INITIAL RETURN IS SMALLER THAN UNDERPRICING

Taiwan has an Emerging Stock Market similar to the Alternative Investment Market in the United Kingdom. Using data on 164 book building IPOs once listed in the Emerging Stock Market from October 2005 to December 2009, we find that directly measured underpricing (the market price on the day before the offering announcement day divided by the offering price, minus one) is significantly larger than initial return (the market price on the offering day divided by the offering price, minus one). Cross-sectional analysis shows the difference between underprcing and initial return can be explained by the after-market liquidity.

Keywords: Initial Public Offerings, Underpricing, Initial Return, Liquidity

Derrien and Kecskes (2007) argue that the two-stage offering strategy through Alternative Investment Market (AIM) is less costly than a direct initial public offering (IPO) because trading reduces the valuation uncertainty of these firms before they issue equity. They also argue that since they can observe market prices before setting the offering price for two-stage firms, they can directly measure underpricing (the market price on the day before the offering announcement day divided by the offering price, minus one). They are therefore able to compare underpricing to initial returns (the market price on the offering day divided by the offering price, minus one), and they can explore the determinants of underpricing. We found an interesting result on their Table II that the mean of initial return (11.9%) is smaller than the mean of underpricing (13.9%). Is this a reasonable situation in a two-stage offering system, and what determine the magnitude of the difference between underpricing and initial return?

The Emerging Stock Market in Taiwan is similar to the Alternative Investment Market in the United Kingdom. In Taiwan, there are two major stock markets: Taiwan Stock Exchange (TWSE) and GreTai Securities Market (OTC). The Emerging Stock

Market (ESM) is operated in GreTai Securities Market. This Emerging Stock Market allows smaller companies to trade shares with a more lessen regulatory system than is applicable to the main market. Companies apply for listing at TWSE or OTC, their shares must have been traded on the Emerging Stock Market for at least six months. Firms can list and let develop a public market in the firm's existing shares in the Emerging Stock Market, and then sell new shares to the public latter. It is a two-stage offering.

Following Derrien and Kecskes (2007), we can use market prices in the Emerging Stock Market to directly measure underpricing. We define three underpricing measures based on market prices observed at the Emerging Stock Market: (1) the ratio of the closing price at the emerging stock market before setting the price range over the middle of the price range minus 1; (2) the ratio of offering price over the middle of the price range minus 1; and (3) the ratio of the closing price at the Emerging Stock Market before setting the offering price over the offering price minus 1. We then can compare these underpricings with IPO's initial return. We want to test whether there is a significant difference between underpricing and initial return, and further to explore what contribute to the difference.

If the market is perfect and efficient, the first day's price increase should be able cover the loss in setting the offering price. The ratio of initial return over underpricing should be equal to 1. Similar to Derrien and Kecskes' (2007) results, we are able to show that the ratio is less than 1. We find there is a significant difference between underpricing and initial return in our sample.

The second definition of our underpricing measure is similar to the price update in the partial adjustment literature. Loughran and Ritter (2002) show that with higher price update, there will be higher initial return. In our paper, we have a similar test to show that with higher underpricing, initial return will be higher. This result is related

the partial adjustment effect shown by Loughran and Ritter (2002).

The major concern in this paper is to investigate what contributes to the difference between underpricing and initial return. We define the ratio of initial return over underpricing as our main predicted variable. Using ratio instead of using difference is a standard statistics to compare price change across companies.

Ellul and Pagano (2006) show that after-market liquidity is an important determinant of IPO underpricing. They show that underpricing is affected by the after-market spread and by a quadratic term in the bid-ask spread. In their paper, Ellul and Pagano still use initial return as a proxy for underpricing. Since we are able to distinguish the difference between underpricing and initial return, we want to investigate whether IPO aftermarket liquidity have any direct effect on the difference between underpricing and initial return after controlling for other variables affecting underpricing. We employ different liquidity measures: bid-ask spread and decomposed spread to provide comprehensive analyses on this issue.

We use the ratio of initial return over underpricing as the dependent variable to run regression on bid-ask spread, a quadratic term of bid-ask spread, and other control variables. We want to understand how bid-ask spread, a measure of liquidity, affects the ratio of initial return over underpricing. On one hand, Ellul and Pagano (2006) show that with higher effective spread, initial return will be higher. Based on this argument, the sign between bid-ask spread and the ratio of initial return over underpricing should be positive. On the other hand, Derrien and Kecskes (2007) show that with higher uncertainty, the directly measured underpricing at a two-stage offering will be higher. With higher uncertainty, the after-market liquidity will be lower. This means that expecting lower liquidity after IPO, underwriters may set a lower offering price to compensate investors. Therefore, higher bid-ask spread may cause the denominator in the ratio of initial return over underpricing to be higher and then the ratio

to be lower. We therefore predict that there is a positive relation between bid-ask spread and the ratio of initial return over underpricing. However, we would expect there is leveling off to occur. The effect of bid-ask spread on the ratio of initial return is initially steep and then flattens as spread continues to increase. We therefore add a quadratic term of spread to our main tests to further examine whether spread affect initial return and eventually cause underpricing to increase.

Like many countries in the world, most IPOs in Taiwan now are offered through bookbuilding approach with overallotment option. Unlike British IPOs those are mostly done through the fixed-price method, a data set of bookbuilding IPOs after controlling the underwriter stabilization effect can provide evidence to shed lights to countries where bookbuilding is prevalent.

