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# Exploring the Existence of Short-run Initial Public Offering (IPO) Underpricing at Three Different Stock Exchange Markets in Japan

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**Abstract**

This study conducted the examination of the short-run performance of IPO stocks in the Japanese market by measuring daily AAR/CAAR of sample IPO stocks.. The study did so, in order to detect the positive initial abnormal return of sample IPO stocks as well as the short-run IPO underpricing that was observed by Ibbotson (1975) and McDonald and Fisher (1972) in the US market, and Chang (2011) in the Taiwanese market. The finding was that unlike findings in prior research, this study did not discover the positive initial abnormal returns for sample IPO firms in the Japanese market on the event day with statistical significance. Thereby, the short-run IPO underpricing did not occur in the Japanese market and it is inferred that offer prices of IPOs in the Japanese market are priced rationally, reflecting all available pieces of information at the time of offering. The implication of this finding for Efficient Market Hypothesis is that in the short-run, market efficiency holds well for the Japanese market. Findings from the examination on short-run performance of IPO stocks in the Japanese market has enabled this study to answer the research question: Does short-run IPO underpricing exist at stock exchange markets in Japan? The answer is, the short-run IPO underpricing did not exist.

**Keywords:** Short-run return, IPO, Japanese stock markets

## 1. Introduction

This study is to explore the existence of short-run Initial Public Offering (IPO) underpricing at three different stock exchange markets in Japan. Short-run IPO underpricing refers to a phenomenon that occurs when firms go public by issuing new stocks and the offer prices of the stocks are somehow underpriced, no matter how good the future prospects of the firms are (Rock, 1986). When underwriters decide the offer prices of IPO stocks, some important information may not be taken into consideration, which leads to underpricing of the stocks (Beatty and Ritter, 1986). This contradicts the proposition of the Efficient Market Hypothesis by Fama (1991), which suggests that all available information is incorporated into the stock prices, and thus "security prices at any time 'fully reflect' available information" (p.1575).

Pieces of prior research have extensively investigated the existence of the short-run IPO underpricing in the different markets, such as the US market (Ritter, 1991) and Taiwanese market (Chang, 2011). However, there is not much research on the phenomenon in the Japanese market. This study uses a set of sample of 184 IPO firms that went public on stock exchange markets in Japan during the period from 2004 to 2011, in order to investigate the existence of the phenomenon in the Japanese market. The sample IPO firms are listed on the following stock exchange markets within The Tokyo Stock Exchange (TSE): Tokyo Stock Exchange 1st Section (TOPIX), Tokyo Stock Exchange 2nd Section (TSE-2ND), and The Market of The High Growth and Emerging Stocks (MOTHERS).

To investigate the existence of the short-run IPO underpricing in the Japanese market, this study follows McDonald and Fisher (1972) and Ritter (1991), who conducted the event study method to examine the short-run performance of IPO stocks in the US market. To examine the short-run performance, this study calculates the daily average abnormal return and cumulative abnormal return of sample IPO stocks for 31 consecutive days, from the event day (day 0: when firms go public) to 30 days after IPO, by following the research method developed by McDonald and Fisher (1972) and Ritter (1991). This study also follows McDonald and Fisher (1972) to conduct a t-test to examine whether the daily average abnormal return and cumulative average abnormal return differ significantly from zero.

## 2. Literature Review

Ibbotson (1975) investigated the initial return performance of newly issued stocks, including IPO stocks. He found that the initial return of newly issued stocks, measured by risk-adjusted returns, was high and on average 11.4 percent per month. He employed a sample of new stocks issued during January 1960 to December 1969 to measure the return performance of new stocks in the initial return period, the period by his definition between the beginning and end of the day when new shares are issued and become available to bid on. He empirically found that the mean initial returns of newly issued stocks to be positive, and that the phenomenon, where new stocks perform well by achieving positive abnormal returns during the initial return period, was significant, confirming the short-run underpricing of new stocks including IPO stocks.

McDonald and Fisher (1972) conducted empirical research to investigate the short-run

performance of newly-issued stocks by use of excess returns of newly-issued stocks. McDonald and Fisher (1972) used a sample of 142 newly-issued stocks issued during the period from 1969 to 1970, and examined the performance of the stocks during the initial period; from the day of issuance to a week after the issuance. From the test, they found the positive excess returns of sample stocks during the period; the mean excess return was positive at 28.5 percent per week. Because of the positive excess return observed during the initial return period, they asserted that it is likely that newly-issued stocks are underpriced, enabling positive abnormal returns to exist.

Beatty and Ritter (1986) explained why newly-issued stocks, including IPO stocks, are underpriced. They argued that it is underwriters' deliberate behavior that sets offering prices of newly-issued stocks low, attracting investors to bid for the offering as well as enabling them to achieve positive initial returns on the day of offering. They started their paper by defining these two types of investors; the informed and uninformed investors.

By their definitions, the informed investors are referred to as investors willing to incur costs to gain information of firms in which they would consider investing in, whereas the uninformed are those who do not incur such costs. They argued that the proportion of uninformed relative to informed investors is much greater, and thus the uninformed are uncertain about the prospect of IPO stocks, whose information is not yet available prior to offerings.

