

RESEARCH ARTICLE

The Impact of Private Equity Investment on the Market Performance of Listed Companies on the A-Share Market in China

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This study aims to analyze all the Chinese Initial Public Offerings (IPOs) during 2010–2014 and follow their performance for five years. The study particularly tests the competing hypotheses on the role of Chinese private equity. The sample includes 916 firms that operate continuously for five years after IPOs to provide additional evidence on long-term performance. The results using the BHARs method indicate that private equity-backed IPOs tend to have significantly higher initial returns than non-PE-backed ones during three years of listing, supporting the screening and monitoring effect hypothesis in China's capital market. After three years, the market performance of PE-backed IPOs is lower than non-PE-backed IPOs due to the exit of the PE after the lockup period. In contrast, the CAR method has the contrary results. Further analysis finds that the size of the issue, invention patents, company industry area, and hot market index have a significantly stable influence on the stock performance of companies even for five years after IPOs. The implication of the study is that PE firms serve as an effective function of quality screening, which is directly related to the probability of successful exit in the year after the lockup period.

Keywords: private equity, market performance

JEL Classification: D72, D80

Since the Chinese government set “Reform” as the fundamental state development policy in 1978, the Chinese economy has experienced remarkable growth in the last 40 years and even took over Japan as the world's second-largest economy in 2010. Market-oriented reform, industrialization, and

urbanization can be the best fertilizers for Chinese economic growth. Under this circumstance, the private equity (PE) industry also shares the booming of the Chinese economy. The first nationwide private equity investment firm in China was initially funded in 1985, namely the Chinese New Technology Venture

Capital Corporation. This is a milestone in Chinese PE investment history.

Based on the data from Zero2IPO, there were only 10 PE investment firms in 1995, but in 2020 the number goes to around 15,000. The asset under management (AMU) of PE/VC funds reached 1976 trillion RMB (around 304 trillion USD) in 2021. From 2008 to December 2020, the percentage of IPO companies which were PE-backed increased from 31% to 85%. The book value of more than 90% of the PE/VC funds doubled, whereas 30% of them benefited more than 10 times.

As PE is one sector of the financial market built to serve the real economy, the measurement for the study of PE is the benefit it can bring to the target companies. On the other hand, PE/VC investing in the company was not only providing money but also needed to gain some profit when it quit. Under this situation, private equity will involve in the due diligence before investment, after-investing management, providing value-added service, auditing, and pricing during the IPO year, and exiting after the IPO. Therefore, a comprehensive and systematic analysis will be needed to investigate the effect of PE on the target companies.

Market performance can be the measurement of the effect of PE on target companies, and it is based on historical performance, the financing of capital, the expectation of investors, and so on. Although there was a lot of research conducted on PE in America, Europe, and some developed countries in Asia, research on Chinese PE is scarce. Therefore, the research in this paper is not limited to verifying whether the research of private equity investment in other countries is significant in Chinese domestic stock markets; it is also trying to understand the role of PE in each stage of companies. According to the IPO period, the market performance is divided into three aspects: issue pricing, the first day of listing, and after PE exiting performance (three years), then the long-term market performance (five years).

Factors Affecting the Market Performance of Listed Companies

IPO pricing of listed companies has always been the focus of the market and a hot issue in financial research. The company's pricing theory generally believes that the main factors affecting the IPO pricing and subsequent market performance of listed

companies include company quality, primary market factors, secondary market factors and distribution system design factors, market sentiment, and so forth. These indicators generally have asset size, profitability, solvency, operational capability, innovation capability, financial leverage, corporate governance, and the nature of equity structure. They use the information asymmetry in the issuance of new shares to make the IPO issue price deviate from the company's intrinsic value in order to benefit from it. In the trading stage, the secondary market is not necessarily effective. Investor sentiment, monetary policy, media reports, institutional investor teams, and even domestic and international economic and financial sentiment will affect stock prices.

The main hypotheses about the impact of private equity investment on the market performance of listed companies are the screening and monitoring effect hypothesis, the certification effect hypothesis, the grandstand effect hypothesis, and the market power effect hypothesis. To judge the effect of private equity investment on China's A-share market-listed companies, it is necessary to understand the ideas of several hypotheses and compare their differences.

