Inter and Intraday Analyses of IPO Aftermarket: Evidence from Indonesia Stock Exchange

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ABSTRACT

We investigate IPO aftermarket using interday (daily) and intraday analyses in Indonesia Stock Exchange. Our findings show that much of IPO actions concentrate on early trading. Offer to open return makes up around 80% of initial return. This finding seems to be consistent with IPO models that argue that underpricing is a compensation to investors in IPO pre-market. In daily analysis, prices, volatility, and trading volume stabilize in the first week of IPO trading. In intraday analysis, we find that volatility, trading volume, and return are unusually high in the first few minutes of trading. Sell initiated trades seem to dominate trading in first day of IPO trading. Managing underwriters are more active as liquidity providers in cold IPO. Our results are consistent with information asymmetry based IPO models. The asymmetry seems to disappear quickly once the trading starts.

Keywords: IPO, Underpricing, Interday, Intraday, Indonesia Stock Exchange

1. INTRODUCTION

IPO underpricing is a common phenomenon found in practically all markets in the world. The size of underpricing varies. In US market, underpricing averages around 21% in the 1960s, 12 % in the 1970s, 16% in the 1980s, 21% in the 1990s, and 40% in early 2000s (Ljungqvist, 2007). Using UK market, Chambers and Dimson (2009) show that averages of underpricing is 3.8% in the period 1917 to 1945, 9.15% in the period 1946 to 1986, and increases to 19% in the period 1987-2007). Ljungqvist (2007) reports IPO underpricing in Europe markets that varies from 5% in Luxembourg to around 60% in Poland market, in Asia-Pacific and Latin America that varies also, with Malaysia registers for the largest underpricing (around 90%).

This consistent phenomenon prompts various studies to investigate this issue. The bulk of these studies investigates why the IPO underpricing occurs. Ljungqvist (2007) summarizes various theories into three main theories: asymmetric model, institutional theory, ownership and control, and behavior finance. None of the theories that have been advanced can provide full explanation for the IPO underpricing. Most of IPO related works is based on asymmetric information model. Empirical works seem to document evidence of asymmetric information in IPO markets (Ljungqvist, 2007), such as the bulk of underpricing related gains goes to informed investors, uncertainty on firm's valuation increases underpricing, informed investors influence investment banks decision on IPO offer prices.

With some exceptions, most of the studies on IPO uses interday (daily) data, as opposed to intraday data. We believe that intraday data provide a more precise and richer analysis. For example, the use of initial return, which is usually calculated as return of offer to closing price of day one, combine return of offer to open and open to close. Return of offer to open is probably more consistent with various IPO models that attempt to show that initial return is a compensation for informed investors in primary markets (Benveniste and Spindt, 1989; Sherman, 2005). The ability to separate offer to open with open to close will probably provide more precise picture of the analysis. Using intraday data, we will also be able to investigate minute to minute trading activities, volatilities, and return in the IPO aftermarket. Efficient market hypothesis suggests that equilibrium prices should be reached quickly. Previous studies seems to show that prices adjust quickly in the aftermarket IPO. The use of intraday data enables us to investigate more precisely return and trading activities in IPO aftermarket.

Previous studies show that offer to open returns make up the larger component of initial return compared to open to close return (Barry and Jennings,1993; Cheng et al., 2004; Bradley et al., 2009). These findings are consistent with several IPO models that argue that underpricing is a necessary compensation. In Benveniste and Spindt (1989) and Sherman (2005), underpricing is a

compensation for informed investors who are willing to reveal their demand preference for IPO. In Rock (1986), underpricing is a compensation for uninformed investors who experience adverse selection problem vis-à-vis informed investors. The findings seem to suggest that investors who are willing to take risks in the primary markets are compensated, while investors in the aftermarket should not be compensated.

Most of IPO models are based on information asymmetry, which suggest that equilibrium should be reached quickly once information asymmetry diminishes, for example, through trading. Using Canadian IPO, Kryzanowski et al. (2005) show that returns, trading volume, liquidity, and spread are high during the first few days, and then rapidly decay in the next trading days. While most of IPO studies focus on pricing aspect, studies on microstructure aspect of IPO is also of interest. Cheng et al. (2004) show that intraday volatility for first day of IPO trading in Hong Kong market exhibits a familiar U-shaped pattern. This pattern is also found in normal period, either in dealer based (Mclnish and Wood, 1992; Chan et al., 1995), and order driven markets (Ahn and Cheung, 1999).

Previous studies document that trading volume in the first few days of IPO is significantly large. Aggarwal (2003) shows that trading volume in the first two days accounts for around 82% of shares offered. Popular press often attributes this finding to flipping activities. However, Aggarwal (2003) shows that flipping activities account for only 19% of trading volume and 15% of shares offered. Ellis (2006) attempts to investigate the source of the high trading volume in first day of IPO trading. She shows that on average, 77% of trading is investor motivated, and interdealer trading accounts for 23% of total trading. These numbers vary depend on market conditions (cold and hot markets). Moreover, Ellis (2006) argues that microstructure aspects explain IPO trading volume. Market makers and Lead Underwriters conduct trading to maintain their optimal inventory positions.

This paper contribute to the extensive IPO literature by combining inter and intraday analyses to investigate IPO aftermarket. We show that volatility and trading volume are unusually high during first day of IPO trading, then rapidly stabilize in the next trading days. Prices increase significantly in the first trading day, then stabilize in the next trading days. Given significant activities during early day of IPO aftermarket, we next move to intraday analysis of IPO aftermarket. Our intraday analysis shows that aftermarket trading activities practically concentrates on the first few minutes of first trading day. Aftermarket return, volatility, trading volume, number of trades concentrate on the first few minute and then diminish quickly in the rest of trading day. While some studies show that IPO aftermarket concentrate on first trading day, we pinpoint that the action of IPO aftermarket concentrates on the first few minutes of trading day.

Further analysis shows that sell sides seems to be more aggressive during first trading day. We then decompose transaction into small-medium-large, hot-cold, and foreign-domestic transactions. Our analysis shows that large trades are more aggressive sellers, leave it to small and medium trades as liquidity providers. We do not find any differences in aggressiveness of foreign and domestic investors, either in sell or buy transactions. Finally we attempt to investigate whether managing underwriters provides liquidity. We find that they provide liquidity for sell transactions in cold IPO.

We organize our paper as follows. Next section provides an overview of Indonesia Capital Market. Then we discuss data used for this paper. Empirical findings follow in the next section. Last section concludes.

2. OVERVIEW OF INDONESIA CAPITAL MARKET

The modern Indonesia Stock Market was established in 1977. However the stock market starts to pick up in 1989 when Indonesia Government launched deregulation package. The package consists of three new regulations: (1) Simplifying IPO process, (2) Imposing tax on interest income, making deposit investment becomes less attractive, (3) Allowing foreign investors to buy shares up to 49% of total outstanding shares. Indonesia Stock Market grows steadily since this year, with up and down periods during this development. Table 1 shows IPO development in Indonesia Stock Exchange from 1990-2010.[1] Note that the table shows IPO development in a long period. We include exchange rate development in last column to provide a more appropriate comparison among different years.

