

The Impact on IPO Performance of Reforming IPO Allocation Regulations: An Event Study of Shanghai Stock Exchange A-Shares

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Abstract

Initial public offerings (IPOs) in China are distinguished from the IPOs in other developed and emerging markets by their extremely high abnormal initial returns and so-called *Chinese Characteristics*. Many policy changes have been made since the late 90s in order to regulate and promote the development of the Chinese primary stock market. This paper examines the influences of changes in IPO regulations in May 2002 on IPO underpricing and short-run performance, based on a sample of 209 Chinese IPOs from 2001 to 2003. Event study methodology is adopted and both parametric and non-parametric tests are performed. The results show an average abnormal initial return of 117.48%, which is lower than earlier Chinese IPOs but still much higher than IPOs in other markets. More importantly, the results reveal that, after the regulation change, abnormal initial returns decreased by 43.3%, beta risks of the IPOs increased, and an evenly-upward trend of cumulative abnormal initial returns was reversed to become evenly-downward. The implication of these findings is that the allocation method of the lottery mechanism related to the tradable shareholding reduced the degree of underpricing and increased the average sensitivity of IPO returns to the market return. The changes may have arisen from the influence of the reform on both investors' demands for IPOs and the behaviour of noise traders. Trader reactions may have essentially changed the liquidity of the secondary market, thus affecting the degree of IPO underpricing (which comes from the liquidity creation process as trading moves from the primary market to the secondary market). The phenomenon is also consistent with the Information Cascade Hypothesis (Welch 1992) and the Bandwagon Hypothesis (Ritter 1998). Further areas for research into the market microstructure of the Chinese stock market are suggested, with possible implications for policy makers, particularly with respect to decreasing IPO uncertainty (and the degree of IPO underpricing), increasing market liquidity and enhancing investor confidence.

JEL classification: G14; G28

Keywords: IPO underpricing; IPO allocation; Policy impact; Chinese stock market; Shanghai Stock Exchange A-shares

1 Introduction

Initial public offering (IPO) refers to the first sale of stocks by an unlisted company to the public. Once the company is listed on a stock exchange (i.e. the IPO stocks are traded publicly in an open market), a market price and liquidity for these stocks are created. Associated with the IPO process is the key issue of IPO price discovery. Information asymmetries and agency problems in the market distinguish the valuation of IPOs from that of common stocks. Apart from direct costs (e.g. underwriting fees, information disclosure fees, etc.), indirect costs to compensate for unknown risks adhering to the offering (risks other than the systemic risk generally involved in pricing listed common stocks) play a particularly important role in IPO pricing. The complex and special nature of IPO pricing is reflected in the market as the IPO underpricing phenomenon: it is widely observed that there are statistically significant average positive abnormal initial returns to IPOs in the first day of trading.

The IPO underpricing anomaly is well documented in the literature and is broadly observed almost in every stock market in the world, although the level of abnormal initial return varies a lot across countries over time. The degree of underpricing has been found to depend on particular market circumstances (e.g. different trading mechanisms, market liquidity, regulation status, etc.). For instance, Loughran *et al.* (1994) revealed abnormal initial returns that varied from a low of only 4.2% in France (1983-1992) to a high of 80.3% in Malaysia (1980-1991) while Ritter (1998) found a higher average level of abnormal initial returns in 13 emerging markets (40.8%) than in 20 developed markets (19.6%). In a study of particular interest in the context of this paper, for East Asian markets Loughran *et al.* (1994) found a lower average level of underpricing in the 90s than in the 80s that apparently resulted from a reduction in regulatory interference.

Launched in 80s, established in 1990 and developing during the period of transition from central planned economy to market economy, the Chinese stock market is

distinguished for its *Chinese Characteristics*¹. High economic uncertainties in the privatization and the transition process caused severe asymmetric information problems in the immature Chinese market. Without exception, empirical studies on Chinese IPOs have found extraordinarily high abnormal initial returns. In addition, it has been shown that the degree of underpricing is sensitive to the period sampled. Su and Fleisher (1997) documented an abnormal initial return as high as 948.59% for the early period from

¹ *Chinese Characteristics* of the IPO market in China:

- 1) *High equity retention by the state, government control and restricted IPO supply.* The Chinese government still holds a large number of government shares (equity in state-owned enterprises). These government shares constitute the major part of all outstanding shares and are non-tradable on the stock market. A reduction in government ownership would promote the growth of the stock market but the question of when and how to implement this is still unresolved. Until these problems are resolved the supply of IPOs to the market may be seriously limited. For example, although investment banks were introduced to the IPO approval process in order to certify IPO quality after the 2001 IPO policy change, the aggregate IPO supply remains largely in the control of the government. Furthermore, because the Chinese stock market is still relatively undeveloped and there are limited investment instruments, IPO supply is barely able to meet investment demand. Basu and Li (2000) have also argued that bureaucrats possess inside information about which companies would be most likely to succeed, so that underpricing is used to compensate outsiders and to signal a trustworthy future.
- 2) *Two types of tradable shares on SSE/SZSE and segmented A-share and B-share markets.* A-shares are ordinary domestic shares sold to Chinese citizens and qualifying foreign institutions; B-share are shares sold to foreign investors. The A-share and B-share markets are segmented. According to Chen (1997), although the two types of share carry equal voting rights and obligations for any given company, the offering and trading prices of A-shares are about twice as high as those of B-shares. Poon *et al.* (1998) attributed this to a lack of investment opportunities for domestic investors. A-shares are also more underpriced than B-shares. Chen *et al.* (2000) associated the underpricing of A-shares with firm risks and high government shareholdings, whereas that of B-shares with seasoned equity offerings (SEOs) and government ownership. In addition, Mok and Hui (1998) suggested that B-share investors are better informed than A-share investors, due to different disclosure requirements and underwriter reputation. Finally, the time lag between offering and listing are longer for A-shares than for B-shares. Chen *et al.* (2000) documented an average time lag of 10.71 months for A-shares against 1.46 months for B-shares.
- 3) *Allocation methods and changes in government regulation.* The share allocation method has been changed several times, but broadly in two phases. Before 1996, the allocation of IPO shares to investors was made via application forms by computer system. After 1996, the allocation was carried out through a lottery mechanism. There was an important regulatory reform implemented in May 2002, during the second phase, when the lottery mechanism was changed in favour of an allocation based on the market value of investors' tradable shareholdings. After May 2002, investors were able to subscribe to new issues only if they already owned tradable shares while the amount of the new shares subscription was determined by the quantity of their tradable shareholdings – the more the existing shareholding, the higher the probability of winning the IPO 'lottery'. Before the May 2002 policy reform the odds of winning the 'lottery' depended on the money spent on the subscription. There was considerable debate on this regulation change. On one side, it was argued that the reform is beneficial to small investors and help the stability of the market; on the other, it was criticized for its failure to motivate institutional investors.

1987 to 1995 whereas Mok and Hui (1998) found lower (but still substantial level) underpricing of 289% from 1990 to 1993. Chan *et al.* (2001) reported a further reduced underpricing level of 178% for the later period from 1993 to 1998. This change in underpricing may have arisen from policy reforms that altered the IPO mechanism in various ways, affecting the microstructure of the market. Although the Chinese market is developing, many uncertainties still exist, particularly with respect to IPO regulation, making for interesting natural experiments in the impact of policy reform.

In this paper, we exploit the particular natural experiment created by the IPO allocation reform of May 2002. We investigate the impact of this reform by comparing underpricing and cumulative abnormal returns before and after the IPO regulation change, using data from 2001 to 2003 in an event study methodology. Any change in IPO policy (and the consequent shock to market microstructure) is likely to alter IPO costs and be reflected in IPO performance. This research therefore sheds light on the relationships between IPO costs, IPO pricing, market liquidity and market microstructure, with implications for issuers, underwriters and policy makers.

The remainder of this paper is structured as follows. Section 2 summarises theories about the underpricing anomaly. Section 3 explains data and methodology adopted in this paper. Section 4 presents results and section 5 provides concluding remarks.

2 Theoretical Background of the Underpricing Phenomenon

In moving from the primary to the secondary market, risky IPO stocks experience a price discovery process. It is well established that this process produces anomalies in IPO performance in the initial day. Stoll and Curley (1970), Reilly (1973), Logue (1973) and Ibbotson (1975) all documented significant and systematic increases from the offering price to the first day closing price in the US market. This phenomenon appears to violate the efficient markets hypothesis, in that it seems abnormal both for investors to be willing to pay much higher prices in the secondary market than they were willing to pay in the primary market very shortly before and for issuers to 'leave money on the table'.

Since the 1970s, numerous empirical studies have provided international evidence on this anomaly from almost all of the world's financial markets. Various theories have been developed to explain such underpricing. Most hypotheses are based on asymmetric information problems between issuers, investment banks and investors, although there are alternative explanations. While no single theory completely resolves the underpricing anomaly, the various theories are not necessarily mutually exclusive and different theories find supporting evidence in different markets. In the next section the main theories of underpricing are briefly reviewed.

2.1 Explanations Based on Asymmetric Information

2.1.1 The 'winner's curse'

There are more-informed and less-informed investors competing with each other in the market. Less informed investors incur higher risks: if the offering price is less than the expected value of the IPO stocks more-informed investors will appropriate most of the offered shares, but if the offering price is greater than the expected value the less informed investors will get all the shares they request. This risk can be anticipated so, to attract less-informed investors, issuers uncertain about their market price have to set a low offer price (Rock 1986).

2.1.2 Information cascades and bandwagon effects

Informational cascades and bandwagon effects in the stock market have been proposed respectively by Welch (1992) and Ritter (1998). In this approach, less well informed investors make decisions by judging the interests of other investors. They request only those stocks from offerings they believe to be popular and refuse IPOs that other investors do not want (even if they have favourable information). Therefore, to avoid failure, issuers may underprice their IPOs to attract better informed investors and to induce a positive cascade or bandwagon effect.

2.1.3 Signalling and Certification

Here it is assumed that issuers are better informed than investors about the quality and value of their investment projects. They use underpricing to signal good quality to outsiders, since only high-quality issuers will be able to cover the cost of underpricing from seasoned equity offerings (Welch 1989). There are also direct IPO costs, including underwriting fees, legal fees etc., making it expensive for a poor issuer to pretend to be good. Underpricing is therefore interpreted in this view as a means for issuers to signal their good quality and to create a company reputation that will facilitate subsequent issues.

In the certificate hypothesis, underpricing is again seen as a way for issuers to signal their quality to investors but the role of investment banks and auditors is also emphasised (Booth and Smith 1986, Beatty 1989, Gale and Stieglitz 1989, Carter and Minister 1990). Investment banks and auditors acting in support of IPOs have the incentive to set fair offering prices because reputation and goodwill is so important for their continuing business operations. Therefore, issuers employ investment banks and auditors as certificates to indicate a reliable quality.

