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Performance persistence of institutional investors in IPO market : evidence from China

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PERFORMANCE PERSISTENCE OF INSTITUTIONAL INVESTORS IN IPO MARKET: EVIDENCE FROM CHINA

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PERFORMANCE PERSISTENCE OF INSTITUTIONAL INVESTORS IN IPO MARKET: EVIDENCE FROM CHINA

by
LIU Sibo

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ABSTRACT

Performance Persistence of
Institutional Investors in IPO Market:
Evidence from China

by

LIU Sibo

Master of Philosophy

Using a dataset consisting of complete bid information for 477 bookbuilt IPOs that took place during Nov 2010 to Oct 2012 in China, I examine whether the performance of institutional investors demonstrates persistence in the IPO market. Building on the adverse selection model as developed by Rock (1986) and a two-period analysis, I develop three hypotheses and obtain empirical results that are consistent with the hypotheses. Firstly, I find that the performance of institutional investors continues into the next period. Secondly, I find that the performance persistence exists only for the investors with good past performance but not for investors with bad past performance. Finally, an index capturing the past performance of institutional investors is shown to be informative about the IPO's initial and medium-term post-market returns. Overall, the results are consistent with the existence of performance persistence among the institutional investors. I conduct additional tests to trace the roots of the observed performance persistence. Results support the hypothesis that institutional investors with good past performance are relatively more informed than those with bad past performance. Specifically, investors with good past performance are more likely to participate in issues with high underpricing, exhibit stronger bid shaving ability, provide more information in terms of high elasticity of demand curve, and show a weaker tendency of naïve reinforcement learning. The results are robust after controlling for the influence of underwriters and after ruling out different alternative explanations. Taking all the results together, my study provides the first systematic evidence on the performance persistence of institutional investors in the IPO market. The results provide important insights for understanding the role of institutional investors in the IPO process and have implications for the design of IPO methods.

DECLARATION

I declare that this is an original work based primarily on my own research, and I warrant that all citations of previous research, published or unpublished, have been duly acknowledged.

(LIU Sibo)

Date:

CERTIFICATE OF APPROVAL OF THESIS

PERFORMANCE PERSISTENCE OF
INSTITUTIONAL INVESTORS IN IPO MARKET:
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Master of Philosophy

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PERFORMANCE PERSISTENCE OF INSTITUTIONAL INVESTORS IN IPO MARKET: EVIDENCE FROM CHINA

Chapter 1. Introduction

The existence of performance persistence among institutional investors has been intensively debated over the past two decades (Busse *et al.* 2010). This issue is important because the evidence has significant implications on the market efficiency hypothesis and also contains valuable indicative information for investors. Some studies document that some institutional investors consistently outperform others. As such, the past performance of institutional investors provides valuable information about these investors' quality and future performance (Grinblatt & Titman 1992; Brown & Goetzmann 1995). Nevertheless, other studies argue that the performance persistence is caused by the existence of momentum effects instead of heterogeneous skills of institutional investors (Carhart 1992, 1997). The existing studies have been focused mainly on the performance of institutional investors in the secondary market and none of them has investigated the performance persistence of institutional investors in the IPO market. The IPO market is fundamentally different from the secondary market in terms of the information and trading environment (Sherman & Titman 2002). As a result, evidence obtained from the institutional investors in the secondary market cannot be automatically generalized to the IPO setting, because the expertise and skills required by institutional investors in these two markets are likely to be different. In this study, I try to fill this gap in the literature by using a dataset of complete bid information in China to investigate whether institutional investors demonstrate performance persistence in the IPO market.

The theoretical root of performance persistence in the IPO market can be traced to the seminal paper written by Rock (1986). As an asymmetric information-based model of underpricing, Rock's adverse selection model suggests the existence of information heterogeneity among investors in the IPO market. Specifically, investors in his model are divided into an informed group and an uninformed group. Informed investors who have undertaken costs to determine the true value of IPO shares will subscribe to the shares only if they are underpriced and therefore offer a

positive return on their investment. Uninformed investors, in contrast, subscribe to IPO shares indiscriminately and earn a zero expected return on average. As a result, there is a positive performance gap between the informed and uninformed investors. If the mix of informed and uninformed investors remains largely stable over time, I expect to observe that the performance gap between informed and uninformed investors persists over time. Furthermore, if performance persistence exists, the past performance of investors who have participated in the subscription of an IPO can provide valuable indicative information about the performance of the new shares.

To the best of my knowledge, performance persistence among institutional investors in the IPO market has not yet been documented in the literature. I believe that the paucity of the research on this important issue is largely due to two reasons. Firstly, in the typical bookbuilding process, performance of institutional investors is heavily influenced by underwriters' discretions in share allocation. As shown by prior studies that examine performance persistence of institutional investors in the secondary market, the performance of investors in secondary market can be captured by using data on the quantities and prices of the stocks that these investors have bought and sold in the market. Unlike the secondary market where institutional investors can buy and sell stock at prevailing market prices, the successful buying of stocks in IPO market is constrained by the subscription and share allocation mechanisms in which underwriters can exercise substantial discretion. For example, Binay *et al.* (2007) found that underwriters enjoy substantial discretion in share allocation when a bookbuilding method is used and they tend to exercise their discretion to allocate more shares to their favored institutional investors. Ritter & Zhang (2007) also provide evidence that the underwriter tends to allocate hot IPOs to its affiliated funds. As a result, measuring the performance of institutional investors in the IPO market by using data on the shares that have been actually obtained by the institutional investors from IPOs may not accurately capture these investors' incentives and performance, unless the influences of underwriters can be mitigated.

The second hurdle for investigating performance persistence in IPO market is data availability (Degeorge *et al.* 2010). A full set of bidding information is needed (both

participation and bid information) for each investor in order to discern the incentives and abilities of the institutional investors in IPO markets, such as their participation decision and bid shaving ability (Sherman 2005; Field & Lowry 2009; Chiang *et al.* 2010; Chiang *et al.* 2011). IPO bid-level data are not available in US and Europe markets[1]. Existing studies have relied on data obtained from the private sources (e.g. investment banks), which usually contains a small sample of issues (Aggarwal *et al.* 2002).

China, the largest emerging market, provides a valuable testing ground for two reasons. Firstly, new shares in China during our investigation period are required to be allocated to two tranches of investors separately: the institutional tranche and retail tranche. The method of allocation for the institutional tranche in China has a distinctive and has a valuable feature: the share allocation is not determined by underwriter but on the basis of *pro rata* and lottery. In addition, the IPO regulations prevent institutional investors that are affiliated to the underwriter from participating in the bidding process. Therefore, the confounding influences due to underwriters' discretion over share allocation are likely to be mitigated. Secondly, the regulations in China require the underwriters to release the full set of bidding information to the public before the first-day trading commences. Thus, we are able to obtain a dataset that consists of complete bid information for 477 bookbuilt IPOs, which is much larger than the sample size employed by most prior studies.

Building on information heterogeneity of investors as suggested by Rock (1986), I propose three hypotheses using a two-period framework. Firstly, I expect that the performance of institutional investors is persistent. That is, investors who perform well (poorly) in the first period will continue to perform well (poorly) in the second period. Secondly, the performance of investors who performed well in the first period will show persistence but no such pattern can be observed for the investor who performed poorly. Thirdly, I further hypothesize that there is a positive relation between the past performance of institutional investors who have participated in an IPO and the IPO's initial and subsequent returns.

[1] Data on the participations of institutional investors in US bookbuilt IPOs has been obtained from private sources, as used in Chemmanur *et al.* (2010).

My empirical analysis yields consistent results. I find that the performance of institutional investors continues into the next period. Such a pattern exists for investors with good past performance but cannot be found for ones with bad past performance. Moreover, an index capturing the past performance of institutional investors involved in the bidding process of an IPO is shown to be informative about the IPO's initial and medium-term post-market returns. I conduct additional tests to trace the roots of the observed performance persistence. Results appear to support the hypothesis that institutional investors with good past performance are informed. Specifically, investors with good past performance are more likely to participate in issues with high underpricing[2], exhibit stronger bid shaving ability, provide more information in terms of the elasticity of demand curve, and are less prone to naïve reinforcement learning.