There are two main 'boards' in the Indonesia Stock Market: Regular and Cross boards. In regular board, trading is conducted through continuous auction. This market is also an order driven market, where buy and sell orders come from investors. There are no market makers in Indonesia Stock Market. Buy and sell orders are matched by Jakarta Automated Trading

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1   Before 2007, there are two exchanges in Indonesia: Jakarta Stock Exchange and Surabaya Stock Exchange. Jakarta Stock Exchange maintains stock trading, while Surabaya Stock Exchange maintain bond trading. In 2007, both exchanges merge to become Indonesia Stock Exchange.

Year	Number of IPO	Amount raised (billion Rp)	Number of listed companies	Exchange rate Rp/$
		Table 1: Yearly number of IPO, amount raised, and number of listed companies in indonesia stock exchange		
1990	44	5,221	132	1,901
1991	11	626	145	1,992
1992	10	743	162	2,308
1993	8	1,362	181	2,110
1994	14	4,804	231	2,200
1995	13	5,682	248	2,308
1996	11	2,662	267	2,383
1997	17	3,950	301	3,989
1998	6	1,017	304	11,591
1999	9	317	315	7,100
2000	21	2,127	332	9,595
2001	31	1,335	316	10,255
2002	22	1,116	331	9,049
2003	6	9,504	333	10,260
2004	12	2,141	331	10,263
2005	8	3,545	336	9,830
2006	12	3,005	344	9,200
2007	22	16,868	383	9,400
2008	19	24,388	396	9,466
2009	10	3,854	398	9,065
2010	5	29,678	430	9,879

This table shows development of IPO from year 1990-2010 in indonesia stock exchange. Number of listed campanies excludes number of delisting companies. Exchange rate is average exchange rates on particular year.

System (JATS). Prices resulted from this board are used to calculate Jakarta Composite Stock Index. In cross board, buyer and seller negotiate transactions directly. Once they reach agreement, they use single broker to record the transaction and then report to Indonesia Stock Exchange. In our sample, the proportions of Regular and Cross boards are 85.95% and 14% (in trading value), 87.36% and 12.62% (in trading volume), and 98.77% and 1.21% (in number of trades). Prices in cross market are negotiated between buyers and sellers, although the Exchange suggests that prices from regular board be used as references.

Before October 2000, Jakarta Stock Exchange uses fixed price method for IPO. After that date, Jakarta Stock Exchange uses Book-Building method for IPO process. In general, in fixed price method, offer price is set without soliciting investors' demand. Price discovery takes place in secondary market. In book building method, underwriters have an opportunity to gauge investors' demand before setting the offer price. Underwriters compensate informed investors who reveal their preferences through share allocation and underpricing. General rule is that 70% of IPO will be distributed as fixed allotment, while the rest will be allocated to public investors. The composition may vary. For example, for state owned enterprise IPO, allocation for public investors tends to be larger. Conversation with practitioners reveals that underwriters' commissions are in the range of 2-7%. Although theoretically book building is superior to other methods (Sherman, 2005)[2], this method is not without drawbacks. One main objection to book building method often mentioned in popular press is transparency of IPO allocation. In some cases, public investors express dissatisfaction with allocation system (receive less), and complain that most of good IPO is distributed to special clients and powerful investors.

3. DATA DESCRIPTION

We collect daily and transaction data. Daily data contains information on highest, lowest, and closing prices, trading volume, trading value, for the first 30 days of IPO trading. We then extract transaction data for the first IPO trading day. Since May 1995, all transactions in Jakarta Stock Exchange are stored electronically in Jakarta Automated Trading System (JATS). This situation effectively eliminates IPO sample before May 1995 when we use transaction data. Transaction data record time

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2   Empirically, the evidence is still mixed.

stamped transactions that contain transaction number, order number, price, volume, value, brokers for buy and sell, investor identity (foreign or domestic).

Number of stocks used in this paper varies depend on the data availability. We use trades that take place in regular board. As explained above, regular board is the largest board in Indonesia Stock Exchange. Regular board is also the most likely place for marginal investors to trade. Table 2 provides statistics descriptive of various variables of interests.

In our sample, trading hour or trading session one starts at 09.30 am. Lunch break starts at 12.00 until 13.30. Session two trading starts at 13.30 pm and closes at 16.00. If we divide total trading into five-minute intervals, we have 60 five minute intervals.3 Starting January 2013, trading session in Indonesia Stock Market starts at 09.00 in the morning, while lunch break and trading session two use the same schedule.

4. EMPIRICAL FINDINGS

4.1. Interday Analysis

We begin our analysis using interday data. For each IPO, we collect data on daily closing prices, volatility, trading volume, and number of trades, for the first 30 trading days. We calculate return as ln (closing price (t)/closing price (t-1)). For day one, return is an initial return, which is calculated as ln (closing price at day 1/offering price). In the next section, we decompose initial return into offer to open and open to close returns. Daily volatility is calculated using Parkinson (1980) method, which is log (High price (t)/Low price (t)). Table 3 reports descriptive statistics for IPO returns from day +1 to day 30, while Figure 1 shows cumulative average returns from day +1 to day +30. Figure 2 shows graphs for daily volatility, trading volume, and number of trades, from day +1 to +30. Daily trading volume and number of trades for each stock are adjusted by mean of daily trading volume and number of trades for the first 30 trading days for each stock, respectively.

Examination of Table 3 reveals that initial return averages around 17% in our sample and are highly statistically significant. However prices quickly stabilize and returns quickly diminish in the next trading days. Prices seem to be already stabilized in the first week. Figure 3 seems to support this observation. Consistent with the result of return, in Figure 2, we observe that volatility, trading volume, and number of trades are unusually high in the first trading day, and then quickly diminish in the next few trading days. In about one week, volatility, trading volume, and number of trades already stabilize.

4.2. Offer to Open, Open to Close, and Initial Returns

In previous section, we calculate initial return as return from offer to closing price at day 1. In this section, we decompose initial return into return from offer to open and return open to close. Previous studies show that aftermarket return consists of much smaller proportion of initial return), while offer to open return makes up much larger proportion. (Barry and Jennings, 1993; Bradley et. al, 2009, Chen et al., 2004). Table 4 shows decomposition of initial return.

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3   Note that in our graphs, five-minute intervals are marked by number 1 to 30 (for session one) and number 49 to 78 for session two.

Table 2: Statistics descriptive of variables of interest					
Variable	**Mean**	**Median**	**Standard deviation**	**Minimum**	**Maximum**
Offer price (Rp)	2,265	800	2,930	100	14300
Closing price (Rp)	904	450	2038	10	29150
Companies daily volatility	0.0289	0.0236	0.0217	0	0.1027
Companies daily trading volume (000 shares)	17.584	5.695	30.172	0.500	164.354
Companies daily number of trades	366	188	478	1	2913
Percentage of IPO over total outstanding shares	0.2414	0.2321	0.1008	0.0100	0.7339
Size of IPO (Rp million)	242,364	49,725	888,452	4,056	12,250,000
Size of IPO (million shares)	399	70	1,218	0.8928	11,500

This table shows statistics descriptive for various variables of interest. Volatility is calculated using Parkinson method, which is log (Highest price/lowest price).

