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Premature Listing and Post-IPO Venture Capital Refinancing

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Abstract

We examine why venture capital firms re-invest in portfolio companies also after the IPO. Companies are taken public earlier than optimal, resulting in lower post-IPO returns, and a greater likelihood of, and shorter time to, the first post-IPO VC refinancing.

Keywords: Holding period; IPOs; Pre-mature listing; Refinancing; Venture capital

JEL Classification: G24; G32

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1. Introduction

Contrary to conventional wisdom, Iliev and Lowry (2020) report that 15% of the venture capital (VC) backed IPOs obtain post-IPO VC funding. They view this as an efficient solution to curb information asymmetry problems constraining value enhancing investments. Consequently, the capital injection results in better stock market performance. We complement their work by offering and testing an alternative rationale for post-IPO VC refinancing and the resulting return patterns.

We put forward the “pre-mature listing” hypothesis. VCs have incentives to take portfolio companies public pre-maturely to enhance their reputation and to facilitate future fund-raising (Gompers, 1996). Taking a portfolio company public prematurely can be value destroying because young companies grow rapidly and thereby need both capital and monitoring to reach their full potential. Their lower profitability and short operational track record impede external fund-raising. Consequently, VCs step in to offer new rounds of financing even after the IPO. To examine the impact of pre-mature listing on VC refinancing likelihood and time, we construct a pre-mature listing proxy. The procedure involves subtracting the realized holding period from the conditionally estimated expected holding period.

<Figure-1>

A pre-mature listing also manifest itself through worse stock market performance (Johan, 2010), since they will have difficulties to raise external funds and pursue profitable investment projects (Piotroski and Zhang, 2014). Hence, we expect VC refinancing to be preceded by below peer stock market performance. Following the capital injection, the companies can pursue value enhancing investments, resulting in improved performance. We extend the evidence in Iliev and Lowry (2020) that firms obtaining post-IPO VC funding outperform traditional benchmarks, by 1.) studying pre-refinancing returns, and 2.) benchmarking against other VC-backed IPOs. Benchmarking is important (Barg et al., 2021) because other VC-backed IPOs may have differential performance. Figure 1 shows that without appropriate benchmarking, stock market performance of refinancing firms is upward biased.

In sum, our findings lend support to the pre-mature listing hypothesis. Pre-mature listings result in lower post-IPO returns, and a greater likelihood of, and shorter time to, the first post-IPO VC refinancing.

2. Data

We retrieve all US VC-backed IPOs between 1996 and 2018 from SDC's VentureXpert database. We include all non-financial IPOs (excluding SIC-codes: 6000-6999) with offer price above \$5 and IPO proceeds above \$5 million. Additionally, we require companies to have founding dates on Jay Ritter's website, firm characteristics in COMPUSTAT and stock price data in CRSP, resulting in a final sample of 955 VC-backed IPOs.

We focus on lead VCs, since they provide funding and auxiliary services for longer periods. We define lead VCs by the following sequential criteria: 1.) a lead VC must have the highest amount invested in SDC; 2.) if two or more VCs satisfy criteria 1, the lead VC must have the highest ownership before the IPO; and 3.) if two or more VCs fulfill both criteria, the lead VC must hold the greatest number of directorship positions. Following the criteria, we end up with one lead VC per company. We track the companies for 60-months following the IPO or until 12/31/2021 to identify if and when refinancing occurs. We create an indicator that equals one if the lead VC reinvests post-IPO and a time to VC-refinancing variable by subtracting the IPO date from the first refinancing date.

We create a premature listing proxy by first estimating the expected pre-IPO holding period in a regression framework,

$$\text{Holding Period}_i = \alpha_i + \mathbf{X}\boldsymbol{\beta} + \text{Industry FE} + \text{Year FE}. \quad (1)$$

Following the estimation of regression (1), we obtain the E(Holding period) conditional on the factors in the \mathbf{X} matrix (see, column (1) of Table 2). Then, we subtract realized from the expected holding period.¹

$$\text{Premature listing}_i = E(\text{Holding Period}_i) - \text{Holding Period}_i. \quad (2)$$

Where, positive values infer pre-mature listing. All control variables are defined in Table 1.

To better capture the stock market performance of the refinancing firms, we create a value weighted portfolio of VC-backed IPOs (60-month holding period) to use as benchmark.

<Table-1>

Table 1 shows that pre-mature listing (0.64 compared to -0.09) increases the refinancing likelihood. The companies subject to VC refinancing are less profitable. At the same time, they operate with higher pre-IPO leverage and hold more cash.

¹ Similarly, Uysal (2011) estimates capital structure deviation.

3. Results

To test the pre-mature listing hypothesis, we study: 1.) the impact on the re-financing likelihood; 2.) the time to first VC-refinancing using a semi-parametric survival model; 3.) the pre- and post-refinancing stock market performance. We include year fixed effects to control for regulatory and other changes over time (Atkinson and Duca, 2019).

