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Section 3: Green business

Tick size change and market liquidation in the Indonesia stock exchange

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ABSTRACT: One action taken by the Indonesia Stock Exchange (IDX) in order to compete with members of the World Federation of Exchange (WFE) is changing the tick size. It is hoped that an increase to a five tick size in the price group will increase liquidity. This research used the bid-ask spread and depth was estimated using stock volume in closing price before and after a new tick size policy was applied in each price group. We used the nonparametric test to examine the mean difference in two related samples. An increase in the tick size leads to increases in the spread. Bid depth and ask depth also increased; however, ask depth did not show any difference. Therefore, to eliminate the ambiguity this study used the depth to relative spread ratio, which resulted in a broader spread. The IDX needs to consider a tick size that can increase liquidity in each stock price group, which therefore becomes more attractive for investors.

Keywords: bid-ask spread, market depth, tick size, market liquidity

1 INTRODUCTION

Stock markets around the world are striving to provide a liquid market. Toward increasing market liquidity, Indonesian stock exchanges are improving capital market regulation. One of the regulations used to increase liquidity is a change in price frac- tion. Many of the world's stock exchanges have changed the price fraction. In the United States, both the American Stock Exchange (AMEX) and The New York Stock Exchange (NYSE) lowered the price fraction on September 3, 1992 and June 24, 1997. In Asia, the Stock Exchange of Singapore (SES) lowered the price fraction on July 18, 1994 (Ahn, Cao, and Choe, 1996). In Australia, the Aus- tralian Stock Exchange (ASX) lowered the price fraction on December 4, 1995. In New Zealand, the New Zealand Exchange (NZX) lowered the pricefraction in 2011.

The numerous stock exchanges making price-fraction changes pushed the Indonesia Stock Exchange (BEI) to follow the changes to compete with members of the World Federation of Exchange (WFE). The BEI price fraction has changed several times. Before July 3, 2000, BEI implementeda Single Fraction system of Rp25. As of July 3,2000, the price fraction decreased to Rp5. Further- more, since October 20, 2000, BEI has implemented the multifraction system up to now. BEI imposeda new price fraction based on SK Direksi PT BEI No. Kep-00023/BEI/04-2016 effective on May 2, 2016. The new price fraction applies five price frac- tion groups from the previous three groups of price fractions. The application of this new price fraction is expected to be better suited to the needs of both retail and institutional investors to increase the value and volume of transactions.

Based on Harris (1994), it remains unclearwhether a smaller price fraction will improve marketliquidity. Harris (1994)) finds a trade-off in the frac- tional decline in prices, in that a smaller fraction of the price could lead to a decrease in bid-ask spreads, thereby lowering trading costs. However, the declinein price fraction also has the potential to decrease liquidity because it causes a decrease in depth. Although in general the lower price fraction led toan increase in liquidity Aitken and Comerton-Forde (2005) found that stocks with a high fraction of rela- tive prices experienced the highest increase in liquid-ity, while stocks with relatively low price fractions and trading volumes experience a low decreased liquidity.

Several previous studies have found different results regarding the effect of price fraction changes on market liquidity. This research there-fore aimed to determine whether the change of price fraction in the Indonesian capital market increases marketliquidity. The study examined the change of price fraction dated May 2, 2016 by analyzing the difference in liquidity in the periodtwo months before and after the change of price fraction as measured by bid-ask spread and depth. This study used a control group consisting of stock price groups that had not changed the price fraction to ensure the difference in liquidity is dueto a change in price fraction. The change in the

price fraction should not have any effect on the control group, so there will be no difference of liquidity in the period before and after the change.

2 THEORY AND HYPOTHESIS DEVELOPMENT

2.1 Influence of price fraction on bid-ask spread

In a competitive market, a decrease in price fraction increases the bid-ask spread (Aitken & Comerton- Forde 2005). Aitken and Comerton-Forde (2005) sug-gested that the decrease in price fraction is crucial in stocks where the previous spread was limited by the minimum fraction and where the relative tick size is high. However, even though the stock is not limited, the price may also decrease the spreads as investors can place orders at prices previously unavailable. As the price fraction is the lowest price increase at which the investor can place a limit order, the minimum price fraction causes the stock to be traded on a narrower spread (Anderson & Peng 2014).

