

Tan, Jin; Kim, Sunghwan

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The Information Effect of Time-span and Magnitude of Returns on Underpricing, Volume and Cycles in the IPO Market: An Empirical Analysis on Chinese Stock Market

Jin Tan^a and Sunghwan Kim^b

^a Ph.D. Candidate, School of Business Administration, Kyungpook National University, Daegu, Republic of Korea

^b Associate Professor, School of Business Administration, Kyungpook National University, Daegu, Republic of Korea

ABSTRACT

This study addresses two puzzles in the IPO markets in China: whether underpricing in the IPO market is affected by earlier market information, especially the volume and number of IPOs in the prior period, and whether underpricing in the previous period leads to a subsequent hot period in the IPO markets in China.

The main results of this study are as follows. First, while that the magnitudes of weighted (equally or value weighted) IPO volumes in the past have a positive effect on the magnitude of IPO returns in the future, the IPO volume itself has a negative effect on the magnitude of IPO returns in the future. Second, the magnitude of weighted IPO returns in the past has a positive effect on the magnitude of IPO returns, while simultaneously reflecting the effects of both time-span and magnitude in returns and volume. Third, as higher market returns and larger numbers of IPOs only result in more IPOs in the subsequent period during the period before 2004, whereas this phenomenon has since reversed.

Keywords: Information Effect; Time-span; Magnitude of Returns; Volume; IPO Market Cycles; China

1. Introduction

An initial public offering (IPO) is one of the best known, or maybe the most important financing methods in corporate finance (Fang, Shi and Xu, 2012). Firms use IPOs as windows of opportunity to reduce the costs of raising capital, and high IPO initial returns are not a surprising phenomenon for the Chinese stock market (Loughran, Ritter and

Rydqvist, 1994), although the phenomenon of extremely high IPO initial returns exists in almost every capital market in the world (Agrawal, 2009). While high underpricing is a common phenomenon in most stock markets, in both developed and emerging economies, it is evidence against market efficiency and can hurt firms trying to raise funds for expansion. Thus, several extensive studies have begun to explore the causes of this apparent anomaly in the IPO market. With a number of theories of IPO underpricing and empirical studies using the data of various stock markets, the anomaly still exists and lasts in most economies. Most previous studies on the determinants of corporate financial decision-

† Sunghwan, Kim, Ph.D.

Associate Professor in Finance
School of Business Administration, Kyungpook National University, Daegu, Republic of Korea,
Tel: 82-10-9921-9336, E-mail: indiank@knu.ac.kr

making to go public and the consequences of IPOs in the free capital market report that firms tend to issue equity when stock prices are high during booming periods (Choe et al., 1993; Graham and Harvey, 2001; Schultz, 2003; Kim and Weisbach, 2005), and that in the IPO markets, investors have reportedly enjoyed surprisingly high returns, or an underpricing phenomenon.

IPO markets have long provided opportunities firms to finance funds for growth and in most cases lower the cost capital. The surprising underpricing phenomenon in IPO markets still exists as a puzzle. Su and Fleisher (1997) report that the primary purpose for Chinese firms going public is to raise owners' capital, not mainly to transfer state ownership to private sectors, that IPO underpricing is the largest at the earliest stage of development of stock markets in China, and that absurdly huge IPO underpricing is at least partially due to a relatively small aggregate supply of shares. While the lasting and huge IPO underpricing can benefit firms to finance capital with ease from the capital market, abnormally high returns in Chinese IPO markets have caused some expected problems. Meanwhile, the opposite phenomenon has been observed in some advanced markets. As a result of a higher supply of stocks, the issuance of new stocks usually leads to decreases in IPO returns. The adverse effect of IPOs on market returns is evidenced in the U.S. (Baker and Wurgler, 2000), in emerging markets (Braun and Larrain, 2009), and internationally (Henderson et al., 2006; Wang, 2011).

Accordingly, this paper focuses on the underpricing of IPOs in Chinese markets. The case is of great interest, partly due to the extreme magnitude of the initial returns and as a lasting phenomenon since the introduction of IPOs in China. There have been so many extremely high IPO initial returns, one with 29,698% offered before September 1st, 1987, another with 3,601% offered before August 8th, 1988, and another with 3,195% offered before March 20th, 1987. In addition, in contrast to Lowry and Schwert (2002) and many other studies, we will report some clear conclusions with respect to IPO puzzles: the negative relation between the IPO volume and subsequent

initial returns, yet the positive relation between the initial returns and subsequent IPO volume. However, Chen et al. (2015) report hardly any evidence of such relations in the Chinese IPO markets, unlike those in the IPO market in advanced economies like the U.S., U.K., and Japan, mainly due to the intervention of the government thru the China Securities Regulatory Committee (CSRC) in market timing, volume of issuance, and market shutdowns. Thus, we focus on whether firms that file IPOs following high initial returns and high volume can themselves also expect to be extremely underpriced, leading to a hot period of IPOs in China, an issue still under debate. Similar to Chen et al. (2015), we will also explore the effect of government intervention in market timing and shutdowns on IPO underpricing and the provision of IPOs in the subsequent period.

To study the phenomena still under debate in the IPO markets in China, specifically to explain the relation between the initial returns and the IPO volume, we will use most factors known as affecting IPO underpricing and some other factors introduced for this study, IPO bubbles, from 1987 to 2015.

This study addresses some of the IPO puzzles in China by applying a unique methodology. First, while the magnitude of weighted (equally or value weighted) prior IPO volumes in the past have a positive effect on the magnitude of IPO returns in the future, the IPO volume itself has a negative effect on the magnitude of IPO returns in the future. Thus, the relative magnitudes of weighted prior IPO volumes in the past to the volume of a specific IPO firm has a positive effect on the magnitude of the initial return of an IPO firm in the future. Second, we find that the magnitude of weighted IPO returns in the past has a positive effect on the magnitude of IPO returns. The simultaneous, not separated, effect of both time-span and magnitude in returns and volume, reflecting the information effect of IPOs, can affect the initial returns, or underpricing, of the subsequent issuance, as well as the timing of other IPO firms in consideration. Third, we introduce subsamples to study the differences between stock exchanges, and in subsamples divided into two

periods for a long period of time in China. We find more significant results mostly from IPOs on Shenzhen and those offered in the more recent period. Fourth, we study the effect of shutdown periods by the CSRC on the initial returns and volume of IPOs, following Chen et al. (2015) and find that there is a clear cooling down effect on the initial returns, and on the number of IPOs in the subsequent period. Fifth, most importantly, we use all IPOs individually at the firm-level to study the IPO puzzle in more detail and avoid losing possible critical information when taking the average. The studies by Lowry and Schwert (2002) and Chen et al. (2015) used a monthly average on an aggregate basis. In addition, we use information on every IPO, from the viewpoint of each IPO firm, unless the related information is not available. As far as we know, other studies have only used a portion of the IPOs on the stock exchanges.

In the remainder of this paper, Section II discusses related literature and Section III explains the hypotheses and empirical models. Section IV investigates the data and basic relations between the initial returns and other related factors. Section V then investigates the effects of market information and other factors on IPO underpricing and the volume of IPOs in the subsequent period. Finally, Section VI summarizes the results.

II. Related Literature

A. IPOs in Chinese Markets

According to Su and Fleisher (1997), the IPO markets in China have several intriguing traits. First, the government, not the market, determines through the State Planning Committee of the People's Bank of China, the Chinese central bank, and the China Securities Regulatory Committee (CSRC), the quota or aggregate amount of new shares to be issued each year, which is then distributed to individual provinces. The central security regulatory authorities ask firms to request a listing and then make a selection based

on criteria, like corporate performance, regional development objectives, etc. For example, firms in public industries, like electricity and water supply, are given priority for approval. Second, a large portion of state-owned enterprises has been privatized through IPO processes by selling its ownership to other state-owned enterprises, their own employees, domestic public and foreign investors. Third, the underpricing of IPOs in the Chinese markets has shown very extreme patterns. Fourth, in practice, the CSRC generally intervenes in the IPO market by suspending IPO applications during recessions and reopening IPO applications during market booms. According to the State Council Report, the primary goals of the government in capital markets are to stabilize the markets and support more firms to finance through the markets efficiently.