<Table-2>

Column (1) of Table 2 shows that *Company_age*, *VC_reputation*, *Cash* and *MTB* shortens the pre-IPO holding period, while *VC_age* increases it. In column (2), pre-mature listing is positively related to the re-financing likelihood after the inclusion of controls. This finding indicates that shorter nurturing periods increase the VC-refinancing likelihood. Model (3) confirms prior findings, pre-mature listing decreases the time to VC-refinancing. The economic magnitude is large, a one-year increase in pre-mature listing leads to an increased refinancing likelihood of 16.64% and a shortened time to refinancing by 13.67%. Among the controls, *Cash* and *Leverage* are positively related to the likelihood of VC-refinancing. Our findings lend support to the pre-mature listing hypothesis. Pre-mature listing increases the likelihood of and shortens the time to post-IPO VC-refinancing.

Next, we study the return patterns -24 to +24 months around the refinancing event. Columns (1) and (2) of Table 3 analyze the pre- and post-refinancing returns in a five-factor calendar-time framework using equally weighted portfolios. In columns (3) and (4), we create long-short portfolios taking a long position in the refinancing portfolio and a short position in a portfolio consisting of all VC-backed IPOs.

<Table-3>

Our findings in Table 3 columns (1) and (2) show similar patterns as in Iliev and Lowry (2020). Pre-refinancing alphas are not different from zero, while companies have positive post-refinancing alphas (2.014; $p < 0.01$). After we account for the performance of other VC-backed companies in columns (3) and (4), we observe different patterns. Consistent with the pre-mature listing hypothesis, companies obtaining refinancing have negative pre-reinvestment returns compared to other VC-backed IPOs. Upon refinancing, they outperform other VC-backed IPOs.

4. Conclusion

We offer and test a new rationale for why VCs reinvest in portfolio companies after the IPO - the pre-mature listing hypothesis. To test the hypothesis, we construct a pre-mature listing proxy by subtracting realized pre-IPO holding period from the conditionally expected. In line with our hypothesis, we find that pre-mature listing is linked to both a greater likelihood of and a shorter time to first VC refinancing. In further support of our hypothesis, we find that firms obtaining post-IPO VC funding have lower pre-refinancing returns compared to other VC-backed IPOs.

5. References

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Figure 1: Returns around refinancing

The graph shows return patterns around the refinancing at $t=0$. The dashed (solid) line shows excess returns of the refinanced firms over the risk-free rate (excess returns over a VC-backed IPO portfolio).

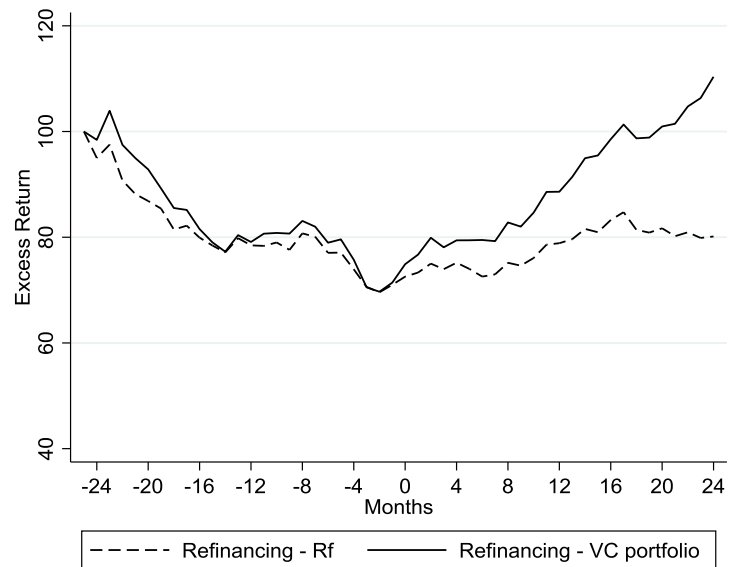


Table 1: Summary statistics

Column (1) includes all VC-backed IPOs, column (2) the non-VC-refinanced companies, and column (3) the refinanced companies. We report mean (median) of company, VC and IPO characteristics and t-stats for the mean differences in column (4). *Premature_listing* is the difference between estimated holding period and companies' investment period, *VC_holding_period* is the difference between IPO date and lead VC's pre-IPO first investment date, *Company_age* is the difference between companies' founding dates and lead VCs' first investment dates, *VC_age* is the IPO date minus the VC's founding date, *VC_reputation* is the ratio of market capitalization of all lead VC's IPO involvements during the past five years to the market capitalization of all VC-backed IPOs during the same period (Nahata, 2008), *IPO_size* is IPO proceeds to market capitalization, *Underpricing* is the first day return, *IPO_fees* is the gross spread, *Cash* is cash holdings to total assets, *Ln(Assets)* is the natural logarithm of total assets, *MTB* is the ratio of market value of total assets to the book value of total assets, *Leverage* is the ratio of total debt to total assets, and *ROA* is EBITDA to total assets. All accounting variables are measured pre-IPO and winsorized at the 99th percentile. ***, **, and * denote significance level at 1, 5 and 10%, respectively.