The rest of the paper is organized as follows. Section 1 develops our hypotheses. Section 2 describes institutional features of Taiwan's Emerging Stock Market, variables used in the analysis, and data. Section 3 presents our empirical results and Section 4 concludes.

1. Hypotheses

In an Emerging Stock Market, we can observe underpricing and do not use initial return to proxy for underpricing. We therefore can compare initial return to underpricing. Due to market imperfection: eq. information asymmetry, transaction cost, etc., initial return may be smaller than the observed underpricing. It indicates that stock prices on the first trading day increase by an amount, which is on average less than the observed underpricing. This is considered an anomaly because in a perfect capital market the stock price should, on average, increase by exactly the amount of the underpricing. In this paper, we try to provide a rationale for this anomaly. We first need to provide evidence on the difference between initial return and underpricing.

Hypothesis 1. Underpricing (measured as the ratio of the offering price over the market price on the day before the offering announcement day, minus 1) is significantly different from initial returns (measured as the ratio of the closed price on the offering day over the offering price, minus 1).

Empirical evidence shown by Hanley (1993), and Loughran and Ritter (2002) that the first day return is positively related to the revision in the offer price from the mid-point of the file price range. This partial adjustment phenomenon was first documented by Hanley in 1993. In our study, we have three measures of underpricing. Their definition is similar to the price update in the partial adjustment literature. We therefore follow partial adjustment literature to test whether there is a positively relation between initial return and underpricing.

Hypothesis 2. With higher underpricing, initial returns will be higher.

In dividends literature, Elton and Gruber (1970) and Kalay (1982) both show that in a perfect market, arbitrage traders will attempt to eliminate any difference between the first trading day price change and the underpricing dividend amount. Market frictionless, especially, the transaction cost may be the reason that keeps the price drop from adjusting the same amount as the dividend. Market liquidity is a measure of the transaction cost. Naranjo et.al. (2000) show that liquidity affects ex-dividend abnormal returns. Based on this argument, we suspect that the ratio of initial return over underpricing depends on market liquidity. In this paper we use Taiwan's IPO data to take a closer look at initial return over underpricing ratio, and how it is affected by after-market liquidity. With better liquidity, investors will ask for lower return. We

therefore predict that there is a positive relation between bid-ask spread and the ratio of initial return over underpricing. However, we would expect there is leveling off to occur. For this purpose, we add a quadratic term of spread to our main tests. That is, we run regressions of the ratio of initial return over underpricing on *spread* and *spread squared*. If the effect of spread levels off or even reverses itself, we expect the coefficient on the squared term to be of the opposite sign to that on the linear term.

Hypothesis 3. The sign between the ratio of initial return over underpricing and spread and will be positive, and the sign between the ration of initl return over underpricing and spread squared will be negative.

Following Lin, Sanger, and Booth (1995), we decompose bid-ask spread into: the adverse selection costs, and the order processing costs. Adverse selection component of the spread compensate the liquidity providers for trading with informed traders. In the presence of informed traders, the adverse selection cost is observed and the initial return will be higher. So the ratio of initial return over underpricing ratio will be higher when there is higher adverse selection cost.

Hypothesis 4A. With higher adverse selection cost (order processing cost), the ratio of initial return over underpricing will be larger.

The IPO underpricing phenomenon is often explained in the literature with asymmetric information. The degree of information asymmetry will be reduced after shares are listed at the OTC market or the exchange market. The impact of adverse selection cost on the ratio of initial return over underpricing will be smaller and even is less important than that of the order processing cost. We therefore have another

hypothesis on this issue:

Hypothesis 4B. Adverse selection component of spread is less important than the order processing component in explaining the ratio of initial return over underpricing.

2. Data Description

2.1 Institutional features of Taiwan's Emerging Stock Market

Taiwan's Emerging Stock Market was established on January 2, 2002. Emerging Stock Market is Taiwan is operated by Gretai Securities Market (GTSM, the OTC market in Taiwan) and is designed to quote stocks for small and median sized companies to involve in trading unlisted stocks. In line with the internationalization and liberalization of the capital market and in support of government's call for businesses around the world to list in Taiwan, the government has formulated the rules and support measures for enterprises to register on the emerging market board and later apply for initial public offering on the OTC or on the exchange market.

There are no requirements on the revenue, market capitalization, years of operating and numbers of shareholders, a company only needs to meet all three of the following criteria (1) To register their supervision agreement with recommending securities firms to GTSM, (2) To have at least two recommending securities firms. The recommending securities firms should provide recent one month financial statements and other important information of the company, and (3) To obtain the service of registered house in the Taipei metropolitan area.

By the current listing regulation of TWSE and OTC, initial public offering firms must be listed and traded on Emerging Stock Market for over than six months to be

familiar with the transaction rule of market and disclose the information of the company fully transparently. To be listed on Emerging Stock Market is a pure *introduction* of the stock, that is, a new listing unaccompanied by the sale of any primary or secondary shares. Therefore, in Taiwan, stocks to be listed must pass a two-stage process.

Empirical literatures use observed initial returns as a proxy for unobserved underpricing (see for example, Habib and Ljungqvist (2001) and others). In the two-stage IPO process, we can observe both underpricing (the difference between the market price on the day before the offering announcement day and the offering price) and initial returns (the difference between the market price on the offering day and the offering price). We will test how after market liquidity affects the ratio of initial return over underpricing.

Fixed price offering was once the major IPO underwriting method in Taiwan. Following the global trend, Taiwan now uses bookbuilding as the dominating method in selling initial public offering shares.