According to Fang, Shi, and Xu (2012), the CSRC as a government agency usually faces a dilemma whether to facilitate more new issues or to mitigate the subsequent depression of market prices. To successfully achieve its goals, the committee is likely to use its authority to control the timing and size of IPOs. In some extreme cases, it decides to completely shut down for a long period of time and resume IPOs later. However, such peculiar interventions of the CSRC in the Chinese stock market trigger extensive debates over their efficiency. Opponents of the shutdown policy argue that decreasing the supply of stocks in IPO markets increases demand in the secondary stock market, thereby distorting the otherwise well-functioning market supply and demand system. Meanwhile, policymakers and their supporters advocate that the capital market should be evaluated in terms of its basic role to help firms raise capital. Thus, the regulatory organization balances these arguments by carefully adjusting the schedules and sequences of IPOs.

In addition, Fang, Shi, and Xu (2012) claim that the Chinese capital market is limited in capacity and open strictly to domestic investors at least for some time, although the number of potential issuers has increased over the years. The market value of the

China National Petroleum Corporation (CNPC) at the time of its IPO on the Shanghai Stock Exchange in 2007 reached approximately 22% of the total market value of the exchange. Thus, due to the limitations of size and nationality, the IPO market can increase the supply of stocks and decrease the market return and heavily reduce investors' confidence, which in turn results in a decrease of investments.

Using a sample of 156 monthly returns over the period of 1996-2008, Fang, Shi, and Xu (2012) found a positive relation between the monthly issuing size and prior market returns as evidence of efficient intervention by the CSRC on the timing and issuance size based on prior market conditions. However, they found no evidence of decline in subsequent market returns after IPOs, unlike many prior studies (Ritter 1991; Loughran and Ritter, 1995; and Spiess and Affleck-Graves, 1995, 1999; Lyandres et al., 2008). While IPO issuance has a significantly negative effect on the return momentum, the degree of effect is indifferent to the issuing size. They concluded that the committee's management of the timing of large IPO issuances was effective in reducing the financing costs of issuers and mitigating the negative impact on the stock market, and that for a transitional market, such as China, government intervention in the capital market at least partially improves market efficiency. While the role and efficacy of regulation in capital markets are still in dispute both in academia and practice, we test the effect of a market shut down on the IPO underpricing in China, as well as the effect of micro-factors, such as firm size and volume of the IPO issuance at the firm level, and macro-factors, such as the overall IPO market returns before the IPO of a firm.

Chen et al. (2015) recently reported that the lead-lag relationship between the initial returns and the volume of IPOs is not statistically significant due to institutional differences in the Chinese IPO markets, even though the IPO volume is sensitive to changes in market conditions (Pastor and Veronesi, 2005; Benninga et al., 2005; Yung et al., 2008), and investor sentiment (Ljungqvist et al., 2006; Bustamante, 2012),

theoretically. They claim, in China, that the CSRC substantially controls IPO timing, the IPO volume does not respond to changes in market conditions or sentiment as in market-driven economies, and there is no statistically significant relationship between the IPO volume and past market returns, volatility, and valuations in China. However, they report that, similar to the U.S. IPO market, for the IPO market in Hong Kong, the IPO volume is related to past and future market returns, yet not as strongly as in the U.S., past changes in market volatility, with strong seasonality, even stronger than in the U.S., and despite a significant decline in the volume of the IPO markets in China and Hong Kong after the global financial crisis which occurred in 2008, it recovered strongly in 2009.

B. IPO Underpricing

Theoretically, IPO firms should be relatively overvalued since firms will try to finance by timing their equity issuance: they offer when their IPO costs are the lowest, or when the initial returns are the smallest due to the highest IPO price or low initial price on the listing date. The timing of issuing securities in the U.S. IPO market is explained generally by two theories. First, the rational market-timing theory or 'the window of opportunity', suggests that due to agency problems between managers and investors, managers have incentives to postpone their IPO when their securities are undervalued, until the bull market arrives for more favorable pricing (Lucas and McDonald, 1990; Graham and Harvey, 2001). Second, the life cycle theory suggests that a firm finds optimal timing in their life cycle to go public after its early life cycle as a private firm (Chemmanur and Fulghieri, 1999; Benninga et al., 2005). In addition to firm-level micro approaches, some prior research on IPO underpricing uses macroeconomic factors, like the stock market and bond market performances for a three-month period before the IPO (Bayless and Chaplinsky, 1991), other macroeconomic variables, including the term

spread, default spread, and three-month equity market return prior to the IPO (Korajczyk and Levy, 2003), and more recently legal protection and a country's accounting disclosure standards (Wang, 2011).

However, the pattern of IPOs noticed by Ibbotson and Jaffe (1975) is puzzling because theoretically firms do not go public when the initial returns are the lowest. Rather, in reality, firms tend to go public when the initial returns are the highest. It is against the general belief that firms would prefer to raise as much capital as possible in their IPO, especially when the initial returns are at the lowest. Scholes (1972) asserts that an increase in stock supply by a new equity issuance, if it is a small percentage of the assets, should not affect market prices negatively. However, Ritter (1991) provides evidence that overoptimistic investors during certain periods contribute to especially high initial returns, as they tend to bid up the after-market price of the IPO firms. Baker and Wurgler (2000) show that an increase in asset supply by a new equity issuance leads to a decrease in future aggregate equity market returns after periods of active issuance. Lowry and Schwert (2002) report weak evidence of a negative relation between the IPO volume and future initial returns, yet a significant positive relation between the initial returns and future IPO volume. It appears that increased numbers of companies go public after observing that IPOs are being underpriced by the greatest amount. Loughran and Ritter (2002) report that the initial returns tend to be especially underpriced even though they reflect public information available during the registration period, yet only insufficiently incorporated into the offer price due to overlapping periods, generating cycles in the initial returns. Braun and Larrain (2009) also report that shocks in asset supply have a positive effect on asset prices in emerging markets. Their study also shows that a shock has a more negative effect on those stocks by the issuance of new stock in the same industry, of a similar size, or of a similar book-to-market ratio.

Lowry and Schwert (2002) reported a positive relation between the initial returns and subsequent IPO volume. However, Chen et al. (2015) reported

hardly any evidence of lead-lag relations in the Chinese IPO markets, even after controlling for IPO market shutdowns due to the distinct regulatory regime in China. Thus, our study focuses on whether firms that file IPOs following high initial returns and high volume can themselves expect to also be extremely underpriced, leading to a hot period in IPOs in China, an issue still under debate.

We test the lag and lead relation between the IPO volume and average initial returns. We also investigate the effect of firm-specific factors and market factors on high initial returns as in many other prior studies. In the process, we investigate the differences and value-weighted aggregate forces in time and volume between IPOs.

III. Hypotheses and Test Models

While Chen et al. (2015) report hardly any clear evidence of lead-lag relations in the Chinese IPO markets, even after controlling for IPO market shutdowns mainly due to a distinct regulatory regime in China, we follow the findings of Loughran and Ritter (1995) and Lowry and Schwert (2002) in the U.S. market to set and test the hypotheses in this study.

A. Hypotheses

1. *Effects of Market Information on Initial Returns*

Following Lowry and Schwert(2002)'s report on a positive relation between the number of IPOs and the initial returns, the first hypothesis is set to compare the initial returns of IPOs on the Shenzhen Stock Exchange relative to the Shanghai Stock Exchange, since the former has a larger number of listed firms.

Hypothesis 1: IPOs on the Shenzhen Stock Exchange have a higher initial return when compared

with the Shanghai Stock Exchange.

Basically, a higher IPO price leads to a larger IPO volume, given that the issuance number is fixed. Therefore, the initial returns will be smaller, even with the same first trading day price, leading to a negative relation between them. Hanley (1993) showed a negative relation between initial returns and the proceeds of IPOs. Meanwhile, Braun and Larrain (2009) showed that a supply shock by another firm in the same industry, of a similar size or with a similar book-to-market ratio, has a more negative effect on initial returns. Thus, the larger the size of an IPO, the lower the initial returns of the IPO. We then hypothesize as follows.

Hypothesis 2: The magnitude of an IPO has a negative effect on the initial return of the IPO.

Lowry and Schwert (2002) showed a positive effect of market returns on initial returns, without a strong statistical significance, whereas Loughran and Ritter (2002) showed that initial returns are significantly related to market returns during the 15 days prior to the offering, with a strong statistical significance. Following Loughran and Ritter (2002), we set the following hypothesis.

Hypothesis 3: The market returns of IPOs offered prior to an IPO have a positive effect on the initial return of the subsequent IPO.

To test the effect of spillover information in our study, we introduce the number of IPOs, as in Lowry and Schwert (2002). They showed a strong negative relation between current initial returns and past numbers of IPOs. Ritter (1991) provided evidence of investors' over-reaction during certain periods leading to underpricing in a subsequent IPO. However, following Lowry and Schwert (2002), we set the following hypotheses for the number of IPOs in the current period and in the previous period as follows.

