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AUTHORS	Min-Hsien Chiang Chih-Hsien Lo

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ARE VENTURE CAPITALISTS ABLE TO CERTIFY INITIAL PUBLIC OFFERINGS? TESTING USING INTRADAY PRICE BEHAVIOR

Min-Hsien Chiang*, Chih-Hsien Lo**

Abstract

This study investigates the trading characteristics of the market microstructure of venture-backed initial public offerings using intraday data from the Taiwan's stock market. Previous studies have demonstrated that venture capitalists may fulfill a certification role and can reduce information uncertainty associated with initial public offerings. These studies also identified an adverse selection problem in which IPO firms with poor operating performances tend to seek venture capital support. The empirical results demonstrate no significant differences in relative effective spreads between venture-backed and non-venture-backed IPOs. The information asymmetry cost and the price volatility of venture-backed IPOs exceed those for non-venture-backed IPOs. Additionally, the degree of underpricing is found to be the main influence on the information asymmetry cost. Contrary to traditional venture capital studies, the results of this study indicate that the certification effect and monitoring services of venture capitalists do not prevail in the perception of market place in the new issue market in Taiwan.

Key words: information asymmetry; IPOs; venture capital.
JEL Classification: G14, G24.

1. Introduction

Initial public offering (IPO) is a method via which firms can raise capital by selling securities on public equity markets. However, the IPO process has been found to be characterized by information asymmetry. Restated, insiders in IPO firms have access to more information than public investors. To reduce this information asymmetry and ensure the success of an IPO, third-party certification is introduced. Wang et al. (2003) argued that certification is best performed by venture capitalists (VC) for two reasons. First, venture capitalists have good knowledge of the issuing firm because of having equity holdings and in many cases board seats, and enjoying longer and closer working relationships with the management team than do other financial intermediaries. Second, considerations of reputation can control possible false certification by venture capitalists.

Besides this certification role, venture capitalists also fulfill a monitoring role in companies they invest in. VC firms have an incentive to use various methods to monitor the companies they invest in and to control opportunistic behaviors because of the large investments they have made. The certification/monitoring roles of VC firms can add value to the IPO process, the post-IPO performance of the issuing company, and its long-term market performance (Barry et al., 1990; Megginson and Weiss, 1991; Jain and Kini, 1995; Brav and Gompers, 1997).

On the other hand, several authors have suggested that venture capitalists exert negative effects on IPO firms. Amit et al. (1990) identified an adverse selection problem in which less capable entrepreneurs involve venture capitalists in sharing business risks while more capable entrepreneurs manage their ventures without seeking external participation. Consequently, VC-backed firms may not perform well in terms of stock prices because of information asymmetry. Gompers (1996) proposed the "grandstanding hypothesis" regarding young VC firms, in which they have an incentive to signal their abilities to potential investors by launching their portfolio companies on public markets too soon. Thus, young VC firms may end up with poor performance owing to going public prematurely. The adverse selection/grandstanding effects generally exacerbate the information asymmetry problem existing between IPO firm insiders and public investors.

* Institute of International Business, National Cheng Kung University, Taiwan.
** National Cheng Kung University and Hsing Kuo University of Management, Taiwan.

Existing VC empirical studies generally use long-term accounting performance measures (for example, ROE or ROA) in developed markets[1] to study whether VC participation adds value to firms they invest in. By taking a different prospective from accounting measures, this study adopts market microstructure measures, including effective bid-ask spread, information asymmetry component of bid-ask spreads, and volatility to study whether VC participation helps alleviate information asymmetry during IPOs. As is well documented in the literature on market microstructure, bid-ask spreads and volatility in market prices increase with information asymmetry between insiders and outsiders. If the certification/monitoring effects are stronger than the adverse selection/grandstanding effects, reducing information asymmetry in the market place, the bid-ask spreads and volatility will be smaller in venture-backed IPOs than non-venture-backed IPOs. Otherwise, the bid-ask spread and volatility are much higher if the certification/monitoring effects are dominated by adverse selection/grandstanding effects. Furthermore, the price formation and information assimilation processes in venture-backed IPOs can be clarified by examining market microstructure data, since the trading mechanism and regulatory structure in stock markets are believed to impact investor behavior (O'Hara, 1997; Madhavan, 2000).

This study selected Taiwan as the research setting, an emerging market with less than 20 years of VC history. The first venture capital investment company in Taiwan was established in 1984 and expanded to control 188 billion New Taiwan dollars by 2005[2]. Owing to the lack of research attention paid to the role of venture capitalists in emerging markets, the rapidly growing Taiwan venture capital market is chosen as the focus of this study.