Taiwan's aftermarket features pervasive underwriter stabilization. Underwriter can play active roles in the aftermarket and this stabilization activity can artificially enhance after-market liquidity. The overallotment arrangement is an agreement between the issuer of the IPO and the underwriter. The overallotment arrangement enables the underwriters to sell more shares to the public than the actual size offered. Underwriters repurchase stocks in the open market when trading in the stock has commenced due to weak market demand. Aggarwal (2000) considers this action is intended to stimulate the total demand in the stock, in an attempt to protect the share price from decreasing. This action will therefore affect IPO's initial return.

We use Taiwan bookbuilding IPOs controlling underwriters' stabilization to investigate the impact of market liquidity on the ratio of initial return over underpricing. Results analyzed based on this data set can shed light to countries using bookbuilding

with overallotment.

2.2 Underpricing and initial return

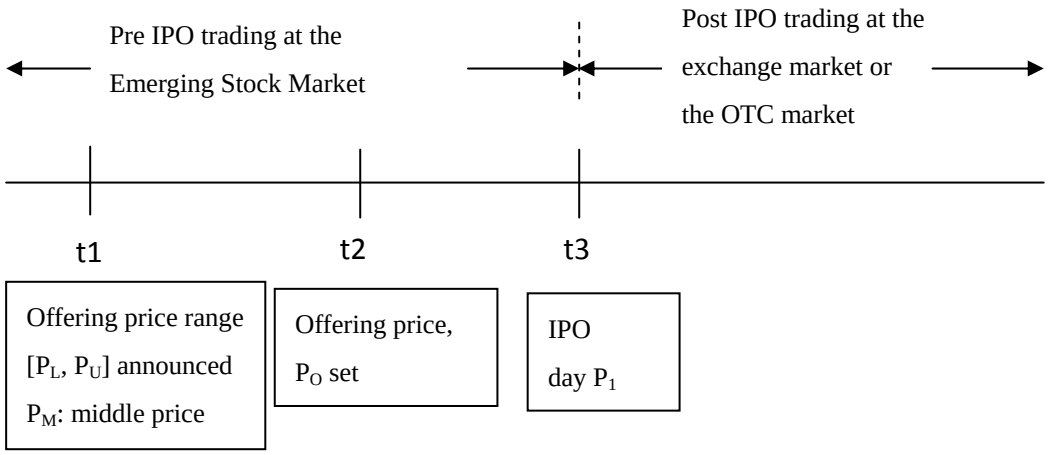

Figure 1 Time line of the bookbuilding process in Taiwan's IPO market.

2.2.1 The difference between initial return and underpricing

Figure 1 shows the IPO process. We especially care about several prices set during this process. Before road show, underwriters may take consideration of private information and public information, especially the trading prices at the Emerging Stock Market, to set an offering price range [P_L, P_U]. Underwriters then collect information from road show. They then decide an offering price, P_O, incorporating those information they collect and the trading information at the Emerging Stock Market. Once the stock is issued and then traded at the exchange market or the OTC market, we observe the closing price on the first trading day to calculate the initial return.

As Darrien and Kecskes (2007) mentioned underpricng can be observed at the Alternative Investment Market in the United Kingdom, we can also observe underpricing at the Emerging Stock Market in Taiwan. We use three measures to

calculate underpricing for IPOs.

We have the first definition of underpricing when underwriters set the price range. We define:

$$Ud1 = \frac{P_{R-1} - P_M}{P_M}$$

Where P_{R-1} is the closing price at the emerging stock market before setting the price range. $P_M = \frac{P_L + P_U}{2}$ is the middle of the price range.

The second definition is given as:

$$Ud2 = \frac{P_O - P_M}{P_M}$$

This measure is the price update used in the IPO partial adjustment literature like Loughran and Ritter (2002).

Our major concern of underpricing is the one shown below:

$$Ud3 = \frac{P_{O-1} - P_O}{P_O}$$

Where P_{O-1} is the closing price at the Emerging Stock Market before setting the offering price. P_O is the offering price.

We also calculate initial return to compare with underpricing defined above.

$$IR = \frac{P_1 - P_O}{P_O}$$

P_1 is the closing price on the first trading day.

This two-stage IPO process provides us a chance to compare the observed underpricing with the first day initial return. We apply the paired t-test to test the differences between initial return and underpricing. We then investigate what reason contributing to the difference.

2.2.2 Partial adjustment

Tests based on the partial adjustment model typically only consider the final offer price relative to the original file range. Bradley and Jordan (2002) decompose the total

adjustment into two components, the pre-offer adjustment and the final adjustment. This breakdown allows them to evaluate the information content of the offer price relative to the final file range and, separately, the final file range compared to the initial file range. In this paper, we define different price update as a measure of underpricing. We then want to test the partial adjustment hypothesis with initial return and these different price adjustments.

2.2.3 Testing the impact of after-market liquidity on the ratio of initial return over underpricing

We define ***DIF*** as the ratio of initial return and underpricing. We follow dividends literature to define this ratio. We find issuing firms set an offering price smaller than the trading price, i.e. underpricing, in Emerging Stock Market, and the increase of price from offering price to the first trading day's closing price is less than the underpricing. Elton and Gruber (1970), Kalay, (1982), and a large body of empirical work on the ex-dividend day price behavior of stocks has demonstrated that the price drop in most cases is only partial, decreasing by less than the full dividend amount. Tax-Induced Clienteles effect is traditionally used to explain that the stock price drop is less than the dividend amount, while Naranjo et al. (2000) argue that liquidity also affects ex-dividend returns. Lack of liquidity prevents traders from arbitraging away these returns.