Hypothesis 4: The number of IPOs in the current

period has a negative effect on the initial return of a subsequent IPO.

Hypothesis 4-1: The number of IPOs in the previous period has a negative effect on the initial return of a subsequent IPO.

The initial returns for the recent sample period may have changed over time from 1987 till 2015 in the full sample. From the 2,889 firms offered since late 1984, there were so many extremely high IPO initial returns, such as the one with 29,698% offered before September 1st, 1987. It is well known that, on average, the initial returns were high in the 1980s and early 1990s, even with some cycles or variations before the early 2000s. Therefore, we set an additional hypothesis to compare the initial returns of IPOs in the earlier period before 2004 and the recent period after 2004 inclusively or during the last 12 years.

Hypothesis 5: The IPOs offered during the earlier period had higher initial returns, when compared with the recent period.

Similar to Frankel, Stein, and Wei (1993)'s gravity models in international trade, we introduce gravity factors in finance as additional market information, as previously outlined by Lowry and Schwert (2002): the magnitude of things in weight and the distance between them. The gravity model of Frankel, Stein, and Wei (1993) predicts that the aggregate magnitude of things has a positive effect on the gravity between them. Thus, following Lowry and Schwert (2002), we set the following hypothesis to study the effect of the magnitude of IPOs as follows.

Hypothesis 6: The aggregate volume in proceeds of IPOs has a positive effect on the initial return of a subsequent IPO.

In addition, we introduce time lags among IPOs, represented by the aggregate proximity in time, measured in months for 15 IPOs and 30 IPOs prior

to the IPO. Thus, we set the following hypothesis to study the effect of distance in time as follows.

Hypothesis 7: The aggregate distance in time with prior IPOs has a negative effect on the initial return of a subsequent IPO.

According to Chen et al. (2015), the CSRC plays a significant role in controlling the market-timing of IPOs. However, they found hardly any evidence of lead-lag relations between market information and initial returns in the Chinese IPO markets, even after controlling for IPO market shutdowns due to the distinct regulatory regime in China. Here, we posit that a shutdown period has a negative effect on initial returns, thereby cooling down the market as intended by the regulatory committee. Thus, without prior evidence from formal studies, we set the following hypothesis to study the effect of distance in time as follows.

Hypothesis 8: IPOs following a shutdown period have lower initial returns than other IPOs.

2. *Effects of Market Information on Number of IPOs*

We next examine the effects of market and firm-specific information on initial returns on the number of firms filing IPOs following periods of high average underpricing. Lowry and Schwert (2002) reported a positive relation between initial returns and the subsequent IPO volume, unlike Chen et al. (2015) who reported hardly any evidence of such relations in the Chinese IPO markets and claimed intervention by the government as the cause of insignificance of their findings. Thus, we set the following hypothesis to study the effect of distance in time as follows.

Hypothesis 9: The market returns of the prior IPO period have a negative relation with the number of IPOs in the following period.

Lowry and Schwert (2002) also suggested a

positive relation between the volume of IPOs and subsequent IPO volume using SDC data on aggregate IPO activity in the U.S., 1985 to 1997. Thus, we set the following hypothesis to study the effect of distance in time as follows.

Hypothesis 10: The aggregate volume in proceeds of IPOs has a positive effect on the number of IPOs in the subsequent period.

Following the study of Lowry and Schwert (2002), the lengths in time differences among IPOs could have a negative effect on the volume of IPOs in the subsequent period. Thus, we set the following hypothesis to study the effect of distance in time as follows.

Hypothesis 11: The numbers of IPOs in the previous period have a positive relation with the number of IPOs in the following period.

B. Empirical Models

Our study is focused on two issues still under debate; whether firms that file IPOs following high initial returns and a high volume can themselves also expect to be extremely underpriced, and whether underpricing in the previous period leads to a hot period subsequently in IPO markets in China. Basically, we develop the model from Lowry and Schwert (2002) for the empirical study to reflect the market information.

To test whether firms that file IPOs following high initial returns and a high volume can themselves also expect to be extremely underpriced, leading to a hot period in IPOs in China, we developed the empirical models below. We use the initial returns (IR) defined as the difference between the first-day market opening price minus the IPO price, divided by the IPO price, as shown in (1).

$$IR_{it} = \frac{Open\ Price_{it} - IPO\ Price_{it-1}}{IPO\ Price_{it-1}} \quad (1)$$

Here, we assume that using the first-day market closing price, as by Lowry and Schwert (2002), to calculate the initial returns can cause a significant distortion for the following reasons. First, based on the beliefs of investors, known as prospect theory, IPO investors, after realizing huge initial margins, do not hold onto IPO stocks, but rather sell at least some of them to avoid downside risks in price. Second, according to market segmentation theory, there can be a separate market for IPO investors and post-IPO investors. Thus, we use the open price on the listing date as the selling price in the market for IPO underpricing and as the purchasing price in the following study with respect to IPO firms' overvaluation after underpricing.

Unlike most previous studies, we do not use monthly returns or periodic average returns in order to reflect firm-specific traits in IPOs and reflect the aggregate effects of volumes, IPO returns, passing periods in time and other market and firm factors for a different time span. While other studies use calendar years, we use the duration of the time-span and value-weighted IPO returns and time-span of the prior 15 or 30 IPOs defined. To simultaneously control the magnitude and dispersion of IPO bubbles in the market, we similarly introduce the time-span and value-weighted IPO market returns of 15 or 30 prior IPOs.

In this study, we use distance in time or more precisely distance in 'information spillovers', as discussed in Lowry and Schwert (2002). We calculate the time lags in months for each of 15 IPOs and 30 IPOs prior to the IPO date. This use of time differences among IPOs was uniquely developed for this study. To reflect the overall market performances of IPOs before an IPO, we also introduce both a value weighted and equally weighted return R_m to 15 IPOs prior to the offer date, which is similar to Lowry and Schwert (2002), who used the CRSP equal-weighted portfolio of stocks for the 15 trading days prior to the offer date¹⁾²⁾. In addition, to test

the effect of spillover information, we introduce the number of IPOs, defined as NIPO, in the same or past month. Information spillovers have been reported to produce a negative relation between the IPO volume and subsequent initial returns, yet a strong positive autocorrelation.

Furthermore, following Lowry and Schwert (2002), we introduce the volume of IPOs, M_{it} . We also introduce various dummy variables to control firm-specific factors as follow.

$$IR_{it} = \alpha + \beta_1 \ln M_{it} + \beta_2 \ln \sum_{j=1}^n M_{ijt-1} + \beta_3 \ln \sum_{j=1}^n D_{ijt-1} + \beta_4 R_{imt-1} + \beta_5 NIPO_{it} + \beta_6 NIPO_{it-1} + \beta_7 Shenzhen_{D_{it}} + \beta_8 Shut_{D_{it-1}} + \beta_9 \ln Asset_{it-1} + e_{it} \quad (2)$$

where M_{ijt-1} is the sum of proceeds for other IPO firms, D_{ijt-1} is the sum of time in months passed for other IPO firms, R_{imt-1} or is the IPO market returns calculated as value-weighted initial returns, is the dummy variable for a stock, 1 if an IPO was on the Shenzhen Stock Exchange and 0 otherwise, $Shut_{D_{it-1}}$ is the dummy variable for IPOs followed by a shutdown period and the size of the firm in total assets at the end of the previous year. We use either 15 or 30 IPO firms prior to the specific IPO firm i in time t . We simply assume that IPO firms refer to information in the market prior to their own IPO.

Now, we simplify the notations in (2) to use basic regression models, the ordinary least squares (OLS) multiple regression models with Huber White sandwich estimators in Lowry and Schwert (2002), as follows for the whole period:

$$IR_{it} = \beta_0 + \beta_1 M_{it} + \beta_2 Rm_{30it-1} + \beta_3 NIPO_{it} + \beta_4 NIPO_{L_{it-1}} + \beta_5 Asset_{it-1} + e_{it} \quad (3)$$

the first month after the IPO and the offer price, we do not use a monthly average.

2) Equally weighted IPOs of small firms can have the same influence as IPOs of large firms. In contrast, value weighted IPOs of larger firms have a larger influence than those of smaller firms. We apply both weighting methods in this study.