On May 2, 2016, BEI increased the price fraction in the price group of Rp200 to <500 and at the price group Rp2000 to <5000. In the price group Rp200 to <500, the fraction increased from Rp1 to Rp2, while in the price group Rp2000 to < Rp5000, the fraction increased from Rp 5 to Rp10. An increase in price fraction causes investors to place orders on wider price increases.

Similar to Aitken and Comerton-Forde (2005) this study used a relative spread, as it allows liquidity to be compared between stocks with different prices (Aitken & Comerton-Forde 2003). The relative bid- ask spread can be calculated by the formula

$$Relative\ Spread\ \% = \frac{(Ask_{j,t} - Bid_{j,t})}{(Ask_{j,t} + Bid_{j,t})\ /2}$$

Ask Depth, t is the best ask volume of stock j on day t. Bid Depth, t is the best bid volume of shares j on day t. Relative spread, t is the relative bid-ask share spread j on day t (Ekaputra & Ahmad 2006).

Hyphotesis 1: An increase in the price fraction increases the bid-ask spread in the Indonesian capital market.

2.2 Influence of an increase in price fraction on depth

A decrease in the price fraction will reduce the premium paid to the limit order to provide market liquidity (Aitken & Comerton-Forde 2005). As a result, investors and traders who previously placed a limit order on the best bid-ask price chose to move some or all of their orders away from the best bid and ask price in order to earn a higher premium (Aitken & Comerton-Forde 2005). Another possibility is that the impatient investor chooses to use the market order rather than the limit order as the cost of demanding liquidity decreases. As a result, the depth offered at the bid and ask best price will be reduced.

On May 2, 2016, BEI increased the price fraction in the price group of Rp200 to <500 and at the price group Rp2000 to <5000. In the price group Rp200 to <500, the fraction increased from Rp1 to Rp2, while in the price group Rp2000 to < Rp5000, the fraction increased from Rp 5 to Rp10. An increase in the price fraction increases the order of the best bid and ask prices and increases the use of limit orders.

Similar to Ekaputra and Ahmad (2006), this study uses bid closure and ask depth (volume) data. In fact, both the price and bid-ask volume change con- tinuously during trading hours.

Hypothesis 2: An increase in price fraction increases the bid-ask depth in the Indonesian capital market.

2.3 Influence of an increase in price fraction on liquidity

Harris (1994) tested the trade-offs associated with a minimum fraction reduction. Harris (1994) states that a smaller price fraction will lead to a decrease in bid–ask spreads, thereby lowering transaction costs and increasing trading volume. However, the decline in the faction also has the potential to reduce liquidity if investors use the opportunity to free ride on other investors. If the price fraction is too small, the time pri- ority rule becomes negligible because of quote- matcher or front-runner problems (Ekaputra & Ahmad 2006). The quote-matcher will try to put the order slightly better than the order queue, which will be more advantageous if the fraction of the price is small. Thus, although a small fraction of the price causes lower bid–ask spreads, it may also make investors less willing to expose orders, thereby reducing depth. The influence of price fraction on liquidity in terms of spread and depth still cannot be determined.

In order-driven markets, the benefits of decreasing price fractions also vary. Aitken and Comerton- Forde (2005) found that stocks with higher relative price fractions actually experienced the highest increase in liquidity, while stocks with relatively small price fractions and low trading volume decreased liquidity. Aitken and Comerton-Forde (2005) argue that price fractions are more important in order-driven markets, as are their own limit orders that provide the only source of market liquidity. Therefore, it is important to set the price fraction at the level that will encourage the placement of limit orders and provide protection from free-riders (Aitken & Comerton-Forde 2005). The Indonesia Stock Exchange is an order-driven market, facilitating trade through a system called JATS (Jakarta Automated Trading System). The order is automatically executed based on price pri- ority rather than time priority. The effect of the decline in price fractions on spread and depth explains the adverse effect on liquidity. For example, regarding

spreads, it shows a decrease in liquidity when the price fraction is increasing. Incontrast, increasing depth indicates that liquidity increases following an increase in price fraction. For that reason, we suspect that the price increase makes a difference in liquidity, but we do not pre- dict its direction.