I attribute the observed performance persistence to the information heterogeneity of institutional investors. However, there are several alternative explanations for my findings. Firstly, although the underwriters in the Chinese markets cannot enjoy discretion in share allocation, they can intentionally discount the offer prices to favor certain institutional investors through pricing discretion as in the auctioned IPOs in US (Degeorge *et al.* 2010). Furthermore, some institutional investors can achieve good performance by correctly anticipating the underwriters' pricing strategy and participate in IPOs with greater price discounts. To mitigate the influence caused by underwriter's discount policy, I include a control variable to measure the extent of the price discounts offered by underwriters. In addition, I also use a control variable to capture the number of IPOs involving the same pair of investor-underwriter (that is the participation of an investor in IPOs with the same underwriter). The results indicate that all our results still hold when the pricing discount and investor-underwriter connection have been controlled.

Secondly, the release of bidding information by some large and reputable institutional investors may grab the attention of retail and institutional investors. Thus, the IPOs subscribed to by some specific institutional investors may

[2] In this thesis, I use the term "underpricing" and "initial return" interchangeably.

experience greater buying pressures on their first day of trading and thus result in higher initial returns. Under this circumstance, high initial returns earned by certain institutional investors are not due to their better stock picking abilities, but because their bidding information has triggered positive sentiment among other investors (Barber & Odean 2008). To control for this possibility, I adopt the method in Da *et al.* (2011) and construct an abnormal search volume index (ASVI) to capture the changes in market-wide attention on an IPOs after its bidding information has been released. My results are still retained after this variable has been included in the regressions.

Thirdly, the evidence of performance persistence may be caused by investors who consistently submit high bids or low bids. Specifically, in my current definition of performance, submissions of bids below offer price will generate zero return, while institutional investors submitting high bids will obtain an initial return. Given that the initial returns are on average positive, consistently submitting high bids or low bids could possibly generate the performance persistence that I have documented. I therefore construct two variables to capture the submission of high bids and low bids. However, the inclusion of these two variables does not affect my results.

Lastly, I further test whether the information heterogeneity of investors is due to industry-specific expertise or to more generic skills or knowledge. My results suggest that the performance gap is more likely to be driven by generic skills and knowledge rather than industry-specific expertise.

My study has both academic value and practical relevance: Firstly, this study provides first systematic evidence on the performance persistence of institutional investors in the IPO market. This provides a useful addition to the extant literature on performance persistence of institutional investors (Carhart 1992; Grinblatt & Titman 1992; Brown & Goetzmann 1995; Carhart 1997; Busse *et al.* 2010). My study shows that performance persistence may exist not only in the secondary market but also in the IPO market. This calls for more future research on this important issue within the context of the IPO market. My study offers evidence on the existence of performance persistence when IPO shares are allocated through a

bookbuilding method where underwriters have no discretion. As IPO shares can be allocated under different IPO methods, it is important to examine whether performance persistence can also be observed under each method. For instance, it is interesting to investigate whether performance persistence can also be seen in the typical US bookbuilding method where underwriters have discretion in share allocation. It is also worthwhile to identify the possible causes for the persistence under those circumstances (if there are any). Furthermore, my evidence is obtained from an emerging market where the information environment tends to be opaque and institutional investors are less experienced than those in mature markets. As a result, further studies are needed to verify my findings by using data obtained from mature markets.

Secondly, my study also contributes to the general literature on the role of institutional investors in the IPO market. To begin with, the existing studies tend to assume that institutional investors in the IPO market are homogeneous and equally informed while retail investors are uninformed (Rock 1986; Chiang *et al*. 2010). Such an assumption has been challenged by some scholars such as Ljungqvist (2007), who argues that "it cannot be ruled out that the information asymmetry is most severe *within* groups, rather than between institutional and retail investors". Yet so far, the co-existence of informed and uninformed investors within the group of institutional investors has not been systematically investigated. My study is the first one to investigate whether the information sets of institutional investors in IPO market are heterogeneous and how such heterogeneity may affect the performance of institutional investors. My evidence on performance persistence confirms the existence of information heterogeneity among institutional investors in the market, which enhances our understanding of the information environment of the IPO market. My results also call for more future research to further identify the possible sources of the information heterogeneity and examine the effects of such information heterogeneity on other aspects of IPO processes.

In addition to academic value, my study also has implications for investors and the design of IPO methods. My results show that the participation of certain investors with good past performance may serve as a predictor for initial and subsequent

returns. From an investor's point of view, the past performance of investors in the IPO market can provide investors with valuable information to capture superior returns. Based on the quartiles of the past performance of institutional investors, I find that the IPOs in the highest quartile have an average initial return of 32.2%, compared to just 13.6% for those in the lowest quartile. This economically large spread of 18.6% is robust after I control for the conventional predictors of initial returns. This spread is comparable to the performance difference associated with underwriter persistence as documented by Hoberg (2007). Specifically, Hoberg (2007) finds that the IPOs where their underwriters' past initial returns are in the highest quartile have an average initial return which is 14.7% higher than that of the lowest quartile. In addition, institutional investors are expected to realize a 0.154% greater performance in the following period for every 1% performance achieved in the past period. The association is also comparable to that documented by Grinblatt & Titman (1992) for the institutional investors in the secondary market (0.24%).

Furthermore, my findings can also have important implications for the design of the IPO method. Some recent studies have proposed that a hybrid-auction, which divides the investors into institutional and retail tranches and employ auction as the allocation mechanism, is a promising IPO method (Chiang *et al.* 2010; Jagannathan *et al.* 2010). This method can prevent the uninformed retail investors from introducing noises into the bidding process. The allocation method in China has all the characteristics of a hybrid-auction and provides a unique setting to explore its functioning and effectiveness. My study has at least two important practical implications on this proposed IPO method [3]. Firstly, my results show that institutional investors are not equally informed. Although the hybrid-auction system prevents the retail investors from introducing noises into the bidding process, the effectiveness of the system depends crucially on the quality of institutional investors in a financial market: whether the majority of the institutional investors are informed or uninformed. The existence of uninformed institutional investors can still introduce noises that are similar to those introduced by retail investors. Secondly, my study suggests that releasing the bidding information and the past

[3] The proposed IPO method is to extract the valuable information from the institutional investors. In this study, I show that some institutional investors with good past performance is better informed. One aspect of the effectiveness of the method is that informed investors get compensated in the process of subscription.

performance of the bidders to the public helps to enhance the effectiveness of the system to improve the market efficiency, as the data contain valuable information about the value of the stocks that have recently listed.

The remainder of this paper is organized as follows. Chapter 2 offers a literature review on the extant literatures on performance persistence and asymmetric information-based model of IPO underpricing. I discuss the institutional background and IPO mechanism of China in Chapter 3. Chapter 4 presents the theoretical background and develops the hypotheses. Chapter 5 describes the core empirical results on the performance persistence of institutional investors. Chapter 6 presents the additional analysis. Chapter 7 concludes.

Chapter 2. Literature Review

In this chapter, I conduct a brief review on the related literature and explain how my study extends the prior literature. As performance persistence in the IPO market has not been documented by prior studies, the first set of related literature comes from the studies that examine performance persistence of institutional investors in the secondary market. The extensive studies in the past two decades generate mixed evidence on the existence of performance persistence among institutional investors (Busse *et al.* 2010). A number of empirical studies have demonstrated that the relative performance of mutual funds persists over time. For example, early evidence suggests that funds with good performance in the preceding year appear to obtain superior returns in the current year (Carlson 1970). While some studies present evidence that the performance of institutional investors shows persistence over the short-term horizons of one to three years (Hendricks *et al.* 1993; Goetzmann & Ibbotson 1994; Wermers 1999), other studies show that the persistence can last over the horizons of five to ten years (Grinblatt & Titman 1992; Elton *et al.* 1993; Elton *et al.* 1996). The performance persistence over a short term horizon has been attributed mainly to “hot hand” or common investment strategies (Hendricks *et al.* 1993), while the persistence over long-term horizon has been attributed to managers’ differential information or stock-picking talent (Elton *et al.* 1993). Furthermore, it is also suggested that financial regulations, such as minimum

capital restrictions, can also give rise to performance persistence in the primary market (Cumming *et al.* 2012).

