Long Abstract

Proposed title: *Venture Capital and IPO*

Tarek MILOUD
INSEEC Business School
Savoie Technolac
12, avenue Lac d'Annecy
73 381 Le Bourget du Lac Cedex – France
E-mail: tmiloud@gmail.com
Tel.: +33 (0)4 79 25 38 53; Fax: +33 (0)4 79 25 33 54

1. Background

The initial public offering (IPO) process is known for its asymmetric information between investors: the firm insiders have easier access to private information than the individual investors. To reduce this asymmetry and to ensure the IPO success, a third party stakeholder should oversee the process. Wang, Wang and Lu (2003) confirm that venture capital (VC) certification is the best way of achieving this for two reasons. *First*, the VC firms have reliable information on the issuing firm because, being members of the board of directors, they benefit from special working relations with the issuing firm's team of directors, unlike the other financial intermediaries. *Second*, the VC firms have to verify false certification to ensure that they preserve their reputation.

Apart from their certification role, the VC firms also have a monitoring role in the firms that they finance. Because of their numerous investments, they are encouraged to use diverse methods to supervise or to verify opportunist behavior in these firms. According to Barry *et al.* (1990), Megginson and Weiss (1991), Jain and Kini (1995) and Brav and Gompers (1997), the certification and monitoring roles during an IPO can increase the value and improve the operational and financial performance of issuing firms in the medium to long term. However, numerous research studies have shown that VC firms have a negative effect on these operations. Amit *et al.* (1998) identified an adverse selection problem where the less experienced entrepreneurs ask the VC firms to share the risk, whereas the more experienced ones manage their firms without requesting outside finance. Consequently, the firms with VC may perform badly because of information asymmetry. Gompers (1996) suggests a 'grandstanding' hypothesis on the part of young VC firms, where they are encouraged to reveal their abilities too soon to potential investors by assisting the firms with their portfolio in the financial markets. Therefore, they may find that they perform badly because of a lack of IPO experience. Generally during the IPO, either the adverse section effects or grandstanding aggravate the information asymmetry problem between the initiates and the individual investors.

The existing empirical studies generally use accounts data. Our approach differs; we use microstructure measures from the markets including bid-ask spreads. This information asymmetry and the volatility component should be studied when investigating whether the participation of a VC firm contributes to reducing the information asymmetry during the IPO process. The markets microstructure literature shows that the spread and the volatility of prices increase according to the information asymmetry that exists between the insiders and the outsiders. The certification/monitoring effects are stronger than the effects of adverse selection/grandstanding; however, reducing information asymmetry in the financial marketplace would consequently diminish the spreads and the price volatility for the IPOs financed by the VC firms. However, if the effects of certification and monitoring are dominated by the effects of adverse selection and grandstanding, then the spread and the price volatility become too high. Moreover, the pricing and disclosing information process during a VC-backed IPO could be clarified by examining the microstructure data in the financial markets because, according to O'Hara (1999) and Madhavan (2000), the negotiation mechanism and the structure regulating the stock markets both have an effect on investor behavior.

I chose to investigate the French market, a market with a two-decade VC history and with few existing studies analyzing the role of VC firms in the French market. The empirical results show that the effective relative spreads,

the cost of information asymmetry and the volatility of the IPOs financed by VC firms are not more reliable than other classic operations. Their degree of information asymmetry perceived by the market is not therefore inferior to that of other operations. The effect of certification/monitoring by VC firms is no more marked than that of the adverse selection/grandstanding. Although both effects exist, the positive effects of the certification/monitoring of a venture-backed IPO are largely counterbalanced by the negative effects of adverse selection/grandstanding.

1.1. Certification and IPO underpricing

In conformity with the certification hypothesis, Megginson and Weiss (1991) and Barry *et al.* (1990) showed that IPOs with VC firm involvement present a larger degree of underpricing than for those not involving VC firms. In contrast, Francis and Hasan (2001), Peggy and Wahal (2004) and more recently Arikawa and Imad'eddine (2010) and Elston and Yang (2010) found that IPOs without VC firm involvement show higher underpricing than those financed by VC firms and question the certification hypothesis, rekindling the debate on the subject. Peggy and Wahal (2004) tested the certification hypothesis using the samples of Megginson and Weiss (1991) and Barry *et al.* (1990) and noted no significant difference in the level of underpricing between the two means of financing. Consequently, because of the transfer of assets and the commissions borne during the IPO, the cost of such an operation financed by VC firms is much lower than one not financed by VC firms. The question then arises as to why VC firms in particular bear such costs. Loughran and Ritter (2002) showed that VC firms acquire underpriced IPO securities to later resell them with large secondary gains. Gompers (1996) pointed out that a VC firm is subjected to liquidity constraints when it reimburses investors and that the IPO helps it to create a good investor image that in turn enables it to raise more capital for future investments.

