IPO Performance: A Cross-Country Comparison of the Effect of Regulations

CNV Krishnan
Case Western Reserve University

Yu He
Case Western Reserve University

We compare short-term returns around IPOs, as well as longer-term returns and post-issue performance, between US and China IPOs. Short-term abnormal returns are higher for China IPOs than US IPOs, both in univariate tests (difference of means and medians tests), and in multivariate tests, controlling for other variables and fixed effects. We postulate that this is due to the different regulations between the two countries that could lead to more underpricing and constraints on reaching true value, in the short run, for China IPOs. However, the upward price pressure leading to superior stock returns does not last. In the longer-term, not only do China and US IPO firms have similar abnormal stock returns – on average negative as documented in the extant literature - but also the firms' operating performance, on average, as well as their book-to-market ratios (a proxy for future growth options) are not significantly different, in both univariate and multivariate tests.

Keywords: initial public offerings, US IPOs, China IPOs, regulations, abnormal returns, post issue performance, post issue returns

INTRODUCTION

The US stock market is the world's largest, and China's stock market is the world's second-largest. We compare and contrast IPO characteristics and performance between these two countries. The securities market in the United States has a long history starting from the Civil War and developed into a highly regulated market after the economic crisis in the 1920's. On the other hand, the Chinese securities market developed in 30 years from 1990 and is growing at a fast speed. The regulatory systems governing the two markets are different, as are the influences of government and media.

The IPO process in China is controlled by the government. There are various restrictions on the issuance of new stocks. China Securities Regulatory Commission (CSRC) approves IPOs in China (Su and Fleisher 1999), similar in role as the Securities Exchange Commission (SEC) in the US. But the difference is that, in the US, investment bankers generally help the firm determine the offer price through a book-building process. In China, most of the investment bankers follow the guidance of the CSRC to restrict the Price to Earnings (P/E) ratio to below 23 times, to get approvals easily. However, this may contribute to significant underpricing at the time of IPO. In addition, there are limits on the maximum daily returns in the immediate post IPO period. This may lead to price pressure and perceived "hype" around an IPO.

The extant literature on China IPOs include Mok and Hui (1998), who report underpricing to the extent of 289% in *A*-shares based on 101 IPOs in 1990-1993; Su and Fleisher (1999), who report 948% initial returns for *A*-share IPOs based on 308 cases in 1987-1995, and Li (2006) who documents 134% return because of IPO underpricing based on 314 IPOs in 1999-2001. Researchers have provided explanations for underpricing in China that include Padgett and Chi (2005), who suggest that underpricing in China's IPO is caused by the imbalance in supply and demand, and Tian (2010), who proposed that intervention and control of the Chinese government may be a decisive factor in the significant underpricing in China IPOs. Many studies have examined US IPOs. Ritter and Welch (2002), for example, report an initial underpricing of 18.8% based on IPO data in 1980-2001. In general, the underpricing in the US may be much lower than in China.

We compare US and China IPOs. We examine short-term and longer-term returns post IPO, identify patterns, and link to the effects of different IPO processes in the two markets. In univariate difference of means *t*-test and difference of medians Wilcoxon rank-sum (Mann-Whitney) tests, short-term abnormal returns are higher for China IPOs than US IPOs: the means are generally significantly higher using the *t*-statistic, and the medians sometimes significantly higher using the *z*-statistic over the longer period of 20 days. We postulate that this is due to the P/E limit regulations for China IPOs, and on restrictions on maximum change in price in the initial post-IPO period. These regulations are explained in greater detail below.

The longer-term returns tend to be negative for both US IPOs and China IPOs and the differences tend to be, generally, around zero (statistically), especially when computed over and above the equally-weighted and value-weighted indices. China IPOs tend to have significantly lower negative longer-term returns than US IPOs when using the market Index adjustment and when using BHAR returns over the longer run, but the medians of long term returns are never significantly different from one another. Overall, US IPO and China IPO returns tend to converge in the longer-run post IPO and be negative, in line with the findings in extant literature.

We find that although the operating performance of the China IPO firms in the year of the IPO is significantly better than those of the US IPO firms, measured by ROA and ROE in terms of difference of means; in the longer run, they are statistically not different from each other. There is no difference in the proxy for (inverse of) future growth options- the book-to-market ratio – of IPO firms between the two countries. The medians of these measures for China and US IPOs are never different from each other.

Multivariate regression results, after controlling for other variables and fixed effects, show that only short terms returns of days 3, 10, and 20 immediately after the IPO are significantly lower for US IPOs as compared to China IPOs. The longer-term returns, post-IPO operating performance, and book to market ratios between US and China IPOs are not significantly different from each other.

Thus, the initial hype and upward price pressure created by regulations for China IPOs, do not last, as expected.

DATA AND VARIABLES

Data

The IPO data over the period 1993 through 2018 comes from Refinitiv's Securities Data Company's (SDC) Platinum Global Public Issues database. Company and stock market details are taken from COMPUSTAT and Center for Research in Security Prices (CRSP) databases, for US firms. Details on Chinese IPOs are collected from the China Securities Market & Accounting Research (CSMAR) database, which is a comprehensive database of China stock returns, covering all companies listed on the Shanghai Stock Exchange and the Shenzhen Stock Exchange.

To be included in the sample, stock return data of IPO firms must be available from the CRSP or CSMAR for two years after the issue. Another requirement is that the firms must have accounting data available from COMPUSTAT or CSMAR post issue. Since our comparisons focus on China *A*-share IPOs, we also remove China IPO firms listed on markets other than the *A*-share market. We focus on large IPO cases of both countries so that we are examining the economically important cases. Finally, we have tried

to, roughly, match firm features by country. After all the above screens, we have a final sample of 43 US IPOs and 21 China IPOs.

All firms are analyzed by industry. For the US firms, the industrial classification comes from COMPUSTAT's 4 digit SIC code. The first two digits are used to get the major industrial classification. For China firms, we use the National Bureau of Statistics of China (NBS) which is the major official classification. These industrial classifications are matched between the two countries.

To compare firm performance, we use financial statement information taken from COMPUSTAT and CSMAR. Net income, total assets, total equity, and common shares outstanding are collected in the post IPO period for up to 24 months. These are then used to compute ratios – the Return on Assets (ROA), the Return on Equity (ROE), Book Value of Equity (BVE), and Market Value of Equity (MVE).

Variables

We calculate different announcement periods' abnormal returns based on various benchmark returns. These market returns are collected from Center for Research in Security Prices (CRSP) and China Securities Market & Accounting Research (CSMAR) and include Standard and Poor's (S&P) 500 Index return for the United States, and Shanghai Stock Exchange Composite Index (SSE Composite Index) return for China. We also use equal-weighted and value-weighted market returns for both countries, from CRSP and CSMAR.

For short-term abnormal returns, we follow Aggarwal and Rivoli (1990) and Durukan (2002) and define short-term abnormal returns as each stocks' 1-day, 3-day, 10-day, and 20-day post IPO returns over and above corresponding benchmark returns, given by: $\mathrm{AR_i} = \mathrm{R_{firm}} - R_{benchmark}$

For longer-term abnormal returns, we follow Barber and Lyon (1997) and Wagner (2006) by computing Cumulative Abnormal Return (CAR) and Buy-and-hold Abnormal Return (BHAR). CAR is calculated as the sum of monthly abnormal returns of the IPO firm, over and above the benchmark, while BHAR is calculated as the product of 1 plus the monthly abnormal returns of the IPO firm, over and above a benchmark, minus 1 as: $\mathrm{CAR_i} = \Sigma_{\mathrm{k}} AR_{i,t+k}$ and $\mathrm{BHAR_i} = \Pi_{\mathrm{k}}\left(1 + AR_{i,t+k}\right) - 1$. We calculate CAR and BHAR for each IPO firm over 6 months, 12 months, and 24 months post-IPO. The test statistics and significance levels are computed using the bootstrapping procedure described in Lyon et al. (1999).