They asserted that the majority of investors feel uncertain about IPO firms and they are reluctant to invest in the IPO stocks if prices are set too high. Underwriters will damage their reputations as well as future clients if underwriting stocks are undersubscribed; thereby, underwriters need to price IPO stocks at a discount, so that investors who feel uncertain about bidding for IPO stocks are attracted to bid for the stocks.

After observing that underwriters deliberately underprice IPO stocks to attract investors, Beatty and Ritter (1986) clarified the following proposition: "The greater is the ex ante uncertainty about the value of an issue, the greater is the expected underpricing" (p.216). They used a sample of 1,028 IPO firms in the US during a period from 1977 to 1982, and investigated the relationship between the average initial return of the sample and ex ante uncertainty of investors.

They found that the more uncertain investors feel about an IPO, the more the price is discounted, enabling them to achieve the greater positive initial returns; thereby underwriters of IPOs deliberately underprice IPO stocks.

Chang (2011) conducted research investigating whether underpricing of IPO stocks occurred in the Taiwanese market by examining the abnormal return of sample Taiwanese IPO stocks. He found that IPO stocks traded in the Taiwanese market have an average abnormal return of 9.08 percent on the first day when the firms go public. This result helped him conclude that short-run IPO underpricing in the Taiwanese market occurs.

## 3. Literature Review on Methods for Analyzing Performances of IPO Stocks

Research by Muradoglu et al. (1998) helped clarify the method to calculate the return of stocks and indices that are necessary for this study to calculate abnormal returns of IPO stocks. They used the following equation to calculate the return of gold prices in the Turkish gold market: "ln rt = ln Pt – ln Pt-1 ," (p.87) where ln rt represents gold prices with continuous compounding, ln Pt represents the logarithm of gold prices at time t, and ln Pt-1 represents the logarithm of gold prices at time t – 1.

McDonald and Fisher (1972) calculated excess returns of newly-issued stocks to investigate the performance of the stocks in both the short- (on the issuance day) and long-run (a few years after the issuance day). They used the following equation to calculate excess returns: An excess return, u, is computed for each stock in each period: ujt = Rjt – Rmt, where Rjt is the return on stock j in period t, and Rmt is the return on the O.T.C. average in the same period" (p.98). Subsequent to calculating the excess return, they conducted Student's t-test on the excess return of samples, investigating whether the values of excess returns are significant.

## 4. Research Method

Our research question is if short-run IPO underpricing exist at stock exchange markets in Japan. This study strives to answer the research question by conducting statistical tests on examining short-run return performances of sample IPO stocks traded at three different stock exchange markets. The examination of the short-run return performance of IPO stocks enabled this study to investigate the existence of the short-run IPO underpricing in the Japanese market by looking at the performance of IPO stocks during the initial return period (from the day of IPOs to the 30th day after IPOs).

The samples are Japanese firms that went public during the period from January 2004 to June 2011. All the sample firms are listed on stock exchange markets within The Tokyo Stock Exchange (TSE), the largest stock exchange market in Japan, and the number of sample IPO firms is 184. Within TSE, there are three different exchange markets where the sample IPO firms are listed; Tokyo Stock Exchange 1st Section (TOPIX), Tokyo Stock Exchange 2nd Section (TSE-2ND), and The Market of The High-Growth and Emerging Stocks. Hereafter (MOTHERS). This study conducted statistical tests to examine the short-run return performances of IPO stocks, as well as to test the market efficiency of TSE during the sample period from 2004 to 2011. The collected sample firms were categorized into three groups: TOPIX, TSE 2ND, and MOTHERS.

This study collected data of 184 firms that have gone public and are listed in three different stock exchange markets within TSE: TOPIX, TSE-2ND, and MOTHERS. There are 41, 45, and 98 sample firms listed on these markets, respectively. The list of sample firms was obtained from KabuWeb (2014). Financial indicators that were necessary to compute the daily/monthly stock returns, abnormal returns, market returns, etc., were retrieved from Thomson Reuter's Datastream. The study collected data of sample firms' daily stock prices for 31 consecutive days, and monthly stock prices for 36 consecutive months after they went

public. Along with daily/monthly stock prices of IPO firms, daily/monthly index prices of respective markets, where the stocks are traded, were also collected. This study calculated daily/monthly returns of sample IPO stocks and indices using daily/monthly stock/indices. How the returns were calculated by using the stock/indices prices is explained in the following chapter. Index prices to compare with IPO stock prices at TOPIX, TSE-2ND, and MOTHERS are TOPIX, Tokyo Stock Exchange Second Section Stock Price Index, and Tokyo Stock Exchange Mothers Index. The currency of stock and index prices was denominated in Japanese Yen (￥).

This study defined 'the day of IPO' as 'the event day,' and defined day t (t = 1,2,3,…30) as 't days after IPO.' In order to detect the existence of the short-run IPO underpricing, this study examined the performance of sample IPO stocks during the period from 'the event day' to '30 days after IPO.' Thus, in this study, 'the short-run period' is defined as the period from the event day to 30 days after IPO. The short-run performance of IPO stocks was measured by examining the short-run cumulative average abnormal return (CAAR) of IPO stocks. This study took several steps to calculate the CAAR.