Neither explanations is convincing as the first refers to a speculative bubble in the 2000s, whereas underpricing is a persisting phenomenon that is independent of the period. The second explanation is not valid for all VC firms, particularly the youngest ones. Moreover, it is based on the American finance system, where VC firms are more experienced because of the large number of IPOs in that market. To reconcile these two explanations, Rossetto (2008) recognized that the IPOs with VC firm involvement are distinguished by higher underpricing during the normal period and by overpricing during the so called 'hot' periods. To overcome the irregularity of empirical underpricing results, Rossetto (2013) proposed a theoretic model that depends on the period of issue. During a hot period, there are considerable opportunities for profitable investments and VC firms are motivated to recover their invested capital to reinvest in new projects. In normal periods, the VC firms try to maximize the yield from the projects in their portfolios during an IPO.

Chemmanur and Krishnan (2012) reexamined the role of VC firms and conclude that underpricing is not appropriate for measuring the role of the VC firms and propose a third explanation as an alternative: the IPO price ratio/the intrinsic value. Using this variable, they show that the role of a VC firm is not only to certify the value of the IPO, but above all, to play a commercial role in their contacts with the other players in the financial market. The presence of a VC firm helps all of the shareholders to obtain the maximum from the product generated by the transfer of securities, and it can crucially attract serious firm purchasers who have a solid reputation.

1.2. Research hypotheses

IPO information asymmetry can be measured by the bid-ask spread. The more uncertain the value, the larger the bid-ask spread will be. Many studies have modelled the remuneration of the market makers for information asymmetry risks with the aid of a bid-ask spread. The purchasing price is always lower than the sales price; this enables a profit to be made for each purchasing–selling operation. Copeland and Galai (1983) and Glosten and Milgrom (1985) proposed theoretic models linking the bid-ask spread and the level of information asymmetry.

These models assume that the market makers expect to make losses during negotiations with an informed trader; this is the reason for the wide bid-ask spread. However, if the exchanges are made with a 'noise trader', then the market maker reduces the bid-ask spread. Market makers are confronted with an adverse selection problem if they do not know who, among the traders, has private information. The market makers therefore aim to optimize the bid-ask spread to maximize their profits. Consequently, the bid-ask price perfectly reflects the uncertainty and the risk of information asymmetry in the financial market: firms with a low level of these factors will be characterized by a wider bid-ask spread. Stoll (1989) estimates that the cost of information asymmetry is approximately 43% of the bid-ask spread in the NASDAQ and Lin, Sanger and Booth (1995) claim that is approximately 35% in the NYSE. Moreover, Menyah and Paudyal (2000) observed that it amounts to 47% in the London Stock Exchange. Certification by a VC firm leads to a reduction in the costs connected with information asymmetry that has the effect of decreasing the bid-ask spread. Moreover, when there is a lack of transparency

concerning the real value of a firm, we consider that there is a divergence of opinion among the investors. Shalen (1993) empirically demonstrated that price volatility, as an approximation of the level of information asymmetry, is strongly correlated with a divergence of anticipations. Because of the divergence of opinion of the noise traders, an increase in volatility is to be expected during the IPO, leading to an increase in the risks to which they are exposed. If certification by a VC firm enables a reduction in information asymmetry, then the IPO price volatility can also be reduced. If the level of information asymmetry is low, then it can be expected that the effect of certification/monitoring is more marked than that of adverse selection/grandstanding, bid-ask spread, information asymmetry cost and volatility. The following hypotheses have been developed to test the importance of the VC firm role during an IPO:

Hypothesis 1: *If the certification/monitoring effect is stronger than that of adverse selection/grandstanding, then the bid/ask spread of the IPOs with VC firm involvement will be weaker.*

Hypothesis 2: *If the certification/monitoring effect is stronger than that of adverse selection/grandstanding, then the cost of the information asymmetry of IPOs with VC firm involvement will be weaker.*

Hypothesis 3: *If the certification/monitoring effect is stronger than that of adverse selection/grandstanding, then the volatility of the IPOs with VC firm involvement will be weaker.*

2. Proposed Method

I adopted several microstructure measurements to ascertain the degree of information asymmetry including the bid-ask price spread, the information asymmetry component that concerns the spread and the volatility.