2.1.4 Reduction of Monitoring

Because of information asymmetry, issuers underprice their IPOs in order to create oversubscription and to attract a large number of small investors. By selecting dispersed investors, excessive monitoring from large shareholders can be avoided and an optimal dispersion of ownership structure achieved. In addition, the large number of investors helps to increase the aftermarket liquidity of the IPO stocks.

2.1.5 Agency Theory

In this body of theory (Baron 1982), underpricing is caused by principal-agent problems. Issuers (principal) are viewed as less informed than investment banks (agent) and there is a conflict of interests in IPO projects – issuers are interested in maximizing IPO revenues (seeking a higher placing price) whereas investment banks are interested in

minimizing their underwriting costs (seeking a lower placing price). Issuers have little information about investor interest or market demand for IPOs and are unable to monitor the marketing and distribution activities of the investment banks, so that underpricing is needed as an inducement for the banks to disclose their information and to work effectively. The IPO price specified in the contract between issuers and investment banks is therefore set low enough to meet the expected returns of the latter.

2.1.6 Market feedback

This hypothesis is applicable when bookbuilding mechanisms² are used, where the behaviour of investment banks and market feedback from investors greatly affect the IPO process. Again, information asymmetry between investment banks and investors is emphasized. From their marketing activities, investment banks gain information advantages over investors, as long as investors with accurate information can be induced to reveal their interests truthfully during the marketing phase. To motivate these better informed investors, the IPO stock must be underpriced (Ritter 1998).

2.2 Explanations not Based on Asymmetric Information

2.2.1 Lawsuit avoidance

Hughes and Thakor (1992) and Tinic (1988) have suggested that underpriced IPOs are less likely to be subject to lawsuits, because a loss in the aftermarket is less likely. Given excess returns from the IPO, investors are likely to ignore small errors by the issuers and their investment banks. The excess returns can be regarded as an insurance premium paid to investors, protecting the issuers and investment banks against legal liabilities and the related damage to reputation.

2.2.2 Monopoly power of investment banks

² Here the lead underwriter(s) request institutional and retail investors to commit to the subscription of the IPO shares prior to the closure of the offering, revealing the number of shares they are willing to take and at what price. The process generally has five stages: 1) underwriter(s) decide which institutional investors to target; 2) the road show is started; 3) bookbuilding reveals market demand and the IPO price range is revised; 4) investors confirm the exact number of the IPO shares they want; 5) the final price of the IPO is decided by underwriter(s) and issuers, followed by allocation of the IPO shares.

According to Boehmer and Fishe (2001), underpricing is related to the trading revenues of investment banks. In the primary market, where investment banks act as underwriters, underpricing is used to avoid underwriting failure. In the secondary market, investment banks can use their informational advantages to increase profits from market making. Overall, underpricing helps create profit-enhancing effects for the investment banks.

An essential motive for underpricing in the theories reviewed above is compensation for risks inherent in the IPO process. These are different from the systematic risks of common stocks in the secondary market because the IPO uncertainties arise from the liquidity creation process in the move from primary to secondary markets and are likely to disappear in a very short term (a day). As IPO uncertainties increase, so do the degree of underpricing and the initial returns. Solutions to the problem of extreme underpricing and improvements in the efficiency of primary markets may therefore lie in reforming IPO mechanisms and balancing IPO demand and supply. In this respect, as proposed by Ritter and Welch (2002), researches on IPO share allocation will be a promising area.

3 Data and Methodology

3.1 Data

This research aims to examine the impact on underpricing and short-run performance of the May 2002 change in IPO regulations in China. The Chinese IPO market is distinguished for its immaturity and frequent regulation reform. Since it was necessary to avoid compounding effects from other regulation changes, the sample period was chosen from 2001 to 2003 after the consideration of various factors.

- 1) Since 2001, the Offering Censorate has taken on the role of the CSRC (China Securities Regulatory Commission) in regulating IPO supply. Recommendations on IPOs have been carried out by investment banks, where they were previously made by local regulatory authorities.
- 2) In mid-1999, the fixed pricing method was modified and book-building has become predominant since 2001.

- 3) After Oct. 2000 the Shenzhen Stock Exchange (SZSE) was closed to IPOs, leaving the Shanghai Stock Exchange (SSE) as the only IPO market from 2001 to 2003.
- 4) From 2001 the Chinese stock market turned to bear from bull, keeping a downward trend during 2001-2003 as shown in Figures 1 and 2 (SSE and SZSE respectively).