Starting from Jensen (1969), some studies do not find solid evidence of performance persistence. For example, Carhart (1992, 1997) argues that the result of performance persistence is mostly driven by momentum effect. On the other hand, Lewellen (2011), argues institutional investors as a whole closely mimic the market portfolio and no evidence of stock-picking skill can be found by using the data obtained from the period of 1980 to 2007. Matallín-Sáez *et al.* (2014) also challenge the existence of performance persistence by showing that the evidence of performance persistence in mutual funds is not robust over the period 2001 to 2011.

The prior studies on performance persistence have focused on secondary markets but not the IPO market. I believe that it is important to revisit this issue in the context of the IPO market for several reasons. Firstly, the information environment in the IPO market is different from that of that secondary market. Primary markets are well-recognized for having severe information asymmetry. Different opinions and beliefs about the value of IPO stocks are possible because there is no market price of corporate assets (Chemmanur & Krishnan 2012). The information opacity is further intensified due to availability of very limited public information on the IPO firms. The limited public information not only creates a significant information gap among different market participants and also reduces the abilities of financial institutions to conduct research to close the information gap. Such an information environment is very likely to lead to information heterogeneity among institutional investors, which in turn make performance persistence likely to occur in the market.

Secondly, the existence of performance persistence represents a significant challenge to the efficient markets hypothesis and its evidence can provide valuable information for sophisticated investors to strategically generate superior returns and consequently improve market efficiency. The secondary market for newly listed stocks tend to be less efficient than secondary market for the stocks that have been listed for a long time, because there is more limited information available for newly listed stocks. Thus, evidence on performance persistence in the IPO market may

provide investors with a better chance to capture superior returns and consequently greater potential for improving the efficiency of the immediate post-IPO market.

The second related literature is asymmetric information theories/models in the IPO literature. As I have discussed in the Introduction, the idea of information heterogeneity has been proposed by Rock (1986) in his adverse selection model. By assuming that some investors are better informed about the true value of the shares and bid only for attractively priced IPOs[4], and assuming the uninformed bid indiscriminately (Ljungqvist 2007), Rock's model implies that there will be a performance gap between the informed and uninformed investors, which could persist over time.

Rock's model has been extensively tested using data obtained from outside the U.S. (Koh & Walter 1989; Levis 1990; Keloharju 1993; Amihud *et al.* 2003)[5]. Nevertheless, the existing studies have focused on the information heterogeneity between institutional investors and retail investors rather than information heterogeneity among institutional investors. For instance, Chiang et al. (2010) conclude that institutional investors appear to be more informed. Aggarwal *et al.* (2002) show that institutional investors earn greater returns on their IPO allocations than do retail investors.

In addition to Rock's adverse selection model, there are also other asymmetric information-based models in the IPO literature, such as theories on IPO methods (Benveniste & Spindt 1989; Jagannathan *et al.* 2010) and information production theory (Sherman & Titman 2002). These studies attempt to test whether a group of investors are more informed than others by looking at the different behaviors of investors such as endogenous entry (Sherman 2005), bid shaving ability (Chiang *et al.* 2010), elasticity of demand curve (Kandel *et al.* 1999; Liu *et al.* 2001) and learning behaviors (Degeorge *et al.* 2010; Chiang *et al.* 2011), For example, Sherman (2005) shows that informed investors are more attracted by issues with

[4] Attractively priced IPOs refer to IPOs with sufficient underpricing.
[5] Koh & Walter (1989) used IPO data from Singapore during the 1970s and 1980s. In this setting, the oversubscribed IPOs were allocated by random ballot, which is similar to the method used in China. Levis (1990) used data from the UK. Keloharju (1993) used data from Finland and Amihud *et al.* (2003) used data from Israel.

sufficient underpricing and thus endogenously more likely to participate in those IPOs. On the other hand, Liu *et al.* (2001) offer evidence to show that the participation of more informed investors will lead to a more elastic demand curve for an IPO.

Similar to the empirical studies that test Rock (1986)'s model, studies on other information-based models have also focused only on the information heterogeneity between institutional investors and retail investors. Therefore, existing studies on the asymmetric information among investors in the IPO market offer no evidence on whether there are significant differences in information among institutional investors. My study offers systematic evidence to show that some institutional investors are in fact more informed than the others, which consequently leads to the existence of performance persistence

Finally, my study is also related to the work of Hoberg (2007), which explores underwriter persistence phenomenon in the IPO market. The author provides evidence that initial IPO returns have a persistent underwriter-specific component, which has been attributed to information heterogeneity among underwriters. Specifically, a premium constructed on the basis of underwriter quality has been shown to have predictive power on initial returns. Underwriters and investors are the two major players in an IPO process. While Hoberg (2007) has focused on the information heterogeneity of underwriters, my study focuses on the information heterogeneity of institutional investors. My work contribute to the long-standing literature that examines that information environment of IPO market (Ritter & Welch 2002).

Chapter 3. Institutional Background

China opened its stock market around 1990 and set up two stock exchanges in Shanghai and Shenzhen, respectively. Since then, China's IPO rules have experienced several reforms. From 1990-1999, fixed-price public offers were used with prices set by government according to a pre-determined formulas rather than by issuers (Jagannathan *et al.* 2010). Then a retail investor online auction was

instituted from July 1999 to June 2002. From July 2002 to 2004, a controlled P/E system was adopted in which offering price P/E ratios are required to be set at less than 20 (Ritter 2011). In 2005, the CSRC introduced a procedure officially referred to as "bookbuilding", which was replaced by a new version in 2009 (Cheung *et al.* 2009). This 2009 version "bookbuilding" method is in use until now.

My study is based on the "bookbuiding" method adopted since 2009. In the "bookbuilding" procedure, shares to be issued are divided into two parts, an institutional tranche and a retail tranche. Institutional investors submit bid price and share demands in the institutional tranche. The underwriters collect bids from institutional tranche, analyze the demand and set the offer price. Retail investors subscribe to new shares through an online system, however they are not involved in the offer price setting procedure.

The nature of the institutional tranche in China is a typical "sealed uniform dirty Dutch-auction". During the period of bid submission, institutional investors are not allowed to know other investors' bidding information. The offer price set by the underwriter can deviate from the market clearing price. Institutional investors that submit bids above the offer price are referred as winning investors and have the opportunity to get the shares at the uniform offer price[6]. Retail investors accept the offer price set afterwards and are not supposed to influence the behavior of institutional investors.

Different from a typical bookbuilding process in US, in China's version, underwriters are not able to use discretion in share allocation. Institutional investor's share allocation in China is determined on *pro rata* and lottery basis and there is a difference between the Shanghai and Shenzhen markets. In the Shanghai exchange, the number of shares that are allocated to a particular investor is based on the percentage of shares subscribed by this investor against total demand (number of shares subscribed by all winning institutional investors), which can be regarded as a pure *pro rata* basis. In the Shenzhen exchange, several institutional investors

[6] The bookbuilding method in China requires a deposit from institutional investors. Institutional investors that are allocated the shares have to accept the shares and cannot withdraw.

are selected by lottery from the winning investors and then share allocation among these selected investors is based on *pro rata*.

Institutional investors in the bookbuilding process include security firms, funds, trusts, insurance companies, SOE financial firms, and others. Institutional investors affiliated to the underwriter are not allowed to bid in China, which eliminates the favoritism as shown by Ritter & Zhang (2007). Nevertheless, in the Chinese IPO market, underwriters still have some pricing discretion. In this regard, investors still can be favored if underwriter intentionally discounts the offer price. This feature is similar to that of the "dirty" auction as used in U.S. where offer price can deviate from market clearing price.