Like the liquidity reason in dividend literature to explain dividend-price ratio, in this paper, we investigate whether after-market liquidity can explain the initial return over underpricing ratio.

To test the impact of liquidity on IPO underpricing, we use different liquidity measures: bid-ask spread, decomposed spread, and trading volume.

We use intraday data to calculate bid-ask spread. For each trade execution, we

calculate the following spreads and then calculate daily average as each IPO firm's liquidity measures. Four measures of the spread are given: the quoted spread, the quoted relative spread, the effective spread, and the effective relative spread. The quoted spread and the effective spread are measured in NT$, while the quoted relative spread and the effective relative spread are measured in percentage.

1. The quoted spread (*QSP*) is defined as the difference between the bid price (B_t) and ask price (A_t).

   $$QSP_t = A_t - B_t$$

2. The quoted relative spread (*QRSP*) is defined as the quoted spread (*QSP*) divided by the quote midpoint (M_t).

   $$QRSP_t = (A_t - B_t) / M_t$$

   Where

   $$M_t = (A_t + B_t) / 2$$

3. The effective spread (*ESP*) is defined as twice the absolute difference between the transaction price (P_t) and the midpoint of the bid-ask quotes (M_t).

   $$ESP_t = 2 * \left| P_t - M_t \right|$$

4. The relative effective spread (*ERSP*) is defined as twice the absolute log of P_t over the quoted midpoint (M_t).

   $$ERSP_t = 2\left|\ln(P_t / M_t)\right|$$

Following Lin, Sanger, and Booth (1995), we further decompose bid-ask spread into: the adverse selection costs, and the order processing costs. The adverse selection component is the coefficient λ, using the regression $\Delta M_{t+1} = \lambda z_t + \varepsilon_{t+1}$, where $\Delta M_{t+1} = M_{t+1} - M_t$, with M_t the log quote midpoint at time t; $z_t = P_t - M_t$, with P_t the log trade price at time t. The order processing component is the coefficient γ, using the

regression $\Delta P_{t+1} = -\gamma z_t + \mu_{t+1}$. The values reported are the means of all individual coefficients. Each component is given firstly in proportion of the effective spread, and secondly in dollars, by the coefficient times mean $|z_t|$ times mean M_t. The spread includes an adverse information component that compensates the liquidity providers for losses from trading with better-informed agents. Liquidity suppliers bear costs in transacting, therefore, an order processing component must be included in the spread to compensate the liquidity suppliers for the routine costs of conducting business[1]. We will test whether increase in these costs will cause the ratio of initial return over underpricing to be larger. We also like to know which component has the more power to explain the ratio.

Suggested by Ellul and Pagano (2006) that underpricing is affected by the after-market spread, and by a quadratic term in the bid-ask spread. We therefore incorporate a quadratic term of the liquidity measure to explain the difference between underpricing and initial return.

2.3 Data description

Sample Selection and Data Sources

Our initial sample of new listings includes 164 book building IPOs in Taiwan between October 2005 and December 2009. Table 1 shows the composition of the sample, by year, by industry, and by market. The companies in our sample list either on the OTC market (66%) or on the TWSE (34%). High-tech firms account for 79.27%.

For each company, we collect two types of data: (1) company-level data from prospects, and (2) intraday transaction data collected from the Taiwan Economic Journal (TEJ). Intraday data include transaction prices, volumes and bid and ask prices of

[1] The TWSE is an order-driven market with no market makers or specialists. An order-driven market is considered no inventory holding costs.

unsettled limit orders.

Table 2 provides descriptive statistics for the IPOs in our sample. The table shows that the typical firm making an IPO operates for more than 13.49 years before the IPO, lists in the Emerging Stock Market for 778.62 days, and has total sales of NT$3,073 million in the year before the IPO. Of interest are underpricing, initial return and ***DIF***. The mean of Ud_1 is 58.73%, that of Ud_2 is 0.04%, and that of Ud_3 is 61.53%, the average initial return is 59.99%, and ***DIF***, the ratio of initial return over Ud_3 is only 86.81%, less than 1. This indicates that after-market price does not increase up to the market price in the Emerging Stock Market.

The average quoted spread is NT$0.4230, while the quoted relative spread man is 0.0061. The average effective spread is NT$0.3668, while the effective relative spread is 0.0027. The average adverse selection cost accounts for 13.63%, while the average order processing cost accounts for 0.15%.

On average, our samples have an overallotment share ratio of 11.71%. Not all underwriters ask for the maximum percentage of 15%. The overallotment shares exercised ratio is only 0.0034599%. We also control shares traded by investment banks related to the underwriter. The percentage of shares traded by investment banks is -0.000141663%.

3. Empirical Evidences

3.1 Testing the Relation between Underpricing and Initial Return

From the descriptive statistics shown in Table 2, we see initial return is smaller than underpricing. This is similar to the result in Derrien and Kecskes (2007). Here, we use paired t test and Wilcoxon signed rank test to investigate the relation between underpricing and initial return.

We have three different measure of underpricing. Ud_1 is calculated with the

middle of offering price range and the previous market price observed in the Emerging Stock Market. Ud_2 is calculated with the midpoint of offering price and the offering price. Ud_3 is calculated with the emerging stock market price on the day before setting the offering price and the offering price. In Table 3, the average (median) of Ud_1 is not significantly different from *IR*. The median of Ud_2 is significant smaller than the average (median) of *IR*. The relation between Ud_2 and *IR* is intensively examined in the partial adjustment literature, while the major concern in this paper is the relation between Ud_3 and *IR*. The median of Ud_3 is significant ***larger*** than the median of *IR*. This implies that price increase by amount less than the cut of offering price from the market price at the Emerging Stock Market.