Screening and Monitoring Effect

Barry et al. (1990) proposed the "screening effect" and "supervised effect" in their study. Other researchers found that venture capital-backed companies have lower underpricing rates at IPOs, and the quality of screening is directly related to the probability of successful exit. The reason is that venture capital firms choose better quality than other companies listed at the same time (Sensen, 2007; Chemmanur & Loutskina, 2006). Some researchers conducted an empirical analysis and claimed that the underpricing rate does not adequately measure the role of PE in corporate IPOs. The ratio of the company's IPO value reveals its intrinsic value and the secondary market value of the IPO company, and the intrinsic value of the transaction in the secondary market could be measured to estimate the role of PE investment (Megginson & Weiss, 1991; Lee et al., 2004). However, for the Chinese market, the contribution of the primary market to the underpricing is not significant, whereas the secondary market

factors have a greater impact. Combined with the situation of China's capital market, if the screening effect hypothesis is established, PE support enterprise market performance should meet several conditions, such as better quality, ROA, innovation ability, higher P/E ratios, and better long-term market performance.

Certification Effect

Meggison and Weiss (1991) first proposed the "certification effect." The IPO underpricing rate and initial returns of listed companies with a background in wind insurance investment holdings are significantly lower than that of ordinarily listed companies, and their issuance costs will be lower (Meggison & Weiss, 1991). Because of a good market reputation, venture capital institutions will ensure the quality of listed companies. Furthermore, the selectivity bias of venture capital holdings will reduce information asymmetry, thus reducing the difficulty of underwriting auditing and reducing the underpricing of the secondary market (Gompers, 1993, 1996; Bhojraj & Lee, 2002; Levis, 2011). Kini (1994) strongly argued that the vital in lessening conflicts of benefit between agents is the certification role of private capitalists. If the certification effect is reliable, the following conditions should be met in the Chinese market. The PE investment enterprise has a lower degree of underpricing at the time of IPO issuance.

Grandstand Effect

Gompers (1996) believed that the number of successful listings owned by venture capital institutions is related to the organization's position in the market, and the difficulty of raising funds from venture capital institutions depends on the reputation. As a result, some young venture capital investment institutions will be eager to promote the listing of smaller, younger, and perhaps more risky companies to have a reputation in the industry as soon as possible (Chemmanur & Loutskina, 2004; Swaminathan & Moorman, 2009). The grandstanding hypothesis is applicable even in the "bubble" period (Lee et al., 2004). Under this hypothesis, PE-holding companies will be significantly smaller and younger when they go public and may have a positive effect on the pricing of the issue and the cumulative excess return after listing.

Market Power Effect

Chemmanur & Loutskina (2004) claimed that under the market power hypothesis, PE/VCs can attract a group of quality market participants to join the IPOs of the companies they invest in. The addition of these high-quality participants not only supports the company's better valuation at the time of issuance but also performs well on the first day after the listing (Chemmanur & Loutskina, 2004). Under this hypothesis, a PE-backed listed company has a lower underpricing, higher intrinsic value, and better performance in the holding period (before listing to the lockup period) than non-PE holding companies (Swaminathan & Moorman, 2009).

The four hypotheses explain the impact of PE on the market performance of listed companies from different perspectives. The judgments and differences between these hypotheses involve at least four explanatory variables. They are P/E ratio, underpricing, abnormal return and accumulated abnormal rate of return during the lockup period. Others update the measurement of underpricing by proving that the estimation of intrinsic firm value could better explain the role of PE/VC backed (Meggison & Weiss, 1991; Levis, 2011). There are also many intermediate variables involved, such as company age, company size, issuance costs, underwriter reputation, and lot winning rate (PROB). These four hypotheses are similar but not the same. Therefore, each hypothesis is needed to be verified with respect to many aspects as follows:

H1: The PE-backed companies will have a better market performance than non-PE backed.

H2: The hypotheses about the PE will stand in the Chinese market.

H2a: If the screening hypothesis is established, the price-to-equity ratio (PE ratio) of the listed companies in the PE (private equity)-backed group will be higher than the non-PE group.

H2b: If the certification effect is established, the underpricing rate of the PE group should be significantly lower than that of the non-PE group.

H2c: If the grandstand effect is established, the age of the PE group should be smaller than that of the non-PE group.

H2d: If the market power hypothesis is established, the underwriter's reputation of the PE group should be better than that of the non-PE group.

This paper divided all data into PE groups and non-PE groups so that group testing could be performed. Several hypotheses are initially verified by PE and non-PE group difference tests. The regression analysis test verifies the four types of hypotheses mainly from two aspects. First, through the coefficient and significance of the PE index in the regression equation, verify whether the market impact described under each hypothesis is significant. Second, by introducing an interaction variable, it is analyzed the intermediate variable, and then the hypothesis is established.