	(1) All	(2) No- Refinancing	(3) Refinancing	(4) Diff (t-stats)
Pre-mature_listing	0.00 (2.48)	-0.09 (2.49)	0.64 (2.31)	-3.15***
VC_holding_period	4.50 (3.20)	4.55 (3.26)	4.15 (2.68)	1.44
Company_age	3.63 (6.47)	3.69 (6.72)	3.16 (4.28)	1.15
VC_age	21.22 (13.26)	21.23 (13.27)	21.15 (13.23)	0.06
VC_reputation	2.17 (2.69)	2.15 (2.73)	2.30 (2.40)	-0.62
IPO_size	26.17 (554.44)	28.90 (591.49)	6.46 (15.85)	1.10
Underpricing	40.25 (61.48)	43.03 (62.91)	20.18 (45.27)	4.83***
IPO_fees	7.00 (0.45)	7.00 (0.46)	6.97 (0.39)	0.86
Cash	0.50 (0.28)	0.48 (0.28)	0.58 (0.30)	-3.44***
ln(Assets)	3.27 (1.29)	3.27 (1.30)	3.31 (1.19)	-0.36
MTB	12.95 (30.81)	13.60 (31.54)	8.19 (24.53)	2.14**
Leverage	0.18 (0.27)	0.17 (0.26)	0.25 (0.36)	-2.27**
ROA	-0.47 (0.78)	-0.45 (0.77)	-0.61 (0.80)	2.04**
Observations	955	839	116	

Table 2: Refinancing probability

We create a premature listing variable by taking a difference between estimated pre-IPO holding period from column (1) and the realized. Column (2) shows a logit model predicting the likelihood of lead VCs' post-IPO refinancing. Column (3) shows estimates of an exponential semi-parametric survival model to predict time to refinancing. Constants are not reported. Variables are defined in Table 1. Clustered robust t-statistics (SIC-3) are reported in brackets. ***, **, and * denote significance level at 1, 5 and 10%, respectively.

	(1) Holding period estimation	(2) Logit model	(3) Hazard model
Premature_listing		0.154*** (3.03)	-0.147*** (-3.01)
Company_age	-0.059*** (-3.64)	-0.013 (-0.66)	0.016 (0.76)
VC_age	0.018*** (3.86)	-0.002 (-0.27)	-0.001 (-0.15)
VC_reputation	-0.083* (-2.07)	0.037 (0.80)	-0.036 (-0.75)
IPO_size		-0.001 (-0.84)	0.003 (1.16)
Underpricing		-0.006 (-1.51)	0.006* (1.66)
IPO_fees		-0.330 (-1.13)	0.361 (1.29)
Cash	-1.553*** (-3.82)	1.032*** (2.64)	-0.974** (-2.43)
ln(Assets)	0.041 (0.56)	0.028 (0.18)	0.041 (0.27)
MTB	-0.007*** (-4.43)	-0.005 (-0.41)	0.006 (0.52)
Leverage	0.936 (1.64)	0.782* (1.89)	-0.752* (-1.89)
ROA	0.551* (1.79)	-0.070 (-0.59)	0.019 (0.16)
Industry, Year FE	Y	Y	Y
Observations	955	955	955
R-squared	0.400	0.100	
Log pseudolikelihood		-268.44	-425.31

Table 3: Returns around VC-refinancing

This table shows calendar-time regressions of companies subject to post-IPO VC-refinancing in a Fama-French five-factor framework. We form equally weighted excess return portfolios for pre-refinancing (-24 to -1 months relative to refinancing) in column (1) and post-refinancing (0-24 months) in column (2). Column (3) and (4) show long-short portfolios, formed by subtracting the return of a VC-backed IPO portfolio from the refinancing portfolios in column (1) and (2). Robust t-statistics are reported in parentheses. ***, **, and * denote significance level at 1, 5 and 10%, respectively.

	(1)	(2)	(3)	(4)
	Pre-Refinancing (-24 to -1)	Post-Refinancing (0 to +24)	Long-Short Pre-Refinancing	Long-Short Post-Refinancing
Alpha	-0.720 (-1.03)	2.014*** (3.76)	-1.561** (-2.56)	1.102** (2.34)
Market - Rf	1.060*** (5.71)	1.197*** (9.75)	-0.115 (-0.68)	0.035 (0.34)
SMB	1.455*** (5.51)	1.003*** (4.62)	0.500** (2.33)	0.061 (0.34)
HML	-0.142 (-0.45)	-0.013 (-0.06)	0.383 (1.48)	0.460*** (2.74)
RMW	-1.047** (-2.58)	-1.257*** (-4.76)	-0.066 (-0.19)	-0.243 (-1.12)
CMA	-0.592 (-0.93)	-0.518 (-1.34)	-0.230 (-0.44)	-0.204 (-0.67)
Months	294	305	294	305
R-squared	0.442	0.555	0.033	0.030