This IPO allocation method resembles a "hybrid" auction proposed by Jagannathan *et al.* (2010). Although the auction method is more transparent[7], sophisticated investors have to anticipate the behavior of other investors, especially the behavior of irrational investors, which increases the cost of entry in the auction process. Since retail investors are allowed to participate only in the fixed price public offer tranche, the method limits auction participants to a relatively small, predictable number of institutional investors, who are supposed to be more sophisticated than retail investors. The effectiveness of this "hybrid" method has not been tested yet, and still remains as an open question. Features of IPO method in China in essence match all the requirements of "hybrid-auction" method, which provides a suitable setting to explore its effectiveness.

A typical timeline of IPO bookbuilding process in China is presented in Table 1. The bookbuilding starts with an announcement (about day T-6)[8] by the issuer. The announcement releases the information of the IPO date and the number of shares issued in the institutional tranche and retail tranche respectively. In the subsequent days (T-5 to T-3), road shows are conducted in three cities: Beijing, Shanghai and Shenzhen. During road shows, the underwriter collects bids (including bid prices and share subscriptions) from institutional investors. Issuer and underwriter will

[7] The spirit of the auction method is to give pricing power to the market. However, in the "dirty" auction of China, underwriters still can influence the pricing process.
[8] Following the terminology in China's IPO market, day T is the day for subscription of retail investors.

analyze the demand and set the offer price on day T-2. On day T-1, an updated prospectus with an offer price is released. Then retail investors will submit the subscription application through the online system on date T. The share allocation for the institutional tranche is determined on T+1. On the following day (day T+2), the allocation result for institutional investors is released on T+2. On the same day, the share allocation for retail investors is determined by lottery. The allocation result for retail tranche is announced on day T+3. And on T+N the new shares become publicly traded. The average value of N is 10 in my sample.

[Insert Table 1]

The bid information used in this study is obtained from the announcement on T+2. This bid information is required to be released by CSRC in order to increase the transparency of the bookbuilding process. I summarize the details of the related bid information as follows.

(1) The account name for each institutional investor that subscribes to the IPO shares.
(2) The specific bids and number of shares each institutional investor submits
(3) The number of shares that are eventually allocated to the investor

By using the information above along with other data, I construct several measures for analyzing the issue of performance persistence such as performance variables, market clearing prices and oversubscription rates.

To summarize, the Chinese IPO market during my investigation period provides a unique setting for an investigation of performance persistence of institutional investors for at least three reasons. Firstly, bid information is required to be released, whereas such information is not available in other markets. Secondly, although the underwriters still have the discretion in setting the offer price, they cannot directly influence the performance of institutional investors via share allocation. This feature mitigates the concerns that the performance of institutional investors in IPOs may not reflect the superior ability or private information of these investors.

Lastly, the IPO mechanism used during my investigation period resembles the "hybrid"-method as proposed by prior studies as a promising IPO method. The setting of China allows me to examine the effectiveness of this proposed method.

Chapter 4. Theoretical Background and Hypothesis Development

4.1 Asymmetric information-based model and performance persistence

In this subsection, I revisit one asymmetric information-based model, the adverse selection model of Rock (1986), and show how the information heterogeneity among investors will indicate the existence of a performance gap between informed and uninformed investors (that partially explains investors' performance persistence). The following description is mainly based on the paper of Rock (1986) and the appendix of Beatty & Ritter (1986).

In an IPO setting of the strict *pro rata* allocation rules[9], Rock (1986) assume information heterogeneity exists among investors in the IPO subscription process. The true value of price per share, *u*, on offer is known to some investors who are informed by taking a cost *c*. Uninformed investors do not incur this cost and only know the probability density function of *u*, *f(u)*. *u* will be realized as the aftermarket value on the initial listing day. The difference[10] between *u* and the offer price (*Offer*) determines the change of the wealth for the subscribers.

Underpriced IPOs ($u > Offer$) attract the participation of informed investors who have investable wealth of $W-c$. Informed investors' behavior imposes a negative externality on uninformed investors. Uninformed investors will receive all the shares of overpriced IPOs ($u < Offer$), while their demand for underpriced IPOs is partly crowded out by the informed investors. This adverse selection problem impedes the participation of uninformed investors unless their expected profit is non-negative. According to Rock's discussion, two equilibrium conditions are

[9] The strict *pro rata* allocation rule means when the share is oversubscribed the allocation is based on the proportion of shares subscribed by the investors over the total demand. When the share allocation is discretionarily determined by underwriter, Rock's model cannot be directly tested.
[10] Usually the difference is just initial return.

necessary for the success of the IPO market[11].

(a) Zero expected profits for informed investors

$$N \cdot c = \alpha \int_{offer}^{+\infty} n(u - Offer) f(u) du, \quad (1)$$

where *N* is the number of informed investors. *n* is the number of shares. α denotes the percentage of shares allocated to the informed investors. *c* represents the cost imposed on informed investors for being informed. The right-hand side is the profit for informed investors. The aggregate cost of information acquisition is set to equal, the expected money "left on the table" (Beatty & Ritter 1986).

(b) Zero expected profits for uninformed investors

$$\int_0^{Offer} n(Offer - u) f(u) du = (1 - \alpha) \int_{Offer}^{+\infty} n(u - Offer) f(u) du. \quad (2)$$

For uninformed investors, they subscribe to the shares indiscriminately. The aggregate loss on overpriced issues (left-hand) equals the gross profit on underpriced issues (right-hand). This condition keeps the continued participation possible.

In order to solve the optimal offer price in this context, α needs to be given. According to the discussion by Beatty & Ritter (1986), α is set to equal the proportion of aggregate informed investors' demand to the total demand. The uninformed demand is assumed to be able to fully subscribe to the issue. That is

$$\alpha = \frac{\text{Aggregate informed demand}}{\text{Aggregate informed demand+Aggregate uninformed demand}} = \frac{N(W-c)}{N(W-c)+Offer \cdot n}. \quad (3)$$

By assuming the probability density function, *f(u)*, is uniform with parameter *a* and *b* (*0*≤*a*<*b*), the optimal offer price can be solved out using equations (1) and (2) as

$$Offer = a + \frac{(b-a)c}{W-c} + \sqrt{\frac{2ac(b-a)}{W-c} + \frac{c^2(b-a)^2}{(W-c)^2}}. \quad (4)$$

The two equilibrium conditions yield an important implication. In the IPO setting with strict *pro rata* allocation rules, informed investors earn positive profits covering their costs of becoming informed, while uninformed earn zero profits. By

[11] The success of the IPO market means the market will not collapse due to the adverse selection problem.

defining the performance of investors as the initial returns of shares subscribed, I obtain the expected aggregate profits of informed (PerfInfo) and uninformed investors (PerfUninfo) as

$$PerfInfo = \alpha \int_{Offer}^{+\infty} n(u - Offer) f(u) du = N \cdot c, \quad (5)$$

And

$$PerfUninfo = \int_{0}^{Offer} n(Offer - u) f(u) du - (1 - \alpha) \int_{Offer}^{+\infty} n(u - Offer) f(u) du = 0. \quad (6)$$

Thus, the difference between expected aggregate profits of informed (*ProfitInfo*) and uninformed investors (*ProfitUninfo*) represents the gap in performance between the informed and uninformed. With the existence of informed investors (*N* is strictly positive), the gap in performance is positive. That is

$$ProfitInfo - ProfitUninfo = N \cdot c > 0 \quad (7)$$

4.2 Heterogeneity among informed investors

Rock's model assumes investors can be classified into two groups: the informed group and the uninformed group. However, the information of investors within the informed and uninformed groups is assumed to be homogeneous. I relax the assumption on within group investors in my study. Specifically, I assume that there exist information heterogeneity among the informed investors but the uninformed investors tend to be homogeneous. I believe that it is reasonable to assume that uninformed investors tend to be homogeneous. Given that they are uninformed they are unlikely to possess different information on the value of IPO stocks. On the other hand, the assumption behind information heterogeneity for informed investors is also reasonable for the following two reasons.

(1) Heterogeneous ability in knowing the true value

In Rock's model, all the informed investors know the true value of new shares. Therefore, informed investors are homogeneous and only target attractively underpriced shares. However, in the real world, the precision in knowing the true value can be heterogeneous for different informed investors. This heterogeneous precision may be caused by different abilities among informed

investors (either innate intelligence or human capital acquired through education and experience). This is the same explanation for the performance persistence in the secondary market (Elton *et al.* 1993).