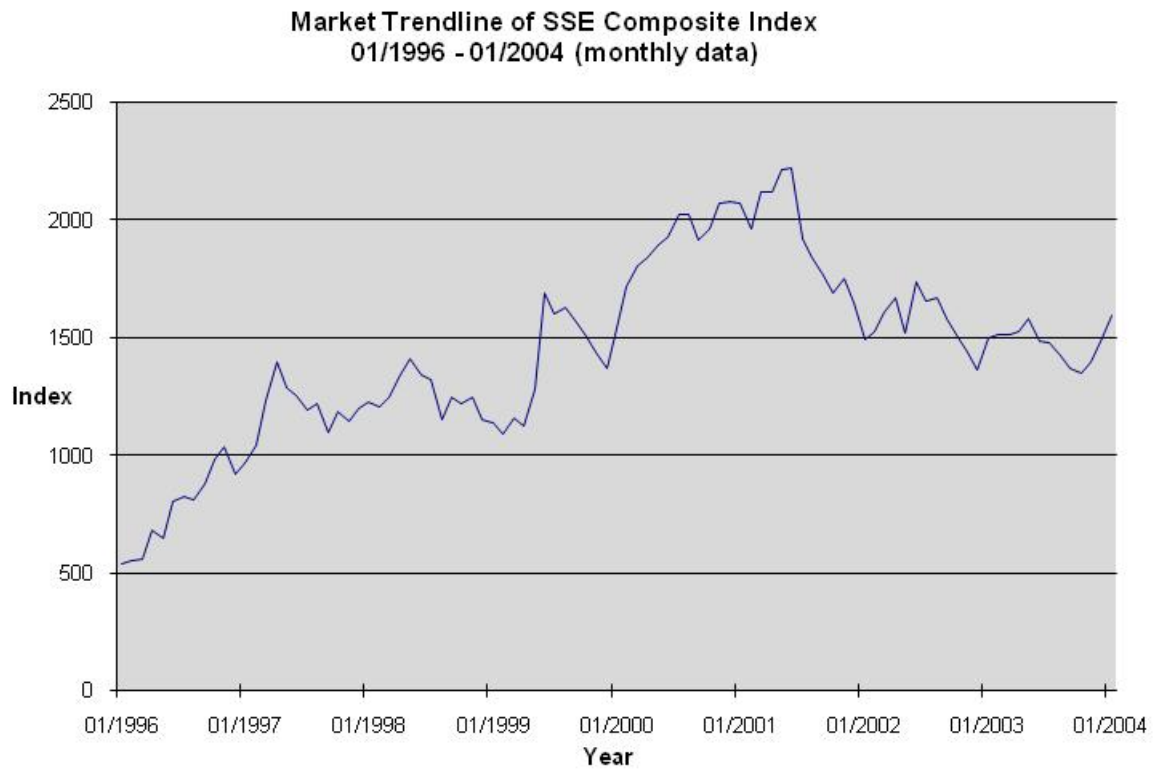
These considerations suggest that the period 2001-2003 is relatively stable in terms of both policy environment (only one regulation change was made, which is the focus of this research) and market performance (a consistent trend).

The data include all A-share IPOs floated on SSE during 2001-2003 – a total 209 IPOs. Companies listed on SZSE³ are not included since SZSE stopped IPOs in Oct. 2000. B-share IPOs were excluded because A-share and B-share markets are segmented and A-shares represent more *Chinese Characteristics*.

For each of the 209 IPOs, the offer price was collected from www.cnlist.com and daily closing prices for 60 trading days after IPO were collected using the software provided by www.gw.com.cn.

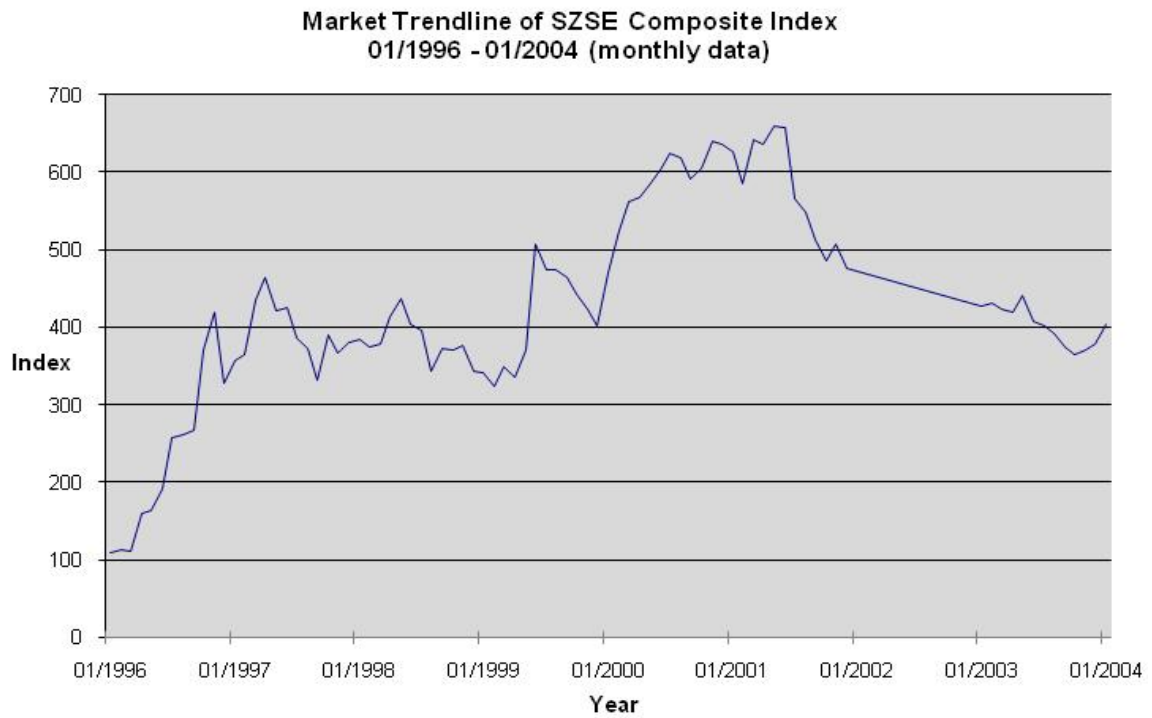
³ The Shanghai (SSE) and Shenzhen Stock Exchanges (SZSE) are equally important in the Chinese stock market. They have similar trading rules and were originally designed for the IPOs of their local firms. While the two exchanges initially showed regional characteristics these tended to disappear as more and more firms from other areas listed on the two exchanges. The total trading volume and number of listing firms were almost equal for the two exchanges. Before Oct 2000 there were 521 firms listed on SSE and 495 on SZSE. In terms of the trend of stock prices (in both primary and secondary markets) and yields of stocks, these two markets also showed a positive correlation.