Empirical results demonstrate that relative effective spreads, information asymmetry costs, and volatility of venture-backed IPOs are no smaller than those of non-venture-backed IPOs. The degree of information asymmetry of venture-backed IPOs perceived by the market thus is no smaller than that of non-venture-backed IPOs. Restated, the certification/monitoring effect of venture capitalists is not stronger than the adverse selection/grandstanding effect on the Taiwan's stock market. Although both the certification/monitoring effect and the adverse selection/grandstanding effect exist, the positive certification/monitoring effect on IPO of venture capitalists is mostly offset by the negative adverse selection/grandstanding effect.

The remainder of this paper is organized as follows. Section 2 reviews the literature on the certification/monitoring and adverse selection/grandstanding roles of venture capitalists. The market microstructure literature regarding information asymmetry, bid-ask spread, information asymmetry costs, and price volatility is also briefly summarized. The hypotheses we are interested in testing are also established. Section 3 then outlines the data and research methodology employed in this study. Section 4 summarizes and discusses empirical results, and finally Section 5 presents conclusions.

2. Literature Review and Hypotheses

This section reviews the literature and develops the hypotheses to be tested.

2.1. The Roles of Venture Capitalists

The IPO process is characterized by information asymmetry. To avoid information asymmetry causing market breakdown, VC firms certify the companies they invest in to try and ensure the IPO is successful. The certification role played by VC firms in the IPO process is designed to reduce information asymmetry between corporate insiders and public investors. Besides certification, VC firms also fulfill a monitoring role. VC firms are actively involved in managing the ventures they invest in because of their large shareholdings and positions on directorships. Sahlman (1990) proposed that venture capital is a professionally-managed pool of capital invested in firms during their early stages in an effort to achieve high returns. Venture capitalists usually can screen several investment proposals before deciding which firms to invest in using their specialized skills and competence. Furthermore, venture capitalists have better ability to monitor firm operations than general public investors. The abilities of venture capitalists to certify IPO firm quality reduce in-

[1] To our knowledge, only Wang et al. (2003) studied the participation of venture capitalists in an emerging market, Singapore.

[2] These figures are obtained from the Taiwan Venture Capital Association.

formation asymmetry between corporate insiders and public investors. Amit et al. (1998) contended that venture capitalists are skilled at selecting high-quality firms and provide firms with value-enhancing recommendations. Since information asymmetry is perceived as costly, venture capitalists prefer to select firms with low information asymmetry costs. Consequently, firms with venture capitalist participation tend to have a smaller information asymmetry problem.

Several studies regarding U.S. firms have empirically supported the certification/monitoring role of venture capitalists in IPOs. Barry et al. (1990) indicated that venture capitalists provide intensive monitoring services in IPOs, reducing the agency cost residing in an IPO firm. Megginson and Weiss (1991) reported that the certification role of venture capitalists reduces information asymmetry between issuing firms and investors. IPOs backed by VC firms can have lower underpricing because venture capitalists are frequently actively involved in managing the entrepreneurial ventures they invest in. In a study of the quality of venture-backed IPO firms and non-venture-backed IPO firms, Jain and Kini (1995) found that the participation of venture capitalists in venture-backed IPOs signals good firm quality and displays superior post-issue operating performance. Furthermore, Brav and Gompers (1997) demonstrated that the long-run performance of venture-backed IPOs is better than that of non-ventured-backed IPOs.

Despite the information asymmetry between corporate insiders and public investors, information asymmetry also exists between entrepreneurs seeking outside funding and VC firms. Amit et al. (1990) proposed a theoretical model and demonstrated that best entrepreneurial ventures are self-funded, but that venture capitalists may fund average ventures owing to the same pricing for all "lemons" in the VC market. Less capable entrepreneurs tend to involve venture capitalists to share the risk while more capable entrepreneurs tend not to seek external participation. Thus, the quality of VC-backed firms may be poor because of information asymmetry between entrepreneurs and venture capitalists. Besides the adverse selection effect, Gompers (1996) proposed a "grandstanding hypothesis" regarding young VC firms. New venture capitalists need good records, for example participation in IPOs, to improve their image, and aggregate reputation in the capital market, increasing the likelihood of success in new fundraising. Consequently, new venture capitalists have a strong incentive to signal their ability to potential investors by bringing entrepreneurial ventures to market sooner than veteran VC firms. The participation of inexperienced young VC firms thus negatively impacts the IPO process. Wang et al. (2003) studied the relationship between long-term venture performance and participation by venture capitalists, and confirmed the "grandstanding hypothesis".

The relationship between the information uncertainty regarding IPO firms perceived by outside investors and the roles played by VC firms can be summarized as follows. During the IPO process, outside investors are uncertain of IPO firm quality. Participation by venture capitalists signals to the market place that the ventures invested in are of good quality, alleviating the information asymmetry between corporate insiders and outside investors. However, if the adverse selection/grandstanding roles exist, venture capitalist participation will not signal good IPO firm quality. To summarize, information asymmetry between corporate insiders and outside investors is lower for VC-backed IPOs than for non-VC-backed IPOs if the certification/monitoring effects outweigh the adverse selection/grandstanding effects. In contrast, if the selection/grandstanding effects outweigh the certification/monitoring effects, the degree of information asymmetry between corporate insiders and outside investors of VC-backed IPOs exceeds that for non-VC-backed IPOs.