(2) Heterogeneous resource available for conducting research

Institutional investors may have a constrained budget for conducting research on new shares. The heterogeneous performance persistence within the informed investor group is possible if we assume that different investor group can afford to conduct research only on a limited number of IPOs. For example, some investors can afford to investigate all IPOs and therefore cherry-pick the best, whereas some can investigate only a few IPOs at the same time. In this regard, investors with tight budget constraints for conducting research will underperform ones with loose budget constraints.

The above two reasons are not mutually exclusive. As I shall explain shortly under hypothesis development, my assumptions on within group investors implies that performance persistence is unlikely to be observed among uninformed investors while it can be expected for informed investors.

4.3 Hypothesis Development

Based on the theoretical background and extant literature above, I propose the main hypotheses for empirical testing. There are two sets of hypotheses in my study. The first set focuses on the testing of the existence of performance persistence of institutional investors, while the second set aims to trace the reasons underlying the performance persistence that I have documented.

Following prior studies that investigate the performance persistence in the secondary market (Grinblatt & Titman 1992), I use a two-period analysis to develop my first hypothesis: If investor persistence exists, then average performance in the first period will be positively correlated to that in the second period.

H1a *Investors' performance in the first period will be positively correlated with that in the second period.*

This hypothesis will be tested at both the investor-level and bid-level. At the level of investors, the average performance of institutional investors in the second period is regressed on their corresponding average performance in the first period. In the bid-level analysis, the average performance of an institutional investor in the first period is used to predict the performance for each subscription in the second period.

H1a suggests that institutional investors with good past performance are relatively more informed than those with bad past performance. Under my assumption that uninformed investors tend to be homogeneous but informed investors tend to be heterogeneous. I further expect to observe the existence of significant performance persistence in the subsample of investors with good past performance but not with bad past performance. This is predicted as the belief that uninformed investors will subscribe to shares randomly and we are unlikely to observe differences in performance among these investors. Among the informed investors, the relatively more informed investors are able to pick up better IPO stocks than the less informed ones. This can lead to the occurrence of performance gap among the informed investors. So I develop the following hypothesis.

H1b *For investors with good past performance, investors' performance in the first period will be positively correlated with that in the second period, whereas for investors with bad past performance, performance persistence cannot be observed.*

Similar to **H1a**, **H1b**[12] will also be tested at both the investor-level and bid-level.

Hoberg (2007) shows that the average past performance of an underwriter is informative of the underwriter's current IPO performance. As an analogy of Hoberg (2007), the past performance of an institutional investor should reveal the quality of institutional investors. Thus, the aggregate level of the past performance of the

[12] Note that this hypothesis **H1b** does not imply that the performance persistence of institutional investors is driven by investors with good past performance. The existence of performance gap between two informed and uninformed investors leads to the performance persistence in the full sample. The subsample analysis is built on the theoretical discussions that informed investors can also be heterogeneous.

institutional investors who have participated in an IPO should be informative to the IPO's initial and subsequent returns at the issue-level. Specifically, the participation of more investors who have good past performance suggests that this new IPO is more likely to be underpriced. Thus, I develop the following hypothesis.

H1c *The initial return of new issues will be positively correlated with the participating institutional investors' average past performance.*

To test this hypothesis, I construct an issue-level index to capture the past performance of all subscribers in an IPO. In addition to the initial returns as specified in **H1c**, I also examine whether the past performance of subscribers is relevant to the three-month returns.

My second set of hypotheses aims at testing whether the performance persistence I observed is caused by the information heterogeneity of investors. My hypotheses mainly build on the prior research that focuses on information heterogeneity of investors in the IPO market. Specifically, I examine whether investors with good past performance are more likely to participate in issues with high underpricing (Sherman 2005), exhibit stronger bid shaving ability (Chiang et al. 2010), provide more accurate information in terms of a high elasticity of demand curve (Kandel et al. 1999; Liu et al. 2001), and show a weaker tendency of naïve reinforcement learning (Degeorge et al. 2010; Chiang et al. 2011).

Firstly, according to both the adverse selection model Rock (1986) and information production model (Sherman & Titman 2002; Sherman 2005), investors choose to participate in an IPO endogenously and informed investors tend to participate only in IPOs with underpricing. As a result, existing studies take the positive relationship between endogenous entry of certain investors and underpricing as the evidence that these investors are informed (Chiang *et al.* 2010). In my setting, if institutional investors with good past performance are more likely to be informed, the entry of these investors is expected to be positively correlated with initial return of the IPOs they participate in. My specific hypothesis is:

H2a *Institutional investors with good past performance are likely to earn positive returns in the future IPOs they participate in.*

To test this hypothesis, I use the oversubscription rates of the investors with good past performance and bad past performance as the proxies for their respective endogenous entries. The effects of endogenous entry of both types of investors on three-month returns are also expected to be positive and therefore examined in my empirical analysis.

Secondly, the bookbuilding exercise in China resembles a uniform auction. Subscribers have to anticipate the bidding behavior of others. As Sherman (2005) points out, informed investors are capable of submitting the bids high enough to insure the opportunity to obtain a prorate allocation of shares (shaving the bid adequately) when the shares are expected to be underpriced[13]. For example, in an underpriced issue, informed investors will submit high bids (shave the bids adequately) to ensure their bids are not less than the offer price. Therefore, the positive relationship between average level of bids submitted by certain investors and underpricing can be treated as the evidence that these investors are informed. "Bid premium", calculated as the weighted average of bids, has been used by the existing studies on auction-based settings such as mergers and acquisitions (Kummer & Hoffmeister 1978) and auctioned IPOs (Chiang *et al.* 2010) to measure the behavior of bidders. Following these studies, I use the bid premium to quantify the level of bids submitted by subscribers and develop the following hypothesis.

H2b *The bid premium of institutional investors with good past performance is positively correlated with the initial return of the current IPO.*

Previous literature argues that the demand curve with a high elasticity is indicative of high information content in investors' bids, because if investors have access to more precise valuation information, their bids are closer to each other resulting an elastic demand curve (Kandel *et al.* 1999; Cornelli & Goldreich 2003). Therefore, if

[13] Chiang *et al*. (2010) refers this point in the context of IPO auction as partial adjustment similar to that for bookbuilt IPOs in (Hanley 1993).

institutional investors with good past performance are really informed, the participation of more investors with good past performance should be associated with a more elastic demand curve. I thus formulate the following two hypotheses.

H2c *The average past performance of all participating institutional investors in the current issue is positively correlated with the elasticity of the demand curve.*

H2d *Endogenous entry of institutional investors with good past performance is positively correlated with the elasticity of the demand curve.*

Another dimension I explore is the different levels of behavioral bias among investors with different levels of past performance. Starting from Kaustia & Knüpfer (2008), researchers are concerned about whether investors overweight their past experience in their subscription of IPO shares. Some studies also show that good past performance in terms of financial decisions encourages investors to make similar decisions in the future (Choi *et al.* 2009; Seru *et al.* 2010). The dependence of current decisions on past performance has been considered as evidence of learning by economic actors. Nevertheless, learning can be rational or naïve and differentiating between these two types of learning is empirically challenging. Chiang *et al.* (2011) examine whether the performance of investors decreases as they participate in more IPOs. The pattern of deteriorating performance is taken as evidence of naïve reinforcement learning. Building on this approach, Chiang *et al.* (2011) find that retail investors are driven by naïve reinforcement learning, whereas institutional investors do not show such a tendency. In my study, if the investors with good past performance are relatively more informed, they will less likely to display the pattern of naïve reinforcement learning, while ones with bad past performance is more prone to this behavioral bias (perform even worse in the future). As a result, I develop the following hypothesis.

H2e *Investors with good performance in the first period show less tendency of naïve reinforcement learning.*

Chapter 5. Empirical evidence

This chapter presents the major results in my study. Section 5.1 describes the data sources. Section 5.2 discusses the definitions of key variables and summary statistics. Section 5.3 presents the evidence of the performance persistence of institutional investors. Section 5.4 conducts further analysis to explore the information heterogeneity among institutional investors.