Following Ou and Penman (1989), we compute key financial ratios such as Return on Assets (ROA), calculated as net income divided by the book value of total assets (Carter, D'Souza, Simkins, and Simpson (2010)), and Return on Equity (ROE) calculated as net income divided by Book Value of Equity (BVE). We calculate the Market Value of Equity (MVE) by multiplying the number of shares outstanding by the share price during that time. All these firm characteristics are calculated in the year of the IPO (year 0), 1 year after IPO (year 1), and 2 years after IPO (year 2), using data from COMPUSTAT for US and CSMASR for China firms. The main industries in our dataset are finance, wholesale, health, mining, and manufacturing.

IPO PROCESS

The differences in regulations between the two markets can influence the differences in the short-term and longer-term abnormal returns observed. We discuss these regulations in this section.

The Book Building Process in the U.S.

The cumulative bidding inquiry mechanism used in the United States is a widely adopted issuance pricing method in mature capital markets. Its advantages are threefold. First, a communication mechanism is established between issuers and investors, which may reduce information asymmetry. Second, institutional investors' pricing in the inquiry process becomes more rational, which can reduce the risk for the underwriter. Third, the book-building process can avoid a price difference between the primary market and the secondary market, and avoid occurrences of sharp rises or plunges after the listing of new shares.

The "Quiet" Period in the U.S.

The quiet period is a mandated embargo by SEC and it prohibits the management teams of the issuer, its investment bankers and lawyers, from providing any new information which is not included in the registration statement, because any such information can significantly influence prices. The main purpose of setting a quiet period is to protect investors. Investors should make investment decisions based on vetted information, that is, the information in the prospectus that they have access to.

Cap on P/E Ratio in China

On January 12, 2014, the China Securities Regulatory Commission (CSRC) issued guidelines titled "Measures to Strengthen the Supervision of new IPO firm". It asked the issuers to report the average price-earnings ratio of the most recent month released by China Securities Index Co., Ltd as a reference basis. The CSRC also clarified that the issuers should determine the industry following the "Guidelines for the Classification of Listed Companies". Although the CSRC never clearly states that the issuer cannot exceed 23 times the P/E ratio, issuers set a red line at 23 times, because the main worry of issuers is that the approval process may not go smoothly at a higher P/E ratios.

Such underpricing of IPO firms may lead to a hype or demand being created. The difference between the issue price and secondary market valuation may attract more investors to the IPO. If the IPO investors earn immediately high returns, it can help the securities market build faith and attract more investors to the IPO market. Many people sell other stocks or otherwise divert funds in preparation for buying new IPOs. Underpricing ensures that investor's interest in the IPO markets is maintained, with immediate short-term returns on their investments.

Daily Returns Limits in China

In January 2014, a 44% price limit system was implemented on the first day of IPO in the Shanghai Stock Exchange and Shenzhen Stock Exchange. The original intention is to avoid new stock speculation and smoothen price changes. But in reality, perhaps because of the above-mentioned underpricing, the vast majority of new stocks may easily increase by 44% on the first day. After the first day, they are supposed to follow normal rules on daily return. To prevent speculation, China Securities Regulatory Commission stipulated that the daily return limit is -10% and 10% on the downside and upside, and individual stocks whose daily returns exceed these limits are automatically suspended from trading for the rest of that day. These regulations can result in pent-up price pressure and higher abnormal returns in the short term, as prices move towards the perceived fundamental value.

"State-Run" Enterprises Effect in China

According to a report released by World Bank, state-owned firms in China contributed between 23-28 percent to its GDP, and assets held by the "state-run" enterprise reached $8.2 trillion in 2018. China relies on state-run enterprises as a cushion against "international pressure and risks". The government requires state-owned enterprises should have strong capabilities in defending against various risks and innovating in the high-tech industry.

In 1994, the former State Administration of State-owned Assets and the State Economic Reform Commission jointly issued departmental regulations "Interim Measures for the Administration of State-owned Equity in Joint Stock Companies". The measures set the rule that for state-owned holding companies "the issue price of shares shall not be lower than the net assets per share". Although the measure has been abolished and the subsequent relevant provisions on state-owned property rights transactions no longer clearly stipulate this requirement, in practice, almost all state-owned holding companies, when deciding whether or not to issue an IPO or issue additional shares in the securities market, still rely on this guideline. In the securities market, IPO value may be determined by expected (future) cash flows rather than on current assets value, which may lead to underpricing.

IPO EXAMPLES: CROSS-COUNTRY COMPARISONS

The following examples illustrate the effects of regulations on post IPO short-term and longer-term returns.

CITIC Securities

CITIC Securities Co., Ltd. was incorporated on 25 October 1995. Listed on Shanghai Stock Exchange in 2003, the company offers a wide range of financial services and products and had a revenue of RMB 440.8 billion and realized net profits of RMB 152 billion, with dividends of RMB 56.2 billion. It remains at or near the top of this industry on revenue and net profits for more than ten years.

The daily abnormal return 3 days, 10 days, and 20 days after IPO are 0.12, 0.25, and 0.26 respectively, while the cumulative abnormal return 6 months, 12 months, and 24 months after IPO are 0.10, 0.15, and 0.01 respectively. The ROA at year 0, year 1, and year 2 after IPO are 0.0059, 0.0309, and 0.0125 respectively, and the ROE at year 0, year 1, and year 2 after IPO are 0.0215, 0.0667, and 0.0298 respectively. Thus, we find that the short-term abnormal return is high, and in the long run, the abnormal return was almost down to zero, in 24 months; the performance also deteriorates in the longer run.

Orient Securities

Orient Securities is an integrated securities company established with the approval of the China Securities Regulatory Commission and offers comprehensive financial services comprising securities, futures, asset management, wealth management, investment banking, investment advisory, and securities research. Its predecessor, Orient Securities Limited Liability Company, commenced operations on March 9, 1998. Orient Securities is a financial holding group with total assets of more than RMB 200 billion, and 168 branches in 81 cities nationwide, and has an existing registered capital of RMB 7 billion. It was successfully listed on the Shanghai Stock Exchange on March 23, 2015.

The daily abnormal return 1 day, 3 days, 10 days, and 20 days after IPO is 0.10, 0.33, 1.01, and 1.10 respectively. The cumulative abnormal return 6 months, 12 months, and 24 months after IPO is 0.03, 0.30, and -0.07 respectively. The ROA at year 0, year 1, and year 2 after IPO is 0.0355, 0.0114, and 0.0155, respectively, and the ROE at year 0, year 1, and year 2 after IPO is 0.2085, 0.0593, and 0.0673, respectively.

Like CITIC Securities, Orient Securities also had relatively high short-term abnormal returns, but, in the long run, the abnormal return turns negative and performance deteriorates.

Hilton Worldwide Holdings Inc.

Hilton (NYSE: HLT) is a leading global hospitality company with a portfolio of 18 world-class brands comprising more than 6,300 properties and more than one million rooms, in 118 countries and territories. Hilton Worldwide Holdings Inc. (“Hilton Worldwide”) announced on Dec 11, 2013, that the pricing of its IPO of 117,640,624 shares is $20 per share.

The daily abnormal return 1 day, 3 days, 10 days, and 20 days after IPO is 0.03, 0.01, -0.03, and -0.02, respectively. The cumulative abnormal return 6 months, 12 months, and 24 months after IPO is -0.01, 0.05, and -0.12, respectively. The ROA at year 0, year 1, and year 2 after IPO is 0.0156, 0.0257, and 0.0546, and the ROE at year 0, year 1, and year 2 after IPO is 0.0971, 0.1428, and 0.2359, respectively.

Compared to the two China firms above, the short-term abnormal returns are lower and sometimes negative, suggesting less underpricing. The longer-term returns are also low and negative at 24 months post-IPO, but the post-issue performance seems to improve over time.

Tallgrass Energy

Tallgrass Energy is a growth-oriented midstream energy company, transporting crude oil and natural gas from some of the nation’s most prolific basins in the Rocky Mountains, Upper Midwest, and Appalachian regions with access to major demand markets in the Rockies, the Midwest, eastern Ohio and points beyond. The company owns and operates more than 8,300 miles of natural gas pipeline, more than 850 miles of crude pipeline, and more than 350 miles of water pipeline across a broad portion of the U.S.