2.1. Independent variables

A. Effective spread

The bid-ask price spread is the difference between the lowest purchasing price and the highest sale price. Demsetz (1968) takes the bid-ask spread as a recompense granted to the market-makers for them to undertake immediate negotiations. It is one of the main transaction costs for investors. We estimated the effective spread $S_{i,j}$, and the relative effective spread[1] $RS_{i,j}$ in the same way as Hebb and MacKinnon (2004):

$$S_{i,j} = 2 \times \left|P_{i,j} - MP_{i,j}\right| \; et \; RS_{i,j} = \frac{2 \times \left|P_{i,j} - MP_{i,j}\right|}{MP_{i,j}} \tag{1}$$

where $P_{i,j}$ designates the firm's closing price i on day j, and $MP_{i,d}$ represents the middle of the bid-ask spread defined as $(ask_{i,d}+bid_{i,d})/2$. The terms $ask_{i,d}$ and $bid_{i,d}$ respectively represent the required closing price and that of the offer for the firm i on day j.

B. Information asymmetry component in the spread

This involves compensating the market-makers for negotiations with the informed traders who have the best information. The market-makers try to enlarge the spread during the periods where there is strong information asymmetry. To measure the cost of the information asymmetry in the bid-ask price spread, we followed the method by George *et al.* (1991). This is defined as $\phi_{id} = 1 - \pi_{i,d}$ and indicates the proportion of the bid-ask spread resulting from the information asymmetry of an action i on day j. $\pi_{i,d}$ represents the proportion of the spread arising from another piece of information asymmetry:

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

where $RD_{i,t} = R_{iTt} - R_{iBt}$, R_{iTt} represents 10 minutes of intraday yield for the firm i according to transaction price T in a lapse of time t–1 and t, R_{iBt} represents 10 minutes of intraday yield calculated according to the bid price (Bid) B, $S_{i,d}$ is the arithmetical average over 27 periods of 10 minutes per day for the firm i and $Cov(RD_{i,t}, RD_{i,t-1})$ represents the covariance of the statistical series $RD_{i,t}$.

[1] Corresponds to the difference (relative to the middle of the spread) in absolute value between the price at which a transaction has been carried out and the middle of the spread.

C. Volatility

Unlike in the classical approach that uses the closing price to calculate the security yield, Garman and Klass (1980) propose a more relevant improved estimator that considers the high (*H*), low (*L*), opening (*O*) and closing (*C*) prices since the share price is supposed to follow a Brownian motion without breaks. We estimated the volatility according to this approach using the following formula:

$$\sigma_{i,d}^2 = 0{,}511(a-b)^2 - 0{,}019[x(a+b) - 2ab] - 0{,}383x^2 \quad (3)$$

where $a=ln(H/O)$, $b=ln(L/O)$, $ln(C/O)$ and $\sigma^2_{i,d}$ represents the volatility of firm *i* on day *j*. According to Garman and Klass (1980), the coefficients are fixed in such a way that the estimator is unbiased with minimal variance.

2.2. The basic regression model

Consider that the presence of a VC firm enables the information asymmetry to be reduced between the issuer and the individual investors; hence, it is likely that there will be a decrease in the bid-ask spread, the cost of information asymmetry and the volatility. The particular nature of a VC firm is likely to influence the microstructure characteristics of the financial markets. We tested the regression in the following cross-section.

$$Y_i = \alpha_0 + \alpha_1 VC_i + \alpha_2 Board_i + \alpha_3 Nbr_i + \alpha_4 Share_i + \alpha_5 MAR_i + \alpha_6 LnMV_i + \alpha_7 (1/Age)_i + \alpha_8 Earnings_i + \alpha_9 NTr_i + \varepsilon_i \quad (4)$$

where Y_i represents the average of the bid-ask spreads (RS_i); ϕ_i represents the information asymmetry and σ^2_i represents the volatility, both between days 1–30; VC_i (within the capital) and $Board_i$ (seat on the board) are two silent variables; $Share_i$ represents the share held by the VC firm; Nbr_i indicates the number of VC firms within the capital; MAR_i represents the observed yield on the first day adjusted to that of the market; $lnMV_i$ is the logarithm of the firm's equities market value; $1/Age_i$ represents the inverse of the age of the firm in years on the day of its IPO; $Earnings_i$ represents the earnings per share during the year before the firm's IPO divided by the average observed closing price on the first day; and NTr_i represents the average number of trades between days 1 and 30 following the IPO.

3. Preliminary Results

I compared both subsamples in terms of their effective relative spread, their information asymmetry costs and their volatility using Mann–Whitney's nonparametric test and the classic t-test.

