may be related to stock liquidity, whose factors should be controlled.

Alpha was re-estimated using the daily frequency data, Fama-French 3 factors, and Amihud and effective spread. Panels A and B in Table 7 show that different tick sizes produce abnormal returns after controlling liquidity factors. Furthermore, a relatively smaller tick size stock group gives higher returns than bigger relative tick size stocks. After controlling the liquidity factors, the size of the abnormal returns decreases but is still significant at 1%. This means that abnormal returns related to different tick sizes cannot be accounted for the liquidity.

Table 6. Abnormal Returns based on Tick Size

	Raw Return		**Alpha CAPM**		**Alpha FF3**		**Alpha FF5**	
	EW	**VW**	**EW**	**VW**	**EW**	**VW**	**EW**	**VW**
High Tick (<IDR 200)	0.0002	0.0002	0.0010	0.0008	0.0032	0.0045	0.0055	0.0048
			(0.0062)	(0.0073)	(0.0050)	(0.0063)	(0.0048)	(0.0061)
2 (IDR 200 to <IDR 500)	0.0208	0.0223	0.0217***	0.0232***	0.0234***	0.0255***	0.0245***	0.0259***
			(0.0056)	(0.0062)	(0.0045)	(0.0054)	(0.0045)	(0.0052)
3 (IDR 500 to <IDR 2,000)	0.0297	0.0234	0.0303***	0.0242***	0.0324***	0.0267***	0.0331***	0.0265***
			(0.0054)	(0.0060)	(0.0047)	(0.0055)	(0.0047)	(0.0055)
4 (IDR 2,000 to IDR 5,000)	0.0307	0.0208	0.0314***	0.0214***	0.0328***	0.0228***	0.0329***	0.0225***
			(0.0057)	(0.0060)	(0.0054)	(0.0060)	(0.0054)	(0.0061)
Low Tick (≥IDR 5,000)	0.0304	0.0266	0.0310***	0.0271***	0.0325***	0.0285***	0.0323***	0.0283***
			(0.0047)	(0.0047)	(0.0046)	(0.0047)	(0.0046)	(0.0049)
Difference High-Low	-0.0303***	-0.0264***	-0.0300***	-0.0264***	-0.0293***	-0.0240***	-0.0268***	-0.0234***
	(0.0048)	(0.0056)	(0.0049)	(0.0057)	(0.0046)	(0.0052)	(0.0044)	(0.0048)

Monthly observations from January 2000 Jan until December 2018. As dependent variables, equally weighted (EW) and value-weighted (VW) returns are used. The single factor model used market return minus risk-free rate as an independent variable. In Fama-French 3 factors model added, SMB and HML factors and Fama-French 5 factors model, additional RMW and CMA factors are added as independent variables. All regression results are corrected with White heteroskedastic consistent standard errors. Standard errors in parentheses, * p<0.10, ** p<0.05, *** p<0.01

Table 7. Abnormal return of Tick Size after Control Liquidity

Panel A: Abnormal Return of Tick Size using FF3 after Controlling Amihud Illiquidity

Group	Alpha	MKT	SMB	HML	Illiquidity	Adj. R-sq
High Tick	0.00902***	0.3680***	-0.0496**	0.0639***	0.0000896***	0.206
	(0.00056)	(0.02060)	(0.01850)	(0.01720)	(0.00002)	
2	0.0108***	0.3830***	-0.1221	0.000449	-7.25E-05	0.299
	(0.00053)	(0.01920)	(0.01570)	(0.01430)	(0.00004)	
3	0.0109***	0.3690***	-0.1692	-0.0378**	-0.000604***	0.373
	(0.00047)	(0.01710)	(0.01370)	(0.01270)	(0.00017)	
4	0.0120***	0.4360***	-0.2063	-0.0888***	-0.000426	0.409
	(0.00049)	(0.01870)	(0.01630)	(0.01350)	(0.00068)	
Low Tick	0.0116***	0.4231***	-0.2133	-0.0906***	0.000757	0.451
	(0.00044)	(0.01700)	(0.01550)	(0.01340)	(0.00117)	
High-Low	-0.00255***	-0.0554***	0.1642	0.1541	-0.0000723***	0.077
	(0.00046)	(0.01680)	(0.01750)	(0.01640)	(0.00002)	