2.2. Market Microstructure

Generally, the degree of information asymmetry perceived by the market place for new listings can be measured based on the bid-ask spread. The greater the public uncertainties regarding the true value of an IPO, the greater the benefits for informed traders with superior information. This phenomenon tends to widen bid-ask spreads. It is well documented in market microstructure models that bid-ask spreads compensate market makers for information asymmetry risk. Copeland and Galai (1983) and Glosten and Milgrom (1985) proposed theoretical models associating bid-ask spreads with information asymmetry. Their models assume that market makers confront two types of traders – informed traders and uninformed traders. Since informed traders possess superior information, market makers expect losses when trading against them and thus widen the bid-ask spread. On the other hand, when

trading with an uninformed trader, a market maker reduces the bid-ask spread in the expectation of trading gains. Market makers thus face an adverse selection problem provided that they are unaware whether a trader possesses private information. The objective of a market maker is to optimize the bid-ask spread so as to maximize profits. Hence, the bid-ask spread reflects asymmetric information risk. Given higher information asymmetry and uncertainty in the market about a firm's true value, firms' stocks will be susceptible to experience wider bid-ask spreads than stocks of other firms with less information asymmetry and uncertainty.

Numerous empirical studies have demonstrated that the information asymmetry cost comprises a large component of the bid-ask spread. For example, Stoll (1989) estimated the percentage of the information asymmetry cost to be approximately 43% of the bid-ask spread for NASDAQ traded stocks. Moreover, Lin et al. (1995) reported that the information asymmetry component was approximately 35% of the bid-ask spread for NYSE traded stocks. Furthermore, in a study of the Hong Kong Stock Exchange Brockman and Chung (1999) found that the cost of information asymmetry was approximately 33%. Menyah and Paudyal (2000) also found that the information asymmetry cost of the London Stock Exchange was approximately 47% of the bid-ask spread on average. Because of certification by venture capitalists, venture-backed IPOs should have lower asymmetric information costs and thus relatively lower bid-ask spreads than non-venture-backed IPOs. Additionally, if information regarding the IPO value of a firm is less transparent, then the dispersion of beliefs the value of the IPO on the capital market should be greater.

Shalen (1993) demonstrated that price volatility is related to the dispersion of expectations regarding future market prices and can provide an effective proxy for the information asymmetry. Uninformed traders with more divergence in opinions may increase volatility. If venture capitalists can reduce this information asymmetry by certifying the quality of new issues, the price volatility of venture backed IPOs can be reduced.

2.3. Hypotheses

Since the information asymmetry perceived in the market place is smaller if the certification/monitoring effects exceed the adverse selection/grandstanding effects, the bid-ask spread, information asymmetry cost, and volatility of venture-backed IPOs are lower than for non-venture-backed IPOs. The following hypotheses are then developed to test the effects of the participation of venture capitalists in IPOs.

Hypothesis 1: If the certification/monitoring effects outweigh the adverse selection/grandstanding effects, the bid-ask spread for venture-backed IPOs will be lower than for non-venture-backed IPOs.

Hypothesis 2: If the certification/monitoring effects outweigh the adverse selection/grandstanding effects, the information asymmetry cost for venture-backed IPOs will be lower than for non-venture-backed IPOs.

Hypothesis 3: If the certification/monitoring effects outweigh the adverse selection/grandstanding effects, the volatility for venture-backed IPOs will be lower than for non-venture-backed IPOs.

3. Data Description and Methodology

3.1. Data Description

The sample period runs from April 1, 1999 to March 1, 2002 and the sample stocks comprise newly-listed issues on the Taiwan Stock Exchange and the Over-the-Counter Market[1]. Information on the number of venture capital firms invested in a company, the proportion of equity shares owned by venture capitalists, and the offer price is obtained from the offering prospectus of each IPO firm. Furthermore, intraday data of trading prices, trading volumes, and bid and ask prices are obtained from the Taiwan Economic Journal Databank. Following careful data screening to filter out recording errors and missing data, the final sample comprised 34 venture-backed

[1] The intraday data of the Taiwan's OTC market date back to March 24, 1999. Therefore, the sample data are gathered starting from April 1, 1999.

newly-listed firms. Each venture-backed IPO was matched to a control sample of non-venture-backed IPO in terms of their industry, market size, and IPO timing. Therefore, 34 non-venture-backed IPOs are selected for comparisons.