Tallgrass kicked off the largest U.S. IPO of 2015 on May 7, 2015, when it raised $1.15 billion, a third more than it had originally planned. The daily abnormal return 1 day, 3 days, 10 days, and 20 days after IPO is -0.01, -0.01, -0.01, and -0.03, respectively. The cumulative abnormal return 6 months, 12 months, and 24 months after IPO is -0.29, -0.13, and -0.19, respectively. The ROA at year 0, year 1, and year 2 after IPO is 0.0106, 0.0076, -0.0300, and the ROE at year 0, year 1, and year 2 after IPO is 0.0158, 0.0145, and -0.0748, respectively.

Again, the short-term abnormal returns are negative. There is no evidence of underpricing. Indeed, the company appears to be affected by the collapse in oil and gas prices, and the longer-term returns (and performance) are also negative.

We next examine the short-term and longer-term abnormal returns of our sample of US and China firms post IPO, as well as the post-IPO performance, systematically, with univariate and multivariate tests. We start with some plots, from which it is easy to see the trend of returns and compare them between the two countries.

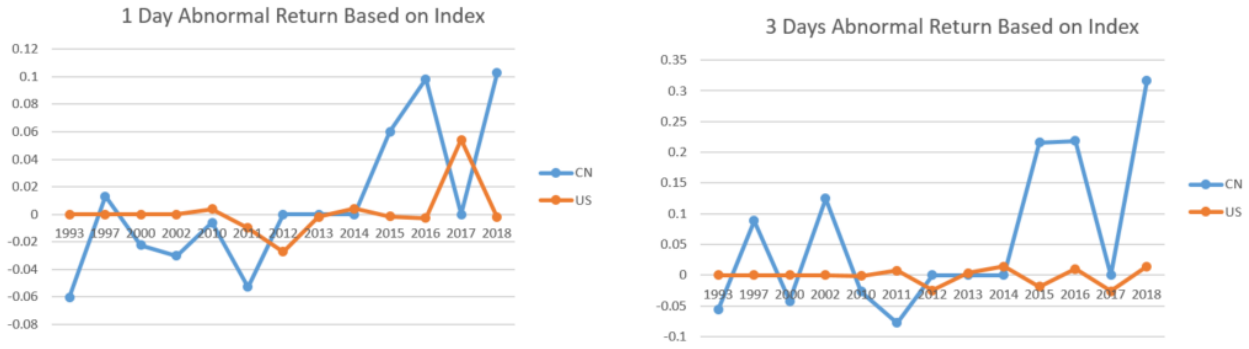
RESULTS

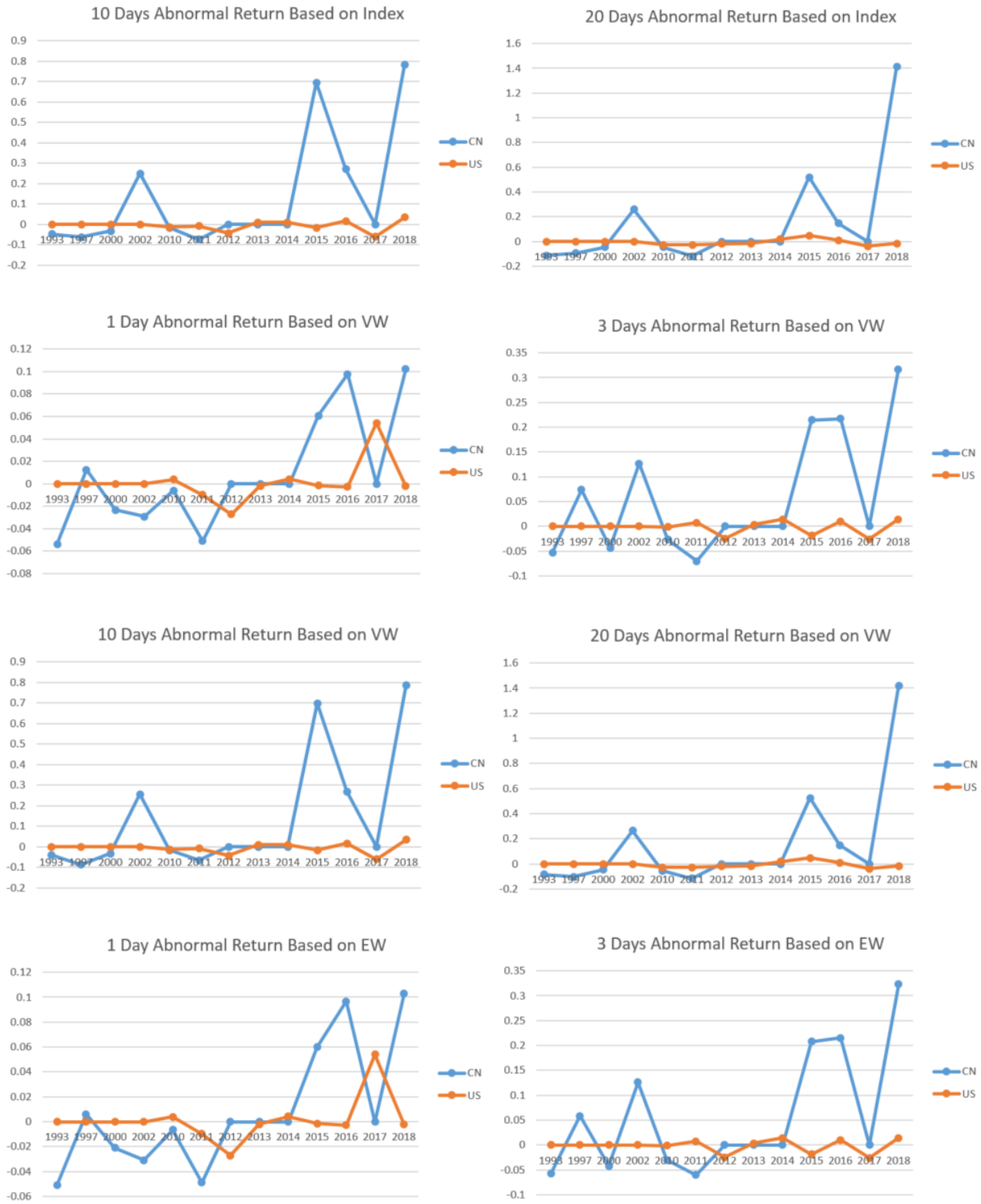
Returns

Figure 1 shows the time series plots of annual average short-term abnormal returns after IPO days by 1 day, 3 days, 10 days, and 20 days for US and China IPOs. These short-term abnormal returns are over and above the index return, value-weighted market return, or equal-weighted market return. We find that, on average, US IPO firms have a lower short-term abnormal return compared to China IPO firms across different periods, suggesting that underpricing caused by the limit on the P/E ratio set by the CSRC may be a reason for the difference, while the book-building process in the US sets the price closer to market valuations, although some money left on the table is still possible. The smoother plots for the US IPOs short-term abnormal returns show that US IPOs tend to be more correctly priced, on average, than the China IPOs, more volatile plots of which indicate price discovery may still be going on. Li (2018) mentions that high IPO underpricing rate and high turnover rate have always been unique to China's new issue market.

The following panels show short-term abnormal returns immediately after US (in red) and China (in blue) firm IPOs. The 1 day, 3 days, 10 days, and 20 days post IPO abnormal returns are shown in the different panels, where abnormal returns are over and above market index return (Index), value-weighted market return (VW), or equal-weighted market return (EW). The IPOs are over the period 1993 through 2018. All variables are defined in the Appendix.