5.1 Data

To increase transparency in China's primary market, all IPO issues are required to release detailed bidding and participation information since Nov 2010. This study uses the full bidding information for the IPO issues in both the Shanghai and Shenzhen exchanges from Nov 2010 to Oct 2012. The sample has a total of 477 bookbuilt IPOs starting from the first IPO with full information release. The sample starts from the first IPO that is required by CSRC to release the complete bid information and ends in Oct 2012 when a 13-month IPO moratorium was implemented by CSRC in Nov 2012. Therefore, my sample period is the longest possible sample period with complete bid information being available.

In this study, bidding information and IPO filing price ranges are hand-collected from firm announcement files. Other information on IPO characteristics, such as underwriters, is obtained from the WIND information system. The trading data are collected from the CSMAR database.

[Insert Figure 1]

Figure 1 shows the number of IPOs and average initial returns by calendar month over the sample period in this study, Nov 2010 to Oct 2012. The dashed line shows the average initial return is 24% for the full sample in the study period. The Histograms and the solid line show the number of issues and the average initial returns by month, respectively. We see that the number of IPOs per month is relatively stable however the monthly average IPO initial returns are volatile. The fluctuation of IPO initial returns across months indicates the uncertainty of investing in IPO market.

5.2 Variables

Following most of the IPO literature, the initial return (IR) is defined as

$$IR \equiv \frac{close-offer}{offer},$$

where $close$ is the closing price at the first trading day and $offer$ is the offer price for an IPO. In the bookbuilding process of China, institutional investors that submit a bid price of no less than the offer price have the opportunity to obtain a prorate allocation of shares. Such investors are referred as winning investors in my study. The winning dummy for the participation of each institutional investor is defined as

$$\text{Win}_{it} \equiv \begin{cases} 1, & bid_{it} \geq offer \\ 0, & bid_{it} < offer \end{cases},$$

where bid_{it} is the bid price submitted by investor i at issue t. As only winning investors have the opportunity to benefit from high underpricing, I define the performance for each investor in an IPO as the initial return if the investor's bid is no less than the offer price and zero otherwise. The specific definition is as follows:

$$\text{Perf}_{it} \equiv \begin{cases} IR, & bid_{it} \geq offer \\ 0, & bid_{it} < offer \end{cases},$$

where Perf_{it} is the performance for investor i that submits a bid price bid_{it} for issue t. The performance definition is similar to the definition of returns in Degeorge *et al.* (2010). I apply this definition for several reasons: Firstly, underpricing is a natural component of performance. Investors that participate in the issues with high underpricing obtain a proportionate share of the money left on the table. When the shares are overpriced, investors make a loss through the subscription. Secondly, submitting bids no less than offer price is the necessary condition to gain the underpricing under the Chinese setting. As the actual

allocation of IPO shares under the lottery system in the Shenzhen exchange involves the element of luck (which is unrelated to investors' stock picking abilities), measuring performance on the basis of the necessary condition for entering into a lottery rather than actual allocation of shares can help to remove the confounding influences of luck in my performance measure.

IPO underpricing is not stationary (Ritter & Welch 2002). Market condition can impact the level of underpricing and the performance of investors. To mitigate the effect of market condition, I conduct a two-period analysis, which follows the method to test the performance persistence in the secondary market (Grinblatt & Titman 1992). The sample is divided into two periods with roughly the same numbers of issues in each period. The average performance of investors in two periods is defined respectively as follows.

$$\text{Perf1}_i \equiv \frac{1}{\text{N}_i^1}\sum_{t=1}^{\text{N}_i^1} \text{Perf}_{it}, \text{ and } \text{Perf2}_i \equiv \frac{1}{\text{N}_i^2}\sum_{t=1}^{\text{N}_i^2} \text{Perf}_{it},$$

where N_i^1 and N_i^2 are the number of participations of investor i in the first and second period respectively. The performance persistence requires that Perf1 have a significant explanatory power on Perf2 in investor-level analysis.

As discussed in the hypotheses development, performance persistence implies that past performance of all subscribers will have a positive effect on the initial and subsequent returns of the current issue. For each IPO, the weighted average[14] of past performance of subscribers is measured by a constructed variable, PastPerf_t.

$$\text{PastPerf}_t \equiv \frac{1}{K_t}\sum_{i=1}^{K_t} \text{Perf1}_i \cdot \frac{Bidsize_{it}}{Total\ demand_t},$$

where K_t is the number of institutional investors that participate in issue t. $Bidsize_{it}$ is the amount of shares subscribed by investor i in issue t. $Total\ demand_t$ denotes the total demand from all institutional investors in issue t.

[14] Using simple average does not influence the main result.

$\frac{Bidsize_{it}}{Total\ demand_t}$ is the proportion of shares that are expected to be allocated to the institutional investor i. If performance persistence exists, PastPerf_t should be informative for the underpricing and subsequent returns. The rationale for this variable is consistent with Bouwman (2011) who constructs a firm-level variable to measure the effect of a current director who also serves on the boards of other firms.

Furthermore, I define two variables to measure the IPO subsequent returns as follows. The adjusted initial return (Adj_IR) is defined as the initial return (IR) less the market return (M_Ret) as

$$\text{Adj\_IR} \equiv \text{IR} - \text{M\_Ret},$$

My study applies the CSI 300 return as the market benchmark. In addition, to measure the subsequent returns, I define the buy-and-hold abnormal return as follows.

$$\text{BHAR}_t \equiv \prod_1^k(1 + \text{Ret}_{tk}) - \prod_1^k(1 + \text{M\_Ret}_{tk}),$$

Where Ret_{tk} is the stock return for issue t at k-th trading day in the aftermarket. Thus BHAR_t is the k-day buy-and-hold abnormal return for issue t. In my study, I examine BHAR_t over different periods. BHAR10d, BHAR3m, BHAR6m and BHAR1y represent buy-and-hold abnormal returns of ten days, three months, six months and one year respectively.

Following the literature, I include other firm-specific characteristics as control variables as follows.

- Mkt15: The 15 day average market return before the issue day (Logue 1973)
- PriorIR30: Average initial returns of the IPO issued within 30 days before the current issue (Ibbotson & Jaffe 1975)

- Overhang: Shares retained by the entrepreneur divided by shares filed[15] (Bradley & Jordan 2002)
- UwCap: Natural logarithm of capital raised by the lead underwriter in the previous calendar year (Megginson & Weiss 1991)
- PriceRev: IPO offer price relative to midpoint of filing range (Lowry & Schwert 2002)
- InvPrice: A proxy for issuer risk, equal to the reciprocal of the filing midpoint (Tinic 1988)[16]
- Age: Years since the establishment of the firm
- Amount: Natural logarithm of the original filing amount for the issue
- Size: Natural logarithm of the firm's total assets in the preceding year
- ROA: Net income in preceding year divided by total asset
- Lev: The total debt divided by total assets
- SOE: A dummy equal to one if the firm is state-owned enterprise based on the ultimate controller

PriorIR30 and Mkt15 are adopted as the proxies to control for the effect of market condition. Overhang is for the overhang problem for entrepreneurs. UwCap represents the quality of underwriters. PriceRev is a proxy for partial adjustment. InvPrice, Amount, Age and Size are typical proxies for new share risk. ROA and Lev control for IPO firms' financial conditions.

In October 2009, ChiNext, a NASDAQ-like market was opened in the Shenzhen Stock Exchange for young growth companies. IPOs on this market are not required to have positive earnings in each of the three years prior to going public. To control for related risks of these growth enterprises' IPOs, I use a dummy, ChiNext, which is coded one if the IPO is listed in ChiNext market and zero otherwise.

[Insert Table 2]

The summary statistics of main variables are presented in Table 2. Panel A shows

[15] The number of shares filed means the number of shares sold in the IPO.
[16] The filing midpoint proxies for the ex-ante uncertainty of the IPOs, as low-priced stocks tend to be issued by highly speculative firms.