The sample mostly comprised high-tech firms. For example, 94% of IPO firms are in the electronic parts and accessories industry. This finding is consistent with the argument of Amit et al. (1998) and Lee and Wahal (2004) that venture capitalists are more significant in industries with greater information asymmetry, such as biotechnology and computer software. Venture capitalists thus congregate in industries characterized by greater information asymmetry and provide funds to firms in technology-intensive industries. This phenomenon implies the existence of a strong industry effect in venture capital investment.

Table 1 lists the average value of several sample firm characteristics. Notably, venture-backed IPOs generally have a higher average offer price than non-venture-backed IPOs. In contrast, the average offer size of venture-backed IPOs is smaller than for non-venture-backed IPOs. Additionally, an average of 2.3 venture capitalists participates in every IPO firm. Furthermore, the average proportion of equity shares owned by all venture capitalists prior to an IPO is 9.43%, which is much smaller than in developed venture capital markets. For example, Barry et al. (1990) and Megginson and Weiss (1991) reported that the average proportion of pre-IPO equity holdings of all venture capitalists ranged from 34.3% to 36.6%. Moreover, Wang et al. (2003) showed that the average equity stake holding of venture capitalists before IPO issue in Singapore was 17.6%. It is widely recognized that the monitoring extended to a firm will increase with the equity stake held by a blockholder in that firm. Based on the relatively low participation of venture capitalists in Taiwan it might be expected that the monitoring role played by venture capital in Taiwan is less prominent than in more developed venture capital markets.

Table 1

Descriptive statistics of venture-backed and non-venture-backed IPOs

	VC	NVC
Offer size	NT$ 370.8M	NT$ 467.4M
Offer price	NT$ 47.88	NT$ 43.20
Underpricing[1]	2.86%	2.28%
Average number of venture capitalists participating in an IPO firm	2.3	
Average proportion of equity shares owned by venture capitalists	9.43%	

Notes: VC represents venture-backed IPOs; NVC represents non-venture-backed IPOs. NT: New Taiwan Dollar; M: million. [1] Underpricing is defined as the division of the difference between the closing price of the first trading day and the offer price.

In Table 1, the degree of underpricing is defined as the difference between the closing price of the first trading day and the offer price over the offer price in an IPO. Fundamentally, based on the certification hypothesis proposed by Megginson and Weiss (1991), the participation of venture capitalists in IPOs can lower the costs of going public and reduce underpricing. Furthermore, Barry et al. (1990) stressed that the monitoring services served by venture capitalists also help minimize underpricing. However, Lee and Wahal (2004) reported that venture-backed IPOs generally display higher underpricing than non-venture-backed IPOs. They found that some disreputable venture capitalists are willing to bear higher underpricing to build their own reputa-

tion and help raise capital in future. As shown in Table 1, the average underpricing of venture-backed IPOs is 2.86%, exceeding the 2.28% for non-venture-backed IPOs on the Taiwan's stock market. These figures are consistent with the finding of Lee and Wahal (2004) that venture capitalists participating in IPOs on the Taiwan's stock market appear to have a propensity to attempt to raise future capital rather than monitoring or certifying IPO firms at first glance.

3.2. Research Methodology

Besides underpricing, this study adopts several microstructure measures to capture the degree of information asymmetry in the IPO process, including the effective bid-ask spread, the information asymmetry component of the bid-ask spread and volatility, which are discussed later. Subsequently, a regression model is designed to test whether venture capitalist characteristics are a significant factor in reducing information asymmetry during IPOs.

3.2.1. Effective Bid-Ask Spread

The bid-ask spread is the difference between the lowest available ask price and the highest available bid price. Demsetz (1968) suggested that the bid-ask spread is the reward given to market makers for providing trading immediacy in the market. The bid-ask spread thus is one of the main transaction costs faced by investors in securities markets. According to Hebb and MacKinnon (2004), the effective spread, $S_{i,d}$, and the relative effective spread, $RS_{i,d}$, are calculated as follows:

$$S_{i,d} = 2\times | P_{i,d} - MP_{i,d} |,$$

$$RS_{i,d} = \frac{2\times | P_{i,d} - MP_{i,d} |}{MP_{i,d}}, \tag{1}$$

where $P_{i,d}$ denotes the closing price of firm *i* on day *d*, and $MP_{i,d}$ represents the midpoint of the bid-ask spread, defined as $(ask_{i,d} + bid_{i,d})/2$. The terms of $ask_{i,d}$ and $bid_{i,d}$ represent the closing ask price and closing bid price of firm *i* on day *d*, respectively.

3.2.2. Information Asymmetry Component of the Bid-Ask Spread

The information asymmetry component of the bid-ask spread is the compensation to market makers for trading with informed traders who possess superior information. Consequently, market makers widen the bid-ask spread upon perceiving increased information asymmetry.