FIGURE 1
SHORT TERM RETURN




10 Days Abnormal Return Based on Index
20 Days Abnormal Return Based on Index
1 Day Abnormal Return Based on VW
3 Days Abnormal Return Based on VW
10 Days Abnormal Return Based on VW
20 Days Abnormal Return Based on VW
1 Day Abnormal Return Based on EW
3 Days Abnormal Return Based on EW
CN
US
1993 1997 2000 2002 2010 2011 2012 2013 2014 2015 2016 2017 2018

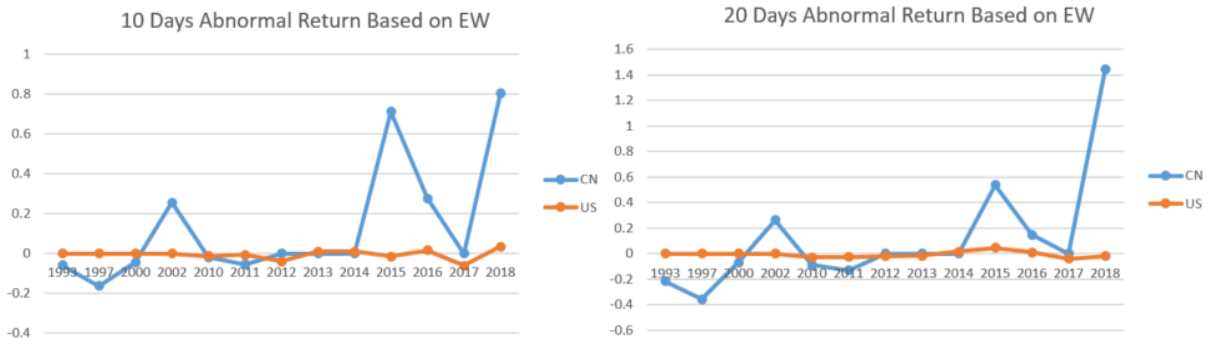
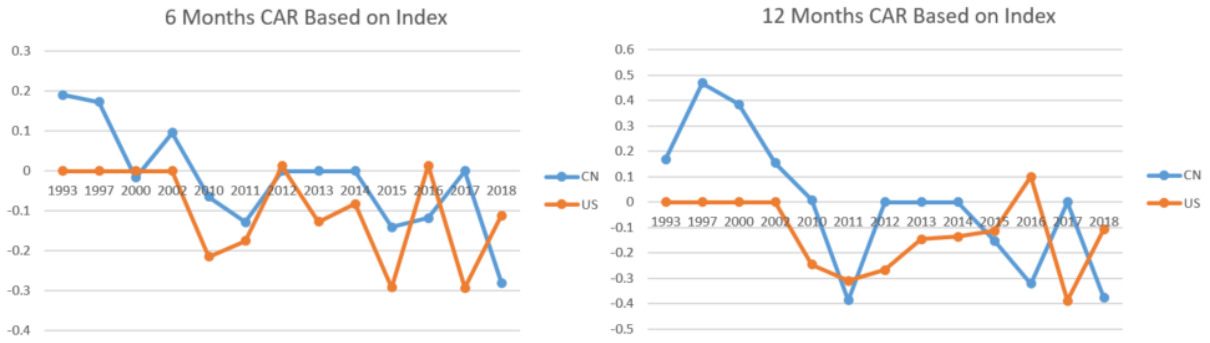
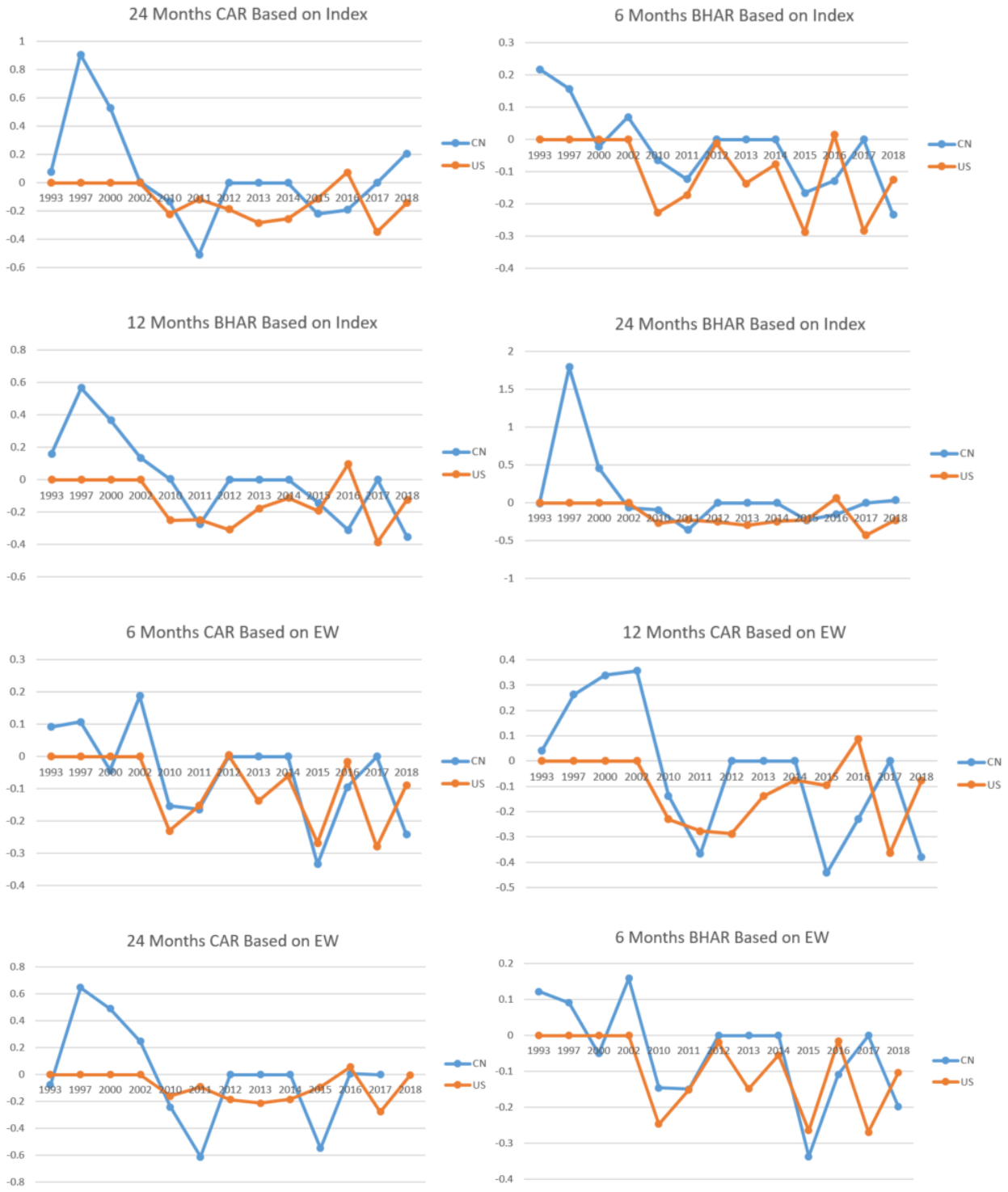


Figure 2 plots the annual average longer-term abnormal returns 6 months, 12 months, and 24 months post IPO for US and China firms. These longer-term abnormal returns include Cumulative Abnormal Return (CAR) and Buy-and-hold Abnormal Return (BHAR) and they are also based on three different market adjustments. Figure 2 shows that China IPO firms have a higher abnormal return in 6 months and 12 months in most cases as compared to US IPO firms, which may be the result of pent-up demand because of price change restrictions in the post IPO period in addition to the demand for state-run enterprises. But at 24 months post IPO, both US and China IPO firms abnormal returns are similar and often zero or even negative, in line with Ibbotson (1975) who notes that for US IPOs there is "generally positive performance the first year, negative performance the next 3 years", and Ritter (1991), who uses a sample of 1,526 US IPOs, finds that in the 3 years post IPO, IPO firms significantly underperformed a set of comparable firms matched by size and industry.

The following panels show longer-term abnormal returns - Cumulative Abnormal Return (CAR) and Buy-and-hold Abnormal Return (BHAR) - over 6 months, 12 months, and 24 months post IPO, for US (red) and China (blue) IPO firms. These returns are calculated over and above market index return (Index), value-weighted market return (VW), or equal-weighted market return (EW). The IPOs are over the period 1993 through 2018. All variables are defined in the Appendix.