Panel B: Abnormal Return of Tick Size using FF3 after Controlling Effective Spread

Group	Alpha	MKT	SMB	HML	Spread	Adj. R-sq
High Tick	0.0081***	0.3623***	-0.0499***	0.0633***	0.0935**	0.207
	(0.0006)	(0.0203)	(0.0186)	(0.0172)	(0.0373)	
2	0.0124***	0.3952***	-0.1182***	0.00272	-0.1451**	0.301
	(0.0009)	(0.0204)	(0.0158)	(0.0144)	(0.0634)	
3	0.0085***	0.3652***	-0.1701***	-0.0394***	0.2333***	0.376
	(0.0007)	(0.0169)	(0.0136)	(0.0127)	(0.0656)	
4	0.0132***	0.4402***	-0.2053***	-0.0869***	-0.1782***	0.411
	(0.0007)	(0.0191)	(0.0163)	(0.0135)	(0.0597)	
Low Tick	0.0133***	0.4291***	-0.2113***	-0.0900***	-0.2682***	0.456
	(0.0006)	(0.0172)	(0.0156)	(0.0135)	(0.0591)	
High-Low	-0.0028***	-0.0591***	0.1642***	0.1541***	-0.0715**	0.078
	(0.0004)	(0.0165)	(0.0175)	(0.0163)	(0.0315)	

Daily observations from January 2000 Jan until December 2018. The total number of observations in each regression is 4463. Equally weighted (EW) were used as dependent variables. In Fama-French 3 factors model, market return minus risk-free rate (MKT), SMB and HML factors, and Amihud illiquidity factors of each group and effective spread of each group are estimated with the method Corwin and Schultz (2012) are used. All regression results are corrected with White heteroskedastic consistent standard errors. Standard errors in parentheses, * p<0.10, ** p<0.05, *** p<0.01

Table 8 shows the effects of tick size altering on the stock return on 6 January 2014. The stock return decreases when the size of group 2 (IDR200~IDR500) decreases from IDR5 to 1. When group 3 (IDR500~IDR2,000) decreases from IDR10 to 5, the stock return does not change. However, when group 5 (>IDR5,000) decreases from IDR50 to 25, the stock return increases, though not in all the models. The result of group 3 is inconsistent with Münnix et al. (2010) and La Spada et al. (2011), La Spada et al. (2012), which showed that diminishing fat-tailed stock return distribution with absolute tick size reduction may increase the stock return. This is because the negative skewness of the stock return diminishes.

Table 8. Tick Size Altering and Stock Return using Fama-MacBeth Regression

	2 (IDR200 ~ IDR500)				**3 (IDR500 ~ IDR2,000)**				**Low Tick (>IDR5,000)**			
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**
Alpha	0.00202***	0.0161***	0.0147***	0.0159***	0.00216***	0.0155***	0.0153***	0.0150***	0.00197***	0.0168***	0.0168***	0.0169***
	(0.0004)	(0.0005)	(0.0011)	(0.0005)	(0.0003)	(0.0004)	(0.0004)	(0.0007)	(0.0004)	(0.0004)	(0.0004)	(0.0005)
Dum	-0.00133***	0.00023	0.00076	-0.00095**	-0.00117**	0.00024	-0.00034	0.00033	-0.00070	0.00084***	0.00034	0.00083***
	(0.0005)	(0.0003)	(0.0005)	(0.0004)	(0.0005)	(0.0003)	(0.0003)	(0.0003)	(0.0006)	(0.0003)	(0.0003)	(0.0003)
MKT		0.710***	0.703***	0.711***		0.671***	0.672***	0.670***		0.751***	0.751***	0.751***
		(0.0242)	(0.0243)	(0.0241)		(0.0185)	(0.0184)	(0.0183)		(0.0181)	(0.0180)	(0.0181)
SMB		-0.0186	-0.0200	-0.0178		-0.0815***	-0.0813***	-0.0815***		-0.128***	-0.127***	-0.128***
		(0.0192)	(0.0192)	(0.0191)		(0.0158)	(0.0157)	(0.0158)		(0.0213)	(0.0213)	(0.0212)
HML		0.0419*	0.0400*	0.0428*		0.015	0.0141	0.0145		-0.0694***	-0.0690***	-0.0694***
		(0.0172)	(0.0173)	(0.0170)		(0.0134)	(0.0134)	(0.0134)		(0.0170)	(0.0170)	(0.0170)
Illiquidity			0.111				0.00091***				0.00562***	
			(0.0739)				(0.0003)				(0.0013)	
Spread				0.000355***				0.0465				-0.00272
				(0.0001)				(0.0669)				(0.0590)
Adj. R-sq	0.001	0.623	0.623	0.625	0.001	0.726	0.727	0.726	0.000	0.791	0.792	0.791