Empirical Analysis

Data

The sample of this research is composed of 916 companies listed on the A-share market from January 1, 2010, to December 31, 2014. Among the 916 listed companies under the A-share market (including mainboard, GEM, and SEM), there are a total of 458 listed companies with PE holdings, accounting for 50%. There are three sources of data for all listed companies. The pre-IPO financial, PE, shareholding ratio, and innovation data were mainly derived from the prospectus of the listed company. This part of the data is collected by hand from the company. The release data is mainly from the Wind Database and CSMAR(China Stock Market and Accounting Research database).

Dependent Variable

According to the research needs, this paper selects four kinds of indicators as the dependent variables, which are IPO issue pricing level, IPO underpricing rate (R), abnormal stock return rate after IPO (AR), and market reaction during and after PE lock-up period (3–5 years). The measurements are IPO underpricing rate (R), abnormal stock return rate after IPO (AR), cumulative abnormal return (CAR), and buy-and-hold abnormal returns (BAHRs).

The indicators used in the pricing of this paper are the price-earnings ratio of the issue. The primary market issuance price is measured by the IPO underpricing rate, which is numerically equal to the increase in the company's first-day closing price relative to the issue price. The method for calculating the issue underpricing rate is as follows: $P_{i,1}$ indicates the closing price of the first day of the company IPO. $P_{i,0}$ implies the issuing price. $R_{m,1}$ indicates the ups and

downs of the market index of the first day of listing of i company. See the equations as below:

$$(1) \text{ PE ratio: } \text{PE ratio}_{i,1} = \frac{P_{i,1}}{\text{Earning Per shares at IPO day}}$$

$$(2) \text{ Underpricing Rate: } R_{i,1} = \frac{P_{i,1}}{P_{i,0}} - 1$$

$$(3) \text{ Adjusted Underpricing Rate: } AR_{i,1} = \frac{1+R_{i,1}}{1+R_{m,1}} - 1$$

The long-term performance of stocks after buying can be expressed in terms of CAR and BAHRs. The CAR measures how much of the cumulative rate of return it receives exceeds the average market return, whereas the BHARs measures how much of the accumulated gains exceed the market (index) income. These are calculated for stock i for Horizon T as follows:

$$(4): \text{CAR}_{i,T} = \sum_{t=1}^T AR_{i,t}$$

$$(5): \text{BHAR}_i = \prod_{t=1}^T (1 + R_{i,t}) - \prod_{t=1}^T (1 + R_{m,t})$$

Independent Variable

PE-Backed

According to the definition of the concept of private equity investment funds in this study, some adjustments have been made to listed companies that have private equity investment funds. The previous academics (Li & Zhang, 2011) claimed substance over form principle. In this paper, corporate venture capital, angel capital, and so forth are included in private equity investment institutions.

Innovation Capability

As the Chinese government strongly advocates technological innovation and production revolution, innovation capability has also become an important symbol to attract investment and help companies to go public. Innovative evaluation indicators include technical personnel, funding, patents, software copyrights, drug numbers, local or national high-tech enterprise certification, among others. The study will be measured in the following ways” The scores are ranked according to the number of innovation outputs (patent number, software copyright number, new drug number). Previous studies relating to patents were

focused on IPO valuation or the risk of delisting, whereas our paper is more concentrated on after-IPO performance and long-time returns (Useche, 2014; Signori & Vismara, 2014).

Underwriter's Reputation

In measuring the reputation of underwriters, this paper first finds out the underwriters employed by listed companies. We then check whether the underwriters ranked in the top 10 consecutively in the past three years; then use ranking as a dummy variable to measure the reputation of an underwriter. This paper ranks China's existing brokerage firms by revenue, and selects the top 15 brokerage firms in terms of income from 2008 to 2014. If the brokerage ranked at top 15, the UR is defined as 1, if not is 0. It is an important indicator for verifying the market power effect. Other independent variables are shown on Table 1.

The company's characteristics mainly include the company's issue size (CIS). CIS was used by logged number, asset-liability ratio (LEV), ROA, and company's industry dummy (Ind). The stock issuance fee and the company's issue size are the natural logarithms of the value of the issue price multiplied by the number of issued shares. The company's industry (Ind) is only divided into high-risk industries (new energy, biotechnology, medical, IT, new media, financial industry) and traditional industries (Zhang & Liao, 2011). If it is under high-risk industries, the value is 1; otherwise, the value is 0.