This study adopts the method of George et al. (1991) to measure the information asymmetry cost of the bid-ask spread. The informational asymmetry cost, defined as $\phi_{i,d} = 1 - \pi_{i,d}$, indicates the proportion of the bid-ask spread resulting from information asymmetry of a stock *i* on day *d*, and $\pi_{i,d}$ is the proportion of the bid-ask spread resulting from causes other than information asymmetry. $\pi_{i,d}$ can be expressed as follows:

$$\pi_{i,d} = \frac{2\sqrt{-Cov(RD_{i,t}, RD_{i,t-1})}}{S_{i,d}}, \tag{2}$$

where $RD_{i,t} = R_{iTt} - R_{iBt}$, R_{iTt} denotes the 10-minute intraday return of firm *i* based on transaction price *T* at time interval between times (*t* - 1) and *t*, R_{iBt} represents the 10-minute intraday return calculated from bid prices *B*, $S_{i,d}$ is the mean average of the bid-ask spread of 27 10-minute intervals sampled daily for firm *i* , and $Cov(RD_{i,t}, RD_{i,t-1})$ represents the serial covariance of $RD_{i,t}$.

3.2.3. Volatility

The traditional approach to calculating variation in security price returns uses daily closing prices. However, Garman and Klass (1980) (GK) formulated an improved estimator of security price volatility. Garman and Klass proposed a volatility measure that considers current high (H), low (L), opening (O), and closing (C) prices given the assumption that the logarithm of stock prices follows the Brownian motion without drift. The GK volatility measure thus contains more price volatility information than numerous volatility estimators that only consider closing prices. This study adopts the volatility measure of Garman and Klass (1980) to estimate daily volatilities of each IPO firm. Finally, the GK volatility measure can be constructed via the following formula[1]:

$$\sigma_{i,d}^2 = 0.511(a-b)^2 - 0.019[x(a+b) - 2ab] - 0.383x^2 , \quad (3)$$

where $a = \ln(H/O)$, $b = \ln(L/O)$, and $x = \ln(C/O)$, and $\sigma_{i,d}^2$ represents the volatility of firm *i* on day *d*. The coefficients in Eqn. (3) are set such that the estimator has minimum variance and is unbiased, as detailed in Garman and Klass (1998).

3.2.4. Regression Model

If venture capitalists can reduce information asymmetry between issuing firms and public investors, the bid-ask spread, informational asymmetry cost, and volatility will be lower. The characteristics related to venture capitalists thus may be possible key factors affecting the microstructure characteristics. To further test those influences on the bid-ask spread, information asymmetry and volatility, this study adopts the following cross-sectional regression:

$$\begin{aligned} Y_i = {} & \alpha_0 + \alpha_1 VC_i + \alpha_2 Board_i + \alpha_3 Number_i + \alpha_4 Share_i + \alpha_5 Underpricing_i \\ & + \alpha_6 \ln Size_i + \alpha_7 (1/TimeSpan_i) + \alpha_8 Earning_i + \alpha_9 NTrade_i + \varepsilon_i \end{aligned} \quad (4)$$

where, Y_i represents the means of bid-ask spreads (RS_i), information asymmetry (ϕ_i), or volatility (σ_i^2) from days 4 to 30; VC_i is a dummy variable with the value of 1 given venture capital participation and 0 otherwise; $Board_i$ is a dummy variable with the value of 1 if the venture capitalist has seats on the board and 0 otherwise; $Share_i$ represents the proportion of firm equities owned by venture capitalists; $Number_i$ denotes the number of venture capitalists investing in the new firms; $Underpricing_i$ represents the difference between the closing price on the first trading day and the offer price over the offer price in an IPO; $\ln Size_i$ is the logarithm of the market value of total firm equities; $1/TimeSpan_i$ denotes a reciprocal of time span that is the difference between the year of establishment and year of listing of a firm; $Earning_i$ represents the earnings per share during the year before going public divided by the average closing price on the first day; finally, $NTrade_i$ represents the average number of trades from days 4 to 30 following the IPO issuing date.

[1] This measure is termed the best analytic scale-invariant estimator in Garman and Klass (1980).

4. Empirical Results

4.1. Comparison of Market Microstructure between Venture-Backed and Non-Venture-Backed IPOs

This section analyzes the differences between venture-backed and non-venture-backed IPOs in terms of relative effective spreads, information asymmetry costs, and volatility using the non-parametric Mann-Whitney U test and the traditional *t*-test.

Table 2

Relative effective spread differences between venture-backed and non-venture-backed IPOs

	Venture-backed	Non-venture-backed	Between-group difference[1]
Panel A: Daily measure			
Day 4	0.0033	0.0047	-0.7564 (-0.6260)
Day 5	0.0077	0.0075	0.0861 (0.0409)
Day 6	0.0054	0.0103	-0.7924 (-1.0899)
Day 7	0.0124	0.0068	1.0505 (1.3264)
Day 8	0.0117	0.0105	0.8104 (0.2683)
Day 9	0.0073	0.0130	-1.9748[2] (-1.1138)
Day 10	0.0066	0.0134	-1.3328 (-1.6901)
Panel B: Interval measure			
Days 4-10	0.0079	0.0093	-0.5683 (-0.6655)
Days 11-20	0.0090	0.0101	0.1894 (-0.5563)
Days 21-30	0.0088	0.0079	0.6372 (0.6139)

Notes: [1] Z-statistics of Mann-Whitney U test; *t*-statistics are reported in parentheses. [2] represents significance levels at 10%, 5%, and 1%, respectively.

