

The Impact of Private Equity and Venture Capital on Companies' Post IPO Performance: evidence from China

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Abstract: With the rapid development of Private Equity (PE) and Venture Capital (VC), more and more companies receive funding before going to public. This article focuses on the impact of PE/VC's investment on firms post IPO performance, using data from Chinese Shanghai Stock Exchange (SSE) Sci-Tech innovation board (star) market to conduct a regression model. According to the analysis, there is indeed a positive relationship between PE/VC presence and growth rate in share price, with coefficient being 0.147. These results demonstrate the positive impact of PE/VC and provides investors confidence when buying backed companies' stock, which shed light on exploring the inherit effects on investment.

1. Introduction

The capital from first primary market investors, private equity (PE) and venture capital (VC) investors is an alternative source of funding that companies can find other than traditional financial intermediaries such as banks, or their own money or from angel investors. According to Ref. [1], such funding has the implication of intense restructure, the improvement of corporate governance and the better aligned interest of managers and shareholders. Other researcher also argues that VC could infect the company in a positive way because they can help monitoring the firm as well as bringing other value-adding services [2, 3]. In this article, the PE/VC will be considered as a single concept, a source of funding from primary market investors, which could deliver combined service rather than capital only to firms.

Surprisingly, the inconsistency of prior literature is quite significant. For instance, Levis confirms that PE sponsored firms usually obtain significant abnormal returns, examined by various methods and standards, with an observation of three-year period focusing on both equal and value weighted terms [4]. To be specific, these findings suggest that considerable difference exists from the view of market capitalisation, industrial difference, first day returns and core operating actors after IPO. These differences are concluded as PE backed firms have greater scale, better profitability, comparatively modest first day-return, exceeding both other stand alone companies and market index with regard to market performance. Other similar findings are reached by Sheeja and Roshni [5], they argue that due to the fact that PE/VC backed IPO always contain the positive sign on possible future profits as well as the upcoming prosperity of the company, investors will hold the belief that PE backed issues have certain positive influence on practical performance of companies, which arises from the involvement of PE firms with the index. As a result, this practical performance will be attributed to higher stock price, compared with those unbacked companies' stock price. Meles, et al. also arrive at the conclusion that VC could bring positive longstanding impact on companies, which is aligned with the percept of them as "build winners" [6].

Meanwhile, other scholars arrive at relatively contradictory results. Michala argues that there is no considerable distinction between PE/VC backed IPOs and those of unbacked firms and PE/VCS' participation will not necessarily generate an inflation on share price [7]. Que and Zhang found an even more disparate result, in their study of relationship between pre/ post IPO performance [8]. They argue that the long-term post IPO performance are negatively related to VC involvement, an inverted

U shape of relation will occur if there exist VCs, showing VC is lowering the positive impact of pre-IPO performance. Besides, it is also stated that this could be expanded by two main reasons. Firstly, some firms have the over saturated pre-IPO achievement. Secondly, companies tend to involve in accounting misconducts because of confident VCs' urge. Similar finding shows that the longer period of PE participation will contribute to an inverted U-shaped relation considering the post-PE exit performance of firms [6].

Such difference could arise from the variance through regions. Former findings about PE/VC involved IPOs are mostly based on data only from the U.S market. It is appropriate to argue that conclusions from U.S market will not practice properly in other markets under different situation. Therefore, there has been other researches on the divergence of governmental association, which arrive at an argument of such disparity could lead to different level of effectiveness of corporate governance on the firm level [9]. In order to investigate the impact of PE/VC on Chinese market, this paper examines the post IPO performance of 30 Chinese listed companies. The rest part of this article is organized as follows. The Section 2 will explain the reason for choosing China as the object of study and state the uniqueness of this market. Afterwards, the Section 3 will illustrate the main method used to process data. In Section 4 the results of empirical analysis will be presented. Subsequently, Section 5 will discuss the findings as well as limitation of the research. Eventually, a brief summary will be given in Section 6.