Other Variables

Other control variables include year, region, and economic prosperity. The variables are defined as follow: (a) regional marketization index dummy (RMI), and (b) hot market (HM). The regions are divided by province, and the impact is differentiated by the degree of regional marketization. Regional marketization index (RMI) value comes from a study conducted by Zhang & Li (2014) that took into account factors such as innovation resources, intermediary services, transportation, human capital levels, relevant regional policies, and local GDP. Therefore, six provinces or municipalities have the highest RMI value in the country, and the value is 1 (Zhang & Li, 2014). For hot market (HM), criteria were followed by the definition of Lerner (1994) and Ljungqvist et al. (2006). They thought that in the hot market, investors' overoptimism about the market will drive the prices beyond their fair

value. Based on the CSI300 Index of China from 2009–2013, the Bubble Period of China is 2010–2011 (Li, 2017). If the company IPO year is during 2010–2011, make the dummy into 1, others into 0.

Table 1. *Descriptive Statistics for Market Performance*

Variables	Definition	Obs.	Min.	Max.
PE ratio	Price-to-earnings ratio	916	6.23	150.82
R	Underpricing rate	-	-0.2633	6.2674
AR	Adjusted Underpricing Rate	-	-0.2093	6.0802
CAR	Cumulative abnormal return	-		
BAHRs	Buy-and-Hold Abnormal Returns	-		
PE	Private equity dummy	-	0	1
INV	Innovation capability	-	0	383
UR	Underwriter's Reputation	-	0	1
AGE	The period from the start of the business registration to the time it is listed	-	1	28
SIF	The stock issuance fee	-	8988.193	854550
CIS	The company's issue size	-	38700	59591000
LEV	Asset-liability ratio	-	3.4066	98.3
IND	Company's industry dummy	-	0	1
PROB	The lottery winning rate of stock buying	-	0.1347	65.5208
RMI	Regional marketization index dummy	-	0	1
HM	Hot market	-	0	1

Table 1 outlines and summarizes the independent variables and dependent variables of the stock market. There are 916 observations in this article. For a single variable, the minimum value in the PE ratio on the first day of listing is 6.23, and the maximum value is 152.82. The minimum value of R is -0.2633, while the maximum value of R is 6.2674. INV in the table is the number of invention patents in the article, with a minimum value of 0 and a maximum value of 383. The survey found that among the listed companies, the company with the largest number of invention patents was BYD. BYD is well known that its main business is the automotive business of new energy vehicles and traditional fuel vehicles, mobile phone components and assembly business, secondary rechargeable batteries, and photovoltaic business. Especially in the new energy vehicle business, electric vehicles have a 19% market share in China.

Table 2 describes the basic situation of the 916 companies that went public from 2010 to 2014 at the time of IPO. Panel A is the Offer Price of all 916 companies and their market value after listing. It can be seen from the grouping in the table that there are PE-backed and non-PE-backed. And there is a certain

difference in the market value after listing. The average market value after listing without PE support is more than 1122.11 million, which is higher than the average value with private equity support (935.64 million). However, for the top 25% of the market capitalization, companies with private equity support are significantly higher than those without PE support. Private equity funds are more inclined to invest in companies with low valuations. In the long run, companies with private equity investments will grow better. Although the average market value of listed companies without PE support at the time of listing is higher, listed companies backed by PE will grow better and enjoy higher market value growth rates after 3-5 years.

Table 3 compares some of the variable values with and without private placement support, thus simply verifying some of the assumptions(H2a to H2d) in the article. Through the simple statistical average and median of panel A in the table, it is found that the performance with PE support is not higher than the non-private placement group, but slightly lower than the non-private placement group, with a value of -0.7293%. The difference between the two groups is small. H2a (screening effect) does not stand in China