FIGURE 2
LONGER TERM ABNORMAL RETURN




24 Months CAR Based on Index
6 Months BHAR Based on Index
12 Months BHAR Based on Index
24 Months BHAR Based on Index
6 Months CAR Based on EW
12 Months CAR Based on EW
24 Months CAR Based on EW
6 Months BHAR Based on EW
CN
US
1993 1997 2000 2002 2010 2011 2012 2013 2014 2015 2016 2017 2018

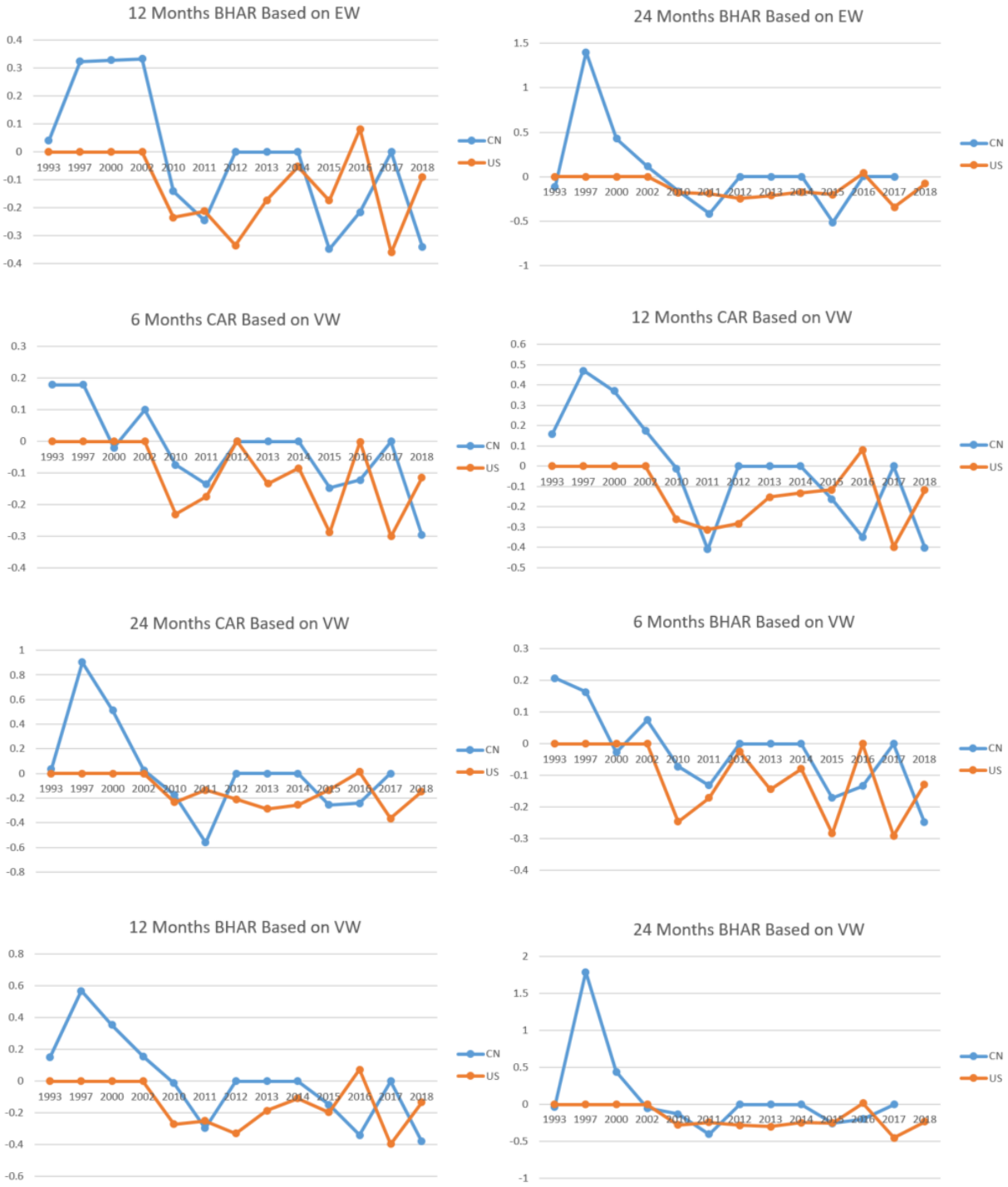


Table 1 shows that our sample of US and China IPO firms are more or less evenly matched on book value of equity and market value of equity at year 0 of IPO, and years 1 and 2 after IPO. This would enable us to compare stock return effects in the short term and in the longer term that are influenced by market conditions and regulations.

The top (bottom) panel reports the descriptive statistics of US (China) IPO firms, in terms of book value of equity (BVEt) and market value of equity (MVEt) in the year of the IPO, t = 0, and in the years 1 and 2 after IPO. The IPOs are over the period 1993 through 2018. All variables are defined in the Appendix.

TABLE 1
DESCRIPTIVE STATISTICS: FIRM FEATURES

US IPO FIRM FEATURES (In USD billions)

	BVE_0	BVE_1	BVE_2	MVE_0	MVE_1	MVE_2
MEAN	8.6	9.3	10.5	16.9	17	23.7
MEDIAN	5.4	5.6	6.0	12.5	10	15.9

CHINA IPO FIRM FEATURES (In CNY billions)

	BVE_0	BVE_1	BVE_2	MVE_0	MVE_1	MVE_2
MEAN	59.4	73.1	85.6	309.3*	248.0*	197.9
MEDIAN	23.6	33.6	34.6	61.8	53.0	52.9

*, **, and *** denote significantly different from the other cohort at the 10%, 5%, and 1% level respectively.

The full sample average returns of all IPO firms in our sample are shown in Table 2. Panel A reports the mean and median of short-term abnormal returns over and above market index return (Index), and equally-weighted index (EW) returns, while Panel B is the mean and median of longer-term abnormal returns post IPO - CAR and BHAR over the 6, 12, and 24 months post IPO, over and above market index return (Index). The table shows that, on average, in almost all years, except for the immediate post-economic crisis year of 2010, the mean and median short-term abnormal returns are around zero, while the longer-term return tends to become more negative, as time elapses post IPO, in line with the findings in extant literature. Aggarwal and Rivoli (1990), for example, report BHAR for US IPOs as -0.0545 for 12 months, while Zhang, Jarrett and Pan (2019) report BHAR returns of -0.07999, -0.02258, and -0.06252 respectively for 6-months, 12-months, and 24-months post IPO for China IPOs. These numbers are similar to our numbers which show that the longer-term return tend to be negative in the long run post IPO.

Panel A shows the mean short-term abnormal returns (over and above market index return – Index, or equal-weighted market return - EW) for each year in our full sample, over 1 day, 3 days, 10 days, and 20 days post IPO. Panel B shows the mean longer-term abnormal return year by year, defined as CAR and BHAR for the 6, 12 and 24 months after the IPO. The IPOs are over the period 1993 through 2018. All variables are defined in the Appendix.

TABLE 2
FULL SAMPLE ABNORMAL RETURNS

PANEL A: MEAN SHORT-TERM ABNORMAL RETURNS

Year	Index 1	Index 3	Index 10	Index 20	EW 1	EW 3	EW 10	EW 20
Before 2010	-0.036 (-0.53)	-0.008 (-0.11)	-0.052 (-0.50)	-0.108 (-1.12)	-0.032 (-0.44)	-0.019 (-0.27)	-0.095 (-0.80)	-0.263 (-3.73)**
2010	-0.002 (-0.62)	-0.016** (-2.01)	-0.015 (-1.17)	-0.039** (-2.98)	-0.019 (-0.82)	-0.017** (-2.20)	-0.064 (-0.86)	-0.125** (-3.49)
2011	-0.024 (-1.92)	-0.021 (-0.91)	-0.030 (-1.60)	-0.056 (-1.56)	-0.023 (-1.86)	-0.015 (-0.77)	-0.023 (-1.46)	-0.060 (-1.60)
2012	-0.027 (-1.06)	-0.025 (-0.60)	-0.041 (-0.66)	-0.020 (-0.37)	-0.027 (-1.06)	-0.025 (-0.60)	-0.041 (-0.66)	-0.020 (-0.37)
2013	-0.002 (-0.22)	0.003 (0.29)	0.010 (0.63)	-0.017 (-0.26)	-0.002 (-0.22)	0.003 (0.29)	0.010 (0.63)	-0.017 (-0.26)
2014	0.004 (1.02)	0.014 (2.78)	0.010 (1.58)	0.018 (1.63)	0.004 (1.02)	0.014 (2.78)	0.010 (1.58)	0.018 (1.63)
2015	0.040 (1.15)	0.138 (1.75)	0.459 (1.52)	0.362 (1.51)	0.039 (1.00)	0.132 (1.63)	0.469 (1.58)	0.374 (1.42)