Table 2 lists relative differences in effective spreads between venture-backed and non-venture-backed IPOs. In Panel A, the sample averages of daily relative effective spreads are reported since day 4 through 10 after the IPO issuing date[1]. Panel B lists the averages of the relative effective spreads for intervals. This study finds no significant differences in relative effective spreads between venture-backed and non-venture-backed IPOs, except on day 9. On day 9, the relative effective spread of venture-backed IPOs is considerably smaller than that of non-venture-backed IPOs. However, no clear pattern exists for the relative effective spreads of venture-backed IPOs being smaller than of non-venture-backed IPOs. Observing the comparison results of the relative effective spreads for three time intervals reveals that the relative effective spreads of ventured-backed IPOs are smaller on Days 4 to 10 and Days 11 to 20, while the relative effective

[1] Generally speaking, there is a honeymoon period in Taiwan's new issue market for which the stock price cannot completely react to the intrinsic value of the issuing firm due to the price limit installed in the Taiwan's stock market. Therefore, we construct variables from day 4 after going public in order to alleviate the honeymoon effects in Taiwan's IPOs.

spreads of non-ventured-backed IPOs are smaller on Days 21 to 30. Consequently, the empirical results of relative effective spreads do not support Hypothesis 1 that IPO issuance with venture capitalists reduces information asymmetry. However, venture-backed IPOs still have smaller relative effective spreads for the first few days following the issuing day.

Table 3

Informational asymmetry differences between venture-backed and non-venture-backed IPOs

	Venture-backed	Non-venture-backed	Between-group difference[1]
Panel A: Daily measure			
Day 4	0.2816	0.3407	0.1440 (-0.2365)
Day 5	0.3751	0.3760	-0.1205 (-0.0077)
Day 6	0.4248	0.4540	-0.1801 (-0.2133)
Day 7	0.5637	0.4099	1.6705[2] (1.3321)
Day 8	0.4355	0.4115	-0.0360 (0.2066)
Day 9	0.4196	0.3545	0.6230 (0.5153)
Day 10	0.4948	0.4734	-0.5138 (0.1521)
Panel B: Interval measure			
Days 4-10	0.4289	0.3960	0.7758 (0.5901)
Days 11-20	0.4757	0.5049	-1.0160 (-0.7891)
Days 21-30	0.5378	0.3512	0.9471 (1.1667)

Notes: 1 Z-statistics of Mann-Whitney U test; t-statistics are reported in parentheses. 2 represents statistical significance at 10% level

Table 3 lists the empirical results exhibiting the comparisons of information asymmetry costs between venture-backed and non-venture-backed IPOs. Generally, the information asymmetry cost of venture-backed IPOs is not smaller than of non-venture-backed IPOs, except for the few days following the issuing date. Empirical results of interval measures on Panel B in Table 3 also reveal that the information asymmetry cost of venture-backed IPOs is not significantly smaller than of non-ventured-backed IPOs. Consequently, Hypothesis 2 is not supported.

Regarding the volatility comparisons, the volatility of venture-backed IPOs is generally significantly larger than that of non-venture-backed IPOs, though the difference is minimal. Additionally, the volatility for venture-backed IPOs also exceeds that for non-venture-backed IPOs by interval measure comparisons, as illustrated in Panel B of Table 4. Consequently, Hypothesis 3 is not supported. Coupled with empirical results found in the relative effective spreads and information asymmetry costs, this study suggests that the certification/monitoring effect of venture capitalists does not dominate the adverse selection/grandstanding effect on the Taiwan's stock market.

The study results demonstrate that the degree of information asymmetry of venture-backed IPOOs perceived by the market is not smaller than for non-venture-backed IPOs in terms of relative effective spreads, information asymmetry costs, and volatility.

Table 4

Price volatility differences between venture-backed and non-venture-backed IPOs

	Venture-backed	Non-venture-backed	Between-group difference[1]
Panel A: Daily measure			
Day 4	0.0042	0.0043	1.0086 (-0.0061)
Day 5	0.0033	0.0025	0.6716 (0.8104)
Day 6	0.0040	0.0033	0.6664 (0.5809)
Day 7	0.0034	0.0033	0.2238 (0.0451)
Day 8	0.0039	0.0029	0.3602 (1.0273)
Day 9	0.0032	0.0033	-1.1517 (-0.0347)
Day 10	0.0022	0.0019	0.4322 (0.4890)
Panel B: Interval measure			
Days 4-10	0.0034	0.0030	0.6372 (0.4969)
Days 11-20	0.0029	0.0023	1.3260 (1.3505)
Days 21-30	0.0027	0.0025	0.7405 (0.3848)

Notes: [1] Z-statistics of Mann-Whitney U test; t-statistics are reported in parentheses.