Table 2. *Number of IPOs*

	Mean	25%	Median	75%
Panel A: Complete IPO sample (Number of Issues = 916)				
Offer Price in ¥(CNY)	25.15	16	22	31
Offer Price Valuation, ¥ millions	830.54	308.87	510.00	855.60
Market Price Valuation, ¥ millions	1028.46	417.50	635.36	1029.18
Panel B: PE-backed IPOs (Number of Issues = 458)				
Offer Price in ¥(CNY)	25.62	16	22	32
Offer Price Valuation, ¥ millions	813.86	288.55	491.70	880.00
Market Price Valuation, ¥ millions	935.64	400.00	652.74	1045.20
Panel C: Non-PE-backed IPOs (Number of Issues = 458)				
Offer Price in ¥(CNY)	24.68	15.2	22	31
Offer Price Valuation, ¥ millions	847.40	321.30	525.43	818.07
Market Price Valuation, ¥ millions	1122.11	437.40	624.00	790.00

Table 3*Test Hypotheses of PE-Backed and Non-PE-Backed IPOs*

All IPOs	PE-Backed IPOs	Non-PE backed IPOs	Difference
Panel A: Median of the PE Ratio (Unit: %)			
42.42	41.0300	43.8000	-2.7700*
Means of the PE Ratio (Unit: %)			
45.5516	45.1882	45.9175	-0.7293
Panel B: Median of the Underpricing Rate (R) (Unit: %)			
27.6459	27.7857	27.4286	0.3571
Means of the Underpricing Rate (R) (Unit: %)			
33.1922	31.2267	35.1577	-3.9310**
Panel C: Median of the AGE			
9	9.0000	9.0000	0
Means of the AGE			
9.5	9.5925	9.3804	0.2121
Panel D: Numbers of the High Reputation of Underwriters (IPO No.=916)			
465(high)	253	212	41
444(low)	201	243	-42
Means of the Underwriter's Reputation (Dummy: High=1, Low=0)			
0.5121	0.5573	0.4669	0.0904**

*, **, *** means significant at 10%, 5% and 1%, presentively.

for this database. There are several reasons for this phenomenon. First, during the period 2010–2014, China's A-share IPOs were mainly listed in traditional industries. As a result, PE investment tends to invest in companies with a higher total market capitalization, and the growth of these companies on the first day after the listing is not as good as that of SME stocks. Second, during the period 2010–2014, China's capital market had insufficient awareness of private equity investment.

Panel B analyzed the certification effect hypothesis (H2b). The average underpricing rate supported by private equity is indeed lower than the value of the non-private equity group, which proves that this hypothesis is valid in the Chinese market. In order to verify the grandstand effect (H2c), the grouping in Panel C compares the time for listed companies with private equity supported and non-PE supported. The time for listing with private equity support is 9.59, which is higher than non-PE backed age, saying 9.38. Therefore, H2c is not valid in China for this period. If the market power hypothesis (H2d) is established, the underwriter's reputation of the PE group should be better than that of the non-PE group. In Panel D,

for the private equity group, the number of IPO-listed companies with high reputations is significantly higher than that of non-private equity. Therefore, the market power hypothesis (H2d) is true.

Regression

In order to verify the impact of the market performance of PE-backed companies listed on the A-share market, this paper uses the price-earnings ratio, IPO first-day ups and downs, IPO post-accumulated abnormal return rate, and buy-and-hold abnormal returns as explanatory variables. At the same time, multiple regression analysis is carried out with PE-backed or non-PE-backed company characteristic variables and market environment variables as explanatory variables.

Table 4 shows the median and average of the three-year and five-year periods of CAR and BHARs of the sample companies. Panel A is the

Table 4

Mid-Term and Long-Term Market Performance of PE-Backed and Non-PE-Backed IPOs

Time	All IPOs	PE-Backed IPOs	Non-PE backed IPOs	Difference
Panel A: Median of the CAR (%)				
3 years	-2.6545	-5.5990	-4.4590	-1.1400
5 years	10.1302	12.2754	8.8117	3.4637*
Means of the CAR (%)				
3 years	2.7333	2.6384	2.8282	-0.1898
5 years	18.5823	18.6119	18.5527	0.0592
Panel B: Median of the BHARs (%)				
3 years	-9.1539	-9.2880	-8.3340	-0.9540
5 years	-9.4608	-10.7070	-8.1020	-2.6050
Means of the BHARs (%)				
3 years	6.2895	9.6816	2.8974	6.7842*
5 years	15.2823	11.7133	18.8514	-7.1381**

*, **, *** means significant at 10%, 5% and 1%, presentively.

performance of CAR. It shows that during a three-year period, the cumulative return of the private equity group is lower than that of the non-private equity group. The reason for this situation may be that the lockup period for listing in China is one or three years. During the three-year period, the equity flow is small, and the liquidity rate affects stock trading and valuation. PE shareholders will reduce their holdings in a one-year and three-year period. Therefore, a large proportion of the shareholding reduction will cause the stock price to continue to fall. However, the CAR of the subsample with private equity-backed is higher than that without private equity in the five-year period. If analyzed according to a 5-year period, listed companies that have been invested by PE perform better. This is because the impact of the reduction in the share price of the listed company is offset by the future performance of the listed company.