	Table 3: Mean of daily returns during the first 30 days of IPO aftermarket					
	Mean	**Standard deviation**	**Minimum**	**Maximum**	**N**	**Probt**
1	0.1724	0.3022	−2.9957	1.7579	473	0.0000
2	0.0136	0.1070	−0.3466	0.3001	537	0.0034
3	0.0077	0.1024	−0.4199	0.2987	537	0.0837
4	0.0062	0.0657	−0.1823	0.2940	537	0.0288
5	0.0115	0.0685	−0.2513	0.2624	537	0.0001
6	−0.0033	0.0618	−0.3264	0.2744	537	0.2116
7	−0.0064	0.0590	−0.3295	0.1613	537	0.0121
8	0.0034	0.0468	−0.2088	0.2022	537	0.0953
9	0.0003	0.0459	−0.1967	0.2141	537	0.8836
10	−0.0031	0.0421	−0.2624	0.1733	537	0.0841
11	−0.0007	0.0623	−0.4142	0.2603	537	0.8000
12	0.0039	0.0522	−0.2938	0.3001	537	0.0800
13	0.0061	0.0573	−0.1335	0.3365	537	0.0140
14	0.0056	0.0449	−0.1484	0.2231	537	0.0040
15	0.0005	0.0481	−0.2007	0.2364	537	0.8267
16	−0.0114	0.0598	−0.3542	0.1398	537	0.0000
17	−0.0020	0.0650	−0.4187	0.3137	537	0.4837
18	−0.0012	0.0509	−0.3102	0.2556	537	0.5724
19	0.0033	0.0542	−0.3567	0.2624	537	0.1538
20	−0.0057	0.0386	−0.2703	0.0974	537	0.0007
21	0.0043	0.0500	−0.1355	0.2513	537	0.0449
22	0.0015	0.0426	−0.1706	0.2921	537	0.4183
23	−0.0090	0.0408	−0.2429	0.0755	537	0.0000
24	-0.0030	0.0344	−0.1633	0.1054	537	0.0428
25	0.0027	0.0410	−0.1807	0.2912	537	0.1241
26	−0.0001	0.0506	−0.3586	0.2877	537	0.9584
27	−0.0024	0.0580	−0.3209	0.2534	537	0.3340
28	0.0025	0.0503	−0.3011	0.2318	537	0.2562
29	0.0054	0.0422	−0.2803	0.2191	537	0.0034
30	−0.0081	0.0511	−0.3272	0.1086	537	0.0003

This table presents daily average returns of the IPO aftermarket. Returns for each day is calculated as ln (closing price (t)/closing price (t-1)), where t refers to day t. For day 1, return is an initial return, which is calculated as ln (closing price at day +1/offering price). For each day, returns for stocks are averaged to get mean of daily return. Probt is probability value for t-test for null hypothesis that mean return is zero.

	Table 4: Offer to open, open to close, and initial returns		
	Open to Offer Return	**Close to Open Return**	**Initial Return**
Mean	0.1379 (0.0000)	0.0345 (0.0000)	0.1724 (0.0000)
Median	0.0953	0.0000	0.1082
Standard deviation	0.2415	0.1665	0.3022
Minimum	−2.8332	−1.0033	−2.9957
Maximum	1.1451	0.9249	1.7579
N	473	473	473

This table reports offer to open, open to close, and initial returns. Open to offer return is calculated as ln (open price/offer price). Open to close return is calculated as ln (closing price/opening price). Initial return is calculated as ln (closing price/offering price). The sample consists of IPOs in indonesia market 1989-2014. P values are in parentheses.
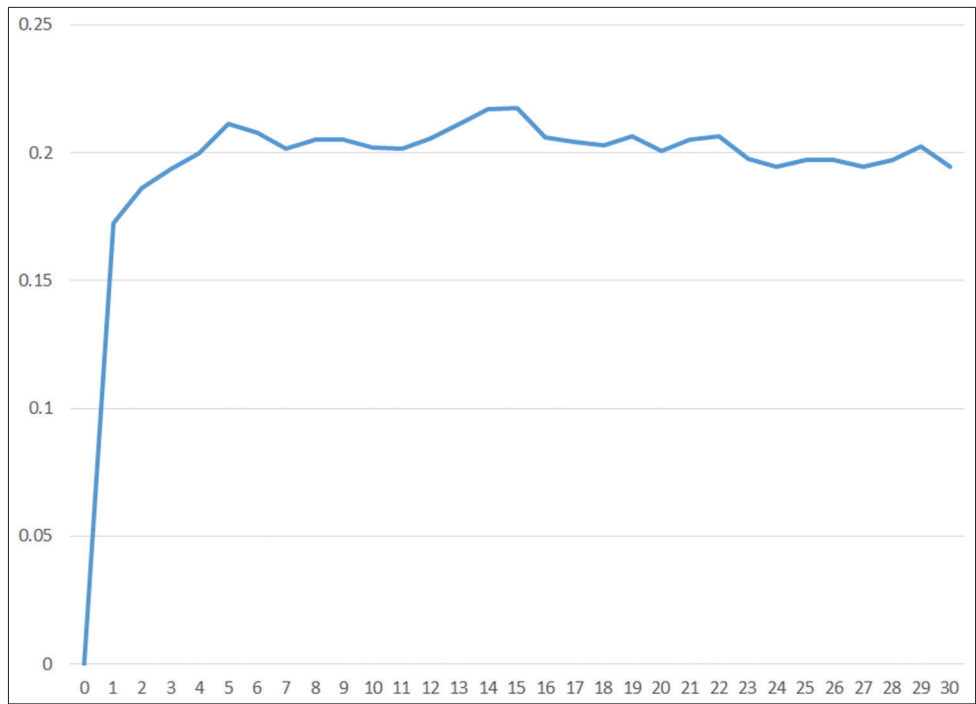
Figure 1: Cumulative Average Returns in The IPO Aftermarket