Figure 1. Shanghai Stock Exchange Index, 1996 to 2004



Source: <http://www.cnlist.com>

Figure 2. Shenzhen Stock Exchange Index, 1996 to 2004



Source: <http://www.cnlist.com>

The 209 IPOs were divided into two groups, according to their allocation method. Group I consists of 88 IPOs floated from Jan 2001 to May 2002, with allocation was based on the *subscription funds related* lottery mechanism. Group II consists of 121 IPOs floated from Jun 2002 to Dec 2003, with allocation based on the *market value of tradable shareholdings related* lottery mechanism. The main characteristics of the sample are listed in Table 1.

Table 1. Characteristics of the Sample – SSE A-shares

	Group I	Group II
Time period	Jan 2001-May 2002	Jun 2002-Dec 2003
IPO pricing method	Book-building pricing	Book-building pricing
IPO allocation method	Subscription funds related lottery mechanism	Tradable shares related lottery mechanism
Number of IPOs	88	121

Source: <http://www.cnlist.com>

3.2 Methodology

3.2.1 Daily abnormal performance

An event study methodology was used to test for the impact of the regulatory change on IPO performance. The event window was 21 days, from the listing day until the 20th trading day. The daily abnormal returns over the event window were calculated for the sampled IPOs, using the Market Model

$$(R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}) \quad (1)$$

to compute the expected returns, allowing the abnormal returns to be adjusted for the beta risk of each stock. Because there are no observable trading prices before listing, a post-event window of 40 trading days (day 21 to day 60) was used as an estimation

window for computing the alpha and beta parameters. The procedure of calculating the daily abnormal return is illustrated in Fig 3 and explained as follows:

1) The actual event window daily return, R_{it} , is defined as $R_{it} = P_{it} / P_{i,(t-1)} - 1$, where P_{it} is the closing price for IPO stock i ($i = 1, \dots, 209$) on day t ($t = 1, \dots, 20$).

2) Expected daily return (i.e. normal return) over the event window is defined as:

$$E(R_{it}|X_t) = \alpha_i + \beta_i R_{mt} \quad (2)$$

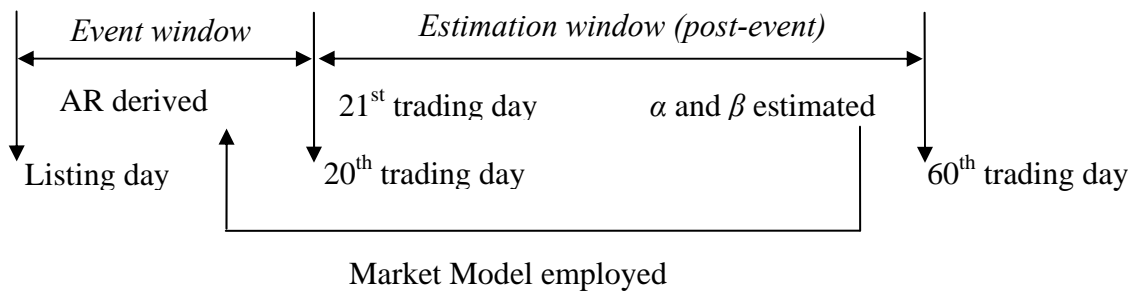
Here X_t is the conditioning information for the market model on day t , α_i is the constant term for IPO stock i measuring the part of the normal return which is independent of market performance, β_i is the systemic risk for stock i and R_{mt} is the market return on day t , calculated from the Shanghai Stock Exchange A-share Index. α_i and β_i are estimated by the market model for the post-event window ($t = 21, \dots, 60$).

3) The daily abnormal return over the event window is defined as:

$$AR_{it} = R_{it} - E(R_{it}|X_t) \quad (3)$$

Figure 3 shows the chronology of the event study estimation.

Figure 3. Estimation of Abnormal Return (AR) Using the Market Model



3.2.2 Aggregation of daily abnormal returns

Abnormal performance was aggregated for each IPO stock i from day 1 until day T ($T = 1, \dots, 20$). Both cumulative abnormal returns (CAR) and buy-and-hold abnormal returns (BHAR) were calculated. The CAR method assumes that a portfolio is

re-balanced in each period (every day in this case), whereas the BHAR method gives the abnormal return from the initial day until the target day (no rebalancing at any point). Lyon, Barber and Tsai (1999) have argued that the CAR approach is to be preferred if the aim is to measure whether or not the sample persistently earns abnormal returns over time. On the other hand, BHAR can precisely measure the investors' experience. In addition, Gompers and Lerner (2003) have suggested that the choice between CAR and BHAR largely depends on the trading strategy. Since both methods have their own advantages, we calculate both. The computation is shown as follows:

The cumulative abnormal return (CAR) for IPO stock i over period $(1, T)$ is defined as

$$CAR_i(1, T) = AR_{i1} + \dots + AR_{iT} = \sum_{t=1}^T AR_{it} \quad (T = 1 \dots 20) \quad (4)$$

The cross-sectional average CARs for the two groups of the sample are:

$$\overline{CAR_I(1, T)} = \frac{1}{88} \sum_{i=1}^{88} CAR_i(1, T) \quad (T = 1 \dots 20) \quad (\text{Group I, pre-reform}) \quad (5)$$

$$\overline{CAR_{II}(1, T)} = \frac{1}{121} \sum_{i=89}^{209} CAR_i(1, T) \quad (T = 1 \dots 20) \quad (\text{Group II, post-reform}) \quad (6)$$

The buy-and-hold abnormal return (BHAR) for IPO stock i over the period $(1, T)$ is

$$BHAR_i(1, T) = \prod_{t=1}^T (1 + R_{it}) - \prod_{t=1}^T (1 + E(R_{it} | X_t)) \quad (T = 1 \dots 20) \quad (7)$$

The cross-sectional average BHARs for the two groups of sample are:

$$\overline{BHAR_I(1, T)} = \frac{1}{88} \sum_{i=1}^{88} BHAR_i(1, T) \quad (T = 1 \dots 20) \quad (\text{Group I, pre-reform}) \quad (8)$$

$$\overline{BHAR_{II}(1, T)} = \frac{1}{121} \sum_{i=89}^{209} BHAR_i(1, T) \quad (T = 1 \dots 20) \quad (\text{Group II, post-reform}) \quad (9)$$

3.2.3 Statistical significance of group differences in IPO performance

The null hypothesis is of no difference in IPO performance before and after the change in IPO allocation regulations. Both parametric (two-sample mean-comparison t -test)

and non-parametric tests (two-sample Wilcoxon rank sum test) were performed.

1) Testing for cumulative abnormal return (CAR)

H_0 : $\overline{CAR_I(1,T)}$ is not significantly different from $\overline{CAR_{II}(1,T)}$, ($T = 1 \dots 20$)

H_1 : $\overline{CAR_I(1,T)}$ is significantly different from $\overline{CAR_{II}(1,T)}$, ($T = 1 \dots 20$)

2) Testing for buy-and-hold abnormal return (BHAR)

H_0 : $\overline{BHAR_I(1,T)}$ is not significantly different from $\overline{BHAR_{II}(1,T)}$, ($T = 1 \dots 20$)

H_1 : $\overline{BHAR_I(1,T)}$ is not significantly different from $\overline{BHAR_{II}(1,T)}$, ($T = 1 \dots 20$)

4 Empirical Results and Analysis

4.1 Underpricing before and after the regulation change

As shown in Table 2, average underpricing (conventionally measured by the percentage change from the offer price to the closing price of the first trading day) for the whole sample period 2001-2003 is 117.48% – a high level, although less than the degree of underpricing reported for earlier Chinese IPOs. Using expected returns computed from the market model as a benchmark, the average AR for the first trading day is very similar to the average return for the initial day (the degree of underpricing). In addition, both underpricing and AR were substantially reduced after the May 2002 IPO allocation reform, with an average decrease in underpricing to 43.3% (43.42% for AR).

Table 2. Underpricing before and after the regulation change on IPO allocation

	01/2001-05/2002	06/2002-12/2003	01/2001-12/2003
Underpricing	1.4255	0.9925	1.1748
First Day Abnormal Return (AR)	1.4275	0.9933	1.1761

For the Chinese market, IPO supply is limited and the odds of winning an entry ticket (to become eligible to subscribe an IPO) are very low.

Before the reform, the odds of success depended on the amount of money spent on the subscription. For large investors (institutional or better informed investors) with a large

proportion of their funds invested in the secondary market, the costs of subscribing to IPOs include the opportunity cost of cashing in stocks from the secondary market (a trade-off between winning the lottery against giving up future gains on existing shareholdings). Therefore they are unlikely to enter an IPO unless they are convinced that the opportunity cost will be paid off.

In contrast, after the reform, the odds of winning the ‘lottery’ were changed so as to depend on the value of investors’ tradable shares. This greatly reduced the costs of subscribing IPOs for large investors, since they were no longer required to risk their existing shareholdings in order to increase the chance of winning a ‘good’ IPO. On the other hand, speculators who before the reform would have used all their funds to chase IPOs in the primary market were ‘punished’ after the reform. Thus the new regulations encourage continuing investment in the secondary market and may help to increase market efficiency, thus reducing the degree of underpricing.

In the Chinese stock market ‘herd’ behaviour may be a significant phenomenon, with marked asymmetry of information. If investors indeed tend to base their decisions on the action of other investors it becomes especially important to attract better informed investors. In this case, the pre-reform allocation method that made success dependent on subscription funds would have been likely to lead to greater underpricing than the post-reform method. The use of underpricing to attract better-informed investors is also consistent with the Information Cascade Hypothesis (Welch 1992) and the Bandwagon Hypothesis (Ritter 1998). Thus, investors make decisions by judging the interests of other investors and they only purchase IPOs which are believed to be popular, while issuers with little information about market demand underprice their IPOs to attract better informed investors. These are in turn observed and followed by less informed investors, thus creating a positive bandwagon (or cascade) effect which can facilitate IPO success.