Panel B in Table 4 is the performance of BHARs. From this table, it can be seen that the median BHAR of the group with PE support is lower than that of the total sample and the group without PE support, and the difference is obvious. From the statistical data group of the mean, it can be seen that a group of three-year (medium-term) BHARs with PE support is much higher than the

group without private equity support. However, from a five-year (long-term) perspective, the BHARs with private equity groups are lower than the market and non-private equity groups. The reason may be that after the three-year lockup period has expired, private equity has sold many its own equity, resulting in changes in market valuation. But at the same time, to obtain excess returns, private equity will increase the market value of listed companies through market value management before it reduces its holdings, so that it can obtain more profits from the sale of equity.

The model is divided into four groups and is represented by ABCD. Group A, B, and C represent the price-earnings ratio, first-day underpricing return (R), and the relative return adjusted by the Shanghai and Shenzhen Stock Exchange Index (AR), respectively. However, Groups D and E are the cumulative abnormal (CAR) and buy-and-hold returns (BHARs) yield of 4 weeks, 26 weeks, 52 weeks, three years (156 weeks), and five years (260 weeks). The weekly date was used here to calculate the returns for the listed- companies.

Table 5 shows the OLS regression results. Model A in table 5 reports the PE ratio of the first day of A-shares of IPOs. In model A, the regression shows that the private equity investment will increase the PE ratio by 1.84%, with a 10% significance level. This situation shows that on the day of the company's IPO, the market will give a

Table 5. OLS Regression

Y	PEratio	R	AR	CAR (4)	CAR (26)	CAR (52)	CAR (156)	CAR (260)	BHAR (4)	BHAR (26)	BHAR (52)	BHAR (156)	BHAR (260)
X													
Model	A	B	C	D1	D2	D3	D4	D5	E1	E2	E3	E4	E5
PE-Dummy	1.84*	-2.53	-2.36	1.22	1.09	0.95	-3.00	-2.69	1.91	2.96	4.02	3.08	-9.02
INV	-0.05*	0.03	0.02	0.09**	0.05	7.03E-3	-0.07	0.03	-0.10**	0.03*	-0.04	-0.18*	-0.13
UR	-0.33	0.11	0.72	-2.57*	-2.79*	-3.00	-3.59	-4.45	-3.88**	-5.48*	-7.09	-7.03	-6.38
AGE	-0.28**	0.36	0.37	0.26*	0.24	0.22	0.31	1.15***	0.33	0.14	-0.06	0.52	1.10
SIF	7.777***	-25.933***	-24.681***	-0.768	-2.188	-3.609	-3.041	-5.907	1.462	4.280	7.098	-0.777	-7.905
CIS	-3.866***	5.475**	5.032**	-3.363**	-4.235***	-5.106**	-6.606***	-11.862***	-5.505***	-10.225***	-14.944***	-12.683***	-9.496
LEV	-0.14***	0.15**	-0.15**	-0.03	-0.03	-0.04	-0.06	-0.20*	-0.02	0.07	0.17	0.11	-0.10
PROB	-0.75***	-2.15***	-2.17***	-0.37	-0.15	0.07	-0.22	0.04	-0.58*	-0.60	-0.62	-0.61	-0.10
RMI	1.22	-6.41**	-5.93**	0.007	0.21	0.43	-0.46	7.57*	0.52	1.01	1.51	1.95	13.51
IND	3.21***	-1.37	-1.38	4.31**	6.80***	9.29***	11.23***	14.30*	6.13**	12.09***	18.04***	19.20***	35.23***
HM	25.65***	1.56*	3.68	-22.26***	-21.47***	-20.69***	-23.89*	-22.61***	-27.51***	-33.77***	-40.03***	-36.70***	-10.81*