Ekaputra and Ahmad (2006) measured the trade-off between relative spread and depth by calculating Depth to Relative Spread Ratio (DRS), defined as:

$$DRS = \frac{(Ask\ Depth_{j,t} - Bid\ Depth_{j,t})}{(Relative\ Spread_{j,t})}$$

Ask Depth$_{j,t}$ adalah volume *ask* terbaik saham j pada hari t. *Bid Depth$_{j,t}$* adalah volume *bid*terbaik sahamj pada hari t. *Relative spread$_{j,t}$*adalah *relative bid ask spread* saham j pada hari t (Ekaputra & Ahmad 2006).

Hypothesis 3: An increase in price fraction causes changes in liquidity in the Indonesia capital market,

3 METHOD

3.1 Population and sample

The population of this study consists of all stocks traded on the BEI period two months before and after the price fraction changes. The sample selectionwas made using purposive sampling, with the fol- lowing criteria:

1. Shares with a closing price of Rp200 to <Rp500 and Rp2000 to <Rp5000 will be the tested group and the stock with the closing price <Rp200, Rp500 to <2000, and Rp ≥ 5000 will be the control group.
2. Shares that move from one fraction to another during the study period as a result of changes in stock prices will be excluded from the sample.
3. Issuers do not conduct corporate actions, such as the announcement of dividend, rights issue, stock split, merger or acquisition, during the observation period.
4. Shares trading at less than one transactionper day will be excluded from the sample.

3.2 Research data

The data used in this research are secondary data sourced from the Indonesia Stock Exchange. Secondary data needed in this research are daily stock data based on closing data in the form of stock price data, ask price, bid price, ask volume, and bid volume.

3.3 Variables

Dependent variable:

1. The bid-ask spread is the difference between the lowest ask price and the highest bid price of the relevant quotes. Bid-ask spreads reflect trading costs and market liquidity.
2. Depth is the ability of securities to absorb buy orders and sell orders without dramatic stock price movements. Bid-ask depth is estimated using stock volume at the bid-ask closing price.

Dependent variable: The price fraction is the min- imum allowable price variation in a sequence, usu- ally determined by the exchange in which securities are traded.

3.4 Analysis model

To test the above hypothesis, we used these models:

1. After *Relative Spread* $_{(Rp\ 200\ to\ <500)}$ > Before *Relative Spread*$_{(Rp\ 200\ to\ <500)}$
2. After *Relative Spread* $_{(Rp\ 2000\ to\ <5000)}$ > Before *Relative Spread* $_{(Rp\ 2000\ to\ <5000)}$
3. After *Bid-Ask Depth* $_{(Rp\ 200\ to\ <500)}$ > Before *Bid-Ask Depth* $_{(Rp\ 200\ to\ <500)}$
4. After *Bid-Ask Depth* $_{(Rp\ 2000\ to\ <5000)}$ > Before *Bid-Ask Depth* $_{(Rp\ 2000-\ to\ <5000)}$
5. After Liquidity $_{(Rp\ 200-<500)}$ ≠ Before Liquidity $_{(Rp\ 200\ to\ <500)}$
6. After Liquidity $_{(Rp\ 2000\ to\ <5000)}$ ≠ Before Liquid- ity $_{(Rp\ 2000\ to\ <5000)}$

4 RESULTS AND DISCUSSION

4.1 Description of research results

The results show research data before and after the fractional changes of each stock price group on each variable studied, which include the relative spread and depth. Table 1 shows the relative spread which includes the mean and standard deviation values in the period before and after.

Based on Table 1 it can be seen that there isa difference in the highest (maximum) and the lowest (minimum) relative spread value in the period before and after. The lowest (minimum) difference between the pre- and post- period is greater in the price group of Rp200 to <500 and the price group Rp2000 to <5000, while in the price group <Rp200, Rp500 to <2000, and ≥ Rp5000, the lowest value (minimum) did not experience a big difference. This can be due to the ranking of the price fraction in the price group of Rp200 to <500 and the price group of Rp2000 to <5000 resulting in the investor placing the order on a wider price increase in the period after. Conversely, in the price group <Rp200, Rp500 to <2000, and

Table 1. Descriptive statistics of *Relative Bid-Ask Spread*, before and after May 2, 2016.