1) Although Ibbotson, Sindelar, and Ritter (1994) and Lowry and Schwert (2002) use the average, across all IPOs each month, of the percentage difference between the closing price within

$$IR_{it} = \beta_0 + \beta_1 M_{it} + \beta_2 Rm_{30it-1} + \beta_3 NIPO_{it} + \beta_4 NIPO_{L_{it-1}} + \beta_5 Shenzhen_{it} + \beta_6 Asset_{it-1} + e_{it} \quad (3-1)$$

Furthermore, we introduce the other market information factors, aggregate magnitude M_{30it-1} and aggregate distance $Dist_{30it-1}$ into the basic models, as follows.

Regression models with Rm_{30Ew} , equally weighted using 30 IPO firms prior to the specific IPO for the whole period:

$$IR_{it} = \beta_0 + \beta_1 M_{it} + \beta_2 M_{30it-1} + \beta_3 Dist_{30it-1} + \beta_4 Rm_{30Ew_{it-1}} + \beta_5 NIPO_{it} + \beta_6 NIPO_{L_{it-1}} + \beta_7 Shut_{D_{it-1}} + \beta_8 Asset_{it-1} + e_{it} \quad (4)$$

$$IR_{it} = \beta_0 + \beta_1 M_{it} + \beta_2 M_{30it-1} + \beta_3 Dist_{30it-1} + \beta_4 Rm_{30Ew_{it-1}} + \beta_5 NIPO_{it} + \beta_6 NIPO_{L_{it-1}} + \beta_7 Shenzhen_{it} + \beta_8 Shut_{D_{it-1}} + \beta_9 Asset_{it-1} + e_{it} \quad (4-1)$$

Regression models with Rm_{30Vw} , value weighted using 30 IPO firms prior to the specific IPO for the whole period:

$$IR_{it} = \beta_0 + \beta_1 M_{it} + \beta_2 M_{30it-1} + \beta_3 Dist_{30it-1} + \beta_4 Rm_{30Vw_{it-1}} + \beta_5 NIPO_{it} + \beta_6 NIPO_{L_{it-1}} + \beta_7 Shut_{D_{it-1}} + \beta_8 Asset_{it-1} + e_{it} \quad (4-2)$$

$$IR_{it} = \beta_0 + \beta_1 M_{it} + \beta_2 M_{30it-1} + \beta_3 Dist_{30it-1} + \beta_4 Rm_{30Vw_{it-1}} + \beta_5 NIPO_{it} + \beta_6 NIPO_{L_{it-1}} + \beta_7 Shenzhen_{it} + \beta_8 Shut_{D_{it-1}} + \beta_9 Asset_{it-1} + e_{it} \quad (4-3)$$

We also test whether there are differences between periods, before 2004 and after 2004 inclusive, by introducing a period dummy for the recent period (Recent_D) instead of a dummy for the exchanges (Shenzhen). Recent_D is the dummy variable for the year of the IPO, 1 if an IPO was offered after 2004 inclusive and 0 otherwise. For simplicity, we use the following regression models.

$$IR_{it} = \beta_0 + \beta_1 M_{it} + \beta_2 M_{30it-1} + \beta_3 Dist_{30it-1} + \beta_4 Rm_{30Vw_{it-1}} + \beta_5 NIPO_{it} + \beta_6 NIPO_{L_{it-1}} + \beta_7 Shut_{D_{it-1}} + \beta_8 Asset_{it-1} + e_{it} \quad (4-4)$$

$$IR_{it} = \beta_0 + \beta_1 M_{it} + \beta_2 M_{30it-1} + \beta_3 Dist_{30it-1} + \beta_4 Rm_{30Vw_{it-1}} + \beta_5 NIPO_{it} + \beta_6 NIPO_{L_{it-1}} + \beta_7 Recent_{D_{it}} + \beta_8 Shut_{D_{it-1}} + \beta_9 Asset_{it-1} + e_{it} \quad (4-5)$$

Next, we revise model (3) and (3-1) to study whether underpricing in the previous period leads to a hot period subsequently in IPO markets in China, following the model from the empirical study of Lowry and Schwert (2002) to reflect the market information introduced in Lowry and Schwert (2002). For simplicity, we only introduce the following two regression models as examples.

$$NIPO_{it} = \alpha + \beta_1 M_{30it-1} + \beta_2 Rm_{30Ew_{it-1}} + \beta_3 NIPO_{L_{it-1}} + \beta_4 Asset_{it-1} + e_{it} \quad (5)$$

$$NIPO_{it} = \alpha + \beta_1 M_{30it-1} + \beta_2 Rm_{30Ew_{it-1}} + \beta_3 NIPO_{L_{it-1}} + \beta_4 Shenzhen_{it} + \beta_5 Asset_{it-1} + e_{it} \quad (5-1)$$

IV. Data and Descriptive Statistics

A. Data

The data used in this study is a merged dataset obtained from two sources, the RESSET database from RESSET Technology Co., Ltd., a Chinese firm specializing in financial databases, and the GTA database from GTA Information Technology Co., Ltd., a nationwide high-tech company providing solutions to the education and investment sectors in China. The statistical traits of the data used in this study are described below. Later sections of our study utilize firm-level initial returns, and this data will be described at that point.

Table 1. Number of IPOs and Initial Returns by Exchange

Year	Full Sample		Shanghai Exchange		Shenzhen Exchange	
	Firms	Initial Returns	Firms	Initial Returns	Firms	Initial Returns
1984	1	6.500	1	6.500	0	
1985	3	6.500	3	3.855	0	
1986	2	10.228	2	10.228	0	
1987	6	63.517	4	88.983	2	12.585
1988	23	13.089	14	16.200	9	8.250
1989	17	6.525	4	5.789	13	6.751
1990	9	7.005	2	4.642	7	7.680
1991	17	7.538	4	12.249	13	6.089
1992	110	4.390	78	2.951	32	7.899
1993	144	2.630	76	2.789	68	2.452
1994	40	1.018	22	1.117	18	0.898
1995	17	0.914	8	1.392	9	0.489
1996	176	1.093	86	0.970	90	1.210
1997	189	1.385	83	1.380	106	1.388
1998	102	1.196	52	1.258	50	1.132
1999	91	1.128	45	1.105	46	1.151
2000	134	1.505	94	1.546	40	1.409
2001	64	1.398	64	1.398	0	
2002	70	1.253	69	1.267	1	0.291
2003	66	0.680	66	0.680	0	
2004	98	0.685	59	0.699	39	0.662
2005	15	0.455	2	0.579	13	0.436
2006	71	0.779	15	0.367	56	0.889
2007	121	1.900	24	1.212	97	2.070
2008	77	1.000	6	0.384	71	1.051
2009	111	0.614	10	0.413	101	0.634
2010	347	0.387	28	0.364	319	0.389
2011	277	0.194	38	0.157	239	0.200
2012	150	0.253	26	0.322	124	0.238
2013	2	0.369	1	0.537	1	0.200
2014	125	0.221	44	0.238	81	0.212
2015	213	0.326	86	0.353	127	0.308
Total	2,889	1.341	1,117	1.803	1,772	1.050

Table 1 shows that the numbers of firms going public in China exhibit a very clear cyclical pattern, with a big boom in 1991 and 1992, followed by much fewer IPOs in 1993, 1994, and 1995, another big boom in IPOs from 1996, with 189 IPOs in 1997, 102 in 1998, 91 in 1999, and 134 in 2000, followed

by 64 in 2001, 70 in 2002, and 66 in 2003. Again, the number reaches 98 in 2004 and drops to only 15 in 2005.

The number of IPOs peaks at 347 in 2010, followed by 277 in 2011 and then 150 in 2012. However, it is only 2 in 2013, increases to 125 in 2014, and

then 213 in 2015. This pattern is repeated many times over the 31-year period, which is quite similar to the situation in the U.S. markets, as reported by Lowry and Schwert (2002). The cyclical patterns are similar for the numbers of IPOs in both the Shanghai and Shenzhen exchanges.

In contrast, the average yearly initial returns are high in the 1980s and early 1990s, decrease from the late 1990s, and then become more or less steady, at least relatively. For example, they increase from 650.0% in 1984, 385.5% in 1985, 1,022.8% in 1986, to 6,351.7% in 1987, then decline to 1,308.9% in 1988 and 652.5% in 1989. Such extremely high average yearly returns stay well over 100% until 2002, except for 91.4% in 1995. They then decline to 68.0% in 2003, 68.5% in 2004, 45.5% in 2005, and 77.9% in 2006. The average increases back over 100% to 190.0% in 2007 and 100.0% in 2008, then declines to 61.4% in 2009 and 38.7% in 2010. They reach 19.4% at the lowest in 2011 and bounce back to 25.3% in 2012, and 36.9% in 2013. These cyclical patterns are similarly repeated over the years for both exchanges, although without the extreme returns seen in the 1980s and early 1990s. Cyclical patterns are also observed in the U.S. markets, as reported by Lowry and Schwert (2002), yet there are some

distinct differences. First, when compared with the U.S. markets, the relation between the number of IPOs and initial returns is not so clear in the Chinese markets. Second, the lags and leads also are not so clear in the Chinese markets. Third, the cyclical patterns show larger variations in the Chinese markets than in the U.S. markets.