This figure shows cumulative average return in the first 30 trading days of IPO. Return at day 1 is initial return which is calculated as ln (Closing price at day 1/Offering Price). Returns for other days are calculated as ln (closing price(t)/closing price (t-1)). On each day, returns are averaged. Then we cumulate these average returns for the next 30 days. The sample consists of IPOs in Indonesia market 1989-2014.
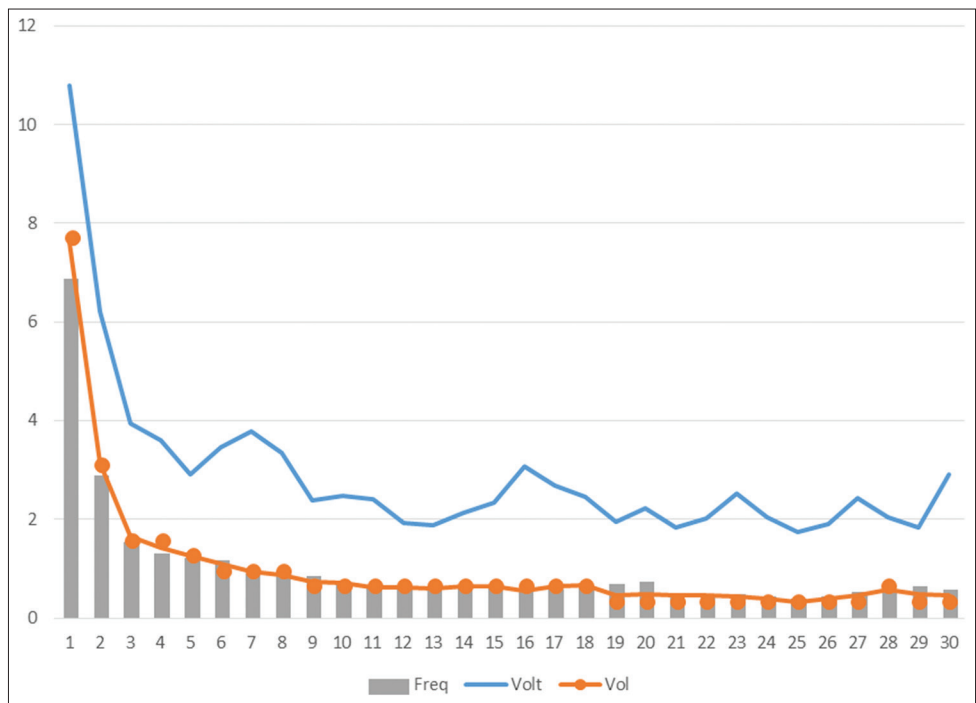

Figure 2: Daily Volatility, Trading Volume, and Trading Frequency in the Aftermarket IPO

Volatility is calculated as log (Highest Price (t)/Lowest Price (t)), then multiplied by 100 to facilitate comparison with other variables. Trading volume is calculated as Trading Volume (t)/Mean of Trading Volume for the first 30 days aftermarket IPO. Trading Frequency is calculated as Total number of Trades (t)/Mean of Daily Number of Trades for the first 30 days aftermarket IPO. The sample consists of IPOs in Indonesia market 1989-2014.

Table 4 shows that offer to open return makes up larger proportion of initial return. Using mean number, around 80% of initial return occurs before aftermarket period. Using median number, the pattern is even more dramatic; almost 90% of initial return accrues in the period before aftermarket period.
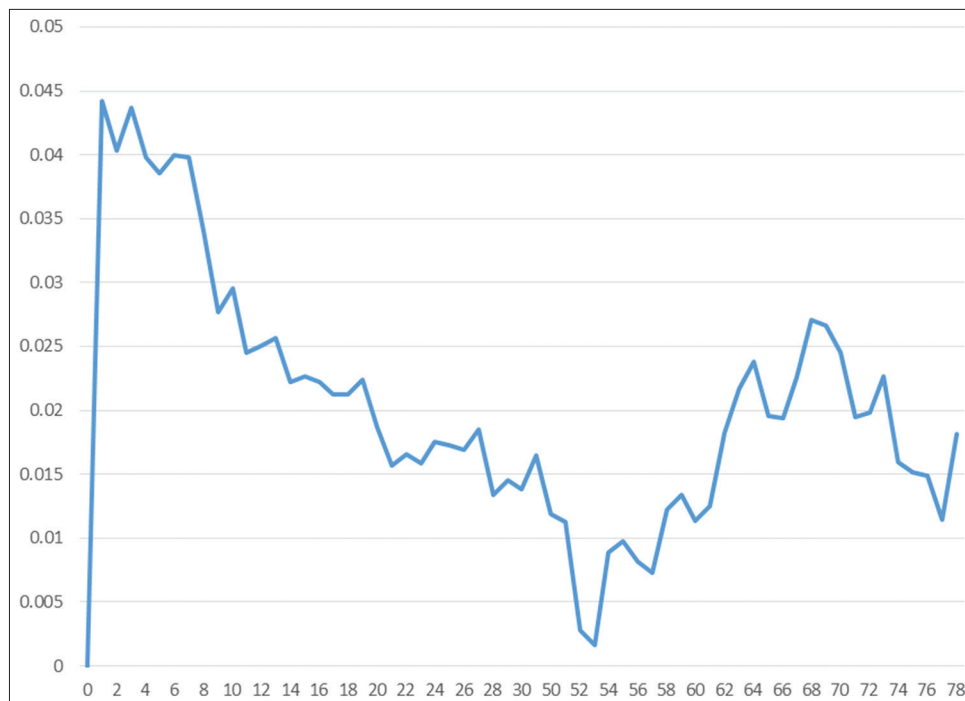
Figure 3: Intraday Cumulative Returns

This figure shows cumulative average return in five-minute intervals during first trading day of IPO. There are 78 five-minute intervals during the day. For each interval we identify opening and closing prices as follows. First, we identify prices for the first transaction in the interval, and assign them as opening prices for the interval. Second, we identify prices for the last transaction in the interval, and assign them as closing prices for the interval. Return is calculated as ln (Closing price(t)/Opening price(t)), where t refers to interval t. For each interval, we take average across stocks, and then sum up to create cumulative returns.

Our result is consistent with previous studies in other markets (Barry and Jennings, 1993; Bradley et. al, 2009, for US market; Chen et al., 2004 for Hong Kong market). Chen et al. (2004) show that offer to close return practically makes up all initial return, leaving to zero profit for day traders or those who buy shares in the aftermarket period. Our results are more consistent with Bradley et al, (2009), who find that although aftermarket return consists of much smaller proportion, this return can be still exploited to make profit. In our case, we find that open to close return is around 3.5% and statistically significant at 1%. The larger proportion of offer to open return supports the argument that investors in the pre-market are compensated for bearing risk and uncertainty related to IPO. Equilibrium prices are reached quickly once information asymmetry disappears through trading in IPO aftermarket. Uncertainty diminishes quickly as shown by rapid decrease in the volatility and trading volume in the IPO aftermarket.

4.3. Intraday Analysis of IPO Aftermarket

To conduct an intraday analysis, we collect transaction and data for stocks in our sample in day +1 of aftermarket trading. We create five-minute intervals from open to close of the day. Indonesia Stock Exchange opens trading at 09.00, closes trading at 16.00 and afternoon break from 12.00-13.30. We have 60 five-minute intervals for the day. For each interval, we construct opening and closing prices. Opening prices are prices resulted from first transaction in the interval, while closing prices are prices from last transaction in the interval. Return for each interval is calculated as ln (Closing Price(t)/Opening Price(t)), where t refers to interval t. Volatility is calculated using Parkinson method. Figures 3,4, and 5 show results from intraday analysis. Figure 3 shows intraday cumulative returns, figure 4 shows intraday volatility and trading volume, while Figure 5 shows intraday trade size and number od trades.