Daily observations from period 4 (3 January 2007 to 5 January 2014 to period 5 (6 January 2014 to 29 April 2016) were used. The total number of observations in each regression is 2232. Equally weighted (EW) was used as the dependent variable. In Fama-French 3 factors model, market return minus risk-free rate (MKT), SMB and HML factors, and Amihud illiquidity factors of each group and effective spread of each group are estimated with the method Corwin and Schultz (2012) are used. Variable Dum is 1 for period 4 and 0 for period 5. All regression results are corrected with White heteroskedastic consistent standard errors. Standard errors in parentheses, * p<0.10, ** p<0.05, *** p<0.01

The decrease in the stock return for group 2 is caused by liquidity changes. An increase in liquidity affects the stock return more than a decrease in negative skewness. However, the group 5 stock return shows contradicting results, meaning that the effect of altering on stock returns depends on the price range.

Robustness Tests

Table 9 shows the descriptive statistics of the variables used in Fama-MacBeth regressions. The effective spread of all the stocks is positive due to the estimation limitation of Corwin & Schultz (2012). However, the zero effective spread is not much different from Corwin & Schultz (2012). The skewness of the stock return is negative and wide.

Table 9. Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Return	58,910	0.0141	0.1603	-0.3896	0.6860
Return $_{(-1,-1)}$	52,039	0.0137	0.1579	-0.3896	0.6860
Return $_{(-12,-2)}$	31,389	0.1348	0.4948	-0.9666	1.5363
Log(mc)	58,910	14.0137	2.0983	2.3514	20.0000
Effective Spread	58,910	0.0096	0.0109	0.0000	0.3529
Amihud Illiquidity	58,910	2.7909	9.9025	0.0000	71.5201
Skewness	58,910	-0.1700	0.6225	-2.2370	3.1564

Monthly return is calculated by $r_t = P_t/P_{t-1} - 1$, return $_{(-1,-1)}$ is the lag return and return $_{(-12,-2)}$ is calculated using summation of during 11 month by $\sum_{t=2}^{12}(r_t + 1)$. Log (mc) is the calculated log of the market capitalization of the month. The effective spread was estimated by Corwin and Schultz's (2012) method, and Amihud illiquidity was calculated by Amihud (2002). The skewness of each month was calculated based on daily stock returns by $(r_i - \bar{r})^3/std^3$. The data are winsorized in 1%.

Table 10 shows the effects of the absolute tick size altering on stock return. Regression (1) indicates that a bigger size has higher stock returns, as shown by the monotonically increasing coefficient. Stocks with the highest size in Group 5 perform better at 42.03% annually than those with the lowest size. Regressions (2) to (7) in Table 4.9 also show that a bigger size positively affects the stock returns. This occurs after controlling firm-specific factors such as market capitalization, skewness, liquidity, return reversal, and momentum. The result is consistent with Tables 4.5 and 4.6 using time series data. According to Onnela et al. (2009), a higher absolute tick size follows normal distributions, increasing the IDX stock returns.