2016	0.048	0.115	0.144	0.080	0.047	0.113	0.146	0.080
	(1.63)	(1.53)	(1.10)	(0.96)	(1.63)	(1.54)	(1.17)	(1.12)
2017	0.054	-0.026	-0.060	-0.037	0.054	-0.026	-0.060	-0.037
	(1.95)	(-0.57)	(-0.94)	(-0.88)	(1.95)	(-0.57)	(-0.94)	(-0.88)
2018	0.040	0.135	0.334	0.555	0.040	0.138	0.343	0.566
	(1.16)	(1.77)	(1.07)	(0.96)	(1.16)	(1.77)	(1.11)	(0.98)

PANEL B: MEAN LONGER TERM ABNORMAL RETURNS (over INDEX)

Year	CAR 6	CAR 12	CAR 24	BHAR 6	BHAR 12	BHAR 24
Before 2010	0.184	0.269	0.352	0.197	0.295	0.595
	(0.80)	(1.67)	(1.26)	(0.81)	(1.63)	(0.99)
2010	-0.125**	-0.093	-0.169**	-0.129**	-0.098	-0.166**
	(-2.90)	(-1.42)	(-2.43)	(-2.97)	(-1.45)	(-2.72)
2011	-0.159	-0.334	-0.248	-0.156	-0.259	-0.268
	(-1.86)	(-1.69)	(-1.31)	(-1.75)	(-1.70)	(-1.45)
2012	0.012	-0.266**	-0.188	-0.012	-0.309**	-0.251
	(0.23)	(-2.76)	(-0.75)	(-0.18)	(-3.28)	(-0.98)
2013	-0.128	-0.145**	-0.285**	-0.137**	-0.177**	-0.296**
	(-2.59)	(-2.78)	(-2.61)	(-2.71)	(-3.60)	(-2.56)
2014	-0.083	-0.136	-0.255	-0.077	-0.113	-0.248**
	(-1.09)	(-1.12)	(-1.70)	(-1.04)	(-1.06)	(-2.20)
2015	-0.192**	-0.139	-0.183**	-0.207**	-0.160**	-0.229**
	(-3.11)	(-1.30)	(-2.25)	(-4.35)	(-2.51)	(-3.86)
2016	-0.053	-0.110	-0.059	-0.057	-0.108	-0.046
	(-0.67)	(-0.89)	(-0.43)	(-0.71)	(-0.89)	(-0.44)
2017	-0.293	-0.387**	-0.349**	-0.284	-0.386**	-0.431**
	(-1.88)	(-2.57)	(-2.53)	(-1.89)	(-2.99)	(-2.53)
2018	-0.179**	-0.215**	-0.004	-0.168**	-0.216**	-0.123
	(-3.09)	(-2.17)	(-0.03)	(-3.25)	(-2.34)	(-0.77)

*, **, and *** denote significant at the 10%, 5% and 1% level respectively.

Table 3 examines short-term abnormal returns, and compares the mean and median abnormal return IPOs by country, where the abnormal returns are computed over and above the index market index (Index) return, or alternatively over and above the equally-weighted market returns (EW) or value-weighted market returns (VW), for 1 day, 3 days, 10 days, and 20 days immediately after the IPOs. The left (right) panels show the difference of means *t*-test (difference of medians Wilcoxon rank-sum (Mann-Whitney) test). Short-term abnormal returns are higher for China IPOs than US IPOs: the means are generally significantly higher using the *t*-statistic, and the medians sometimes significantly higher using the *z*-statistic over the longer period of 20 days. We postulate that this is due to the different regulations between the two countries that lead to more underpricing and upward price adjustments, to the extent allowed, in the short run for China IPOs.[1]

This table compares the short-term abnormal returns around IPOs, over and above market index return (Index), equal-weighted market returns (EW), or value-weighted market returns (VW) for 1 day, 3 days, 10 days, and 20 days after the IPO, between US and China (CN) IPOs. The left (right) panels shows difference of means (difference of medians) test. All variables are defined in the Appendix.

TABLE 3
CROSS COUNTRY COMPARISON: SHORT TERM ABNORMAL RETURNS

	Difference of Means test		Difference of Medians test	
	Mean (US IPOs)	Mean (China IPOs)	Wilcoxon rank-sum (Mann-Whitney) (US IPOs)	Wilcoxon rank-sum (Mann-Whitney) (China IPOs)
Index 1	-0.00003	0.0162	1381	699
Index 3	-0.00001	0.0800***	1366	714
Index 10	-0.00372	0.2241***	1413	667
Index 20	-0.00992	0.2180**	1459	621*
EW 1	-0.00003	0.0168	1392	688
EW 3	-0.00003	0.0778***	1372	708
EW 10	-0.00375	0.2239***	1370	710
EW 20	-0.00993	0.1880*	1493	587*
VW 1	-0.00002	0.0170	1386	694
VW 3	-0.00004	0.0799***	1365	715
VW 10	-0.00373	0.2253***	1400	680
VW 20	-0.00995	0.2203**	1454	626

*, **, and *** denote significant at the 10%, 5% and 1% level respectively with *t*-stat for difference of mean test and *z*-stat for difference in medians test.

Table 4, Panels A, B, and C report the differences of mean and median longer-term abnormal returns, computed over and above the market index (Index), equally-weighted index returns (EW), and value-weighted index returns (VW), respectively. The left (right) panels show the difference of means *t*-test (difference of medians Wilcoxon rank-sum (Mann-Whitney) test). The longer-term returns tend to be negative for both US IPOs and China IPOs and the differences tend to be, generally, around zero (statistically), especially when computed over and above the equally-weighted and value-weighted indices. China IPOs tend to have significantly lower negative longer-term returns than US IPOs when using the market Index adjustment and when using BHAR returns over the longer run, but the medians of long term returns are never significantly different from one another. Overall, US IPO and China IPO returns tend to converge in the longer-run post IPO and be negative, in line with the findings in extant literature.[2]

This table compares the longer-term abnormal returns over and above the market index as Cumulative Abnormal Returns (CAR) or Buy-and-hold abnormal returns (BHAR), calculated over and above market index returns (Index), or Equally-weighted market returns (EW), or Value-weighted market returns (VW) over 6 months, 12 months, and 24 months post-IPO, between US and China (CN) IPOs. Panels A, B and C show abnormal returns over and above Market, EW, and VW Indices respectively. The left (right) panels of each set shows difference of means (difference of medians) test. All variables are defined in the Appendix.

TABLE 4
CROSS COUNTRY COMPARISON: LONGER-TERM ABNORMAL RETURNS

PANEL A: Abnormal return over and above Market INDEX

	Difference of Means test		Difference of Medians test	
	Mean (US IPOs)	Mean (China IPOs)	Wilcoxon rank-sum (Mann-Whitney) (US IPOs)	Wilcoxon rank-sum (Mann-Whitney) (China IPOs)
CAR 6	-0.1273	-0.0655	1328	752
CAR 12	-0.1832	-0.0657	1315	765
CAR 24	-0.2165	-0.0513	1288	792
BHAR 6	-0.1325	-0.0659	1315	765
BHAR 12	-0.1931	-0.0500**	1280	800
BHAR 24	-0.2573	-0.0133**	1256	824

PANEL B: Abnormal return over and above EW Index

	Difference of Means test		Difference of Medians test	
	Mean (US IPOs)	Mean (China IPOs)	Wilcoxon rank-sum (Mann-Whitney) (US IPOs)	Wilcoxon rank-sum (Mann-Whitney) (China IPOs)
CAR 6	-0.1239	-0.1344	1421	659
CAR 12	-0.1647	-0.1668	1415	665
CAR 24	-0.1599	-0.1607	1410	670
BHAR 6	-0.1299	-0.1281	1405	675
BHAR 12	-0.1743	-0.1321	1352	728
BHAR 24	-0.1917	-0.1129	1327	626

PANEL C: Abnormal return over and above VW Index

	Difference of Means test		Difference of Medians test	
	Mean (US IPOs)	Mean (China IPOs)	Wilcoxon rank-sum (Mann-Whitney) (US IPOs)	Wilcoxon rank-sum (Mann-Whitney) (China IPOs)
CAR 6	-0.1333	-0.0728	1330	750
CAR 12	-0.1910	-0.0810	1323	757
CAR 24	-0.2275	-0.1140	1381	699
BHAR 6	-0.1392	-0.0724	1317	763
BHAR 12	-0.2022	-0.0636*	1285	795
BHAR 24	-0.2699	-0.0472*	1330	750

*, **, and *** denote significant at the 10%, 5% and 1% level respectively with *t*-stat for difference of mean test and *z*-stat for difference in medians test.