Result from Figure 3 seems to support the notion that prices adjust quickly. Return increases in the first five minutes, and then reverses during the rest of the day, and stabilizes at small amount of positive return. In Figure 4, we observe a familiar pattern for intraday volatility, which is a U shape pattern. Volatility is highest during the first five minute interval (0.175). Volatility decreases for the next trading hours, and then starts to pick up again by the end of the day. However, the volatility in the first minute is unusually high compared to the first five minute volatility in 'normal' period.
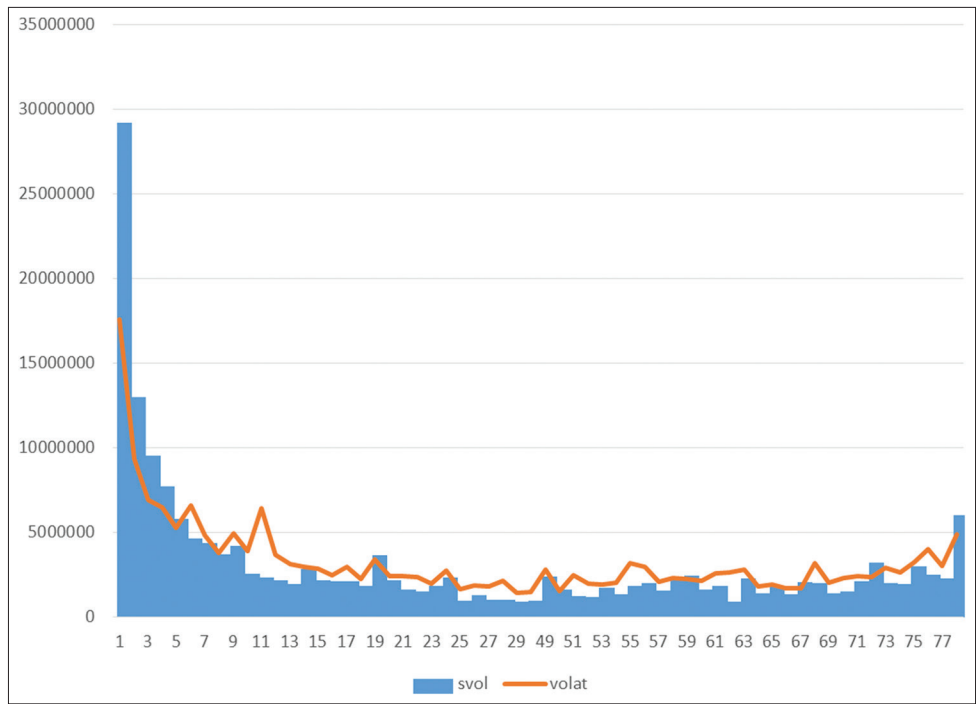
Figure 4: Intraday Volatilty and Trading Volume

This figures shows volatility and Trading Volume in five-minute intervals during the first trading day of IPO aftermarket. There are 78 five-minute intervals in a day. Volatility is calculated using Parkinson method, which is log (Highest Price (t)/Lowest Price (t)) multiplied by 1 million, where t refers to interval t. Trading volume is sum of trading volume in each stock in certain interval, in total number of shares, and then averaged across sample.
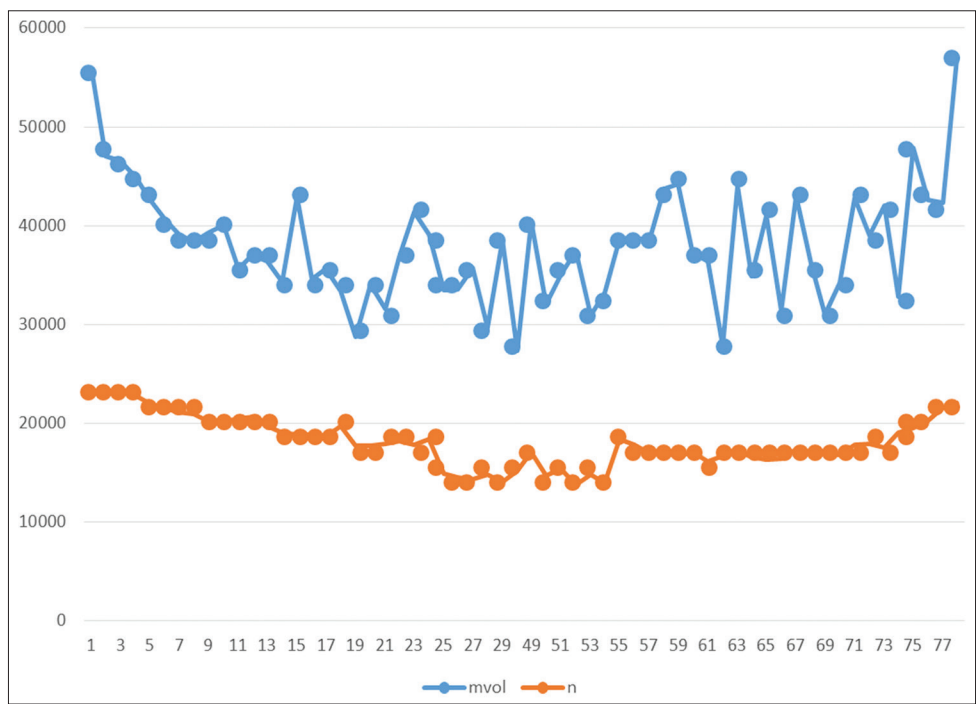

Figure 5: Intraday Trade Size and Number of Trades

This figure shows mean of trades size (in shares) and number of trades in five-minute intervals during first trading day. There are 78 five-minute intervals. Number of trades is multiplied by 100.

To gauge how high the volatility in the IPO aftermarket, we conduct intraday analysis in the 'normal' period. We define the normal period as day +60 in the secondary market, which we believe is already free from IPO activities (such as stabilization activities). Our result shows that first five-minute volatility in normal period is around 0.012 (not reported, available upon

request) The volatility in first five-minute in day +1 of IPO aftermarket is around 14 times higher than that in normal period. We observe that throughout the rest of the day, five-minute volatilities in aftermarket IPO are higher than those in normal period. On average, the numbers in aftermarket IPO is around 11 times higher than those in normal period.

Figure 4 also shows that trading volume starts at unusually high during the first five-minute interval. On average, around 30 million shares change hand only in the first five-minute. In the next hours trading volume decreases and stabilizes at around 11.00 at around 2.5 million shares. In last five-minute, trading volume starts to pick up again at around 5 million shares. Trading volume and volatility seem to move together. Further analysis shows that both variables have strong correlation, with correlation coefficient of 0.95 and statistically significant (p-value of <0.0001). The positive correlation is consistent with the literature, however, the correlation is much stronger in IPO aftermarket than in normal period. In the normal period, the correlation coefficient is 0.635 and significant at 1%.

Figure 5 shows five-minute trade size (in shares) and number of trades on the first trading day of IPO. Trade size and number of trades seem to follow a U shape pattern, which is similar to the pattern of volatility. Trade size is largest in the first five-minute interval, with the average of around 55,000 shares, then decreases in the next trading hours, and starts to pick up again at the end of the day. Similar pattern is observed for number of trades, which starts at around 220 trades in first five-minute interval, decreases in the next trading hours, and start to pick up again at the end of the day. One may expect that price discovery is characterized by smaller trade size and high trading frequency (Chan et al., 1995). We do not find a similar pattern. Price discovery in IPO aftermarket may take different pattern, or other factors than price discovery work in this case.