The empirical results indicate that the reduction of information asymmetry because of the certification/monitoring effect of venture capitalists on IPOs can be largely offset by the adverse selection/grandstanding effect of venture capitalists.

4.2. Cross-Sectional Analysis of Influences on Relative Spreads, Informational Asymmetry, and Volatility

To understand the influences on relative effective spreads, information asymmetry and volatility, this study also investigates key characteristics associated with IPOs. Table 5 lists the estimation results for the relationship between relative effective spreads and factors associated with IPO characteristics. Consistent with the results presented in previous subsections, venture capitalists do not significantly affect relative effective spreads. Consequently, the relative effective spreads are not influenced by any IPO characteristics, and thus Hypothesis 1 is not supported. This may be due to the particular characteristics of the Taiwan's stock market, specifically the domination by individual investors. The bid-ask spreads on the Taiwan's stock market is insensitive to stock price information since most individual investors are uninformed.

Table 6 lists the estimation results for the relationship between information asymmetry costs and factors associated with IPO characteristics. Model 2 indicates that venture capitalists on the board of directors positively impact the information asymmetry cost. This finding is consistent with the empirical evidence presented above that the information asymmetry of venture-backed IPOs is generally not smaller than that of non-venture-backed IPOs. Consequently, Hypothesis 2 is not supported. Table 6 also shows that larger firms have lower information asymmetry costs during IPOs since the information within larger firms is relatively transparent. The information asymmetry cost is positively influenced by the degree of underpricing, supporting the information

asymmetry hypothesis of IPOs that IPO issuers are willing to accept a lower price when their uncertainty about the market demand conditions is larger (Beatty and Ritter, 1986; Michaely and Shaw, 1994).

Table 5

Cross-sectional analysis of factors affecting the relative effective spread

	Model 1	Model 2	Model 3	Model 4	Model 5
Independent Variables					
VC	0.1501 (0.7883)				0.3988 (1.0484)
Boards		0.1115 (0.5422)			0.0355 (0.1172)
Number			-0.0378 (-0.1767)		-0.3703 (-1.0823)
Shares				0.0697 (0.3458)	-0.0309 (-0.0964)
Underpricing	0.1978 (1.0164)	0.2073 (1.0624)	0.2202 (1.0814)	0.1954 (0.9750)	0.2775 (1.2900)
ln(size)	-0.2329 (-0.9414)	-0.2708 (-1.1122)	-0.2869 (-1.1198)	-0.2625 (-1.0659)	-0.3015 (-1.1243)
1/TimeSpan	-0.0443 (-0.2163)	-0.0646 (-0.3033)	-0.0173 (-0.0760)	-0.0553 (-0.2574)	0.1064 (0.4086)
Earning	0.0831 (0.4027)	0.0707 (0.3357)	0.0158 (0.0763)	0.0536 (0.2561)	0.0566 (0.2579)
NTrade	-0.0274 (-0.1183)	0.0146 (0.0622)	0.0008 (0.0038)	-0.0016 (-0.0069)	0.0130 (0.0497)

Notes: *VC* is a dummy variable taking the value of 1 if there is venture capital participation and 0 otherwise. *Board* is a dummy variable taking the value of 1 if the venture capitalist holds the board seat and 0 otherwise. *Share* represents the share proportion of a firm's equity owned by venture capitalists. *Number* is the number of venture capitalists participating in the new firm. *Underpricing* is the division of the difference between the closing price of the first trading day and the offer price over the offer price in an IPO. ln *Size* is the logarithm of the market value of a firm's total equities. 1/*TimeSpan* is a reciprocal of time span that is the difference between the established year and the listing year of a firm. *Earning* represents the earnings per share in the preceding year before going public divided by the average of the first day's closing prices. *NTrade* represents the average number of trades from day 4 to day 30.

Table 7 also reveals that venture capitalists do not significantly influence new issuing firm volatility. Consequently, Hypothesis 3 is not supported. While previous studies indicate that venture capitalists reduce the information asymmetry costs of going public in developed markets, the empirical results on the Taiwan's stock market do not support an information asymmetry reduction effect in venture capitalist participation in IPOs. Therefore, the monitoring effect of venture capitalists does not exist in new issuing firms on the Taiwan's stock market.