Group of price	N	Mean	Std. deviation	Min	Max
Sebelum					
<Rp200	1.428	2.151	1.177	0.63	5.5
Rp200 to < 500	924	1.44	1.923	0.21	7.52
Rp500 to < 2000	2.436	1.272	1.405	0.33	8.98
Rp2000 to < 5000	840	1.169	1.452	0.18	5.08
≥Rp5000	1.092	0.983	1.173	0.23	4.59
Sesudah					
<Rp200	1.428	2.364	1.423	0.62	5.45
Rp200 to < 500	924	1.647	1.744	0.42	7.17
Rp500 to < 2000	2..436	1.368	1.491	0.3	8.55
Rp2000 to < 5000	840	1.468	1.709	0.34	6.14
≥Rp5000	1.092	1.119	1.458	0.2	6.46

increased use of limit orders rather than market orders as the cost of demanding liquidity increases, thus increasing the depth offered in the group.

In the price group <Rp200 there is also an increase in the mean (average) on bid and ask depth (volume). Based on the analysis, BKSL shares experienced a large increase in bid and ask depth in the period after. In the group of Rp500 to <2000 there was an average decrease (bid) on bid and ask depth (volume). Based on the analysis, CTRA stocks experienced a large decline in the ask depth and ADRO shares decreased greatly in bid depth in the period after. The decrease could have been caused by the investors in the group of Rp500 to <2000 choosing to invest in the price group of Rp200 to <500 and Rp2000 to <5000 which has increased the price fraction, so that in the group of Rp200 to <500 and Rp2000 to <5000 there is an increase of bid and ask depth. The increase in price fraction causes an increase in premiums paid to investors, making the stock more profitable, while in the group ≥Rp5000 there was a decrease in average (mean) on ask depth but increase in bid depth. Based on the analysis, ASII shares experienced the highest decrease in ask depth, but also experienced the highest increase in bid depth over the period after. The drop in askdepth could also have been caused by investors choosing to invest in price groups that have increased the price fraction.

4.2 Analysis of research results

The analysis tool used in this study was the nonparametric sign test to test the average difference in two related samples. The dependent variable will be compared to know the difference between the

≥Rp5000, there is no change in price fraction resulting in the lowest value (minimum) and the group did not experience a big difference between the period before and after.

Based on Table 2 it can be seen that in the groups of Rp200 to <500 and Rp2000 to <5000 there is an increase in the mean (average) on bid and ask depth (volume) which indicates an increase in selling orders and purchase orders in the period after the change in price fraction. An increase in the price fraction of May 2, 2016 in the price group of Rp200 to <500 and Rp2000 to <5000 leads to an increase in premiums paid to the limit order to provide market liquidity and

Table 2. Descriptive statistics of *Bid-Ask Depth*, before and after May 2, 2016.

Group of price	N	Before (%)		After (%)	
		Mean	Std. deviation	Mean	Std. deviation
Bid Depth					
< Rp200	1.428	773748.79	2349506.213	798636	2699882.975
Rp200 to < 500	924	396561	772020.855	673161.36	1182412.668
Rp500 to < 2000	2.436	333715.31	583931.692	270706.28	397178.823
Rp2000 to< 5000	840	244132.7	387196.496	360047.1	621017.859
≥Rp5000	1.092	111492.65	158169.22	154247.19	233478.285
Ask Depth					
<Rp200	1.428	555362.85	1637039.819	598952.68	2225824.575
Rp200 to < 500	924	306279.86	414700.532	548870.09	842372.576

Rp500 to < 2000	2.436	319491.6	486410.051	235268.28	359491.17
Rp2000 to < 5000	840	266522.35	486792.49	289663.55	453155.236
≥Rp5000	1.092	264968	434842.715	189290.31	302805.13

periods before and after. The dependent variable in this research is bid-ask spread and bid depth and ask depth. The independent variable in this research is price fraction.

4.3 Model analysis and hypothesis test

The following are the results of the nonparametric sign test to test the average difference in two related samples.

4.3.1 Hypothesis 1

The following is the result of the nonparametric sign test to test the average difference in two samples Table 3 shows the difference of the average of the bid-ask spread for each stock price group before and afterthe price fraction change. The results show that the stocks in the price group Rp200 to <500
(group 2) and the stocks in the price group Rp2000 to <5000 (group 4) experienced a significant increase in spreads. The average spread in group 2 increased from 1.44% to 1.647% and in group 4 increasedfrom 1.169% to 1.468%. This result supports Hypothesis 1 that an increase in the price fraction causes an increase in the related spread.