## 5. Findings

Table 1 reports Descriptive Statistics of the daily cumulative abnormal return (daily CAR) of sample IPO firms at TOPIX. Parameter t in the first column in the table represents day. When t is 0, it is the event day, when firms go public, hereafter referred to as 'the event day'; and when t is 30, it is the 30th day after the event day. On the event day (t = 0), the mean daily CAR for IPO firms at TOPIX is 0.54 percent. The median on the event day (t = 0) is 0.33 percent, which is smaller than the mean. Because of the median that is smaller than the mean on event day, it can be said that 41 sample IPO firms at TOPIX cluster to the left of the mean, meaning that there are more firms whose initial daily CARs (t = 0) are smaller than the mean. The minimum and maximum initial daily CAR (t = 0) are -4.33 and 5.9 percent, respectively, and these values created the range of 10.24 percent. This helped interpret that while the maximum stock achieves an initial AR of 5.96 percent per day, the minimum stock experienced a negative initial AR of -4.33 percent per day. Both the positive initial AR of 5.96 percent and negative AR of -4.33 percent were considered to be very high for a first daily return of stocks. Because the median was less than the mean, the distribution of samples is likely to be right-skewed, and it is the maximum of 5.9 percent that can be a potential outlier raising the value of the mean.

On the event day (t = 0), the standard deviation of daily CAR was 2.56 percent. From Table 1, the maximum on the day of IPOs, which is considered very high for the initial AR is not placed within two standard deviations, but it is placed within three standard deviations. According to the general rule of statistics, Berenson et al. (2012) claim that, "you can consider values not found in the interval 2 as potential outliers (p.152)," and "values not found in the interval 3 are almost always considered outliers (p.152)," and therefore, there is a possibility that the maximum statistic on the event day (t = 0) can be an outlier.

On day 30 (t =30), the mean daily CAR remained positive at the value of 1.636 percent. The median increased to 1.638 percent and the value was very close to that of the mean. The

minimum and maximum values were -9.7 and 17.55 percent, indicating that there was an IPO firm that showed the largest decline in the abnormal return at -9.781 percent, while there was another IPO firm that achieved the largest cumulative abnormal return of 17.55 percent 30 days after the IPOs. The standard deviation was 6.11 percent. The value of the maximum value of 17.55 percent was not within two standard deviations of 0.1222, but was within three standard deviations from the mean. Hence, the maximum value on day 30 (t = 30) can be considered as a potential outlier.

Table 2 reports the daily average abnormal return (daily AAR) and daily cumulative average abnormal return (daily CAAR) of sample IPO stocks at TOPIX in the short-run ($0 \leq t \leq 30$). The first column of the table represents the day, and the following 3 columns report values, t-statistics, and p-values of daily AAR, and the last 3 columns report values, t-statistics, and p-values of daily CAAR. This study computed t-statistics of each value to examine whether the daily AAR/CAAR was significantly different from zero.

On the event day (t = 0), the daily AAR/CAAR was positive at 0.54 percent. However, the t-statistic on that day was 1.343, and the value fell within the region of rejection both at both the 90 and 95 percent confidence levels. Thus, there was insufficient evidence to reject the null hypothesis, and the existence of the positive AR on the event day (t = 0) was not statistically significant. Throughout the period between the event day (t = 0) and day 30 day (t = 30), all of the daily CAARs were positive, but it was not until day 21 (t = 21) when the daily CAAR became significant at the 90 percent confidence level. From day 21 (t = 21) onwards, t-statistics were higher than the upper critical value of 1.6839 (the 90 percent confidence level). Thus, at the 90 percent confidence level, there was sufficient evidence to reject the null hypothesis that daily CAARs from day 21 until day 30 day are equal to zero. Thereby, the alternative hypothesis that daily CAARs from day 21 until day 30 ($21 \leq t \leq 30$) are significantly different from zero was supported with statistical significance. The daily CAAR was significantly different from zero on day 21, 22, 23, 24, 26, 28, 29 and 30 at a 90 percent confidence level, and on day 25 and 27 at a 95 percent confidence level. This helps interpret that the IPO stocks at TOPIX started outperforming the market on the 21st day after IPO, because the positive daily CAAR was observed from that day with statistical significance. The result shows that the short-run IPO underpricing did not occur at TOPIX, because there was insufficient evidence to conclude that the daily AAR/CAAR of IPO stocks at this market was significant on the event day, (t = 0) when the firms go public.

Table 3 reports Descriptive Statistics of the daily cumulative abnormal return (daily CAR) of sample IPO firms listed on TSE-2ND. The number of samples was 46 firms. On the event day (t = 0), the mean daily CAR was -0.17 percent and the median was -0.42 percent. Because the median was smaller than the mean, it can be said that the distribution of samples was right-skewed and the samples were likely to cluster to the left of the mean, inferring that a positive extreme value that raised the value of the mean may have existed. The minimum and maximum values were -5.55 and 8.59 percent, respectively, creating the range of 14.14 percent. Both the negative initial abnormal return of -5.55 percent and positive initial abnormal return of 8.59 percent per day seemed to be too low/high for the first day return. The standard deviation was 3.2 percent because the maximum value of 8.59 percent fell

within three stand deviations from the mean, the value could have been considered as a potential outlier, but it was not conclusive.