Figure 1 shows the monthly IPO volume and initial returns between 1984 and 2015 for firms going public on both the Shanghai and Shenzhen Stock Exchange. The initial returns reach over 2,000% in many cases in the early 1990s with many ups and downs, there are also many periods with monthly average initial returns higher than 100%, plus hot periods and cool periods, and even some periods without any IPOs for some months after hot periods with enormous initial returns. Before 1995, periods of high and rising IPO returns tend to be followed by a big increase in the number of IPOs, followed by periods of seemingly lower initial returns afterwards.

For example, the high initial returns of the 1980s and early 1990s are followed by large numbers of firms going public in late 1991 and 1992, and then by much fewer IPOs in 1993, 1994, and 1995, followed by another big boom in IPOs from 1996 with 189 IPOs in 1997, 102 in 1998, 91 in 1999,

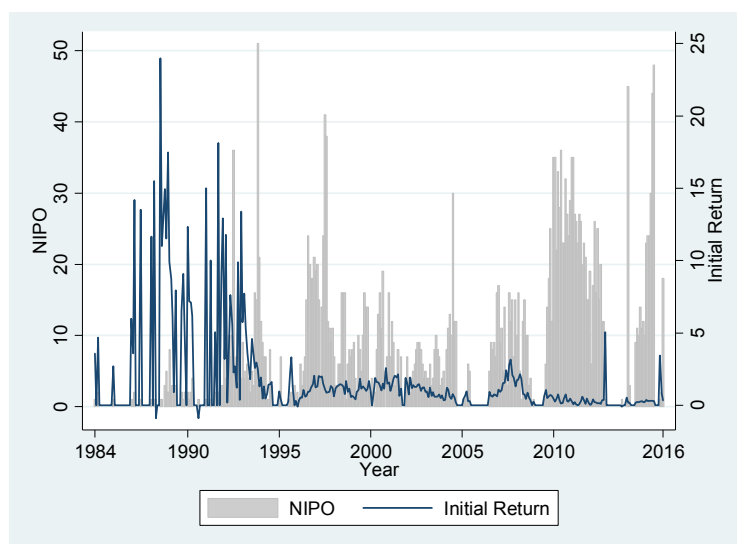


Figure 1. Average Initial Returns from IPOs and Number of IPOs (NIPOs) per Month

and 134 in 2000, followed by 64 in 2001, 70 in 2002, and 66 in 2003. Again, the number reaches 98 in 2004 and drops to only 15 in 2005. This pattern is repeated many times over the 31-year period, and is quite similar to the situation in the U.S. markets, as reported in Lowry and Schwert, 2002. There are also some shutdown periods without any IPOs, possibly following very hot IPO markets or followed by hot IPO markets. The cyclical patterns observed are not market driven, as in the U.S. market, but rather CSRC driven. It seems that even with government intervention in the timing of IPOs, there are huge cycles repeating over time as regards the number of IPOs and magnitude of the initial returns.

Table 2 presents the mean, median, standard deviation, minimum, and maximum of the various variables used in this study. In contrast to Table 1, the total number of IPOs used in this table is 2,153. Thus, 736 IPOs are excluded from the full sample due to outlier problems and lack of useful information, mostly in total assets. Notwithstanding the exclusion of exorbitant outliers, some extreme values are still included.

Here, we focus on certain variables of interest, such as the initial returns (IR) and volume (M) of the IPO measured using a natural logarithm, IPO market return (Rm_15Ew) equally-weighted average of, aggregate volume (M_15) in 100 million yuan of proceeds and distance (Dist_15) from 15 other IPOs in months, prior to a specific IPO measured, and the number of IPOs (NIPO). The initial return (IR) is 93.7% on average for the selected sample

of 2,153 IPOs, the median 63.5%, the minimum -100.0%, and the maximum 908.0%. The volume of IPOs measured using a natural logarithm of million yuan (M) is about 10.58, the median 10.56, the minimum 5.86, and the maximum 10.72. Aggregate volume, measured by the amount of proceeds of 15 other IPOs in months (M_15) is about 141.7 million yuan, the median 89.1 million yuan, the minimum 7.0 million yuan, and the maximum 2,205.5 million yuan. The average distance (Dist_15) from 15 other IPOs measured in months prior to a specific IPO, is about 65.0, the median 7.6, the minimum 0.0, and the maximum 502.0, which implies some extremes. Most importantly, the number of IPOs (NIPO) is about 19.6 on average, the median 17, the minimum 1 for itself, and the maximum 51. The equally-weighted average initial return (Rm_15Ew) of 15 other IPOs is about 107.0% on average, the median 87.7%, the minimum -5.8%, and the maximum 899.6%. All other explanations are skipped for simplicity.

Table 3 presents the Pearson correlations between the variables used in this study. Basically, we focus on the correlation between a dependent variable and other major independent variables of concern. The correlation between the initial returns (IR), the dependent variable, and the volume of the IPO (M), or the amount of proceeds from the IPO is -43.6%, negative at a significance level of 1%. The correlation between the dependent variable and the aggregate volume of 15 other IPOs (M_15) is -4.3%, also negative at a significance level of 5%. The correlation between

Table 2. Descriptive Statistics

Var.	Obs.	Average	Stand. Dev	Min Value	Max Value	Median Value
IR	2,153	0.937	1.090	-1.000	9.080	0.635
M	2,153	10.584	1.053	5.858	15.715	10.560
M_15	2,153	1.417	1.904	0.070	22.055	0.891
Rm_15Ew	2,153	1.070	1.156	-0.058	8.996	0.877
Dist_15	2,153	65.0	743.3	0.0	15,502.0	7.6
Dist_30	2,153	154.9	1,749.5	0.0	31,069.7	51.3
NIPO	2,153	19.550	10.896	1.000	51.000	17.000
NIPO_L	2,153	17.216	10.692	0.000	51.000	16.000
Asset	2,153	20.138	1.340	16.025	29.815	19.895

Table 3. Pearson Correlation Coefficient between Variables

Variables	IR	M	M_15	Rm_15Ew	Dist_15	sDist_15	NIPO	NIPO_L
M	-0.436***	1						
M_15	-0.043**	0.206***	1					
Rm_15Ew	0.508***	-0.395***	-0.121***	1				
Dist_15	-0.026	0.031*	-0.005	-0.026	1			
sDist_15	-0.029	0.050*	0.125***	-0.049***	-0.011	1		
NIPO	-0.209***	0.120***	-0.011	-0.236***	0.006	-0.099***	1	
NIPO_L	-0.236***	0.192***	-0.019	-0.332***	0.030	-0.192***	0.567***	1
Asset_	-0.058***	0.032	-0.029	-0.106***	-0.049**	-0.047**	0.054**	0.046**

Note. *, **, and *** denote statistical significance at 10%, 5%, and 1% level, respectively.

the dependent variable and the IPO market return (Rm_15Ew) equally-weighted average of 15 other IPOs is 50.8%, positive at a significance level of 1%. The correlation with distance (Dist_15) in time from 15 other IPOs in months is -2.6%, yet not statistically significant at a level of 10%, while the correlation with the shutdown dummy (Shut_D) for IPOs after shutdown periods introduced to avoid their influence on the gravity variables, such as the aggregate volume of 15 other IPOs (M_15), is -2.9%, also not statistically significant at a level of 10%. The correlation between the initial returns (IR) and the number of IPOs for the current month (NIPO) and previous month (NIPO_L) is -23.6% and -5.8%, respectively, both negative at a significance level of 1%. The correlation between the initial return and the size of an IPO firm measured by (Asset) is -5.8%, negative at a significance

level of 1%. Thus, other than the IPO market return (Rm_15Ew), the independent variables show some negative relations with the initial returns on IPO investments, although some are not statistically significant for distance (Dist_15) and shutdown period (Shut_D). Notwithstanding, the significantly negative or positive correlation among other variables affects our conclusion with paired correlations with the initial returns (IR), since a multi-lateral correlation can cause multi-collinearity in the formal regression analyses.