4.4. Who is More Aggressive? Seller or Buyer?

Previous sections establish facts that IPO aftermarket actions concentrate on the first trading day, and when we look further, the actions concentrate in the first few minutes of the day. In this section, we want to investigate who drive trading in the IPO aftermarket, seller or buyer. If flippers dominate trading, then we expect that sellers drive trading in IPO aftermarket. If stabilization activities dominate trading, then we can expect that buyers drive trading in the market. Still, other investors, including securities companies, may trade to reach their desired portfolio. We believe that identifying which side that drives the trading will provide a better understanding of trading dynamic in IPO aftermarket.

Our first step is to identify buy and sell initiated trades. Initiated trades are identified using the following rule. For a matched transaction, if a buy order arrives after sell order, then this trade is classified as buy initiated trade. If a sell order arrives after a buy order, then the trade is classified as sell initiated trade. Buy or sell arrivals are identified using order number. Smaller order number shows that this order arrives earlier than larger order number. We then calculate initiation ratio as seller initiated trades divided by buyer initiated trades. Larger number for this variable shows that sellers are more aggressive than buyers. We also decompose initiation ratio by trade size, hot-cold IPOs, and foreign and domestic investors, to answer which side is more aggressive, and which side provides liquidity. Figure 6 shows intraday initiation ratio.

Figure 6 shows that in the first few minutes, seller initiated dominates trading. In the mid-day, buyer initiated trades dominates the trading, and close to the end of the day, seller initiated dominates buyer initiated. The average of five-minute initiation ratio for the day is 1.2, which means that seller initiated trades is 1.2 larger than buyer initiated trades. This number is statistically significantly different from 1, at 1%, with t-value of around 11.

In Figure 7, we show initiation ratios sorted by hot and cold IPOs. We define hot and cold IPOs as follows. We sort all IPOs in our sample based on initial return from the largest to the lowest. Then we create quartile (four groups) based on initial return. IPOs in quartile 4 (the largest) is included as hot IPOs.

Figure 7 shows that overall mean of initiation ratio, and mean for every IPO condition is higher than 1. Mean initiation ratio for coldest IPO is 1.46 (p-value of 0.019), second coldest is 1.74 (p-value=<0.0001), second Hottest IPO is 1.72 (p-value of 0.1333), and Hottest IPO is 1.33 (p-value of 0.0160). However a closer examination seems to show that seller is less aggressive for coldest IPO in the first few minutes. Seller is more aggressive in hot IPO, although the differences seem to be small.

Figure 8 shows initiation ratios based on trade size. We classify trade size as follows. Trade size larger than 10,000 shares is classified as large size. Trade size between 1,000-10,000 is classified as medium, while trade size less or equal to 1,000 is classified as small size.
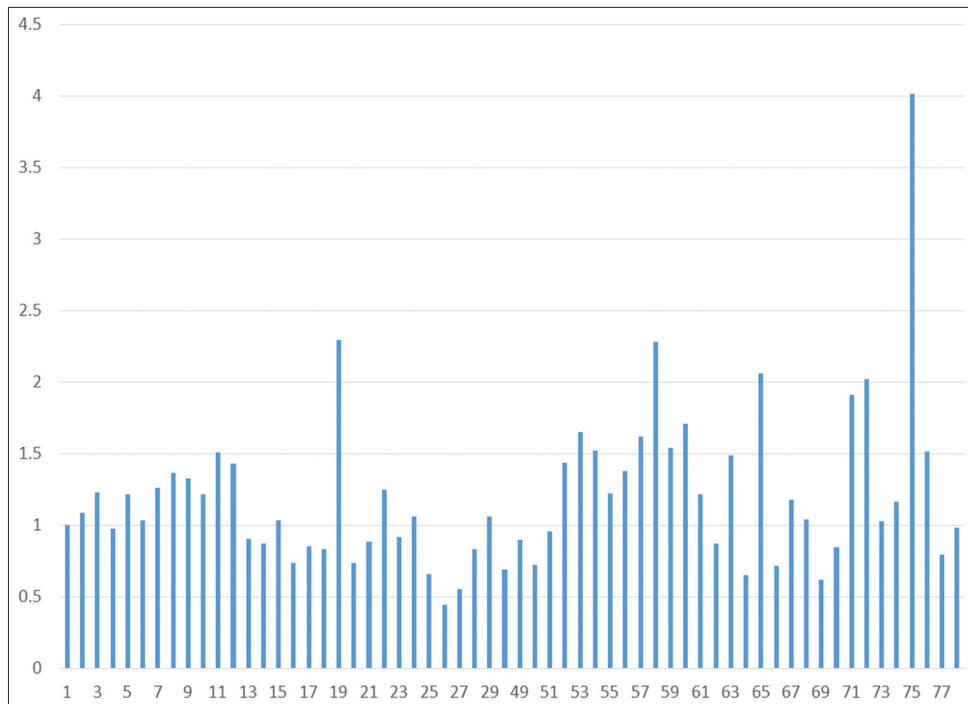
Figure 6: Intraday Initiation Ratio

This figure shows five-minute initiation ratio during the first day of aftermarket IPO. Initiation ratio is defined as (sell initiated (t)/buy initiated (t)) where t refers to interval t. Sell and buy initiated are identified as follows. If buy (sell) order arrives after sell (buy) order, the trade is classified as buy (sell) initiated. Order arrival is identified from order number. There are 78 five-minute interval during the day.
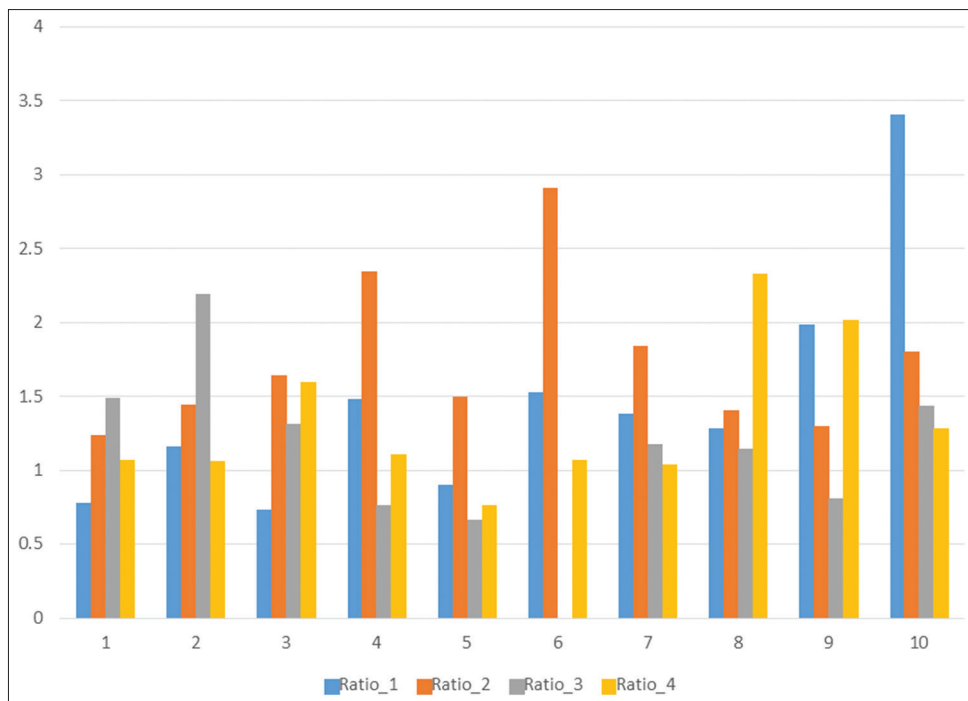