To summarize, the short term abnormal returns tend to be positive for China IPOs, and generally significantly higher than those for US IPOs which tend to be negative, irrespective of the method used. However, the longer run post IPO abnormal returns, tend to be negative for both China and US IPOs and tend to converge, with mean returns only occasionally significantly different from each other (depending on the method used), and the median returns never different from each other.

Performance

The left (right) panels of Table 5 show the difference of means *t*-test (difference of medians Wilcoxon rank-sum (Mann-Whitney) test), respectively, of post-IPO performance using ROA and ROE, as well as a

proxy for (the inverse of) future growth options measured in terms of the book-to-market ratio over the year of the IPO and in the years 1 and 2 post IPO. We find that although the operating performance of the China IPO firms in the year of the IPO is significantly better than those of the US IPO firms, measured by ROA and ROE in terms of difference of means; in the longer run, they are statistically not different from each other. There is no difference in the proxy for (inverse of) future growth options- the book-to-market ratio – of IPO firms between the two countries. The medians of these measures for China and US IPOs are never different from each other.[3]

This table reports the post-issue performance in terms of Return on Assets (ROA), Return on Equity (ROE), and the Book-to-market Ratio (BVE/MVE), calculated at the time of the IPO (year 0), 12 months after IPO (year 1), and 24 months after IPO (year 2) after the IPO. The left (right) panels show difference of means (difference of medians) test between the US IPOs and China (CN) IPOs. All variables are defined in the Appendix.

TABLE 5
CROSS COUNTRY COMPARISON: POST ISSUE PERFORMANCE

	Difference of Means test		Difference of Medians test	
	Mean (US IPOs)	Mean (China IPOs)	Wilcoxon rank-sum (Mann-Whitney) (US IPOs)	Wilcoxon rank-sum (Mann-Whitney) (China IPOs)
ROA 0	-0.0416	0.0435*	1135	945
ROA 1	-0.0262	0.0374	1069	1011
ROA 2	-1.1507	0.0227	1201	879
ROE 0	-0.0386	0.1730***	1164	916
ROE 1	0.00923	0.1125	1072	1008
ROE 2	0.0615	0.0734	1197	883
BM 0	0.7396	0.7806	1337	743
BM 1	0.7008	1.0022	1269	811
BM 2	0.7628	0.8784	1192	888

*, **, and *** denote significant at the 10%, 5% and 1% level respectively with t-stat for difference of mean test and z-stat for difference in medians test.

Multivariate Analysis

Table 6 reports multivariate regression results with bootstrapped t-statistics of the following regression model:

$$Y = \beta_1 * \text{US IPO} + \beta_2 * \text{Issue Size} + \beta_3 * \text{Industry} + \beta_4 * \text{Year} + \varepsilon, \quad (1)$$

where *US IPO* is a dummy variable that takes the value of 1, of the IPO is a US IPO and the value of 0 if it is a China IPO, *Issue Size* is the size of the IPO issue including any overallotment, Industry and Year are vectors of Industry and Year dummy variables to control for fixed effects, and the dependent variable, Y, is short-term abnormal return, longer-term abnormal return, or post-issue performance. Panel A and B report on various measures of short-term returns, Panels C, D, and E on long-term returns and Panels F and G on operating performance and book-to-market ratio.

This table reports multivariate regression results, with bootstrapped t-statistics, of several short-term returns, long term returns and performance.

TABLE 6
MULTIVARIATE ANALYSIS OF RETURNS AND PERFORMANCE

PANEL A: SHORT TERM ABNORMAL RETURNS over INDEX and EW returns

	Index AR1	Index AR3	Index AR10	Index AR20	EW AR1	EW AR3	EW AR10	EW AR20
US IPO	-0.02	-0.07**	-0.23**	-0.31**	-0.03	-0.08**	-0.24**	-0.29*
	(-1.38)	(-2.00)	(-2.03)	(-1.97)	(-1.48)	(-2.17)	(-2.13)	(-1.82)
Issue Size	-0.01	-0.01	-0.02	-0.03	-0.01	-0.02	-0.03	-0.03
	(-0.05)	(-0.12)	(-0.79)	(-0.94)	(-0.17)	(-0.28)	(-0.82)	(-0.95)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.16	0.34	0.23	0.15	0.12	0.31	0.24	0.16

PANEL B: SHORT TERM ABNORMAL RETURNS over VW returns

	VW AR1	VW AR3	VW AR10	VW AR20
US IPO	-0.03	-0.07**	-0.23**	-0.31**
	(-1.44)	(-2.11)	(-2.03)	(-1.96)
Issue Size	-0.01	-0.01	-0.02	-0.03
	(-0.06)	(-0.18)	(-0.80)	(-0.95)
Industry Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Adjusted R^2	0.14	0.33	0.23	0.15

PANEL C: LONGER TERM ABNORMAL RETURNS over INDEX

	CAR 6	CAR 12	CAR 24	BHAR 6	BHAR12	BHAR24
US IPO	-0.01	-0.10	-0.13	-0.01	-0.11	-0.14
	(-0.12)	(-0.21)	(-0.73)	(-0.02)	(-0.17)	(-0.92)
Issue Size	-0.02	-0.01	0.04	-0.01	-0.02	0.02
	(-0.25)	(-0.50)	(0.92)	(-0.06)	(-0.45)	(0.54)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.10	0.06	0.21	0.10	0.12	0.06

PANEL D: LONGER TERM ABNORMAL RETURNS over EW Index

	CAR 6	CAR 12	CAR 24	BHAR 6	BHAR12	BHAR24
US IPO	0.05	0.09	0.13	0.05	0.06	0.18
	(0.56)	(0.66)	(0.80)	(0.56)	(0.52)	(0.91)
Issue Size	-0.02	-0.02	-0.04	-0.01	-0.02	-0.04
	(-0.28)	(-0.60)	(-0.92)	(-0.19)	(-0.63)	(-0.64)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.14	0.07	0.20	0.13	0.12	0.07

PANEL E: LONGER TERM ABNORMAL RETURNS over VW Index

	CAR 6	CAR 12	CAR 24	BHAR 6	BHAR12	BHAR24
US IPO	-0.01	0.10	0.21	-0.01	-0.02	0.06
	(-0.09)	(0.07)	(1.16)	(-0.03)	(-0.03)	(0.34)
Issue Size	-0.02	-0.01	0.04	-0.01	-0.02	0.02
	(-0.21)	(-0.49)	(0.87)	(-0.04)	(-0.44)	(0.53)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.10	0.06	0.20	0.10	0.12	0.07

PANEL F: OPERATING PERFORMANCE

	ROA 0	ROA 1	ROA 2	ROE 0	ROE 1	ROE 2
US IPO	-0.01	0.01	0.41	-0.19	0.02	2.71
	(-0.12)	(0.10)	(0.71)	(-1.59)	(0.23)	(0.17)
Issue Size	-0.03	-0.02	-0.02	-0.01	0.03	-0.06
	(-0.24)	(-0.11)	(-0.21)	(-0.15)	(0.61)	(-0.20)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.16	0.10	0.18	0.17	0.10	0.19

PANEL G: BOOK-TO-MARKET

	BM 0	BM 1	BM 2
US IPO	-0.03	-0.38	-0.31
	(-0.07)	(-0.96)	(-0.67)
Issue Size	-0.07	-0.06	-0.02
	(-0.47)	(-0.34)	(-0.22)
Industry Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Adjusted R^2	0.37	0.41	0.36

*, **, and *** denote significant at the 10%, 5% and 1% level respectively.