Table 4 presents the results of group mean tests for differences between the means of two groups, Shanghai and Shenzhen Exchange listed firms, for each variable used in this study. Each statistic shows the average value for each variable, difference in the group means between the two stock markets, and its statistical significance. The mean tests are

Table 4. Group Mean Tests for Firms on Shanghai and Shenzhen Exchanges

Var.	Shanghai (A)	Shenzhen (B)	Difference (A-B)	t-stat
IR	1.061	0.790	0.271***	6.370
M	145,677	58,380	87,296***	6.406
M_15	938,262	1,653,113	-714,851***	-10.075
M_30	2,006,825	3,263,984	-1,257,159***	-10.823
Dist_15	28.294	83.369	-55.075*	-1.933
Dist_30	602.155	8.007	594.148***	7.049
Rm_15Ew	.329	0.909	0.420***	8.379
Rm_30Ew	1.395	0.933	0.462***	8.016
NIPO	17.125	22.247	-5.122***	-11.106
Asset	28,900	9,230	19,670	1.591

Note 1. *** and * denote statistical significance at 1% and 10% level, respectively.

2. Tests are performed assuming the variances of the two groups are unequal

performed assuming the variances of the two groups are not equal. Obviously, the two markets show significantly different traits judging based on certain critical financial ratios.

The initial returns (IR) from IPOs are higher by 27.1%p on average at a significance level of 1% for the Shanghai Exchange listed firms when compared with the Shenzhen Exchange listed firms. The volume of the IPO (M), or amount of proceeds from the IPO is also much larger on average at a significance level of 1% for the Shanghai Exchange listed firms, relatively. However, the aggregate volume of 15 (M_15) and 30 other IPOs (M_30) is much larger on average for the Shenzhen Exchange listed firms relatively at a significance level of 1%. The equally-weighted IPO market return of 15 (Rm_15Ew) and 30 other IPOs (Rm_30Ew) is higher by 42.0% and 46.2%, respectively, at a significance level of 1% for the Shanghai Exchange listed firms when compared with the Shenzhen Exchange listed firms, although the number of IPOs in the same month (NIPO) as the IPO are more for about 5 firms on

average on the Shenzhen Exchange in contrast to the Shanghai Exchange at a significance level of 1%. The size of the IPO firms listed on the Shanghai Exchange, measured by (Asset), is on average about 3 times larger than the size of the IPO firms listed on the Shenzhen Exchange, insignificant even at a level of 10%.

V. Regression Analysis

A. Determinants of Initial Returns

1. Effects of Market Information on Initial Returns

Table 5 shows the regression results mainly for the volume of IPOs on the initial returns on a subsequent IPO. Here, we empirically test whether initial returns are affected by the market information during the IPO period, as in Lowry and Schwert (2002). Considering two stock exchanges in mainland China, we test whether there are differences between

Table 5. Effects of Market Information on Initial Returns (Basic Models)

Variable		Full Sample	Shanghai Exchange	Shenzhen Exchange
Observations		2153	825	1328
F-value		57.24***	20.05***	54.79***
R-squared		0.354	0.228	0.488
VIF		1.02~1.63	1.05~1.46	1.01~1.58
Variable	Coefficient	Coeff. (t-value)	Coeff. (t-value)	Coeff. (t-value)
Shenzhen	β_1	-0.071 (-1.46)		
M	β_2	-0.315*** (-10.59)	-0.355*** (-8.91)	-0.263*** (-5.16)
Rm-30e	β_3	0.341*** (6.85)	0.160** (2.31)	0.496*** (7.10)
NIPO	β_4	-0.010*** (-3.89)	-0.012** (-2.42)	-0.003 (-1.38)
NIPO_L	β_5	0.000 (-0.11)	0.002 (0.40)	-0.002 (-0.74)
Asset	β_6	-0.006 (-0.56)	-0.033* (-1.74)	-0.003 (-0.22)
Constant	B0	4.272*** (10.08)	5.496*** (9.03)	3.329*** (5.38)

Note 1. ***, ** and * denote statistical significance at 1%, 5% and 10% level, respectively.

2. The estimates are the Huber White sandwich estimators.

Table 6. Effects of IPO volume, distance on Initial Returns (Equally-weighted 30 IPOs)

Variable		Full Sample (1987~2015)	Sub-period I (1987~2003)	Sub-period II (2004~2015)
Observations		2,207	1,007	1,200
F-value		112.53***	14.41***	77.70***
R-squared		0.354	0.228	0.488
VIF		1.03~2.06	1.07~1.54	1.03~1.70
Variable Name	Coefficient	Coeff. (t-value)	Coeff. (t-value)	Coeff. (t-value)
Recent_D	β_1	-0.413*** (-5.48)		
M	β_2	-0.350*** (-12.26)	-0.621*** (-9.53)	-0.176*** (-7.21)
M_30	β_3	0.049*** (7.41)	0.372*** (5.36)	0.022*** (3.06)
Dist_30	β_4	-0.014*** (-3.21)	-0.041 (-1.32)	-0.0003 (-1.23)
Rm_30Ew	β_5	0.355*** (7.44)	0.219*** (3.70)	0.823*** (16.39)
NIPO	β_6	-0.010*** (-4.09)	-0.002 (-0.55)	-0.002 (-1.39)
NIPO_L	β_7	-0.0004 (-0.15)	0.004 (0.82)	-0.0002 (-0.15)
Asset	β_8	0.007 (0.66)	0.098** (2.26)	-0.007 (-1.32)
Constant	B0	4.159*** (10.99)	4.913*** (4.65)	2.144*** (6.65)

Note 1. *** and ** denote statistical significance at 1% and 5% level, respectively.

2. The estimates are the Huber White sandwich estimators.

the Shanghai and Shenzhen exchanges. For the t-statistics, we use White's (1980) heteroskedasticity consistent standard error in regressions.

The Shenzhen Exchange dummy (Shenzhen) has a negative effect on initial returns (IR), but without much statistical significance, with a t-stat of -1.46. The initial returns (IR) from IPOs are negatively influenced by the volume of the IPO (M) or amount of proceeds from the IPO at a significance level of 1%, for the full sample and subsamples of Shanghai Exchange listed firms and Shenzhen Exchange listed firms. This result is consistent with Hanley (1993) who showed that initial returns are significantly related to the price update. Given a fixed number of shares for an IPO, the volume in proceeds is positively correlated with a higher offer price, thus leading to lower initial returns.

The equally-weighted IPO market returns measured with 30 other IPOs (Rm_30Ew) earlier

have a positive effect on the initial return of a subsequent IPO, for the full sample and two subsamples by stock exchange. This result is consistent with Loughran and Ritter (2002) who showed that initial returns are significantly related to market returns during the 15 days prior to the offering, and partly consistent with Lowry and Schwert (2002) who showed a positive effect of market returns on initial returns, without strong statistical significance.³⁾ The number of IPOs in the same month (NIPO) as the initial public equity issuance has a negative effect on the initial return of a subsequent IPO, for the full sample and subsample from the Shanghai Stock Exchange, while the number of IPOs in the previous month (NIPO_L) has a negative effect on the initial return, yet without any

3) Similarly defined IPO market returns, both MKT and MKT+ have modest t-statistics, 1.47 and 1.26, respectively, in Lowry and Schwert (2002).

statistical significance. This result is consistent with Lowry and Schwert (2002) who showed a strong pattern of negative correlations between current initial returns and past numbers of IPOs. The size of the IPO firms (Asset) also shows a somewhat negative effect on the initial return, with a statistical significance at only 10% for the Shanghai Exchange listed firms. This result is partially consistent with Lowry and Schwert (2002), who showed a strong negative effect on the initial return of a subsequent IPO. In general, the results of the basic model regression are consistent with those of prior studies like Loughran and Ritter (2002) and Lowry and Schwert (2002).

Here we empirically test whether initial returns are affected by the equally- and/or value-weighted volume, distance, and initial returns of IPOs in the past. Table 6 shows the regression results mainly for the volume of IPOs and equally weighted factors

of 30 prior IPOs, in addition to factors representing the market information during the IPO period, as introduced in Lowry and Schwert (2002), on the initial returns on subsequent IPOs. Furthermore, we test the differences between periods: before 2004 and after 2004 inclusive.