On day 30 (t = 30), the mean remained negative at the value of -0.74 percent. The median on day 30 was lower than the mean, making the distribution of samples right-skewed. This helped infer again that a positive extreme value that raised the value of the mean may have existed. The minimum and maximum values were -17.41 and 22.3 percent, respectively, creating the range of 39.71 percent. Both minimum and maximum values of daily CARs on the 31st day after IPOs were also considered to be too low/high. Thus, as has been discussed during the mean-median comparison of samples, the positive extreme values on the event day and day 30 were possible outliers, raising the values of the means. The standard deviation statistic was 8.78 percent. The maximum value on day 30 of 22.3 percent could also be considered as a potential outlier, as the value fell within the three standard deviations from the mean.

Table 4 reports the daily average abnormal return (daily AAR) and daily cumulative average abnormal return (daily CAAR) of IPO stocks at TSE-2ND. This study computed t-statistics of each value to examine whether the daily AAR/CAAR was significantly different from zero.

On the event day (t = 0), the daily AAR was -0.17 percent, and the t-statistic was -0.352. Because the t-statistic was within the lower and upper critical values, there was insufficient evidence to reject the null hypothesis at both a 90 and 95 percent confidence level. This led to the following finding that the existence of abnormal returns on the event day (t = 0) was not statistically significant. From day 5 (t = 5) until day 13 (t = 13), t-statistics of the daily CAAR were lower than the lower critical value of -1.6794 (at a 90 percent confidence level); and the daily CAARs during this period remained negative. The negative daily CAARs between day 5 (t = 5) and day 13 (t = 13) were significant at a 90 percent confidence level, and therefore during this period, IPO stocks listed on TSE-2ND underperformed the market. However, from the day 14 (t = 14) onwards, the values of the daily CAAR were not significant because the t-statistics never went higher/lower than the upper/lower critical value at both a 90 and 95 percent confidence level. Hence, even though statistical evidence confirming the existence of negative daily CAARs during the middle of the month ($5 \leq t \leq 13$) was found, there was no further evidence to conclude that the daily CAARs during the rest of the month were significant. Judging from the daily AAR/CAAR on the event day (t = 0), the existence of the short-run IPO underpricing at TSE-2ND was not found statistically, because there was no sufficient evidence to reject the null hypothesis that daily AAR/CAAR on the event day equals to zero.

Table 5 reports Descriptive Statistics of the daily cumulative abnormal return (daily CAR) of IPO firms at MOTHERS. The number of samples was 98 firms. On the event day (t =0), the mean daily CAR at MOTHERS was -0.56 percent. The median on the event day (t =0) was -1.25 percent, a value that was far lower than the value of the mean. Due to the median, whose value was smaller than the mean, the distribution of samples was likely to be skewed to the right, and the sample population clusters to the left of the mean, implying that extreme values exist. The minimum and maximum values of samples were -9.39 percent and 7.89

percent, respectively; and the range was 17.28 percent. The initial abnormal returns of -9.39 percent and 7.89 percent per day were too low/high, and stocks with these extremely low/high returns could be potential outliers. The median was -1.25 percent and it was smaller than the mean, indicating that the distribution of samples was right-skewed and that the sample population was likely to cluster to the left of the mean. The standard deviation statistic was 5.05 percent. Both the minimum and maximum values fell within two standard deviations from the mean, and hence these values should not have been considered as outliers. On day 30 (t =30), the mean remained negative at the value of -3.08 percent. The median on day 30 was -4.19 percent, and the gap between the mean and median that had been observed on the first day was diminished.

Table 6 reports daily average abnormal return (daily AAR) and daily cumulative average abnormal return (daily CAAR) of IPO stocks at MOTHERS. This study computed t-statistics of each value to examine whether daily AAR/CAAR was significantly different from zero.

On the event day (t =0), the daily AAR was -0.56 percent with a t-statistic of -1.103. Since the t-statistic of daily AAR on the event day (t = 0) was within 1.6607 (at a 90 percent confidence level) and 1.9847 (at a 95 percent confidence level), the AR on the event day (t =0) was not significant due to a lack of sufficient statistical evidence. It was not until day 12 (t = 12) that the daily CAAR was significant at a 90 percent confidence level: From day 12 (t = 12) onwards, t-statistics of daily CAARs were lower than the lower critical value of -1.6607 (at a 90 percent confidence level). Hence, there was sufficient evidence to reject the null hypothesis, and to conclude that the daily CAARs differ from zero during day 12 (t = 12) until day 30 (t = 30). The result helped interpret that from the event day (t = 0) until the (t = 12), there was no evidence confirming that daily CAARs differed from zero; but from day 13 (t = 13) onwards, the daily CAARs were found to be significant, and therefore, IPO stocks listed at MOTHERS started underperforming the market 13 days after going public. The result also found that the short-run IPO underpricing did not occur at MOTHERS because the daily AAR of sample IPO stocks on the event day (t = 0) was not statistically significant.

Figure 1 exhibits and compares short-run performances of IPO stocks at TOPIX, TSE-2ND, and MOTHERS. Table 7 reports and compares the daily CAAR of IPO stocks listed on those markets. On the event day (t = 0), none of the values of daily CAAR at the three markets were significant, because t-statistics for these values fell within the lower/upper critical value. Therefore, there was no sufficient evidence to conclude that daily CAAR on the event day (t = 0) at these markets were significant, leading to the finding that the short-run IPO underpricing in the Japanese market did not occur.