3.2 Partial Adjustment Test

In this section, we describe the results of using underpricing to predict initial returns. Following partial adjustment literature, we first run simple regression of initial returns on different underpricing measures. We then run multi regression of initial return on underpricing, controlling for other variables that may affect an IPO's initial return. Results of Table 4 show that the coefficient estimates of Ud_1 and Ud_3 are significantly positive at 1% level. With higher underpricing, initial return will be higher.

Simple regression results show that Ud_1 and Ud_3 both have a significantly positive relation with initial return. This relation holds even after we control for other factors affecting initial return. However, it is interesting to note that Ud_2 has no explanatory power on initial return. This often used variable in partial adjustment model is not proved in our sample to have ability to predict initial return. Ud_3 is calculated with the Emerging Stock Market price on the day before setting the offering price and the offering price. It is the latest price adjustment and contains more information. This

price update is actually the underpricing when underwriters set the offering price. We therefore have the interest to see what contribute to the difference between Ud_3 and the initial return.

3.3 Testing the Market Liquidity Hypothesis

Even though higher underpricing will induce higher initial return, the degree of covering by initial return for underpricing is only partial. We will test whether after-market liquidity may cause this incomplete recovery. We run regression of ratio of initial return over underpricing on different liquidity measures: bid-ask spreads, decomposed cots, and trading volumes. We add a quadratic liquidity term in the regression models. In Panel A of Table 5, we find that quoted spread and effective spread significantly affect the ratio of initial return over underpricing. Results show that the coefficients of the liquidity term are significantly positive, while the quadratic terms are significantly negative. This indicates that the relation between market liquidity and *DIF* is not a linear but a concave relationship. With low level of market liquidity, the higher the market liquidity, the higher the ratio of initial return over underpricing. However, with high level of after-market liquidity, the higher market liquidity, the lower the ratio of initial return over underpricing.

We further use decomposed spread as predictors to run regression, we find that initial return is positively related to order processing cost, but not related to adverse selection cost. We further put both adverse selection cost and order procession cost into the same regression. We find that order processing cost has more power to predict the ratio of initial return over underpricing.

4. Conclusions

From samples of two-stage IPOs, we can observe underpricing and initial return.

Using Taiwan's IPO samples, we find there is a significant difference between underpricing and initial return. Sign rank test shows that initial return is smaller than the underpricing. After-market prices do not increase enough to cover underpricing set when offering the new shares. Initial return only partially covers underpricing. This result is consistent to Derrien and Kecskes (2007), who find similar phenomenon in the United Kingdom.

We concern what contributes to the difference between underpricing and initial return. We predict that after-market liquidity affect the ratio of initial return to underpricing through both the initial return and underpricing. There is a partial adjustment effect that with higher underpricing , initial return will be higher. Spreads cause both the numerator and the dominator of the ratio of initial return over undepricing to increase. The ratio first widens due to higher bid-ask spreads. However, there is a reversion that the ratio of initial return over underpricing later shrinks when spreads are very high.

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Table 1

Sample distribution

The table illustrates the composition of the sample, which refers to the 164 initial public offerings carried out between October 2005 and December 2009 in Taiwan. Firms can choose to be listed on Taiwan Exchange Market (TWSE), or the over-the-counter (OTC) market.

	All IPOs		TWSE		OTC	
Number and % in year						
2005	6	3.66%	3	5.45%	3	2.75%
2006	36	21.95%	8	14.55%	28	25.69%
2007	50	30.49%	16	29.09%	34	31.19%
2008	34	20.73%	11	20.00%	23	21.10%
2009	38	23.17%	17	30.91%	21	19.27%
Total	164	100.00%	55	100.00%	109	100.00%
Number and % in Industry						
High-tech industry	130	79.27%				
Non high-tech industry	34	20.73%				

Table 2

Descriptive Statistics

This table presents descriptive statistics for 164 Taiwan operating firms with an IPO between October 2005 and December 2009. We define underpricing of offering range (*Ud1*) as the market price on the day before the offering range published day divided by the midpoint of the offering range price, minus one. Underpricing of offering day (*Ud2*) is defined as the midpoint of offering range price divided by the offering price, minus one. Underpricing (*Ud3*) is defined as the market price on the day before the offering price set day divided by the offering price, minus one. *Initial return* is the market price on the offering day divided by the offering price, minus one. *Initial return over underpricing ratio* is the ratio of initial return over underpricing. We have four after-market liquidity measurements: *quoted spread*, *quoted relative spread*, *effective spread*, and *effective relative spread*. We also decompose spread into *adverse selection cost* and *order processing cost*. *Days* is the number of days listed in the Emerging Stock Market. *Assets* are in millions of New Taiwan Dollars (NT$) prior to listing. *Age* is the number of years between incorporation and IPO. *VC ownership* is the percentage of shares held by insiders prior to listing. *Insider ownership* is the percentage of shares held by insiders prior to listing. *PE ratio* is the ratio of offering price over EPS. *Debt ratio* is the percentage of total assets/total debt prior to listing. *% of IPO shares* is the ratio of number of new offering shares over number of previous outstanding shares. *Overallotment share ratio* is the percentage of overallotment shares. *Overallotment shares exercised ratio* is the percentage of overallotment shares that underwriters traded on the first trading day. *% of shares traded by investment banks* is the percentage of shares that underwriter related dealers traded on the first trading day. *Market return* is the market returns during the one month prior the offering day.