The initial returns (IR) for the recent sample period (Recent_D) from 2004 to 2015 are lower than those from 1987 to 2003, at a significance level of 1%. This result reflects that the overall level of initial returns of IPOs in China is high until 2003, mostly well above 100%, and then declines to well below 100%. The gravity factor, representing the aggregate volume of 30 prior IPOs (M_30) has a positive effect on the initial return of a subsequent IPO, for the full sample and two subsamples by stock exchange at a significance level of 1%. However, another gravity factor, representing the aggregate distance of the 30 prior IPOs, (Dist_30) has a negative effect on the

Table 7. Effects of IPO volume, distance on Initial Returns (Value-weighted 30 IPOs)

Variable		Full Sample (1987~2015)	Sub-period I (1987~2003)	Sub-period II (2004~2015)
Observations		2,119	981	1,138
F-value		46.38***	12.02***	49.42***
R-squared		0.323	0.237	0.435
VIF		1.03~1.58	1.07~1.63	1.01~1.49
Variable Name	Coefficient	Coeff. (t-value)	Coeff. (t-value)	Coeff. (t-value)
Recent_D	β_1	-0.309*** (-5.24)		
M	β_2	-0.418*** (-12.03)	-0.704*** (-8.84)	-0.201*** (-7.55)
M_30	β_3	0.064*** (8.75)	0.457*** (5.01)	0.082*** (10.58)
Dist_30	β_4	-0.002*** (-3.58)	-0.031 (-1.10)	-0.001*** (-2.55)
Rm_30Vw	β_5	0.237*** (6.30)	0.197** (2.21)	0.203*** (8.68)
NIPO	β_6	-0.008*** (-2.90)	-0.003 (-0.61)	-0.004* (-1.84)
NIPO_L	β_7	-0.007** (-2.49)	-0.001 (-0.20)	-0.009*** (-4.72)
Asset	β_8	-0.030** (-2.44)	0.074* (1.66)	-0.056*** (-6.93)
Constant	B0	5.718*** (13.03)	6.144*** (5.31)	3.634*** (9.79)

Note 1. ***, ** and * denote statistical significance at 1%, 5% and 10% level, respectively.
 2. The estimates are the Huber White sandwich estimators.

initial return of a subsequent IPO, only for the full sample at a significance level of 1%. Thus, the effects of the gravity factors on the initial returns are consistent with our expectations as in the hypotheses. All the other factors related to information with respect to the IPO firm and IPO market around the IPO date show basically the same results as in the basic model. These results are consistent with Loughran and Ritter (2002) and Loughran and Ritter (2002).

Table 7 shows the regression results, the initial returns (IR) on various factors, for example, the volume of IPOs and value-weighted factors of 30 prior IPOs, in addition to factors representing the market information during the IPO period, as introduced in Lowry and Schwert (2002). We also study the differences between 2 periods, before and after 2014 inclusive.

2. Effect of Shutdown Periods on Initial Returns

We now empirically study how initial returns are affected by shutdown periods, using a dummy variable Shut_D, 1 for 30 IPOs following shutdown periods or 0 otherwise. We also examine the effects for the full sample period and two sub-periods, before and after 2014 inclusive, using both equally and value-weighted initial returns of 30 prior IPOs. Table 8 shows the regression results regarding the effect of shutdown periods on initial returns, using equally-weighted IPO market returns.

From the regression, IPOs (Shut_D) following shutdown periods have lower initial returns on average than other IPOs, where the results are only significant at a level of 10% and only for the full sample, while the t-statistics for the two sub-periods are -1.43 and -1.45, respectively. This could imply that the

Table 8. Effects of Shutdown Periods on Initial Returns (Equally-weighted IPOs)

Variable		Full Sample (1987~2015)	Sub-period I (1987~2003)	Sub-period II (2004~2015)
Observations		2,207	1,007	1,200
F-value		49.85***	12.93***	68.52***
R-squared		0.369	0.265	0.582
VIF		1.03~2.07	1.07~1.82	1.04~1.76
Variable Name	Coefficient	Coeff. (t-value)	Coeff. (t-value)	Coeff. (t-value)
Recent_D	β_1	-0.410*** (-5.45)		
M	β_2	-0.350*** (-12.25)	-0.626*** (-9.40)	-0.176*** (-7.21)
M_30	β_3	0.050*** (7.42)	0.397*** (4.76)	0.022*** (3.07)
Dist_30	β_4	-0.001*** (-3.22)	-0.031 (-1.26)	-0.0003 (-1.26)
Shut_D	β_5	-0.131* (-1.81)	-0.249 (-1.43)	-0.083 (-1.45)
Rm_30Ew	β_6	0.352*** (7.30)	0.219*** (3.69)	0.815*** (16.14)
NIPO	β_7	-0.010*** (-4.10)	-0.003 (-0.56)	-0.002 (-1.45)
NIPO_L	β_8	-0.001 (-4.10)	0.004 (0.78)	-0.001 (-0.55)
Asset	β_9	0.006 (0.56)	0.095** (2.18)	-0.008 (-1.47)
Constant	B0	4.198*** (11.03)	4.999*** (4.66)	2.184*** (6.70)

Table 9. Effects of Shutdown Periods on Initial Returns (Value-weighted IPOs)

Variable		Full Sample (1987~2015)	Sub-period I (1987~2003)	Sub-period II (2004~2015)
Observations		2,207	1,007	1,200
F-value		41.44***	11.88***	45.28***
R-squared		0.321	0.241	0.429
VIF		1.03~1.60	1.07~1.93	1.04~1.58
Variable Name	Coefficient	Coeff. (t-value)	Coeff. (t-value)	Coeff. (t-value)
Recent_D	β_1	-0.526*** (-7.36)		
M	β_2	-0.404*** (-12.27)	-0.702*** (-9.15)	-0.189*** (-7.83)
M_30	β_3	0.062*** (8.75)	0.452*** (5.12)	0.080*** (10.72)
Dist_30	β_4	0.002*** (-3.60)	0.032 (-1.09)	0.001** (-2.58)
Shut_D	β_5	-0.159* (-1.95)	-0.265 (-1.50)	-0.245*** (-4.11)
RM_30_vw0	β_6	0.242*** (6.44)	0.197** (2.22)	0.203*** (8.67)
NIPO	β_7	-0.009*** (-3.89)	-0.003 (-0.62)	-0.006*** (-3.89)
NIPO_L	β_8	-0.006** (-2.29)	-0.001 (-0.23)	-0.008*** (-4.50)
Asset	β_9	-0.026** (-2.05)	0.080* (1.80)	-0.053*** (-6.70)
Constant	B0	5.484*** (12.96)	6.014*** (5.31)	3.501*** (10.11)

Note 1. ***, ** and * denote statistical significance at 1%, 5% and 10% level, respectively.
 2. The estimates are the Huber White sandwich estimators.

interventions by the CSRC may have been effective in lowering the initial returns. Table 9 shows the regression results with respect to the effect of shutdown periods on initial returns, using value-weighted IPO market returns. The effect is statistically negative at a significance level of 10% and 1% for the full sample period and sub-period after 2014, respectively, while the t-statistic for the sub-period before 2014 is -1.50. These results strongly suggest that the shutdown periods have some positive effects, at the least in lowering the initial returns. Unlike Chen et al. (2015), we show that the CSRC’s interventions of completely shutting down the IPO markets have a negative effect on the initial returns, thereby cooling down the market, as intended by the regulatory institution.

B. Determinants of Provisions on Number of IPOs

Table 10 shows the regression results for the number of IPOs (NIPO) in relation to the volume of IPOs, the initial returns of the overall IPO market, and other market information factors. Here, we basically test the effect of the initial returns in the prior period on the number of IPOs (NIPO) in the following period. Our tests also include the market information and firm-specific information introduced in Lowry and Schwert (2002), as well as the factors used in our study to reflect the relative effects of other IPOs in the earlier period. As before, we consider two stock exchanges in mainland China, Shanghai and Shenzhen, and study the differences between the exchanges.

Table 10. Effects on Number of IPOs by Exchange (Equally-weighted 30 IPOs)

Variable		Full Sample	Shanghai Exchange	Shenzhen Exchange
Observations		2,209	849	1,360
F-value		204.87***	66.40***	166.83***
R-squared		0.324	0.279	0.315
VIF		1.01~1.15	1.00~1.06	1.01~1.12
Variable Name	Coefficient	Coeff. (t-value)	Coeff. (t-value)	Coeff. (t-value)
Shenzhen	β_1	1.894*** (4.31)		
M_30	β_2	-0.074 (-1.38)	-0.222** (-2.27)	-0.044 (-0.69)
Rm_30Ew	β_3	-0.377** (-2.31)	0.619** (2.05)	-0.996*** (-4.98)
NIPO_L	β_4	0.543*** (22.88)	0.600*** (15.67)	0.494*** (16.06)
Asset	β_5	0.293** (2.16)	0.278 (1.23)	0.384** (2.24)
Constant	B0	3.855 (1.41)	1.871 (0.42)	5.515 (1.58)

Note 1. ***, ** and * denote statistical significance at 1%, 5% and 10% level, respectively.
 2. The estimates are the Huber White sandwich estimators.