The comparison of short-run performances of IPO stocks at TOPIX, TSE-2ND, and MOTHERS helped find that there was a difference in the performances of IPO stocks in the short-run ($0 \leq t \leq 30$): 30 days after IPO, on average, the performance of IPO stocks at TOPIX was superior to that at MOTHERS. IPO stocks at TOPIX had a positive daily CAAR of 1.64 percent, and those at MOTHERS had a negative CAAR of -3.08 percent. The daily CAAR of IPO stocks at TSE-2ND on the 30th day after IPOs was not significant.

## 6. Findings

This study followed prior research on the short-run IPO underpricing. To detect the existence of the short-run IPO underpricing, pieces of prior research (Ibbotson, 1975; McDonald and Fisher, 1972; Chang, 2011) measured the abnormal returns of IPO stocks during the initial return period. McDonald and Fisher (1972) suggested that if underpricing o new stocks occurs, then there should be positive abnormal returns on the day of IPO (t =0) observed. This study conducted statistical tests to examine whether positive initial abnormal returns for IPO stocks existed on the event day at three different markets under TSE: TOPIX, TSE-2ND, and MOTHERS. On the event day (t = 0), the results showed that there was no sufficient statistical evidence to confirm the existence of abnormal returns of IPO stocks listed on these markets, because the t-statistics of daily AAR/CAAR were within the critical values. Thereby, underpricing of IPO stocks listed on TOPIX, TSE-2ND, and MOTHERS was not observed.

The result is inconsistent with the research findings of Ibbotson (1975), McDonald and Fisher (1972), and Chang (2011). Ibbotson (1975) found that newly-issued stocks, including IPO stocks that were issued during 1960 to 1969 in the US had the average return of 11.4 percent in the first month. McDonald and Fisher (1972) found that 142 newly-issued stocks issued during the period from 1969 to 1970 in the US had the average excess return of 28.5 percent in the first week. Chang (2011) found that 1,558 IPO firms that went public during 1962 to 2009 in Taiwan had, on average, the abnormal return of 9.08 percent on the first day. Both Ibbotson (1975) and Chang (2011) have confirmed the existence of short-run IPO underpricing in the respective market (US and Taiwan) with statistical significance, but this study did not find the same phenomenon in TSE. The result has left the inference that the market efficiency holds well for the short-term in the Japanese market compared to markets in the US and Taiwan.

## 7. Conclusion

This study conducted the examination of the short-run performance of IPO stocks in the Japanese market by measuring daily AAR/CAAR of sample IPO stocks.. The study did so, in order to detect the positive initial abnormal return of sample IPO stocks as well as the short-run IPO underpricing that was observed by Ibbotson (1975) and McDonald and Fisher (1972) in the US market, and Chang (2011) in the Taiwanese market. The finding was that unlike findings in prior research, this study did not discover the positive initial abnormal returns for sample IPO firms in the Japanese market on the event day with statistical significance. Thereby, the short-run IPO underpricing did not occur in the Japanese market and it is inferred that offer prices of IPOs in the Japanese market are priced rationally, reflecting all available pieces of information at the time of offering. The implication of this finding for Efficient Market Hypothesis is that in the short-run, market efficiency holds well for the Japanese market.

Findings from the examination on short-run performance of IPO stocks in the Japanese market has enabled this study to answer the research question: Does short-run IPO underpricing exist at stock exchange markets in Japan? The answer is, the short-run IPO underpricing did not exist.

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## Appendix

**Table 1**: Descriptive Statistics of Daily Cumulative Abnormal Return of IPO stocks at TOPIX

| t (day) | Range | Minimum | Maximum | Mean | Std. Error | Std. Deviation | Median |
|---|---|---|---|---|---|---|---|
| t=0 | 0.1024 | -0.0433 | 0.0591 | 0.0054 | 0.0040 | 0.0256 | 0.0033 |
| t=5 | 0.1472 | -0.0900 | 0.0572 | 0.0030 | 0.0052 | 0.0331 | 0.0051 |
| t=10 | 0.2690 | -0.1270 | 0.1420 | 0.0022 | 0.0076 | 0.0485 | 0.0052 |
| t=15 | 0.2895 | -0.1127 | 0.1768 | 0.0075 | 0.0079 | 0.0504 | 0.0069 |
| t=20 | 0.3064 | -0.1097 | 0.1967 | 0.0116 | 0.0085 | 0.0542 | 0.0112 |
| t=25 | 0.3166 | -0.1194 | 0.1972 | 0.0171 | 0.0086 | 0.0551 | 0.0124 |
| t=30 | 0.2733 | -0.0978 | 0.1755 | 0.0164 | 0.0095 | 0.0611 | 0.0164 |