477 IPOs have an average initial return of 24% with a standard deviation 33%. Furthermore, I categorize the IPO companies by CSRC industry classifications. 71% of the IPOs in the sample period are in the manufacturing industry. IPOs in the industries of mining and communication have the highest average initial returns (42%) in the sample.

In order to conduct the two-period analysis, the full sample is divided into two parts with 239 IPOs in the first period and 238 IPOs in the second period respectively. The average return in the first period is the same as the second period; however the return volatility is slightly greater in the first period.

The descriptive statistics for issue-level variables are reported in Panel B of Table 2. All the analysis is conducted in the second period (testing period). The sample in the second period consists of 238 IPOs. PastPerf, constructed as the bid-size weighted average of past performance for all the institutional investors in the current issue, has a mean of 0.16 and standard deviation of 0.02. Mkt15, the average market return (CSI 300) for the 15-trading days preceding the issue date, has very low mean and standard deviation. PriorIR30, the average initial return of IPOs issued in the 30 days before the issue date, has the mean of 0.26. The variable of Overhang suggests that on average 77% of the shares are retained by the original shareholders. The mean of PriceRev indicates that on average the offer price is 12% lower than the midpoint of the filing range. And 44% of the IPOs are in the ChiNext market.

Panel C shows the performance measures at the investor-level and at the bid-level. There are total of 648 institutional investors that have participated in both periods. I divide the 648 investors into two subsamples with an equal number of investors (324 each) based on the performance in the first period, i.e., “good” group and “bad” group respectively. The average performance for these total sample investors is 0.17. For investors with good past performance, the average performance in the second period is 0.19, which is 0.04 greater than the investors with bad past performance. The spread is significant at 1% level. The bid-level sample consists of 36591 bids in the full period with 19541 and 17050 in the first and second period, respectively.

The performance in the second period for the investors with good past performance is 0.02 greater than the investors with bad past performance, and the performance difference is also significant at 1% level.

The investors in my study consist of five types, security companies, mutual funds, trust/insurance, SOE financial firms, and other investors that are recommended by the underwriter to be included in the bidding process[17]. Among all these investors, funds are the majority (55.4%) and have the best performance in both periods with 0.19 and 0.21, respectively. There are on average 76.71 bids per issue and 18.36% of them eventually get share allocations. The detailed information is presented in Panel D of Table 2.

5.3 Performance persistence

This section presents the major empirical evidence on performance persistence of institutional investors in the IPO market. My analysis in this section consists of three parts. In the first part, I conduct cross-sectional regression using the investor-level sample, where the average performance in the second period for each investor is regressed on that in the first period. The ordinary least square regression model is specified as follows:

$$\text{Perf2}_i = \alpha + \beta_1 \text{Perf1}_i + Type_i + \varepsilon_i,$$

where Perf1 and Perf2 are performance in the first and second period. $Type_i$ is dummy for investor types. ε_i is the residual. In the analysis heteroscedasticity-consistent standard errors (White 1980) are used to calculate *t*-statistics.

In order to offer evidence on **H1b**, this model is also estimated using subsamples of institutional investors with good past performance and bad past performance. The "good" group refers to the institutional investors with good past (first-period)

[17] According to the regulations by CSRC, some institutional investors that do not meet the requirements to participate in the primary market can get access to the share subscription if they are "recommended" by the underwriter.

performance, whereas the “bad” group refers to institutional investors with bad (first-period) past performance. The results are presented in Panel A of Table 3. For the full sample and the “good” group, past performance Perf1 is significant across all model specifications, whereas performance persistence cannot be observed in the “bad” group. Specifically, Models (1) and (2) show that the average performance in the first period is positively and significantly correlated to the average performance in the second period. For investors with good past performance (Models (3) and (4)), this effect is still significant at least at 10% level.

[Insert Table 3]

As shown by the prior research that examines the issue of performance persistence in secondary market, solid evidence of performance persistence has to address the survivorship problem (Brown & Goetzmann 1995). It is possible that investors with good past performance tend to be more likely to remain in the sample, whereas ones with bad past performance drop out. This survivorship bias can be partially corrected by using the Heckman model (Heckman 1979). Carhart *et al.* (2002) employ this approach in their analysis of mutual fund persistence. In their sample, 1346 funds survive out of 2071 funds in the full sample. In my study, a two-stage Heckman model is also conducted to mitigate the potential survivorship bias in IPO market. The Heckman two-stage model is as follows.

$$\text{1st stage: } \text{Part}_i = \theta + \gamma_1 \text{Perf1}_i + \gamma_2 \text{Win1}_i + \gamma_3 \text{Alloc}_i + Type_i + \epsilon_i.$$
$$\text{2nd stage: } \text{Perf2}_i = \alpha + \beta_1 \text{Perf1}_i + \lambda_i + Type_i + \varepsilon_i.$$

In the first stage of the Heckman model, Probit estimation is applied to predict the participation of investors in the second period, measured by a dummy Part. According to Kaustia & Knüpfer (2008), past performance is a determinant for the current subscription decision. In addition, due to the possibility of limited capital caused by share allocation in the first period, the allocation probability is expected to be negatively correlated to the participation in the second period. The types of institutional investors are considered to control for the investor-specific characteristics that may influence the participation behavior. Therefore, past performance (Perf1), past winning probability (Win1), past allocation probability

(Alloc) and investor types (Type) are included in the selection equation (1st stage). The predicted dummy variable Part is retrieved and used to calculate the inverse Mills ratio, λ_i, which is included in the second stage equation. The result using the Heckman model is presented in Panel B of Table 3. The first stage of Heckman model suggests that performance in the first period does not have a significant impact on the participation decision in the second period. In contrast, allocation probability significantly decreases the propensity of entry in the second period because of the capital budget constrain for institutional investors. Other results in the Heckman model are similar to the OLS estimation. To sum up, the investor-level analysis provides robust evidence that is consistent with **H1a** and **H1b**.

In the second part, a bid-level panel regression analysis is applied. Average performance in the first period, Perf1, is employed to predict the performance of participation for each investor in the second period measured by Perf. The model is as follows.

$$\text{Perf}_{it} = \alpha + \beta_1 \text{Perf1}_i + X_t + Type_i + Industry + Year + \varepsilon_{it},$$

where X_t are a series of control variables discussed in last section. $Type_i$ are investor type dummies. $Industry$ and $Year$ are industry and year dummies, respectively. ε_{it} is the residual. The result is presented in Table 4. The bid-level sample consists of 17050 bids in the second period for all investors, 8489 bids for investors with good past performance and 8561 bids for ones with bad past performance.

[Insert Table 4]

The coefficients of past performance in the first period (Perf1) positively and significantly explain the performance of current participation (Perf) across different model specifications in the full sample and the “good” group subsample. The explanatory power of Perf1 on the performance in the second period is robust to standard controls, investor types, industry and year dummies. In contrast, investors

with bad past performance do not exhibit the pattern of performance persistence. The panel regressions at the bid-level use standard errors clustered on both investor and calendar month (Petersen 2009). The evidence of bid-level analysis is supportive to **H1a** and **H1b**.

The third part is an issue-level analysis on IPO initial and subsequent returns. According to **H1c**, the initial returns on the current issue are expected to be positively correlated with average past performance of investors. I use the following model to test this hypothesis.

$$\mathrm{IR}_t = \alpha + \beta_1 \mathrm{PastPerf}_t + X_t + Industry + Year + \varepsilon_t,$$

where PastPerf is the bid-size weighted average of past performance for current subscribers. X_t represent a series of existing predictors for initial returns. Industry and year dummies are also included to control for the industry and year specific characteristics. The results are reported in Table 5.