From the table, the Shenzhen Exchange dummy (Shenzhen) has a positive effect on the dependent variable, NIPO or number of IPOs in the same month (NIPO), with a significance level of 1% for the full sample and both subsamples, the Shanghai Exchange listed firms and Shenzhen Exchange listed firms as the number of IPOs in the previous month (NIPO_L). The former result is consistent with the fact that the number of IPOs in the same month (NIPO) as an IPO is 5 firms more on average on the Shenzhen Exchange when compared with the Shanghai Exchange at a significance level of 1%. Plus, the aggregate volume in proceeds of 30 prior IPOs (M_30) has a negative effect on the number of subsequent IPOs, as in Lowry and Schwert (2002). This result is significant at a 5% level for the IPOs on the Shenzhen Stock Exchange, while negative yet not significant statistically for the IPOs on the Shanghai Stock Exchange. The t-stat for the full sample is -1.38.

However, the equally-weighted IPO market returns measured with 30 other prior IPOs (Rm_30Ew) have a negative effect on the numbers of IPOs (NIPO) in the current month, with statistical significance for

the full sample as well as for the two subsamples by stock exchange. This result is contrary to the finding of Loughran and Ritter (2002), who reported that firms tend to go public following periods of high initial returns. The numbers of IPOs (NIPO_L) in the previous month have a negative effect on the numbers of IPOs (NIPO) in the current month, with statistical significance at 1% for the full sample, as well as for the two subsamples by stock exchange. This result implies a strong serial correlation between the numbers of IPOs over time, as in Lowry and Schwert (2002).

Table 11 shows the regression results for the number of IPOs (NIPO) in relation to the volume of IPOs, the initial returns of the overall IPO market, and other market information factors, with subsamples divided by periods. The number of IPOs in the subsequent month for the recent period (Recent_D) since 2004 is larger than that from 1987 to 2003 at a significance level of 1%. The factor, representing the aggregate volume of 30 prior IPOs (M_30) has a positive effect on the number of IPOs in the subsequent month, for the full sample and period before 2003 inclusive, while it has a negative effect

Table 11. Effects of Initial Returns on Number of IPOs (Equally-weighted 30 IPOs)

Variable		Full Sample (1987~2015)	Sub-period I (1987~2003)	Sub-period II (2004~2015)
Observations		2,209	1,009	1,200
F-value		305.77***	86.53***	189.73***
R-squared		0.343	0.320	0.303
VIF		1.03~1.93	1.06~1.16	1.03~1.64
Variable Name	Coefficient	Coeff. (t-value)	Coeff. (t-value)	Coeff. (t-value)
Recent_D	β_1	5.085*** (9.40)		
M_30	β_2	-0.381*** (-5.72)	-1.983*** (-4.30)	0.004 (0.05)
Rm_30Ew	β_3	0.698*** (2.75)	0.970*** (3.20)	-3.397*** (-7.12)
NIPO_L	β_4	0.531*** (21.3)	0.585*** (15.48)	0.405*** (10.95)
Asset	β_5	0.212 (1.59)	-0.235 (-0.55)	0.343*** (2.68)
Constant	B0	3.670 (1.32)	13.341 (1.54)	9.186*** (3.23)

Note 1. ***, ** and * denote statistical significance at 1%, 5% and 10% level, respectively.
 2. The estimates are the Huber White sandwich estimators.

on the number of IPOs for the period after 2004 inclusive, all significant at a level of 1%. This result could reflect a critical change in the IPO markets. Thus, further studies may be needed to explore the reason for the differences. The number of IPOs in the subsequent month (NIPO) is serially correlated over time, at a significance level of 1% for the full sample and both subsamples, based on the test result of the number of IPOs in the previous month (NIPO_L).

The above results are only partially consistent with Loughran and Ritter (2002) and Lowry and Schwert (2002) in that the higher market returns and larger number of IPOs result in more IPOs in the subsequent period. However, this phenomenon is reversed during the recent period. Thus, we can conclude that firms in IPO markets in China responded more sensitively to the market initial returns of prior IPOs during the earlier period. This might be because of limited capacity of the Chinese capital market, only to domestic investment due to the restrictions on foreign investments entering the Chinese market in the earlier stage. Thus, the increase of new assets to the market is likely to result in a relatively large change in market

supply as explained by Fang, Shi and Su (2012), even though the number of initial issuers increases dramatically over time. On the contrary, during the recent period, possibly due to changes in the interventions of the regulatory committee, CSRC, or some other reasons, Chinese firms considering the issuance of equities for the first time take the overall supply of IPOs, in value, into consideration more seriously. Therefore, the result provide some evidence that appropriate government intervention as claimed by Fang, Shi and Su (2012) in the Chinese capital market became more effective recently at least in deciding the timing of and thus controlling exorbitant initial returns on IPOs, although the markets have been largely regulated by CSRC since the establishment of China's capital market.

VI. Conclusion

This study addresses two puzzles in the IPO markets in China: whether underpricing in the IPO

market is affected by earlier market information, especially the volume and number of IPOs in the prior period, and whether underpricing in the previous period leads to a subsequent hot period in the IPO markets in China. Multivariate regressions are conducted using all the IPOs of firms listed on the Shanghai and Shenzhen exchanges from 1987 to 2015. Our findings can be summarized as follows:

First, while that the magnitudes of weighted (equally or value weighted) IPO volumes in the past have a positive effect on the magnitude of IPO returns in the future, the IPO volume itself has a negative effect on the magnitude of IPO returns in the future.

Second, the magnitude of weighted IPO returns in the past has a positive effect on the magnitude of IPO returns, while simultaneously reflecting the effects of both time-span and magnitude in returns and volume for most of the information used in Lowry and Schwert (2002).

Third, the effects of market information in our study are only partially consistent with Loughran and Ritter (2002) and Lowry and Schwert (2002), as higher market returns and larger numbers of IPOs only result in more IPOs in the subsequent period during the period before 2004, whereas this phenomenon has since reversed. Plus, the statistical reliability of the lead-lag relations with the initial returns and volume of IPOs in the subsequent period over time and the impact of market and firm-specific information are better explained by the IPOs on the Shenzhen Stock Exchange than the IPOs on the Shanghai Stock Exchange.

Fourth, consistent with Chen et al. (2015), the effect of shutdown periods by the CSRC on the initial returns and volume of IPOs is a clear cooling down effect on the initial returns and numbers of IPOs in the subsequent period.

Fifth, unlike most other studies on this topic that use monthly or yearly average data, we find clear statistical relations, evidenced by Lowry and Schwert (2002), of IPOs with individual firm-level data, thereby rejecting most conclusions in Chen et al. (2015).

Thus, the IPO underpricing phenomena are more

clearly explained based on the effects of prior initial returns and volume supporting Lowry and Schwert (2002) and rejecting Chen et al. (2015), yet the phenomena differ significantly by exchange and by period. We notice that before 2004, firms in IPO markets in China respond more sensitively to the market initial returns of prior IPOs, while since 2004 they have become more sensitive to the volume in prior IPO markets. Firms in IPO markets in China responded more sensitively to the market initial returns of prior IPOs during the earlier period mainly because of limited capacity of the Chinese capital market, limited only to domestic investment due to the restrictions on foreign investments entering the Chinese market in the earlier stage, even when the number of potential issuers increases dramatically over time. Thus, the increase of new assets to the market is likely to result in a relatively large change in market supply as explained by Fang, Shi and Su (2012).

On the contrary, during the recent period, possibly due to changes in the interventions of the regulatory committee, CSRC, in a more efficient way or some other reasons, Chinese firms seem to consider more seriously their issuance timing of equities into consideration of the overall supply and returns of IPO, supporting Fang, Shi and Su (2012) that government interventions in the Chinese capital market became more effective recently at least in deciding the timing of and thus controlling exorbitant initial returns on IPOs. Notwithstanding, there is still a need for more explanation on the differences in trends, exchanges, and idiosyncrasies in firms, and more detailed investigation into the lengths of lead-lag relations and underlying and managerial factors.

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