Category	Variable	Mean	Median	Std Dev	Minimum	Maximum
Underpricing	Ud1	58.73%	43.72%	55.32%	-0.80%	465.22%
	Ud2	0.04%	0.00%	4.68%	-14.29%	11.76%
	Ud3	61.53%	45.74%	55.56%	-1.82%	443.48%
Initial performance	Initial return	59.99%	37.64%	80.84%	-10.00%	726.09%
	Initial return over underpricing ratio	86.81%	78.33%	64.22%	-157.89%	311.36%
Liquidity	Quoted spread	0.4230	0.2663	0.4367	0.0593	4.0073
	Quoted relative spread	0.0061	0.0054	0.0036	0.0017	0.0217
	Effective spread	0.3668	0.2260	0.3517	0.0572	2.8596
	Effective relative spread	0.0027	0.0024	0.0015	0.0008	0.0091
	Adverse selection cost	0.1363	0.1379	0.1680	-0.4243	0.9534
	Adverse selection cost in NT$	0.6161	0.6298	0.2568	-0.3620	1.3326
	Order processing cost	0.0015	0.0011	0.0026	-0.0064	0.0197
	Order processing cost in NT$	0.0060	0.0053	0.0039	-0.0089	0.0229
Firm characteristics	Days in the emerging stock market	778.62	570.00	495.00	265.00	2,429.00
	Assets (in NT$MM)	3,073.86	1,208.94	8,125.66	40.859	71,943.85
	Firm age	13.49	11.46	8.10	1.49	39.81
	VC ownership	7.98%	1.14%	12.48%	0.00%	72.22%
	Insider ownership	34.06%	29.71%	17.83%	10.85%	98.03%
	PE ratio	151.47	10.18	1724.77	1.85	22,100.00
	Debt ratio	35.79%	34.37%	16.12%	4.00%	85.89%
	% of IPO shares	21.81%	10.64%	67.79%	1.13%	838.29%
Overallotment	Overallotment share ratio	11.71%	14.96%	4.27%	0.00%	15.00%
	Overallotment shares exercised ratio	0.00%	0.00%	0.02%	0.00%	0.10%
	% of shares traded by investment banks	0.00%	0.00%	0.02%	-0.18%	0.06%
Market condition	Market return	0.83%	1.80%	7.90%	-20.42%	20.32%

Table 3

Mean test and Median test for difference between underpricing and initial return

Panel A, B, and C treat each difference as one observation. Panel A, B, and C reports the mean, median of each variable. *Ud1* is the underpricing of offering range, defined as the market price on the day before the offering range published day divided by the midpoint of the offering range price, minus one. *Ud2* is underpricing of offering day, defined as the midpoint of offering range price divided by the offering price, minus one. *Ud3* is underpricing, defined as the market price on the day before the offering price set day divided by the offering price, minus one. *Initial return* is the market price on the offering day divided by the offering price, minus one. In Panel A, B, and C, we use paired t-test for differences in means, and Wilcoxon signed rank test for differences in medians between groups. ***, **, and * denote the difference is significant at the 1, 5, and 10 percent level, respectively.

Panel A: Difference between underpricing (*Ud1*) and initial return

	Ud1	*Initial Return*	Difference
Mean (%)	58.73%	59.99%	-1.25%
Median (%)	43.72%	37.64%	6.08%
N	164	164	

Panel B: Difference between underpricing (*Ud2*) and initial return

	Ud2	*Initial Return*	Difference
Mean (%)	0.04%	59.99%	-59.94%
Median (%)	0.00%	37.64%	-37.64%***
N	164	164	

Panel C: Difference between underpricing (*Ud3*) and initial return

	Ud2	*Initial Return*	Difference
Mean (%)	61.53%	59.99%	1.55%
Median (%)	45.74%	37.64%	8.10%***
N	164	164	

Table 4

OLS regression for initial returns

The dependent variable is the initial return, calculated as the market price on the offering day divided by the offering price, minus one. *Ud1* is the underpricing of offering range, defined as the market price on the day before the offering range published day divided by the midpoint of the offering range price, minus one. *Ud2* is underpricing of offering day, defined as the midpoint of offering range price divided by the offering price, minus one. *Ud3* is underpricing, defined as the market price on the day before the offering price set day divided by the offering price, minus one. *Initial return is* the market price on the offering day divided by the offering price, minus one. *Days* is the number of days listed in the Emerging Stock Market. *Assets* are in millions of New Taiwan Dollars (NT$) prior to listing. *Age* is the number of years between incorporation and IPO. *VC ownership* is the percentage of shares held by insiders prior to listing. *Insider ownership* is the percentage of shares held by insiders prior to listing. *PE ratio* is the ratio of offering price over EPS. *Debt ratio* is the percentage of total assets/total debt prior to listing. *% of IPO shares* is the ratio of number of new offering shares over number of previous outstanding shares. *Overallotment share ratio* is the percentage of overallotment shares. *Overallotment shares exercised ratio* is the percentage of overallotment shares that underwriters traded on the first trading day. *% of shares traded by investment banks* is the percentage of shares that underwriter related dealers traded on the first trading day. *Market return* the market returns during the one month prior the offering day. *List dummy* equals one if the firm is listed on Taiwan Stock Exchange and zero otherwise. *High-tech dummy* equals one if the firm is categorized as in electronic sector by the exchange and zero otherwise. *Market return* is the market returns during the one month prior the offering day. ***, **, and * denote significance at the 1, 5, and 10 percent level, respectively.