**Table 2**: Daily Average Abnormal Return and Cumulative Average Abnormal Return of IPO stocks at TOPIX

| t (day) | AAR | t-stat | p-value | CAAR | t-stat | p-value |
|---|---|---|---|---|---|---|
| 0 | 0.0054 | 1.343 | 0.187 | 0.0054 | 1.343 | 0.187 |
| 1 | 0.0004 | 0.141 | 0.888 | 0.0058 | 1.219 | 0.230 |
| 2 | -0.0051 | -1.686 | 0.100 | 0.0007 | 0.112 | 0.912 |
| 3 | 0.0022 | 0.791 | 0.433 | 0.0028 | 0.573 | 0.570 |
| 4 | 0.0002 | 0.07 | 0.944 | 0.0030 | 0.572 | 0.571 |
| 5 | -0.0002 | -0.081 | 0.936 | 0.0028 | 0.555 | 0.582 |
| 6 | 0.0005 | 0.242 | 0.810 | 0.0033 | 0.527 | 0.601 |
| 7 | -0.0014 | -0.73 | 0.470 | 0.0019 | 0.254 | 0.801 |
| 8 | 0.0011 | 0.728 | 0.471 | 0.0030 | 0.393 | 0.696 |
| 9 | -0.0008 | -0.579 | 0.566 | 0.0022 | 0.291 | 0.773 |
| 10 | 0.0022 | 1.155 | 0.255 | 0.0044 | 0.581 | 0.565 |
| 11 | 0.0008 | 0.403 | 0.689 | 0.0052 | 0.647 | 0.521 |
| 12 | -0.0009 | -0.455 | 0.652 | 0.0043 | 0.532 | 0.598 |

**Table 2**: Daily Average Abnormal Return and Cumulative Average Abnormal Return of IPO stocks at TOPIX (cont.)

| t (day) | AAR | t-stat | p-value | CAAR | t-stat | p-value |
|---|---|---|---|---|---|---|
| 13 | 0.0008 | 0.538 | 0.594 | 0.0051 | 0.597 | 0.554 |
| 14 | 0.0024 | 1.318 | 0.195 | 0.0075 | 0.954 | 0.346 |
| 15 | -0.0020 | -1.237 | 0.223 | 0.0055 | 0.699 | 0.489 |
| 16 | 0.0001 | 0.106 | 0.916 | 0.0056 | 0.73 | 0.470 |
| 17 | 0.0019 | 1.05 | 0.300 | 0.0075 | 0.945 | 0.351 |
| 18 | 0.0037 * | 1.883 | 0.067 | 0.0112 | 1.343 | 0.187 |
| 19 | 0.0004 | 0.237 | 0.814 | 0.0116 | 1.371 | 0.178 |
| 20 | 0.0027 ** | 2.031 | 0.049 | 0.0143 | 1.651 | 0.107 |
| 21 | 0.0021 | 1.067 | 0.292 | 0.0163 * | 1.762 | 0.086 |
| 22 | 0.0002 | 0.092 | 0.928 | 0.0165 * | 1.974 | 0.055 |
| 23 | -0.0016 | -0.814 | 0.421 | 0.0149 * | 1.925 | 0.061 |
| 24 | 0.0022 | 1.174 | 0.247 | 0.0171 * | 1.989 | 0.054 |
| 25 | 0.0003 | 0.141 | 0.888 | 0.0174 ** | 2.068 | 0.045 |
| 26 | -0.0001 | -0.092 | 0.927 | 0.0173 * | 1.987 | 0.054 |
| 27 | 0.0019 | 1.121 | 0.269 | 0.0192 ** | 2.103 | 0.042 |
| 28 | -0.0008 | -0.729 | 0.470 | 0.0184 * | 1.981 | 0.054 |
| 29 | -0.0005 | -0.309 | 0.759 | 0.0179 * | 1.902 | 0.064 |
| 30 | -0.0016 | -1.546 | 0.130 | 0.0164 * | 1.716 | 0.094 |

*significant at α= 0.1 **significant at α= 0.05

**Table 3**: Descriptive Statistics of Daily Cumulative Abnormal Return of IPO stocks at TSE-2ND

| t (day) | Range | Minimum | Maximum | Mean | Std. Error | Std. Deviation | Median |
|---|---|---|---|---|---|---|---|
| t=0 | 0.1414 | -0.0555 | 0.0859 | -0.0017 | 0.0047 | 0.0320 | -0.0042 |
| t=5 | 0.2217 | -0.1083 | 0.1134 | -0.0114 | 0.0070 | 0.0474 | -0.0172 |
| t=10 | 0.3327 | -0.1562 | 0.1766 | -0.0204 | 0.0081 | 0.0548 | -0.0283 |
| t=15 | 0.3776 | -0.1202 | 0.2574 | -0.0169 | 0.0102 | 0.0690 | -0.0251 |
| t=20 | 0.3336 | -0.1448 | 0.1888 | -0.0140 | 0.0100 | 0.0681 | -0.0231 |
| t=25 | 0.3801 | -0.1513 | 0.2288 | -0.0145 | 0.0116 | 0.0788 | -0.0149 |
| t=30 | 0.3971 | -0.1741 | 0.2230 | -0.0074 | 0.0129 | 0.0878 | -0.0177 |