Table 10. Effects of Absolute Tick Size on Stock Returns

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Group2	0.0221***	0.0160***	0.0174***	0.0204***	0.0119***	0.0131***	0.0148***
	(0.0024)	(0.0036)	(0.0032)	(0.0034)	(0.0032)	(0.0032)	(0.0034)
Group3	0.0335***	0.0252***	0.0264***	0.0319***	0.0201***	0.0206***	0.0236***
	(0.0035)	(0.0040)	(0.0040)	(0.0044)	(0.0047)	(0.0047)	(0.0045)
Group4	0.0352***	0.0263***	0.0278***	0.0349***	0.0173**	0.0177**	0.0232***
	(0.0047)	(0.0057)	(0.0056)	(0.0060)	(0.0061)	(0.0061)	(0.0061)
Group5	0.0358***	0.0274***	0.0286***	0.0374***	0.0217**	0.0219**	0.0274***
	(0.0049)	(0.0064)	(0.0065)	(0.0070)	(0.0066)	(0.0068)	(0.0066)
Return $_{(-1,-1)}$		0.0138	0.0157	0.0157	0.0138	0.0157	0.0157
		(0.0141)	(0.0143)	(0.0131)	(0.0141)	(0.0143)	(0.0131)
Return $_{(-12,-2)}$		0.0015	0.0016	0.0016	0.0015	0.0016	0.0016
		(0.0038)	(0.0039)	(0.0037)	(0.0038)	(0.0039)	(0.0037)
Log(mc)		0.0008	0.0008	0.0006	0.0008	0.0008	0.0006
		(0.0011)	(0.0012)	(0.0011)	(0.0011)	(0.0012)	(0.0011)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Amihud			-0.0164			-0.0164	
			(0.0136)			(0.0136)	
Spread				1.060***			1.060***
				(0.2450)			(0.2450)
Skewness					-0.00612*	-0.0051	-0.0025
					(0.0037)	(0.0035)	(0.0033)
Alpha	-0.0081	-0.0218	-0.0223	-0.0339**	-0.0151	-0.0153	-0.0250*
	(0.0067)	(0.0160)	(0.0168)	(0.0145)	(0.0148)	(0.0154)	(0.0136)
Adj. R-sq	0.0271	0.0772	0.0814	0.1604	0.0980	0.0670	0.0771
N	58910	30857	30857	30857	30857	30857	30857

The dependent variable of the Fama-MacBeth regression is the monthly stock return of the individual firms from January 2000 to December 2018. The monthly return of each stock is calculated by $r_t = P_t/P_{t-1} - 1$. Group 2 are the stocks that have a stock price range between IDR200~IDR500, Group 3 are the stocks that have a stock price range between IDR500~IDR2,000, Group 4 are the stocks that have a stock price range IDR2,000 ~ IDR5000, and Group 5 are the stocks that have stock price is the same or bigger than IDR5000. Return $_{(-1,-1)}$ is the accumulated lag return, and return $_{(-12,-2)}$ is calculated using the summation of during 11 months by $\sum_{t=2}^{12}(r_t + 1)$. Log (mc) is a calculated log of the market capitalization of the month. Effective spread is estimated by Corwin and Schultz's (2012) method, and Amihud illiquidity is calculated by Amihud (2002). The skewness of each month is calculated based on daily stock returns by $(r_i - \bar{r})^3/std^3$. All regression results are corrected with White heteroskedastic and consistent with standard errors. Standard errors in parentheses, * p<0.10, ** p<0.05, *** p<0.01

5. CONCLUSIONS

This study investigated the effect of tick size altering on liquidity and stock return using IDX from 2000 to 2018. During the sample period, the stock exchange altered the regime 5 times, though not every altering modified its size from all price ranges.

A decrease in absolute tick size increases the liquidity estimated by the effective spread. However, some cases showed constant liquidity before and after size decrease. The liquidities estimated by Amihud illiquidity showed more inconsistent results than effective spread.

Zero return transactions decrease with absolute tick size, increasing market liquidity and affecting the return distributions. The bigger size positively influences the stock return based on time series approaches. Fama & MacBeth's (1973) approaches using individual firms' data showed similar results to the time series methods after controlling firm characteristic factors.

This study did not consider the changes in price limit rules and the minimum lot transaction that impact the liquidity and stock return. Therefore, these empirical findings should be carefully interpreted regarding the association between tick size, liquidity, and stock return.

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