There was no significant change in bid-ask spread in the control group, which indicated that changes in the test group were due to changes in the price fraction rather than caused by other unrelated factors.

4.3.2 Hypothesis 2

Table 4 shows the difference in bid-ask depth for each stock price group before and after the price fraction change. The results show that stocks in the price group of Rp200 to <500 (group 2) experience a significant increase in bid depth. The average bid depth in group 2 increased from 396,561 to 673,161.36. The average ask depth in group 2 also increased from 306,279.86 to 548,870.09. Using a nonparametric sign test, the increase in ask depth is not significant at the 5% level. In the price group Rp2000 to <5000 (group 4), there is an increase in bid and ask depth. The average bid depth in group 4 increased from 244,132.7 to 360,047.1, while the ask depth increased from 266,522.35 to 289,663.55. Using a nonparametric sign test, the bid increase and ask depth are not significant at the 5% level.

Table 3. Average of *Bid-Ask Spread*, before and after May 2, 2016.

Group	N	Before	After	Difference	Sig.
Bid Depth					
1(Control)	1.428	2.15	2.364	0.213	0.417
2	924	1.44	1.647	0.207	0.046
3(Control)	2.436	1.272	1.368	0.095	0.138
4	840	1.169	1.468	0.299	0.002
5(Control)	1.092	0.983	1.119	0.135	0.382

Table 4. Average of *Bid-Ask Depth*, before and after May 2, 2016.

Group	N	Before	After	Difference	Sig.
Bid Depth					
1(Control)	1.428	77,3748.79	798636	24,887.21	0.417
2	924	39,6561	673161.36	276,600.36	0.046
3(Control)	2.436	33,3715.31	270706.28	−63,009.03	0.138
4	840	24,4132.7	360047.1	11,5914.4	0.002
5(Control)	1.092	11,1492.65	154247.19	42,754.54	0.382
Ask Depth					
1(Control)	1.428	55,5362.85	598952.68	43,589.83	0.417
2	924	30,6279.86	548870.09	242,590.23	0.046
3(Control)	2.436	31,9491.6	235268.28	−84,223.32	0.138
4	840	26,652 2.35	289663.55	23,141.2	0.002
5(Control)	1.092	26,4968	189290.31	−75,677.69	0.382

There were significant differences in ask depth in the control group, i.e., the price group of Rp500 to <2000 (group 3) and the price group ≥ Rp5000 (group 5). Companies with large market capitaliza- tion in Indonesia typically have high family owner- shiprates and often perform stock transactions that can affect liquidity. Based on the decision of the dir- ectors of PT BEJ No. Kep-305/BEJ/07-2004, in Indonesia the controlling shareholder owns 25% or more of the company's shares. The family companies include BCA, Gudang Garam, Unilever, Astra, etc.

4.3.3 Hypothesis 3

The result of relative bid-ask spread in Table 3 and bid-ask depth in Table 4 shows that in the test group Rp200 to <500 (group 2) there was a significant increase in spreads. Bid depth in group 2 also increased significantly, while ask depth increased insig- nificantly at level 5%. In the test group Rp2000 to <5000 (group 4) there was a significant increase in spreads. Bid and ask depth in group 4 increased insig- nificantly at the 5% level.

Whether the increase in spread and bid depth in group 2 significantly led to the effect of increasing the price fraction on liquidity was inconclusive. So to cal- culate the trade-off between relative spread and depth, this study calculates depth to relative spread ratio (DRS). The DRS ratio measures whether the increase in depth is greater or less than the relative spread increase.

Table 5 shows the average difference of DRS for the price group Rp200 to <500 before and after the change of price fraction. The results show that after the new price fraction, the average DRS decreased by 16,260,723.27. The decrease in DRS means that the spread increase is greater than the increase in depth. Although the DRS average decreased, the decrease was not significantat the 5% level, which means that the increase in

Table 5.   DRS average, before and after May 2, 2016.