2. Data

This article will focus on IPOs in Chinese market, examine both PE/VC backed and stand-alone companies' post IPO performance. Firstly, as mentioned by Que and Zhang [8], being one of the biggest emerging economies, there are rapid increase in firm expansion, as well as bright future of prosperity for firms. For instance, there are many outstanding high-tech companies, including Baidu, Alibaba, Tencent, JD, SOHU. Meanwhile, China has a stricter criterial for IPOs rather than a developed market such as the United States, where IPO is totally decided by issuer himself [10]. Chinese companies need additionally apply for approval from China Securities Regulatory Commission before successfully initiate IPO [11]. PE/VC could use their experience to help accelerate this process, where stand alone companies could be at a disadvantage. Secondly, this flourishing market has attracted global investors who are very interested in newly public companies. As a consequence, these start-ups are considered to have rapid growth rate and finally expected to give back satisfactory returns [12, 13]. Thirdly, as mentioned above, most prior researches are base on U.S market or other mature markets. Thus, Chinese market are of great importance to look at. In conclusion, Chinese prosperous market offers great sample to examine, where the difference between PE/VC backed or non backed firms could be more distinct. Considering the focus of former researches, it is decided to use this market as my sample. To be specific, 30 companies listed in SSE Star market will be chosen, all of which completed their IPO progress in late 2019. The requirements of SSE Star market ensure that all of these companies are in similar industries. The companies are listed below: Suzhou TZTEK Technology Co.,Ltd., Zhejiang Hangke Technology Incorporated Company, Montage Technology Co.,Ltd., Western Superconducting Technologies Co.,Ltd., ArcSoft Corporation Limited, Appotronics Corpotation Limited, Guangdong Jiayuan Technology Co.,Ltd., ShenzhenLifotronic Technology Co.,Ltd, Suzhou Harmontronics Automation Technology Co.,Ltd., Ningbo Solartron Technology Co.,Ltd., Aofu Environmental Technology Co.,Ltd., Novoray Corporation, Shenzhen Qingyi Photomask Limited, Luoyang Jalon Micro-nano New Materials Co.,Ltd., Hangzhou Arcvideo Technology Co.,Ltd., Raytron Technology Co.,Ltd., Anji Microelectronics Technology(shanghai)co.,Ltd., Advanced Micro-Fabrication Equipment Inc.China, Traffic Control Technology Co.,Ltd., Jiangsu Cnano Technology Co.,Ltd., Longyan Zhuoyue New Energy Co.,Ltd., Primeton Information Technologies,Inc., Jiangsu Eazytec Co.,Ltd., Kingsemi Co.,Ltd., Giantec Semiconductor Corporation, Jiangsu Bioperfectus Technologies Co.,Ltd., Bloomage Biotechnology Corporation Limited, Sino Medical Sciences Technology Inc., Shanghai Medicilon Inc., Shanghai Friendess Electronic Technology Corporation Limited.

Table 1 The Regression results

Variable	Coefficient	Std. Error	t-Statistic	P value of T test
BACKED.NOT	0.147	0.206	0.712	0.483
GAP	0.446	0.0977	4.57	0.000
AVG	-0.075	0.0439	-1.703	0.101
Constant (the intercept of the linear model)	0.225	0.269	0.836	0.410
R-squared	0.482	Mean dependent variance		0.502
Adjusted R-squared	0.422	Standard dependent variance		0.692
S.E. of regression	0.526	Akaike info criterion		1.678
Sum squared residuals	7.202	Schwarz criterion		1.865
Log likelihood	-21.166	Hannan-Quinn critter.		1.738
F-statistic	8.040	Durbin-Watson stat		2.313
Prob(F-statistic)	0.001			

3. Methods

The OLS (ordinary least squares) will be applied, which is the fundamental and basic model of regression analysis. It requires very few for the model and can provide intuitive findings. The estimator is conducted as follow, regression is built to find the a and bs that minimize the sum of squared residuals:

$$\min_{a,b} \sum_{i=1}^N \hat{u}_i^2 = \min_{a,b} \sum_{i=1}^N (y_i - \hat{y}_i)^2 = \min_{a,b} \sum_{i=1}^N (y_i - a - b)^2 \quad (1)$$

In regards to factors that can influence post IPO performance, the regression takes the form of: growth rate of 2020=constant + β_1 PE/VC (dummy variable) + β_2 GAP (highest price-lowest price during year2020) + β_3 AVG (average turnover rate during year 2020). This is a multiple linear regression model, which explains the average of y as a linear function of parameters of several explanatory variables, as the growth rate of share price may have multiple impact factors on its average behavior. Typically, the R^2 score is utilized to evaluate the performance of the model:

$$R^2 = \frac{ESS}{TSS} = 1 - \frac{RSS}{TSS} \quad (2)$$

where ESS is the explained sum of squares, RSS is the residual sum of squares and TSS is the total sum of squares, TSS=ESS+RSS) is used to measure how much of the sample variability is captured by the model. Breusch-Godfrey and ARCH tests are used to test serial correlation and heteroskedasticity. In this dataset, PE/VC backed companies are defined as those who has PE/VC in their top ten floating shareholders.

Table 2 The correlation coefficients of regression variables

	Growth rate (GR)	BACKED.NOT	GAP	AVG
Growth rate (GR)	1.000	0.252	0.649	0.116
BACKED.NOT	0.252	1.000	0.314	0.325
GAP	0.649	0.314	1.000	0.481
AVG	0.116	0.325	0.481	1.000