**Table 4**: Daily Average Abnormal Return and Cumulative Average Abnormal Return of IPO stocks at TSE-2ND

| t (day) | AAR | t-stat | p-value | CAAR | t-stat | p-value |
|---|---|---|---|---|---|---|
| 0 | -0.0017 | -0.352 | 0.727 | -0.0017 | -0.352 | 0.727 |
| 1 | -0.0038 | -1.094 | 0.280 | -0.0054 | -0.93 | 0.357 |
| 2 | -0.0059 * | -1.898 | 0.064 | -0.0113 * | -1.684 | 0.099 |
| 3 | 0.0007 | 0.295 | 0.770 | -0.0107 | -1.504 | 0.139 |
| 4 | -0.0007 | -0.309 | 0.759 | -0.0114 | -1.626 | 0.111 |
| 5 | -0.0032 | -1.586 | 0.120 | -0.0146 * | -2.003 | 0.051 |
| 6 | -0.0022 | -1.058 | 0.296 | -0.0168 ** | -2.273 | 0.028 |
| 7 | -0.0033 | -1.404 | 0.167 | -0.0201 ** | -3.056 | 0.004 |
| 8 | 0.0011 | 0.638 | 0.527 | -0.0190 ** | -2.705 | 0.010 |
| 9 | -0.0014 | -0.635 | 0.529 | -0.0204 ** | -2.521 | 0.015 |
| 10 | 0.0026 | 1.594 | 0.118 | -0.0177 ** | -2.061 | 0.045 |
| 11 | -0.0036 | -1.423 | 0.162 | -0.0213 ** | -2.109 | 0.041 |
| 12 | -0.0031 | -1.681 | 0.100 | -0.0244 ** | -2.552 | 0.014 |
| 13 | 0.0015 | 0.822 | 0.416 | -0.0228 ** | -2.338 | 0.024 |
| 14 | 0.0060 ** | 2.317 | 0.025 | -0.0169 ** | -1.657 | 0.104 |
| 16 | -0.0013 | -0.626 | 0.535 | -0.0179 | -1.653 | 0.105 |
| 17 | 0.0000 | -0.018 | 0.985 | -0.0179 | -1.664 | 0.103 |
| 18 | 0.0015 | 0.823 | 0.415 | -0.0164 | -1.63 | 0.110 |
| 19 | 0.0024 | 1.313 | 0.196 | -0.0140 | -1.399 | 0.169 |
| 20 | -0.0008 | -0.42 | 0.676 | -0.0148 | -1.426 | 0.161 |
| 21 | 0.0012 | 0.516 | 0.608 | -0.0137 | -1.199 | 0.237 |
| 22 | -0.0014 | -0.769 | 0.446 | -0.0151 | -1.362 | 0.180 |
| 23 | 0.0010 | 0.568 | 0.573 | -0.0141 | -1.267 | 0.212 |
| 24 | -0.0003 | -0.182 | 0.857 | -0.0145 | -1.245 | 0.220 |
| 25 | 0.0005 | 0.199 | 0.843 | -0.0139 | -1.115 | 0.271 |
| 26 | -0.0015 | -0.896 | 0.375 | -0.0154 | -1.236 | 0.223 |
| 27 | 0.0039 | 1.591 | 0.119 | -0.0115 | -0.941 | 0.352 |
| 28 | 0.0031 | 1.481 | 0.146 | -0.0085 | -0.668 | 0.508 |
| 29 | 0.0011 | 0.635 | 0.528 | -0.0073 | -0.579 | 0.565 |
| 30 | -0.0001 | -0.031 | 0.976 | -0.0074 | -0.569 | 0.572 |

*significant at α= 0.1 **significant at α= 0.05

**Table 5**: Descriptive Statistics of Daily Cumulative Abnormal Return of IPO stocks at MOTHERS

| t (day) | Range | Minimum | Maximum | Mean | Std. Error | Std. Deviation | Median |
|---|---|---|---|---|---|---|---|
| t=0 | 0.1728 | -0.0939 | 0.0789 | -0.0056 | 0.0051 | 0.0505 | -0.0125 |
| t=5 | 0.4569 | -0.2079 | 0.2490 | -0.0102 | 0.0108 | 0.1065 | -0.0291 |
| t=10 | 0.6250 | -0.2445 | 0.3805 | -0.0185 | 0.0129 | 0.1275 | -0.0410 |
| t=15 | 0.6666 | -0.3150 | 0.3516 | -0.0261 | 0.0142 | 0.1403 | -0.0494 |
| t=20 | 0.7806 | -0.3453 | 0.4354 | -0.0275 | 0.0154 | 0.1525 | -0.0516 |
| t=25 | 0.8210 | -0.3293 | 0.4917 | -0.0261 | 0.0157 | 0.1553 | -0.0398 |
| t=30 | 0.9657 | -0.3977 | 0.5681 | -0.0308 | 0.0172 | 0.1705 | -0.0419 |

**Table 6**: Daily Average Abnormal Return and Cumulative Average Abnormal Return for IPO stocks at MOTHERS

| t (days) | AAR | t-stat | p-value | CAAR | t-stat | p-value |
|---|---|---|---|---|---|---|
| 0 | -0.0056 | -1.103 | 0.273 | -0.0056 | -1.103 | 0.273 |
| 1 | -0.0004 | -0.084 | 0.933 | -0.0060 | -0.781 | 0.437 |
| 2 | -0.0012 | -0.288 | 0.774 | -0.0072 | -0.774 | 0.441 |
| 3 | -0.0005 | -0.15 | 0.881 | -0.0078 | -0.753 | 0.453 |
| 4 | -0.0024 | -0.74 | 0.461 | -0.0102 | -0.947 | 0.346 |
| 5 | -0.0066 ** | -2.047 | 0.043 | -0.0168 | -1.55 | 0.124 |