Table 1: Relative effective spread

	IPOs with VC	IPOs without VC	Difference*
Panel A: *Daily measure*			
Day 1	0.003	0.004	−0.517 (−0.70)
Day 2	0.006	0.007	0.062 (0.15)
Day 3	0.008	0.007	−0.386 (−1.10)
Day 4	0.246	0.010	1.068 (1.133)
Day 5	0.006	0.013	−2.201$^{\alpha}$ (−2.84)
Panel B: *Interval measure*			
Days 1-10	0.005	0.011	−0.874 (−0.82)
Days 11-20	0.010	0.036	0.169 (−0.45)
Days 21–30	0.008	0.007	0.727 (0.84)

Note: * Z-statistic of Mann–Whitney U test. This nonparametric test is used to compare two independent small samples; t-statistics are reported between brackets: α, β and γ respectively mean a significant coefficient at the level of 1%, 5% and 10%.

Table 1 presents the panel data for both subsamples on the relative differences of the effective spread. Panel A presents the average of the daily spread between days 1 and 5 after the start of negotiations, and Panel B presents the average for the different periods of time. With the exception of day 5, the results do not show any significant difference in the relative effective spread between the subsamples. The results for the first two time periods in Panel B (days 1–10 and days 11–21) show a lower relative effective spread for the IPOs with VC firm involvement, whereas the contrary is true for the third time period (days 21–30). These results allow me to reject the first hypothesis, where the presence of a VC firm enables a reduction in the level of information asymmetry. However, IPOs with VC firm involvement are characterized by a relative effective spread that is lower during negotiations.

Table 2: Information asymmetry analysis

	IPOs with VC	IPOs without VC	Difference
Panel A: ***Daily measure***			
Day 1	0.236	0.300	0.208 (−0.26)
Day 2	0.302	0.331	−0.140 (−0.01)
Day 3	0.304	0.382	−0.178 (−0.35)
Day 4	0.603	0.494	1.706^{β} (1.14)
Day 5	0.539	0.610	−0.104 (0.19)
Panel B: ***Interval measure***			
Days 1 – 10	0.440	0.406	0.101 (0.79)
Days 11 – 20	0.468	0.490	−1.006 (−0.92)
Days 21 – 30	0.495	0.431	1.068 (1.07)
Note: * Z-statistic of Mann–Whitney U test. This nonparametric test is used to compare two independent small samples; t-statistics are reported between brackets: α, β and γ respectively mean a significant coefficient at the level of 1%, 5% and 10%.			

Table 2 presents the empirical results for the information asymmetry costs in both subsamples. Generally, the costs are lower for IPOs with VC firm involvement in the first few days following the IPO. All three Panel B time period results show that the information asymmetry costs of IPOs with VC firm involvement are not lower than those without. Consequently, we reject the second hypothesis. Volatility is higher for IPOs with VC firm involvement than those without, but this difference is less marked and not significant. Table 3 shows that the volatility of IPOs with VC firm involvement is higher in each Panel B time period than in those without VC firm involvement. Consequently we reject the third hypothesis.

Table 3: Price volatility analysis

	IPOs with CR	IPOs without CR	Difference
Panel A: ***Daily measure***			
Day 1	0.006	0.005	1.001 (−0.02)
Day 2	0.004	0.003	0.617 (0.79)
Day 3	0.004	0.003	0.700 (0.58)
Day 4	0.003	0.003	0.198 (0.05)
Day 5	0.004	0.003	0.533

			(1.01)
Panel B: ***Interval measure***			
Days 1 – 10	0.003	0.003	0.601 (0.53)
Days 11 – 20	0.003	0.002	1.024 (1.40)
Days 21 – 30	0.003	0.002	0.803 (0.44)
Note: * Z-statistic of Mann–Whitney U test. This nonparametric test is used to compare two independent small samples; t-statistics are reported between brackets: α, β and γ respectively mean a significant coefficient at the level of 1%, 5% and 10%.			

The different results (spread and relative information asymmetry) reject the hypothesis that the role of certification/monitoring dominates that of the adverse selection/grandstanding of VC firms in the French market. The results prove that the degree of information asymmetry in IPOs with VC firm involvement, perceived by the financial market, is not lower than those without VC firm involvement as far as the relative effective spread, the information asymmetry costs and the volatility are concerned. The results also indicate that a reduction in information asymmetry because of the effect of certification/monitoring by the VC firm may be largely compensated for by the VC firm's adverse selection/grandstanding effect.

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