Table 6

Cross-sectional analysis of factors affecting the informational asymmetry

	Model 1	Model 2	Model 3	Model 4	Model 5
Independent Variables					
VC	0.2188 (1.5130)				0.1785 (0.6604)
Boards		0.3324[1] (2.2402)			0.3660 (1.6979)
Number			0.0467 (0.2797)		-0.3752 (-1.5424)
Shares				0.1847 (1.19961)	0.0717 (0.3138)
Underpricing	0.3558[1] (2.4086)	0.3650[1] (2.5912)	0.3623[1] (2.2783)	0.3345[1] (2.1862)	0.4299[1] (2.8108)
ln(size)	-0.5338[2] (-2.8428)	-0.5851[2] (-3.3297)	-0.5763[2] (-2.8802)	-0.5639[2] (-3.0000)	-0.6583[2] (-3.4528)
1/TimeSpan	0.1956 (1.2581)	0.1200 (0.7801)	0.1889 (1.0597)	0.1546 (0.9419)	0.2472 (1.3358)
Earning	0.1692 (1.0802)	0.2161 (1.4217)	0.1042 (0.6411)	0.1567 (0.9802)	0.1992 (1.2762)
NTrade	-0.0659 (-0.3752)	0.0271 (0.1605)	-0.0442 (-0.2397)	-0.0227 (-0.1282)	0.0850 (0.4550)

Notes: The notations are the same as those in Table 5. [1] and [2] represent statistical significance at 5% and 1% level, respectively.

Table 7

Cross-sectional analysis of factors affecting the price volatility

	Model 1	Model 2	Model 3	Model 4	Model 5
Independent Variables					
VC	0.1425 (0.8566)				-0.3375 (-1.0632)
Boards		0.3032 (1.7709)			0.3571 (1.4107)
Number			0.2047 (1.1171)		0.0861 (0.3014)
Shares				0.2526 (1.4846)	0.2601 (0.9701)
Independent Variables					
Underpricing	0.1171 (0.6890)	0.1207 (0.7424)	0.0766 (0.4395)	0.0748 (0.4426)	0.0696 (0.3879)
ln(size)	-0.3192 (-1.4774)	-0.3505 (-1.7288)	-0.2848 (-1.2989)	-0.3180 (-1.5316)	-0.3690 (-1.6482)
1/TimeSpan	0.2664 (1.4888)	0.1936 (1.0908)	0.1832 (0.9378)	0.2000 (1.1027)	0.0842 (0.3878)
Earning	-0.0797 (-0.4421)	-0.0160 (-0.0916)	-0.0657 (-0.3686)	-0.0394 (-0.2232)	0.0039 (0.0215)
NTrade	0.6197[1] (3.0641)	0.6967[1] (3.5656)	0.6006[1] (2.9714)	0.6568[1] (3.3490)	0.7553[1] (3.4439)

Notes: The notations are the same as those in Table 5. [1] represents statistical significance at 1% level.

5. Conclusion

This study examines whether venture capital participation in new issuing firms is able to reduce information asymmetry between corporate insiders and public investors using intraday data from the Taiwan's stock market. While numerous venture capital studies focus on developed markets, this study focuses on an emerging market. This study finds insignificant differences in relative effective spreads between venture-backed and non-venture-backed IPOs. The information asymmetry cost of venture-backed IPOs is no smaller than that for non-venture-backed IPOs. Furthermore, the price volatility of venture-backed IPOs exceeds that of non-venture-backed IPOs. Hence, the empirical results demonstrate that the reduction of information asymmetry due to venture capitalists' certification/monitoring effect on IPO can be largely offset by the adverse selection/grandstanding effect of venture capitalists. Furthermore, this study finds that the underpricing positively influences the informational asymmetry cost. Since venture-backed IPOs have larger underpricing than non-venture-backed IPOs, the information asymmetry costs of venture-backed IPOs exceed those of non-venture-backed IPOs. Consequently, venture capitalists cannot reduce the information asymmetry cost between informed and uninformed investors. These findings differ from previous studies examining venture capital in developed markets.

The discrepancy between the findings of this and previous may have several causes. First, the involvement of venture capitalists in Taiwanese IPO firms is relatively low. The average proportion of equity owned by all venture capitalists prior to IPOs is 9.43%, which is well below the 34.3% reported in Barry et al. (1990) for U.S. IPOs between 1978 and 1987. Therefore, venture capitalists cannot provide intensive monitoring for IPO firms. Second, venture capital has a relatively short history in Taiwan. Grandstanding motives may lead venture capitalists to participate in IPOs to cultivate good public image and facilitate the raising of future capital inflows, more than to help the IPO firm grow. Overall, the Taiwan's stock market does not display certification and monitoring effects of venture capitalists. This finding improves understanding of the study of venture capital in emerging markets. Third, individual investors dominate trading activity on the Taiwan's stock market, increasing the difficulties for venture capitalists to reduce information asymmetry in IPOs (Chen et al., 2002). Consequently, venture capitalists do not perform to their full potential in terms of reducing information asymmetry in the Taiwan stock market.

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