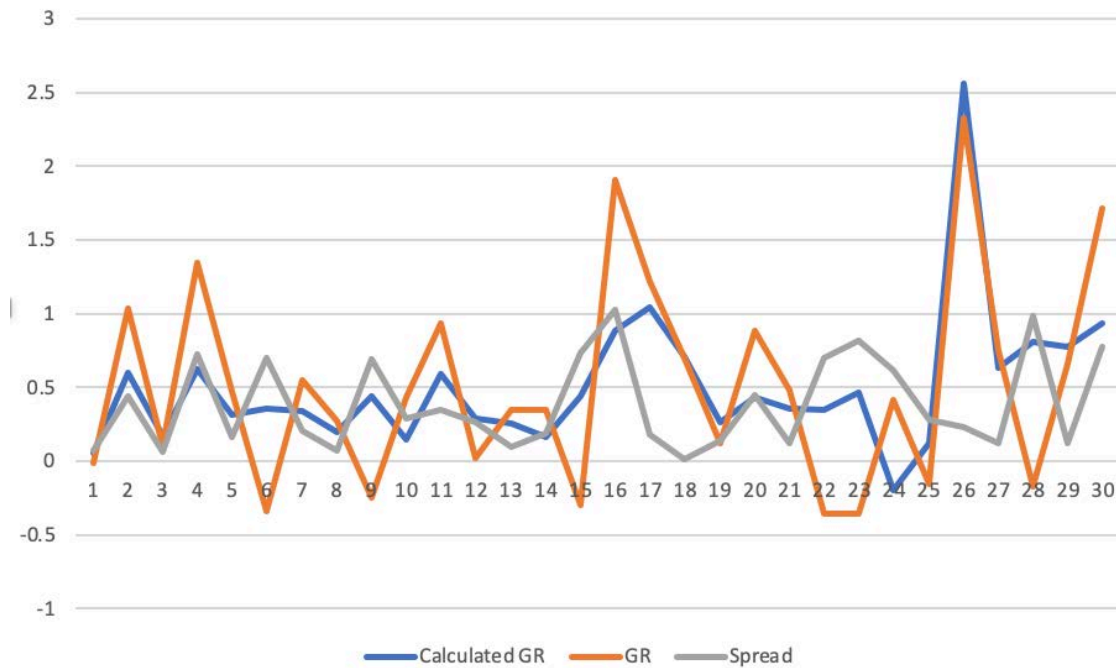


Fig 1 Growth rate (GR) and calculated growth rate.

4. Empirical Analysis

As summarized in Table. I, the P-value for the regression is 0.0005, which suggest that the model is overall significant; R^2 is 0.4815, indicating that the model explains 48.15% of the variation. For better evaluation the effectiveness of the factors, the correlation analysis result is given in Table. II. Tables. I and II indicate that the linear relationship between first year growth rate and PE/VC back is positive but not statistically significant, with regression coefficient of 0.147 and P-value of 0.48, correlation coefficient of 0.252. Unsurprisingly, the growth rates are highly positively correlated with gap between highest and lowest share price of the year, while is not so correlated with average turnover rate.

Table 3 Breuseh-Godfrey Serial Correlation LM Test

Null hypothesis: No serial correlation at up to 1 lag			
F-statistic	1.164	Obs*R-squared	Prob. F(1,25)
	1.335		0.291
			Prob.Chi-square(1)
			0.248

Breuseh-Godfrey Serial Correlation LM Test is conducted to test if there is serial correlation (seen from Table. III), the P-value of is 0.29, i.e., null hypothesis is not rejected at 5% confidence level, which suggests that there is no presence of serial correlation. The P-value of the ARCH test is 0.62,

hence the null hypothesis of homoskedasticity is not rejected, which suggest there is no presence of heteroskedasticity.

Table 4 ARCH test

Heteroskedasticity Test:ARCH			
F-statistic	0.243	Prob.F(1,27)	0.626
Obs*R-squared	0.259	Prob.Chi-square(1)	0.611

Fig. 1 illustrates the calculated growth rate and real growth rate, as well as the spread. In general, the model captured the trend of movement in growth rate and successfully controlled the spread at a relatively stable level (with mean around 0.5%).

5. Discussion & Limitation

While the overall intuition from regression model is consistent with Levis's findings [4], the statistical significance is not so satisfying with P-value of T-statistic of PE/VC dummy being 0.48, which could be ascribed to the effect of combination of factors. Firstly, there could still be industrial difference in SSE Stare listed companies, e.g., some of them are energy focused while others could be medical firms, which have poor similarity. Such disparity may lead to magnificent distinction between their industrial share price growth rate. Secondly and most importantly, as mentioned by Jiang et al. [14], listed companies in China normally reveal very limited and low-quality information, consequence being great level of asymmetric information between investors and companies. In this case, PE/VC presence in firms' top ten floating shareholders may not completely represent if they are backed or not, since PE/VC may invest the firm in other ways.

6. Conclusion

In summary, this paper investigates the impact of PE/VC on companies post-IPO performance based on data from Chinese SSE Star market. According to the analysis, positive impact of PE/VC presence on growth rate of companies' share prices are confirmed. Specifically, PE/VC backed firms shows 14.7% higher growth rate than those stand-alone ones. Such finding is limited mainly by the opacity of financial data and poor level of information disclosure in Chinese market. Overall, these results pave a path for future study on PE/VC impact in Chinese market. Subsequent researches could reach a more particular and convincing knowledge of PE/VC impact with better confirmed data, when the situation of information asymmetry is improved.

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