	Model (1)		Model (2)		Model (3)		Model (4)		Model (5)		Model (6)	
	Estimates	t-value	Estimates	t-value	Estimates	t-value	Estimates	t-value	Estimates	t-value	Estimates	t-value
Ud1	1.1968	6.19***					1.1326	6.72***				
Ud2			2.3777	1.85					0.7306	0.67		
Ud3					1.2946	29.35***					1.2332	19.69***
Ln(days)							0.0241	0.44	0.1466	1.40	0.0204	1.15
Ln(age)							-0.2038	-1.14	-0.4597	-3.70**	-0.1801	-1.60
Ln(assets)							-0.0444	-1.27	-0.1228	-1.97	0.0030	0.08
VC ownership							-0.1929	-1.81	-0.5458	-2.60*	-0.2366	-1.11
PE ratio							0.0000	-0.14	0.0000	-1.64	0.0000	-0.64
Debt ratio							0.3531	3.59**	0.2990	1.26	0.1818	0.84
Insider ownership							-0.1057	-0.42	-0.0960	-0.34	-0.1616	-1.10

% of IPO shares							0.0378	1.90	0.0422	1.17	0.0630	2.40*
Overallotment share ratio							-2.3430	-4.17**	-1.4460	-0.79	-1.7870	-1.96
Overallotment shares exercised ratio							-21.6973	-0.09	-424.3921	-2.66*	203.2640	1.96
% of shares traded by investment banks							443.9766	4.42**	-47.1099	-0.21	220.7136	2.44*
LIST dummy							-0.0270	-0.38	0.0080	0.09	-0.0749	-0.96
High-tech dummy							-0.0972	-1.75	-0.4400	-1.71	-0.0929	-2.83**
Market return							1.7201	2.11	3.0982	2.07	1.3167	3.14**
Constant	-0.0772	-0.49	0.8851	242.90***	-0.2070	-5.53***	0.8304	3.35**	2.1833	2.68*	0.3641	1.33
Year dummy	yes		yes		yes		yes		yes		yes	
R^2	0.6639		0.0760		0.7722		0.7274		0.2916		0.8093	
N	164		164		164		164		163		163	

Table 5. OLS regression for the ratio of initial return over underpricing

The dependent variable is the ratio of initial return over underpricing. We use underpricing measure, *Ud3*, defined as the market price on the day before the offering price set day divided by the offering price, minus one.*Initial return is* the market price on the offering day divided by the offering price, minus one. The *quoted spread* is the mean of (At-Bt), and the *quoted relative spread* is expressed in percentage, as the mean of (At-Bt)/Mt, with Mt=(At+Bt)/2. The *effective spread* is the mean of 2|Pt-Mt|, and the *effective relative spread* is the mean of 2|ln(Pt/Mt)|. The *event period* comprises the first trading day. The *adverse selection cost* is the coefficient λ, using the regression $\Delta M_{t+1} = \lambda z_t + \varepsilon_{t+1}$, where $\Delta M_{t+1} = M_{t+1} - M_t$, with M_t The log quote midpoint at time t; $z_t = P_t - M_t$, with P_t the log trade price at time t. The *order processing cost* in the coefficient γ using the regression $\Delta P_{t+1} = -\gamma z_t + \mu_{t+1}$. Adverse selection cost and order processing cost measured in dollars are coefficients time mean $|z_t|$ time mean M_t . *Days* is the number of days listed in the Emerging Stock Market. *Assets* are in millions of New Taiwan Dollars (NT$) prior to listing. *Age* is the number of years between incorporation and IPO. *VC ownership* is the percentage of shares held by insiders prior to listing. *Insider ownership* is the percentage of shares held by insiders prior to listing. *PE ratio* is the ratio of offering price over EPS. *Debt ratio* is the percentage of total assets/total debt prior to listing. *% of IPO shares* is the ratio of number of new offering shares over number of previous outstanding shares. *Overallotment share ratio* is the percentage of overallotment shares. *Overallotment shares exercised ratio* is the percentage of overallotment shares that underwriters traded on the first trading day. *% of shares traded by investment banks* is the percentage of shares that underwriter related dealers traded on the first trading day. *Market return* the market returns during the one month prior the offering day. *List dummy* equals one if the firm is listed on Taiwan Stock Exchange and zero otherwise. *High-tech dummy* equals one if the firm is categorized as in electronic sector by the exchange and zero otherwise. *Market return* is the market returns during the one month prior the offering day. ***, **, and * denote significance at the 1, 5, and 10 percent level, respectively.

Panel A. Using spread as liquidity measures

	X is the quoted spread		X is the quoted relative spread		X is the effective spread		X is the effective related spread		
	Estimates	t-value	Estimates	t-value	Estimates	t-value	Estimates	t-value	s
X	0.4291	5.71***	-9.9259	-0.17	0.5833	5.46***	-7.8746	-0.05	
X^2	-0.0954	-4.31**	-497.6863	-0.19	-0.1755	-3.27**	-3030.2311	-0.18	
Ln(days)	0.2479	5.95***	0.2199	5.83***	0.2503	6.03***	0.2187	5.91***	
Ln(age)	-0.1794	-1.33	-0.1895	-1.37	-0.1770	-1.31	-0.1926	-1.39	
Ln(assets)	-0.0159	-0.30	-0.0360	-0.57	-0.0163	-0.31	-0.0313	-0.52	
VC ownership	0.0281	0.04	-0.0692	-0.10	0.0338	0.05	-0.0525	-0.08	
PE ratio	0.0000	-0.02	0.0000	0.65	0.0000	-0.10	0.0000	0.64	
Debt ratio	0.5685	1.92	0.3914	1.30	0.5782	1.92	0.4087	1.39	
Insider ownership	-0.2462	-1.45	-0.2491	-1.28	-0.2509	-1.53	-0.2521	-1.32	