The results show that only short terms returns of days 3, 10, and 20 immediately after the IPO are significantly lower for US IPOs as compared to China IPOs. The longer-term returns, post-IPO operating performance, and book to market ratios between US and China IPOs are not significantly different from each other, after controlling for other variables and fixed effects.

CONCLUSION

We compare large IPO cases of US and China firms, by examining short-term stock returns, longer-term abnormal returns, post-IPO operating performance and book-to-market ratio. We employ several alternative methods for computing abnormal returns. We employ both univariate tests and multivariate regression analysis. In univariate tests, we use difference of means *t*-test as well as difference of medians Mann-Whitney-Wilcoxon test. We find that China IPOs have significantly higher short-term returns in the immediate post-IPO period. We postulate that this is because of underpricing engendered by regulations in China. Chang, Chen, Chi, and Young (2008), for example, state that the government plays a very important role in the IPO process as well as in setting the offering prices. The P/E ratio cap for the primary market is usually much lower than the average P/E ratio in the secondary market, causing the offering prices to be significantly lower than true value prices, thereby attracting a large amount of capital to the primary market.[4] There are also restrictions on price changes in the immediate post-IPO period for China firms. Further, State-owned Enterprises (SOE) form a large part of IPOs in China. According to data from the State-owned Assets Supervision and Administration Commission in China, the current state-controlled listed companies at all levels account for about 26% of the *A*-share market, and the market value accounts for about 36%. Policies supporting state-owned enterprises may also lead to better performance of these enterprises in the short run post IPO. The operating performance, as measured by ROA and ROE, is also significantly better, on average, for China IPO firms as compared to US IPO firms in the year of the IPO.

However, the "hype" and stock performance does not last. In the longer-term not only do China and US IPO firms have similar abnormal stock returns – on average negative as documented in the extant literature - but also the firms' operating performance, on average, as well as their book-to-market ratios (a proxy for future growth options) are not significantly different for China IPO firms as compared to US IPO firms.

ENDNOTES

1. In comparison, Chan, Wang, and Wei (2004) document an average short-term return of -0.00572, -0.00702, 0.0234, and 0.0246 respectively for China IPOs over 1-day, 3-days, 10-days, 20-days post IPO respectively, for an earlier period. The reason for the lower returns could be that their data is prior to the China regulations coming into effect. The regulation, as argued earlier, could result in pent-up demand and upward price pressure initially.
2. Ritter (1991) documents a longer-term cumulative abnormal return of -0.0067, -0.1023, and -0.1689 respectively for US IPOs over 6-months, 12-months, and 24-months after IPO. Zhang, Jarrett and Pan (2019) show longer-term cumulative abnormal returns including -0.08096, -0.14049, and -0.19056 respectively for 6-months, 12-months, and 24-months post IPO for China IPOs. These findings corroborate our finding that in the longer run, the abnormal returns of US and China IPO are somewhat similar and negative.
3. In extant literature, Jain and Kini (1994) show the performance of US IPOs declines significantly relative their pre IPO status. They find that the median industry-adjusted change in operating ROA are -0.0291, -0.0624, -0.0812 for year 0, +1 and +2, while Wang (2005) analyze a sample of 747 Chinese firms and document median industry-adjusted ROA drops by 90% from 3 years before IPO to 3 years after IPO.
4. In another study by Chen, Firth, and Kim (2004) argue that government and legal entity shareholdings may be associated with underpricing.

REFERENCES

Aggarwal, R., & Rivoli, P. (1990). Fads in the initial public offering market? *Financial Management*, *19*(4), 45–57.

Barber, B., & Lyon, J. (1997). Detecting long-run abnormal stock returns: The empirical power and specifications of test statistics. *Journal of Financial Economics*, *43*(3), 341–372.

Carter, D.A., D'Souza, F., Simkins, B.J., & Simpson, W.G. (2010). The gender and ethnic diversity of US boards and board committees and firm financial performance. *Corporate Governance: An International Review*, *18*(5), 396–414.

Chan, K., Wang, J., & Wei, K.C.J. (2004). Underpricing and long-term performance of IPOs in China. *Journal of Corporate Finance*, *10*(3), 409–430.

Chang, E., Chen, C., Chi, J., & Young, M. (2008). IPO underpricing in China: New evidence from the primary and secondary markets. *Emerging Markets Review*, *9*(1), 1–16.

Chen, G., Firth, M., & Kim, J-B. (2004). IPO underpricing in China's new stock market. *Journal of Multinational Financial Management*, *14*(3), 283–302.

Durukan, M. (2002). The relationship between IPO returns and factors influencing IPO performance: Case of Istanbul Stock Exchange. *Managerial Finance*, *28*, 18–38.

Ibbotson, R.G. (1975). Price performance of common stock new issues. *Journal of Financial Economics*, *2*(3), 235–272.

Jain, B.A., & Kini, O. (1994) The post–issue operating performance of IPO firms. *Journal of Finance*, *49*(5), 1699–1726.

Li, L. (2006). Can corporate governance variables explain short-term IPO returns? A study of the Chinese market. *Accounting, Accountability & Performance*, *12*(1), 64−88.

Li, L. (2018). The influence of government regulation on IPO underpricing. *Technology and Investment*, *9*, 109–116.

Lyon, J., Barber, B., & Tsai, C.L. (1999). Improved methods for tests of long-run abnormal stock returns. *Journal of Finance*, *54*(1), 165–201.

Mok, H.M.K., & Hui, Y.V. (1998). Underpricing and aftermarket performance of IPOs in Shanghai, China. *Pacific-Basin Finance Journal*, *6*(5), 453–474.

Ou, J.A., & Penman, S.H. (1989). Financial statement analysis and the prediction of stock returns. *Journal of Accounting and Economics*, *11*(4), 512–534.

Padgett, C., & Chi, J. (2005). Short-run underpricing and its characteristics in Chinese IPO markets. *Research in International Business and Finance*, *19*(1), 71–93.

Ritter, J.R. (1991). The long-run performance of initial public offerings. *Journal of Finance*, *46*(1), 3–27.

Ritter, J.R., & Welch, I. (2002). A review of IPO activity, pricing, and allocation. *Journal of Finance*, *57*(4), 1795–1828.

Su, D., & Fleisher, B. (1999). An empirical investigation of underpricing in Chinese IPOs. *Pacific-Basin Finance Journal*, *7*(2), 173–202.

Tian, L.H. (2010). Financial regulation, investment risk and excess underpricing of new share issuance. *Financial Research*, *4*, 85–100.

Wagner, N. (2006). Nasdaq IPOs around the market peak in 2000. *Initial Public Offerings: An International Perspective, Quantitative Finance Series*, pp. 3–12.

Wang, C. (2005). Ownership and operating performance of Chinese IPO. *Journal of Banking & Finance*, *29*(7), 1835–1856.

Zhang, H., Jarrett, J.E., & Pan, X. (2019). The post-IPO performance in the PRC. *International Journal of Business and Management*, *14*(11).

APPENDIX: VARIABLES DESCRIPTIONS

Variable	Description
AR1, AR3, AR10, AR20	IPO stock returns 1, 3, 10, or 20 days immediately after the IPO date, minus Market Index (Index) return, or the Equally-Weighted (EW) Index return, or the Value weighted (VW) Index return, of the same period
CAR 6, 12, 24	Cumulative abnormal return, 6, 12, or 24 months post-IPO, over and above Index, EW Index, or VW Index returns, given by: $\mathrm{CAR_i} = \Sigma_k AR_{i,t+k}$
BHAR 6, 12, 24	Buy and hold abnormal return, 6, 12, or 24 months post IPO, over and above Index, EW, or VW returns, given by: $\mathrm{BHAR_i} = \Pi_k(1 + AR_{i,t+k})$ -1
ROA or ROE or BM 0, 1, 2	IPO firm return on assets (ROA) = net income / total assets, or return on equity (ROE) = net income / total equity, or BVE/MVE = book value of equity/ market value of equity, in the year of the IPO (year 0), or 1 year after IPO (year 1), or 2 years after IPO (year 2).