In general, the IPO price is determined by all market participants including issuers, underwriters and investors, so the demand from large investors plays an important role. After the policy change, the odds of winning an IPO ‘lottery’ increased for large investors, which may in turn have increased overall demand for IPOs and hence decreased the degree of underpricing⁴.

4.2 CARs and BHARs before and after the regulation change

Figures 4 to 7 show the changes of aggregated abnormal return over the event window

⁴ Decreasing market returns in general do not appear to explain the decrease in underpricing, because post-reform decreases in market returns were actually smaller than pre-reform decreases.

for pre- and post-reform periods. Table 3 summarises t -test and Wilcoxon test statistics for the impact of the reform. The two aggregation methods (CARs and BHARs) provide rather different trend lines over the 20 trading day event window – that is, daily re-balancing (CARs) and no re-balancing (BHARs) produce different cumulative abnormal returns.

Figure 4. $\overline{CAR}_t(1,T)$ ($T = 1 \dots 20$) for post- IPO trading days 1 to 20

Average CAR *before* the IPO reform



Figure 5. $\overline{CAR}_t(1,T)$ ($T = 1 \dots 20$) for post-IPO trading days 1 to 20

Average CAR *after* the IPO reform



Figure 6. $\overline{BHAR}_T(1,T)$ ($T = 1 \dots 20$) for post-IPO trading days 1 to 20

Average BHAR *before* IPO reform



Figure 7. $\overline{BHAR}_T(1,T)$ ($T = 1 \dots 20$) for post-IPO trading days 1 to 20

Average BHAR *after* IPO reform



Table 3. Statistical significance of the difference between the aggregated abnormal performances before and after the reform

Variable	Obs	Mean	Median	Std. Dev.	<i>t</i> -stat (paired)	<i>p</i> -value	Wilcoxon test	<i>p</i> -value
$\overline{CAR}_I(1,T)$	20	1.4370	1.4371	0.0062	$t = 340.1618$		$z = 5.410$	0.000
$\overline{CAR}_{II}(1,T)$	20	0.9909	0.9915	0.0021	Ha: mean(diff) < 0	1.000		
					Ha: mean(diff) != 0	0.000		
					Ha: mean(diff) > 0	0.000		
$\overline{BHAR}_I(1,T)$	20	1.4066	1.4064	0.0089	$t = 147.3975$		$z = 5.410$	0.000
$\overline{BHAR}_{II}(1,T)$	20	0.9741	0.9710	0.0108	Ha: mean(diff) < 0	1.000		
					Ha: mean(diff) != 0	0.000		
					Ha: mean(diff) > 0	0.000		

For both pre- and post-reform periods there is a distinct decrease in the aggregated abnormal returns on the 2nd trading day, implying a correction from the high initial day price. Before the reform, CAR continues to increase (an even upward trend) after the 2nd day correction, with an accumulation beyond the initial day return that suggests a degree of market inefficiency. In contrast, this trend disappears after the reform, with no accumulation of abnormal returns after the initial return, implying increased market efficiency. The BHAR method for the pre-reform period, shows that the cumulative abnormal returns remain below the initial day return with no clear trend over the event window. In contrast the post-reform cumulative returns (BHAR) show an even downward trend, which again implies improved market efficiency.

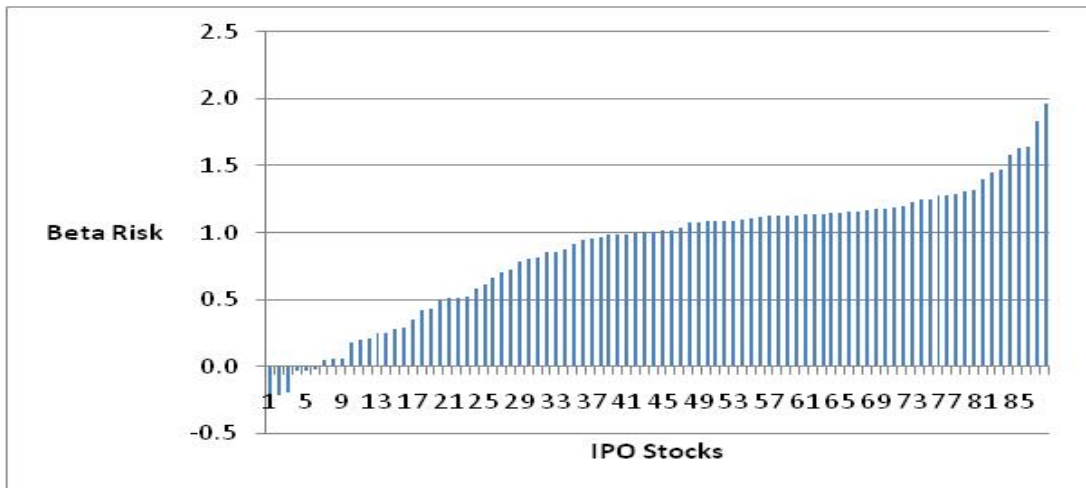
These phenomena demonstrate different after-market reactions in the pre- and post-reform periods. In theory, trading by investors on the open market after listing should rapidly move the IPO offer prices to their market equilibrium, so increased speed of price adjustment after the allocation reform period may indicate an increase in efficiency. If traders tend to overestimate the precision of their information (Daniel *et al.*, 1998) then prices may over- or under-react to new information. Before the reform, given the low odds of winning the lottery, the high initial returns gained by the lucky subscribers may have caused traders to over-estimate the value of the IPO, leading to an accumulating (CAR) or relatively (BHAR) strong abnormal performance over the event window. This effect could have been magnified by the aggregate behaviour of less well informed traders or irrational noise traders (DeLong *et al.*, 1991) However, after the reform it seems that offer prices were closer to market value and provided weaker signals for over-reaction and irrational trading, reflected in the more restrained CAR and the clearly falling BHAR.