Figure 7: Intraday Initiation Ratio by Hot and Cold IPO

This figure shows thirty-minute interval initiation ratio in the first IPO trading day. Initiation ratio is defined as (sell initiated (t)/buy initiated (t)) where t refers to interval t. Sell and buy initiated are identified as follows. If buy (sell) order arrives after sell (buy) order, the trade is classified as buy (sell) initiated. Order arrival is identified from order number. There are 10 thirty-minute interval during the day. To define hot and cold IPOs, we sort IPOs based on initial return and create quartile of four groups. Quartile 1 is IPOs with the largest initial return. Ratio_4 refers to IPOs in quartile four. Other groups are denoted accordingly.
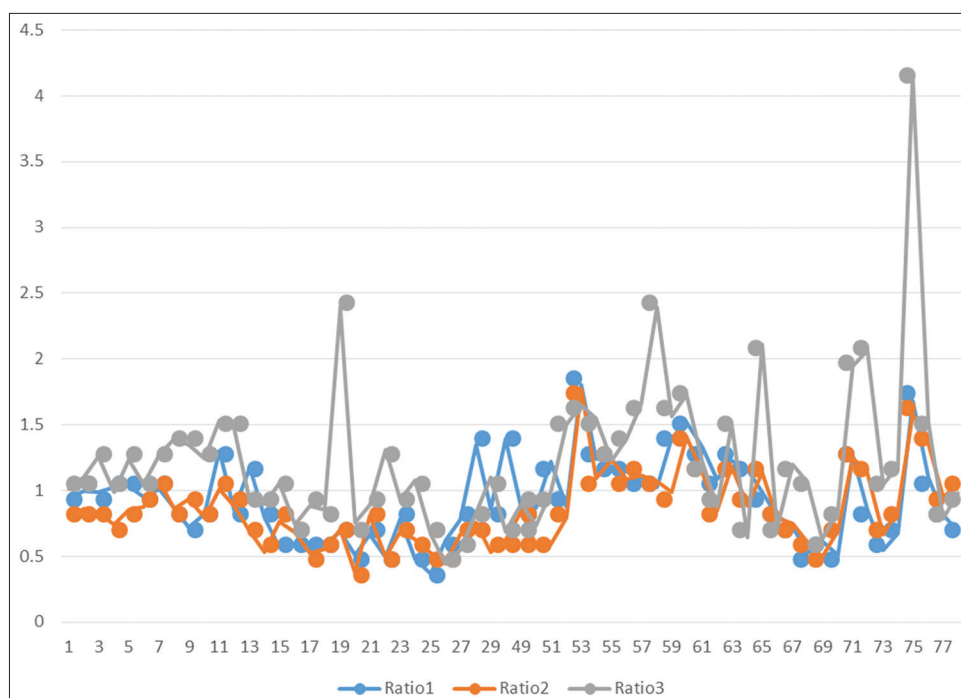
Figure 8: Intraday Initiation Ratio by Trade Size

This figures shows five-minute interval initiation ratios in the first day of IPO trading. Initiation ratio is defined as (sell initiated (t)/buy initiated (t)) where t refers to interval t. Sell and buy initiated are identified as follows. If buy (sell) order arrives after sell (buy) order, the trade is classified as buy (sell) initiated. Order arrival is identified from order number. There are 60 five-minute intervals during the day. Trade size is classified as follows. Trade size larger than 10,000 shares is classified as large (Ratio3), trade size of 1,000-10,000 shares is classified as medium (Ratio2), and trade size less or equal 1,000 is classified as small trade size (Ratio1).

Examination of Figure 8 reveals that initiation ratios for large trades are, in general, larger than those for medium and small trade size. Further statistical analysis seems to confirm this prediction. The average of five-minute interval initiation ratios for small trade is 0.929, which is less than 1, with p-value of 0.087 (significant at 10% level). For medium trade, the average ratio is 0.858, with p-value of 0.0003 (significant at 1% level). Large trades have average initiation ratio of 1.229, with p-value of 0.0033 (significant at 1% level). This result seems to suggest that large trades are more aggressive sellers, small and medium trades become liquidity providers for the large trades.

Last but not least, we investigate initiation ratios between foreign and domestic investors. JATS (Jakarta Automated Trading System) identify transactions identity of foreign and domestic investors. This identification stems from foreign ownership restriction before August 1997. At that time foreign ownership is restricted to 49% of outstanding shares. Identification system is put in place to enforce this policy. After August 1997. Indonesia Government lifts this restriction. However, the system that codes the identity of investors (foreign or domestic) still exists until now. Figure 9 shows intraday initiation ratio by foreign and domestic investors.

In Figure 9, it seems that foreign and domestic investors evenly at the initiation ratios. Further analysis shows that the mean of initiation ratio for foreign investors is 1.886, however, this number is not significant statistically (t-value of 1.64, p-value of 0.105). For domestic investors, the number is 1.2647 with t-value of 3.23 (p-value of 0.002). The numbers for foreign and domestic are not different statistically (F-value of 0.2913, p-value of 0.5904).