Group	N	Before	After	Difference	Sig.
Rp200 to < 500 (Kelompok 2)	924	107,101,196.09	90,840,472.82	−16,260,723.27	0.101

the price fraction did not decrease the overall stock liquidity in the Rp200 to <500 price group.

4.4   Discussion

Based on the hypothesis tests, we could explain the following.

4.4.1   Influence of price fraction on bid-ask spread

The test results for Hypothesis 1 show that there is a significant increase in the relative spread, which indicates a greater transaction cost after the increase of the price fraction. As Anderson and Peng (2014) argue, the price fraction is the lowest stock price increase at which investors can place a limit order, so a decrease in the price fraction will cause the stock to be traded on a narrower spread. On the contrary, the increase of price frac- tion in the Indonesia Stock Exchange on May 2, 2016 will increase the spread width. Results of this test indicate lower liquidity because it will be more expensive for investors to make transactions immediately.

4.4.2   Influence of price fraction on bid-ask depth

The test for Hypothesis 2 shows different results for each group of tested prices. In the price group Rp200 to <500 (group 2) there was a significant increase in bid depth, but an insignificant increase in ask depth. The price group Rp2000 to <5000 (group 4) shows an increase in bid and ask depth, but the bid and ask depth increase is not significant. The increase in bid and ask depth indicates that after the change of price faction of May 2, 2016, the greater the depth offered in the price group Rp200 to <500 and Rp2000 to <5000. Aitken dan Forde (2005) suggests that a decrease in the price fraction will reduce the premiums paid to the limit order to provide market liquidity. Another possibility is that impatient investors choose to use market order rather than limit order as the cost of demanding liquidity decreases. On the contrary, an increase in the price fraction of the Indonesia Stock Exchange on May 2, 2016 will increase the premiums paid to the limit order to provide market liquidity and increase the use of limit orders rather than market orders as the cost of demanding liquidity increases, thus increasing the depth offered in the price group Rp200 to <500 and Rp2000 to <5000. The rising depth indicates increasing liquidity, as there is more supply and demand in the price group.

4.4.3   Influence of price fraction on liquidity

Harris (1994) states that a smaller fraction of the price will lead to a decrease in bid-ask spreads, thereby lowering transaction costs and increasing trade volume. However, the decline in the faction also has the potential to reduce liquidity if investors use the opportunity to free ride on other investors. Thus, a small fraction of the price causes lower bid- ask spreads, and it may also make investors less will-ing to expose orders, thereby reducing depth. On the contrary, the increase of price fraction on the Indo- nesia Stock Exchange on May 2, 2016, viewed from the spread shows a decrease of liquidity when the price fraction is increased, while viewed from the depth it shows increased liquidity following the increase in price fraction.

The test results for Hypothesis 3 show that in the price group of Rp200 to <500 there is an increase in spread higher than the increase of depth. Although the spread is higher, the overall increase in the price fraction does not decrease the stock liquidity in the Rp200 to <500 price group. In the price group Rp2000 to <5000, however, there is an increase in spread without being followed by a significant increase of depth. Thus, overall liquidity becomes lower in the price group of Rp2000 to <5000.

5   CONCLUSION

Based on the results of data analysis related to the purpose of the research, hypotheses and model ana- lysis, the following conclusions can be drawn:

1. The increase in price fraction on May 2, 2016 at the Indonesia Stock Exchange in the price group Rp200 to <500 and Rp2000 to <5000 causing a bid-ask spread in the group was significant. The higher spread indicates lower liquidity, as it will be more expensive for investors to make transactions immediately.
2. The increase in price fraction on May 2, 2016 at the Indonesia Stock Exchange in the price group Rp200 to <500 and Rp2000 to <5000 caused an increase in the bid and ask depth. The increase in bid and ask depth indicates that after the change of price fraction of May 2, 2016, a larger depth is seen in the price group of Rp200 to <500 and Rp2000 to <5000. The increasing depth indicates increased liquidity, as there is more supply and demand in the price group.

3. The price group Rp200 to <500 has a massive spread increase compared with the depth increase. Although the spread is the highest, the overall increase in the price fraction does notdecrease stock liquidity in the Rp200 to <500 price group. Conversely, in the price group Rp2000 to <5000 there is an increase of spread without being followed by a significant increase in depth. Thus, overall liquidity decreases in the price group of Rp2000 to <5000.

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