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

high valuation of a company that was invested by private equity. The explanatory variable coefficient corresponding to INV is -0.05, and the significance level is 1%. Enterprise research and development will consume a lot of capital, labor, and material resources in the short term. In the end, invention patent expenditures lowered the market valuation, resulting in a negative impact on the PE ratio. Debts–asset ratio (LEV) is significant at the 10% level, with a coefficient of -0.14. Generally, for an individual company, the higher debts, the higher possibility that the company is a traditional heavy asset company. The market's valuation of traditional companies will be low. Therefore, the higher the LEV, the lower the company's valuation will be. The last two explanatory variables are company's industry dummy (IND) and hot market dummy (HM). Both variables are significant at the 10% level, and the coefficients of the variables are 3.21 and 25.65. It shows that for every additional enterprise in the high-tech industry, the PE ratio will increase by 3.21 percentage points. Once again, it has been proved that the valuation of high-tech enterprises is higher than that of traditional industries. Secondly, if the company was listed as a hot market, and there were many IPO companies that year, the valuation would be greatly increased.

Models B and C in Table 5 are the regression results of the issue underpricing rate (R) and adjusted underpricing rate (AR) on the day of listing. The parameters of SIF, CIS, LEV, PROB, and RMI are at significant levels for Models B and C. Here the RMI will be explained in detail. The companies that were located in a good location could get better resources and could get a lower underpricing rate. So, RMI has a negative coefficient with R and AR.

Model D and Model E are regression analyses that refer to CAR and BHAs. It can be seen from model D1 that four weeks after the company goes public, the regression of the dependent variable CAR (4) shows that INV, UR, AGE, IND, and HM have significant effects. The correlation coefficient of the underwriter's reputation (UR) is -2.57, with significance at the 1% level. The top underwriters

(high operating cost) are more inclined to choose companies with large assets for IPOs, so the rate of return will be lower than that of small assets. Moreover, the sci-tech innovation board has not been launched in the A-share market during that time, especially listed medical or semiconductor companies, because of high R&D costs and poor profitability. In the end, the companies served by top underwriters are still traditional industries, and their returns after listing are low. However, the impact of UR on the return on listing disappeared after one year (Model D3-Model D5). For Models D1 to D5, the paramotors of CIS, IND, and HM always have a significant effect on CAR.

Model E in Table 5 is a regression analysis of BHARs. The time period in this analysis is consistent with the time period in Model D. In the regression results, INV has a negative correlation with the company's BHARs, and the negative correlation is significant at the level of 1%-5% within three years (156 weeks). The reason is that companies with more invention patents account for a relatively high proportion of R&D expenditures, resulting in a decrease in corporate net profits and thus affecting market valuation.

Conclusion

The first aim of this paper is to analyze the long-run market performance of private equity-backed Chinese IPOs. It tests five hypotheses about private equity-backed companies in the Chinese market. Also, the influence of some parameters from prospectus information is studied as the post-listing performance of IPOs.

The results of test support the certification hypotheses (Megginson & Weiss, 1991; Lee et al., 2004; Gompers, 1993) and market power hypotheses (Chemmanur & Loutskina, 2004) in China. The screening effect and grandstand effect are not supported. Furthermore, the study shows that the market performance for Chinese IPOs depends on the time period and the methodology used. By using the CAR method, the result shows that the mid-term (three years) performance of PE-backed IPOs is lower than non-PE-backed. The long-term (five years) performance of PE-backed IPOs is better than non-PE-backed IPOs. This indicates that for the CAR method, the PE-backed

is not outperformance over the short run. However, the benefits of providing supervision and management by PE yield fruitful results and, hence, improve the company's performance after five years of listing. On the contrary, the median of BHARs of PE-backed IPOs is slightly lower than non-PE-backed IPOs for both mid-term and long-term periods. The mean of BHARs for PE-backed IPOs is significantly higher than the non-PE-backed in the mid-term period, which indicates that private equity will increase the market value of listed companies through market value management before it reduces its holdings in the lockup period (three years). The result also supports screening and monitoring effects. However, for long-term performance, the PE-backed is inferior to the non-PE-backed. The reason may be that after the three-year lock-up period has expired, private equity has sold a large share of its own equity, resulting in changes in market valuation.