% of IPO shares	0.1202	5.34***	0.1127	4.73***	0.1190	5.21***	0.1145	5.02***
Overallotment share ratio	-1.9519	-2.37*	-1.4739	-1.83	-1.9583	-2.48*	-1.5648	-1.89
Overallotment shares exercised ratio	-1361.0075	-5.28***	-1449.3554	-4.56**	-1344.5611	-5.23***	-1455.4223	-4.84***
% of shares traded by investment banks	-206.6518	-2.72*	-160.6686	-2.93**	-205.6954	-2.67*	-166.2993	-3.13**
LIST dummy	0.0425	0.82	-0.0058	-0.15	0.0397	0.70	0.0098	0.29
High-tech dummy	-0.1092	-1.46	-0.1502	-1.59	-0.1068	-1.43	-0.1456	-1.56
Market return	2.3346	6.67***	2.0193	5.76***	2.3069	6.52***	2.1305	7.04***
Constant	-0.2471	-0.59	0.3934	0.68	-0.2833	-0.69	0.3259	0.61
Year dummy	yes		yes		yes		yes	
R^2	0.3837		0.3704		0.3884		0.3670	
N	162		162		162		162	

Panel B. Decomposed spread as liquidity measures

	X is the adverse selection cost		X is the order processing cost		X is the adverse selection cost in $		X is the order processing cost in $		
	Estimates	t-value	Estimates	t-value	Estimates	t-value	Estimates	t-value	s
X	-0.4819	-2.05	0.7385	3.62**	-25.2050	-1.25	50.9215	3.84**	
X^2	1.2581	3.01**	-0.2106	-0.87	2237.9610	2.48*	-1239.8070	-1.29	
Ln(days)	0.2103	5.49***	0.1884	5.35***	0.2047	6.52***	0.2271	10.50***	
Ln(age)	-0.1754	-1.47	-0.1715	-1.51	-0.1857	-1.65	-0.1768	-1.59	
Ln(assets)	-0.0269	-0.52	-0.0515	-0.90	-0.0288	-0.59	-0.0177	-0.32	
VC ownership	0.1112	0.16	-0.0041	-0.01	0.0597	0.09	-0.0072	-0.01	
PE ratio	0.0000	0.34	0.0000	0.03	0.0000	0.40	0.0000	0.56	
Debt ratio	0.4446	1.66	0.5081	1.54	0.4347	1.58	0.5398	1.98	
Insider ownership	-0.2959	-1.40	-0.2293	-1.34	-0.2835	-1.31	-0.1841	-1.12	
% of IPO shares	0.1172	5.31***	0.1151	5.31***	0.1188	5.19***	0.1160	5.13***	
Overallotment share ratio	-2.0230	-1.96	-1.4643	-2.33*	-1.8255	-1.77	-1.6505	-2.27*	
Overallotment shares exercised ratio	-1442.2199	-4.98***	-1364.8223	-5.93***	-1445.7820	-5.44***	-1320.0720	-5.81***	
% of shares traded by investment banks	-207.7121	-2.91**	-207.3213	-4.38**	-187.9102	-3.70**	-225.7573	-4.41**	
LIST dummy	0.0527	1.35	0.0112	0.35	0.0416	1.16	0.0703	4.25**	
High-tech dummy	-0.1348	-1.40	-0.0998	-1.71	-0.1267	-1.44	-0.0550	-0.95	
Market return	2.4770	6.49***	2.0990	5.86***	2.3804	5.75***	2.3889	7.82***	
Constant	0.2624	0.67	0.1051	0.19	0.3338	0.94	-0.3154	-0.78	
Year dummy	yes		yes		yes		yes		
R^2	0.3819		0.3976		0.3701		0.3967		
N	162		162		162		162		

	Decomposed spread		Decomposed spread in $	
	Estimates	t-value	Estimates	t-value
λ	0.8957	2.43*	21.9565	1.22
γ	0.9230	5.08***	36.6755	3.89**
Ln(days)	0.1609	3.69**	0.2253	7.85***
Ln(age)	-0.1388	-1.03	-0.1677	-1.45
Ln(assets)	-0.0651	-1.21	-0.0103	-0.19
VC ownership	0.0363	0.06	0.0825	0.13
PE ratio	0.0000	0.19	0.0000	0.75
Debt ratio	0.5634	1.46	0.5698	2.00
Insider ownership	-0.2232	-1.31	-0.1851	-1.16
% of IPO shares	0.0977	4.04**	0.1132	4.93***
Overallotment share ratio	-1.4347	-2.56*	-1.9145	-2.20*
Overallotment shares exercised ratio	-1354.0856	-6.84***	-1348.4016	-5.64***
% of shares traded by investment banks	-206.0871	-2.84**	-231.3633	-3.37**
LIST dummy	0.0094	0.20	0.0951	2.40*
High-tech dummy	-0.1096	-1.96	-0.0341	-0.74
Market return	2.1116	10.41***	2.5718	8.85***
Constant	-0.0556	-0.12	-0.4066	-0.82
Year dummy	yes		yes	
R^2	0.4234		0.3989	
N	162		162	