4.5. Do Managing Underwriter Provide Liquidity?

In this section we investigate whether managing underwriters provide liquidity in the first day of IPO trading and how extensive is this service. We start by identifying managing underwriters of IPOs in our sample. Some IPOs have to be deleted since we do not have complete data for these IPOs. Indonesia Stock Exchange uses an order driven trading mechanism, hence there is no market makers in Indonesia market. Underwriter or securities companies can trade for their own account. The orders have to go through brokers. Thus, the brokers carry the orders that come from their own clients, including affiliated securities companies.
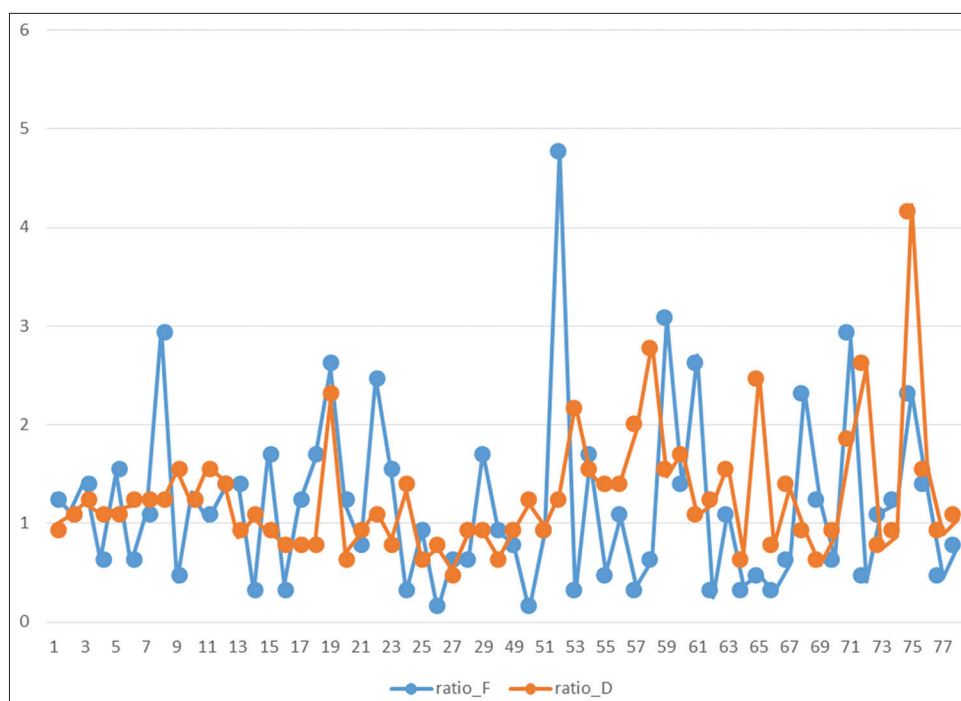
Figure 9: Initiation Ratio by Foreign and Domestic Investors

This figure shows initiation ratio by foreign (Ratio_F) and domestic investors (Ratio_D). Foreign and domestic identification is obtained from JATS (Jakarta Automated Trading System). Initiation ratio is defined as (sell initiated (t)/buy initiated (t)) where t refers to interval t. Sell and buy initiated are identified as follows. If buy (sell) order arrives after sell (buy) order, the trade is classified as buy (sell) initiated. Order arrival is identified from order number. There are 60 five-minute intervals during the day.

Table 5: Proportion of buy and sell by managing underwriter in the first day of IPO trading			
A. Sell initiated			
	First day IPO trading	**Normal period**	**T-test**
Trading volume			
Mean	0.1662	0.2915	−1.93 (0.0598)
Median	0.0853	0.0824	
Trading value			
Mean	0.1667	0.2917	−1.93 (0.0606)
Median	0,0853	0.0826	
B. Buy initiated			
	First day IPO trading	**Normal period**	**T-test**
Trading volume			
Mean	0.1198	0.1322	−0.37 (0.714)
Median	0.0758	0.0612	
Trading value			
Mean	0.1191	0.1319	0.39 (0.700)
Median	0,0763	0.0619	

This table shows proportion of buy and sell by managing underwriter in the first day of IPO trading. First, we calculate buy and sell initiated trades. then we identify and calculate counter-parties for these trades: managing underwriter and the rest of broker. For example, in panel A, for sell initiated trades, brokers that are the same as managing underwriters buy around 16% of sell initiated transactions. Normal period is defined as day +60 after IPO trading. t-test tests mean differences of first day trading and normal period. P values are in parentheses.

Since the are no direct data available on the underwriters' trading, we attempt to infer their trades indirectly. More specifically, we identify transactions that go through brokerage companies that are same as the managing underwriters. We assume that managing underwriters conduct their trading (buy or sell) through their affiliated brokers. Thus, we identify transactions carried out by the brokers that carry the same name, or symbols, as the underwriters. We should be cautious however, since the brokers may carry orders from other than their affiliated underwriters.

Tables 5 and 6 report proportions of counterparty trades by brokers of underwriters. In other words, proportion of liquidity supplied by underwriters.

Table 6: Proportion of buy and sell by managing underwriter in the first day of IPO trading sorted by Hot-cold IPOs				
	Buy initiated		**Sell initiated**	
	Mean	**Median**	**Mean**	**Median**
A. Trading volume				
1 (Coldest)	0.0856	0.0577	0.3080	0.2813
2	0.1656	0.1243	0.2085	0.1349
3	0.1258	0.1062	0.1193	0.0750
4 (Hottest)	0.0881	0.0312	0.0721	0.0359
F-value	1.8490 (0.1455)		5.6809 (0.0014)	
B. Trading value				
1 (Coldest)	0.0819	0.0581	0.3111	0.2801
2	0.1656	0.1243	0.2088	0.1367
3	0.1260	0.1031	0.1187	0.0751
4 (Hottest)	0.0875	0.0316	0.0724	0.0353
F-value	1.9611 (0.1271)		5.7844 (0.0012)	

This table shows proportion of buy and sell by managing underwriter in the first day of IPO trading in different IPO conditions (Hot and cold). Hot and cold are defined as follows. We sort IPO sample by its initial returns, and then create quartile (four groups) based on initial return. Group 1 is IPOs with lowest initial return (Coldest). group 4 is IPOs with the highest initial return (Hottest). F-value is from analysis of variance (ANOVA) to test differences among group averages. P values are in parentheses.

We expect that brokers of underwriters account for larger proportions in both sell and buy transactions, suggesting that they play roles of providing liquidity. In Table 5, panel A, for sell initiated trades, for the mean value, the brokers buy transaction accounts for around 16% of total buy. Orders that go through the brokers may come from investors or from their affiliated underwriters. We attempt to control this issue, by calculating proportions of brokers of underwriters in normal period. As in previous section, normal period is defined as day +60 in the IPO aftermarket. If underwriters provide liquidity in IPO aftermarket, we expect that the proportions in the first trading are higher than those in normal period.

Table 5 shows that buy and sell proportions by brokers of underwriters are smaller in first trading day than in normal period. Thus, underwriters do not seem to be a major party in providing liquidity. We have to be cautious with the data limitation, since underwriters may place orders from other non-affiliated brokers. In Table 6, we partition the buy and sell proportions based on hot and cold markets. As in previous section, hot and cold are defined based on initial return, with the largest initial return is assigned as the hottest IPO. We find an interesting pattern in Table 6. For sell initiated trades (brokers buy), the proportions decrease monothically from coldest to hottest IPOs. For example, in the coldest IPO, the proportion of buy by brokers of underwriters is around 30%, and progressively decreases into around 7% in the hottest IPO. This result seems to suggest that the underwriters buy more aggressively in the cold IPO. It may support the notion that underwriters stabilize more intensely in the cold IPOs.

5. CONCLUSION

This paper investigate IPO aftermarket using interday and intraday data. Our main findings show that much of IPO related actions concentrate on early trading. For daily data analysis, return, volatility, and trading volume concentrate on early trading days. For intraday analysis, return, volatility, and trading volume concentrate on early minutes in day +1 of IPO aftermarket. We show that sellers tend to be more aggressive in day +1 of IPO aftermarket. We do not find evidence that managing underwriters are the main parties in providing liquidity in IPO aftermarket. However, we seem to find evidence that managing underwriters are more active in providing liquidity in cold IPO, suggesting that they are more intensive in price stabilization in cold IPO.

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