The further analysis of this research is to study the influence of IPO prospectus information on the long-term performance of IPO enterprises. The results show that the parameters of the IPO—size of the issue, invention patents, age of the company, company industry area, and hot market index—have a stable significant impact on the stock performance of the samples even for five years after IPOs. The underwriter's reputation and the lottery winning rate of stock buying can influence the market performance only on the issue day. When private equity did not have a long-term effect on the market performance of listed companies, invention patents as another parameter had negative effects on market return even in five years. A large amount of research and development expenditures will be consumed by invention patents. R&D is an expense that will reduce corporate profits. Invention patent expenditures lowered the market valuation, resulting in a negative impact. Meanwhile, the labor-intensive industry still played an important role in the Chinese economy. Innovation needs to be encouraged and accepted by investors, and it still has a long way to go. The Chinese government has already realized the crucial problem and launched a new board named Sci-Tech Innovation Board, which gives unprofitable high-tech firms a path to be listed. Further research will focus on this new board.

The study also has some limitations, which could improve for future research. Firstly, this paper provides a brief picture of the Chinese private equity market. Further research could deepen the research on how private equity affects the companies' valuation by

combining with some specific parameters such as invention patents and company industrial segments. Secondly, the paper focuses on long-run performance during 2010–2014 IPOs, which cover the year from 2010–2019. The New Board- Sci-Tech Innovation Board was not included in this database because the time period is too short. Thirdly, it would be interesting to analyze whether the support provided by different types of private equity (e.g., governmental, private, foreign-owned) differs significantly. In spite of the above limitations, this study considerably extends our understanding of the impact of private equity investment on market performance, particularly in China.

Reference

- Barry, C. B., Muscarella, C. J., Iii, J., et al. (1990). The role of venture capital in the creation of public companies: Evidence from the going-public process. *Journal of Financial Economics*, 27(2), 447–471.
- Bhojraj, S., & Lee, C. M. C. (2002). Who is my peer? A valuation-based approach to the selection of comparable firms. *Journal of Accounting Research*, 40(2), 407–439.
- Chemmanur, T. J., & Loutskina, E. (2004). The role of venture capital backing in initial public offerings: Certification, screening, or market power? [Unpublished doctoral dissertation]. Boston College.
- Chemmanur, T. J., & Loutskina, E. (2006). *How do corporate venture capitalists create value for entrepreneurial firms?* Social Science Electronic Publishing.
- Gompers, P. A. (1993). *The theory, structure, and performance of venture capital* [Unpublished doctoral dissertation]. Harvard University.
- Gompers, P. A. (1996). Grandstanding in the venture capital industry. *Journal of Financial Economics*, 42(1), 133–156.
- Kini, J. O. (1994). The post-issue operating performance of IPO firms. *Journal of Finance*, 49(5), 1699–1726.
- Lee, P. M. et al. (2004). Grandstanding, certification and the underpricing of venture capital backed IPOs. *Journal of Financial Economics*, 73(2), 375–407.
- Li Yao, Zhang Ziwei, LI, et al (2011). The different effects of private equity and angel capital on IPO underpricing in GEM. *Financial Research*, 37 (8), 113–124.
- Li Chong. (2017). Log-periodic view on critical dates of the Chinese stock market bubbles. *Physica A: Statistical Mechanics and its Applications*, 37(8), 105–127.
- Lerner, J. (1994). Venture capitalists and the decision to go public. *Journal of Financial Economics*, 35(3), 293–316.
- Levis, M. (2011). The performance of private equity-backed IPOs. *Asia-Pacific Tax Bulletin*, 40(1), 253–277.
- Ljungqvist, A., Nanda, V., & Singh, R. (2006). Hot markets, investor sentiment, and IPO pricing. *The Journal of Business*, 79(4), 1667–1702.
- Meggison, W., & Weiss, K. (1991). Venture capitalist certification in initial public offerings. *The Journal of Finance*, 57(3), 1171–1200.
- Paleari, S., Signori, A., & Vismara, S. (2014). How do underwriters select peers when valuing ipos?. *Financial Management*, 43(4).233–247
- Srensen, M. (2007). How smart is smart money? a two-sided matching model of venture capital. *The Journal of Finance*, 62(6), 2725–2762.
- Swaminathan, V., & Moorman, C. (2009). Marketing alliances, firm networks, and firm value creation. *Journal of Marketing*, 73(5), 52–69.
- Useche, D. (2014). Are patents signals for the ipo market? an eu–us comparison for the software industry. *Research Policy*, 43(8), 1299–1311.
- Zhang Xueyong,&Liao Li (2011). Venture capital background and corporate IPO: market performance and internal mechanism. *Economic Research*, 46(06), 118–132
- Zhang Yuhua,&Li Chao (2014). Research on the regional agglomeration of venture capital in China and its influencing factors. *China Soft Science*, 12(11), 93–103