Another possible explanation is that the reform may have improved secondary market liquidity, because the rule that winning odds were related to tradable shareholdings may encourage investors to actively seek ‘good’ stocks in the secondary market and to increase their shareholdings so as to become eligible for potential IPO subscription. Given that successful IPOs are ‘good’ stocks, at least in the short term, investors may be encouraged to trade them, increase market liquidity and improving market efficiency.

4.3 Beta risk before and after the regulation change

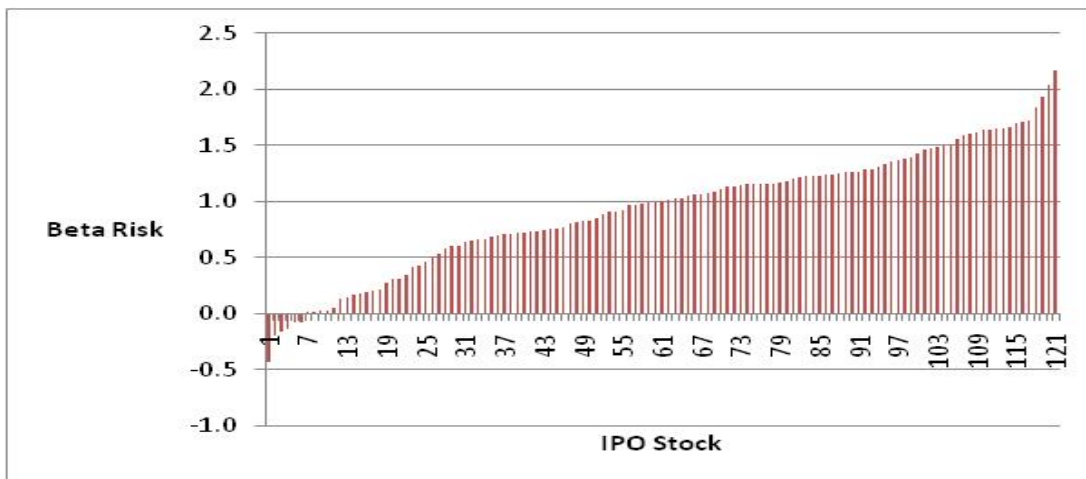
The distributions of beta (Figures 8 and 9) during the pre- and post-reform periods are slightly different, with the average beta being slightly higher after the reform at 0.9360, although this change is not statistically significant. In any case, the betas were estimated from post-event data (because of the lack of historical prices for new issues) so that the observed change in beta is in any case hard to interpret. Nonetheless, this result is consistent with the view that the reforms may have shortened the average post-listing length of time for which newly-listed stocks were particularly subject to ‘herd’ behaviour and/or investor over-reaction. In the pre-reform period such behaviour could have led to both high returns and low sensitivity of the IPO stocks to otherwise relevant market signals. Increased market efficiency in the post-reform period could have encouraged investors to pay more accurate attention to market signals when trading IPO stocks, leading to the observed increase in average beta. For the whole sample period the average beta is less than 1, implying that on average the IPO stocks are slightly less risky than the market index for A-shares in China. This finding is quite different from the results of Balvers *et al.* (1988) who found that the systematic risk of new issues was greater than that of the market index.

Figure 8. Beta risk of pre-reform IPOs (01/2001-05/2002)



Mean (Median) beta of the 88 IPOs is 0.8774 (1.0156).

Figure 9. Beta risk of post-reform IPOs (06/2002-12/2003)



Mean (Median) beta of the 121 IPOs is 0.9360 (1.0094).

5 Conclusions

This paper has reported an empirical event study of the impact of the May 2002 IPO allocation reform on the short-run performance (one-month post-listing) of 209 Chinese A-share IPOs, with abnormal initial returns computed using CAR and BHAR methods. The IPO allocation reform altered the way that odds of winning the IPO 'lottery' were determined. Prior to the reform the odds of winning the right to subscribe depended on the size of the investor's subscription bid, while after the reform the odds were determined by the size of the investor's existing holding of tradable shares.

It is found that, from 2001-2003, the average abnormal initial return (underpricing) of Chinese A-share IPOs was 117.48%, lower than earlier Chinese IPOs but still very high by international standards. Significant pre- and post-reform differences in underpricing and post-listing cumulative abnormal returns (CAR and BHAR) were found, suggesting that the reform of the IPO allocation lottery mechanism significantly lowered the degree of underpricing and improved market efficiency. There is also a suggestion (albeit non-significant) that the average sensitivity of IPO returns to the market index (beta) increased after the reform, which appears to be consistent with an increase in market efficiency. These changes may also have arisen from the influence of the reform on investors' post-listing demands for IPOs. Finally, the post-reform reduction in the degree of IPO underpricing may have increased secondary market liquidity, and hence reduced the cumulative abnormal returns in the after-market.

Further research on the market microstructure of the Chinese stock market is suggested, to clarify the impact of IPO regulatory reform on IPO uncertainties, market efficiency and investor confidence.

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