*significant at α= 0.1 **significant at α= 0.05

**Table 6**: Daily Average Abnormal Return and Cumulative Average Abnormal Return for IPO stocks at MOTHERS (cont.)

| t (days) | AAR | t-stat | p-value | CAAR | t-stat | p-value |
|---|---|---|---|---|---|---|
| 6 | 0.0030 | 0.827 | 0.410 | -0.0138 | -1.19 | 0.237 |
| 7 | 0.0018 | 0.566 | 0.573 | -0.0120 | -0.997 | 0.321 |
| 8 | -0.0055 * | -1.968 | 0.052 | -0.0175 | -1.352 | 0.180 |
| 9 | -0.0011 | -0.442 | 0.659 | -0.0185 | -1.439 | 0.154 |
| 10 | 0.0010 | 0.378 | 0.706 | -0.0175 | -1.321 | 0.190 |
| 11 | -0.0052 ** | -2.151 | 0.034 | -0.0227 | -1.642 | 0.104 |
| 12 | -0.0008 | -0.321 | 0.749 | -0.0235 * | -1.67 | 0.098 |
| 13 | -0.0004 | -0.139 | 0.890 | -0.0239 * | -1.671 | 0.098 |
| 14 | -0.0022 | -0.873 | 0.385 | -0.0261 * | -1.841 | 0.069 |
| 15 | -0.0043 | -1.647 | 0.103 | -0.0304 ** | -2.025 | 0.046 |
| 16 | -0.0013 | -0.49 | 0.625 | -0.0317 ** | -2.096 | 0.039 |
| 17 | 0.0003 | 0.102 | 0.919 | -0.0314 ** | -2.085 | 0.040 |
| 18 | 0.0033 | 1.225 | 0.223 | -0.0281 * | -1.874 | 0.064 |
| 19 | 0.0007 | 0.285 | 0.776 | -0.0275 * | -1.782 | 0.078 |
| 20 | -0.0024 | -0.973 | 0.333 | -0.0298 * | -1.948 | 0.054 |
| 21 | 0.0005 | 0.214 | 0.831 | -0.0293 * | -1.93 | 0.057 |
| 22 | -0.0011 | -0.517 | 0.606 | -0.0304 * | -1.98 | 0.051 |
| 23 | 0.0000 | 0.007 | 0.995 | -0.0304 * | -1.944 | 0.055 |
| 24 | 0.0043 * | 1.674 | 0.097 | -0.0261 * | -1.666 | 0.099 |
| 25 | -0.0031 | -1.395 | 0.166 | -0.0293 * | -1.876 | 0.064 |
| 26 | 0.0017 | 0.706 | 0.482 | -0.0276 * | -1.74 | 0.085 |
| 27 | 0.0007 | 0.328 | 0.744 | -0.0269 * | -1.665 | 0.099 |
| 28 | -0.0009 | -0.392 | 0.696 | -0.0277 * | -1.685 | 0.095 |
| 29 | -0.0015 | -0.661 | 0.510 | -0.0292 * | -1.746 | 0.084 |
| 30 | -0.0015 | -0.748 | 0.456 | -0.0308 * | -1.786 | 0.077 |

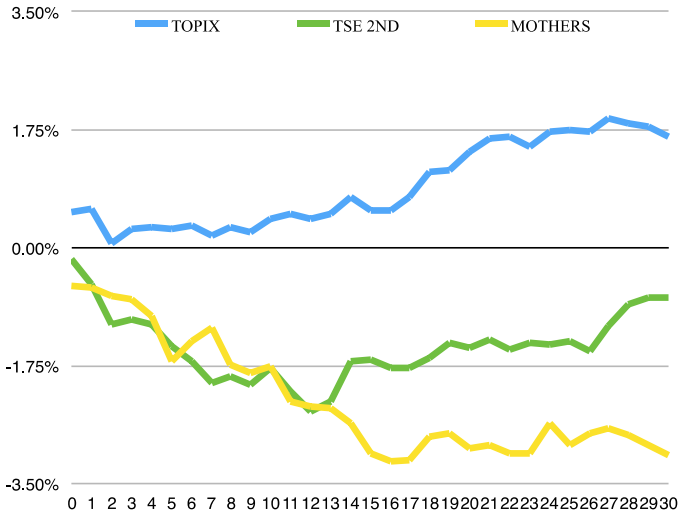
*significant at α= 0.1 **significant at α= 0.05

**Table 7**: Comparison of Short-Run Return Performances of IPO stocks listed on TOPIX, TSE-2ND, and MOTHERS

| | TOPIX | | TSE 2ND | | MOTHERS | |
|---|---|---|---|---|---|---|
| t (day) | CAAR | p-value | CAAR | p-value | CAAR | p-value |
| t=0 | 0.0054 | 0.187 | -0.0017 | 0.727 | -0.0056 | 0.273 |
| t=5 | 0.0028 | 0.582 | -0.0146 * | 0.051 | -0.0168 | 0.124 |
| t=10 | 0.0044 | 0.565 | -0.0177 ** | 0.045 | -0.0175 | 0.190 |
| t=15 | 0.0055 | 0.489 | -0.0166 | 0.116 | -0.0304 ** | 0.046 |
| t=20 | 0.0143 | 0.107 | -0.0148 | 0.161 | -0.0298 * | 0.054 |
| t=25 | 0.0174 ** | 0.045 | -0.0139 | 0.271 | -0.0293 * | 0.064 |
| t=30 | 0.0164 * | 0.094 | -0.0074 | 0.572 | -0.0308 * | 0.077 |

*significant at α= 0.1 **significant at α= 0.05

**Figure 1**: Comparison of Short-Run Performances of IPO stocks at TOPIX, TSE-2ND, and MOTHERS.

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