[Insert Table 5]

The issue-level sample consists of 238 IPOs in the second period. The measure of past performance, PastPerf, positively and significantly affects initial returns (IR) with *t*-statistic of 2.81 and adjusted initial returns (Adj-IR) with t-statistic of 2.76 when all the controls are included. The signs on the coefficients of control variables are generally consistent with the existing literature except PriceRev and UwCap. According to the extant literature on partial adjustment, PriceRev should be positive (Hanley 1993). However, in China this effect cannot be observed, probably due to the fact that the limited discretion of underwriter in share allocation mitigates the possibility for underwriters to benefit from competitions for new share and side payments. UwCap, which controls for the effect of underwriter reputation, has a positive coefficient in the literature (Megginson & Weiss 1991), but it does not have a significant effect in my sample. Tian (2011) finds a positive correlation between state-ownership and underpricing over the period of 1992 to 2004. However, in my sample period (2010 to 2012), the effect of SOE is not significant.

In addition to the tests for initial returns, I also conduct an analysis on the effect of past performance on subsequent returns (BHAR). The results suggest that the explanatory power of PastPerf still remains intact for the short term (ten-day and three-month) buy-and-hold abnormal returns, but the effect of PastPerf diminishes over time. PastPerf is insignificant on the six-month and one-year buy-and-hold abnormal return analyses when all the controls are included. I also check the result on two-year buy-and-hold abnormal returns with available data. An untabulated table shows that the effect is also insignificant as I expected. Because my main dependent variables of interest are initial and intermediate returns, the evidence in general is consistent with **H1c**.

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5.4 Information heterogeneity among institutional investors

This section provides the evidence that investors with good past performance are relatively more informed than ones with bad past performance. The results corroborate the information heterogeneity among institutional investors and show that the pattern of performance persistence of institutional investors is consistent with the prevailing evidence on asymmetric information based models. The results of tests for the second set of my hypotheses are presented in Table 6.

[Insert Table 6]

Firstly, as discussed above, endogenous entry of investors in the “good” group is expected to be positively correlated with the initial returns. The oversubscription rate indicates the demand for certain investors and therefore serves as a reasonable proxy for endogenous entry of these investors. The measures are calculated for investors in the “good” and “bad” groups as Entry_G and Entry_B, respectively. To compare the bid shaving ability between investors in good and bad groups, I follow Chiang *et al.* (2010) to construct the bid premiums for these two groups of investors as follows.

$$\text{Bidpremium\_G}_t = \sum_1^K \frac{\text{bid}_{it}}{Range\_mid_t} \cdot \frac{\text{bidsize}_{it}}{\text{total demand}_t},$$

and

$$\text{Bidpremium\_B}_t = \sum_1^V \frac{\text{bid}_{it}}{Range\_mid_t} \cdot \frac{\text{bidsize}_{it}}{\text{total demand}_t},$$

where K and V denote the number of institutional investors in the "good" group and the "bad" group. $Range\_mid_t$ is the midpoint of the filing range of the current issue. Bidpremium_G and Bidpremium_B are the bid premiums for investors in the "good" group and "bad" group, respectively. The results are reported in Panel A of Table 6. In this issue-level analysis, endogenous entry of investors in the "good" group has a significant effect on initial and subsequent returns, whereas that of investors with bad past performance is not significant. Similarly, bid premium for investors with good past performance is significant, while bid premium for those with bad past performance is not significant. The results are robust when all the controls and dummies are included. The effect also exists on the three-month buy-and-hold returns. Taken together, the results are consistent with **H2a** and **H2b**.

Another indicative measure of information is the elasticity of the demand curve. I define the elasticity as the relative change of bid price to that of the bid size, which is comparable to the approach used by Kandel *et al.* (1999). The average past performance and endogenous entry of investors with good past performance are expected to be positively correlated with the elasticity of the demand curve. Panel B of Table 6 displays the results. Across all model specifications, the average past performance of current subscribers has a significant effect on the elasticity of the demand curve. Endogenous entry of investors in the "good" group is positively correlated with the elasticity of the demand curve, whereas entry of investors in the "bad" group has a negative effect. The results suggest that participation of the investors with good past performance increases the accuracy of information in terms of the elasticity of the demand curve. **H2c** and **H2d** are therefore supported.

The influence of behavioral bias is further explored among investors with different past performance. Theories of reinforcement learning suggest that the current

behavior of investors is expressed as a function of past experience. If investors are biased by naive reinforcement learning, then the performance should be a decreasing function of participation order. That is, investors learn nothing from their past experience. Panel C of Table 6 presents the result of the OLS regression predicting performance using participation order. Models (1) and (2) show that on average the participation order is negatively correlated with performance. The result indicates that in general more participation experience leads to lower performance. However, in the subsample analysis, only investors in the "bad" group display this pattern of naïve reinforcement learning, while investors in the "good" group do not. This evidence suggests that institutional investors with good past performance are less subjective to naïve reinforcement learning and therefore provides supportive evidence for **H2e**.

Chapter 6. Additional analysis

This chapter presents some additional analyses. Section 6.1 analyzes whether the observed performance persistence of institutional investors is due to the influences of underwriters. Section 6.2 investigates whether the performance persistence is caused by investor sentiment effects triggered by the release of bidding information. Section 6.3 conducts tests to rule out the possibility that the performance persistence is caused by investors who consistently submit high bids and low bids. Section 6.4 further tests the effect of industry-specific expertise. Section 6.5 presents a robustness check.

6.1 The influence of underwriters

Although underwriters in China enjoy no discretion in share allocation, they nevertheless still have pricing discretion[18]. The existence of pricing discretion implies that certain investors can enjoy superior performance by underwriters if the underwriters intentionally discount the shares to favor them (Hauser *et al.* 2006). This favoritism from underwriters could generate the pattern of investors' performance persistence as I have documented. On the other hand, some investors

[18] On average, the offer price is 14% lower than the market clearing price. The Pearson correlation between the market clearing price and the offer price is 0.986, which suggests the demand of institutional investors is still the major consideration in the price setting strategy.

can consistently achieve better performance if they have higher ability to correctly anticipate the big discounts offered by underwriters. I therefore conduct additional analyses to mitigate this potential concern.

[Insert Table 7]

I construct two variables to capture the possible favoritism from underwriters. Firstly, I follow Degeorge *et al.* (2010) to use the variable of price discount to measure underwriter's pricing discretion. The discount is defined as

$$\text{Discount}_t \equiv \frac{MCP_t - offer_t}{MCP_t},$$

where MCP_t is the market clearing price, the minimum price that allows the total demand for the new shares in the market to meet the filing amount. $offer$ is the offer price.

Secondly, I construct a variable to measure the extent of underwriter-investor connection. Connect_N is the number of participations in the first period that involves the same pair of underwriter and investor.

I first conduct a bid-level analysis to regress the price discount of an IPO on the past performance of each subscriber. The results are reported in Models (1) and (2) of Table 7. When I include the control variables and all the fixed effects, Perf1 has positive effect on Discount. The results suggest that the participation of investors with good past performance tend to be associated with a deeper discount. This result can be interpreted in two ways. On the one hand, it may indicate institutional investors with good past performance are capable of anticipating underwriters' pricing strategies. On the other hand, it may be caused by underwriters' favoritism towards some specific investors.

My key concern is whether the performance persistence is driven by favoritism from underwriters. I therefore include the variable of Discount or Connect-N alternatively into my previous regression models. The results are reported in Table 7.

As the coefficients on Perf1 are still positively significant, the results suggest that the performance persistence observed at the bid-level is unlikely to be driven by underwriters' favoritism.

I also conduct additional issue-level analysis to further rule out that the predictive power of my investor-based index is driven by underwriters' favoritism. To do this, I construct an issue-level variable for capturing the extent of underwriter-investor connection. The issue-level variable, Ave_Connect_N, equals the average of Connect_N for all subscribers in an IPO. The result is reported in Panel B of Table 7. The first two columns show the existence of a positive relation between the average past performance of current subscribers and Discount, which indicates the possible existence of underwriters' favoritism. Nevertheless, the last four columns of the Table show that my investor-based index still retains its predictive power after Discount and Ave_Connect_N are included. Thus, my results are not driven by underwriters' favoritisms.

6.2 Investors' attention

Ljungqvist *et al.* (2006) and Ritter & Welch (2002) suggest that the investor sentiment effect may be built up surrounding an IPO, which can drive up the IPO's initial return. It is possible that the release of bidding information in China may attract attention from investors and consequently causes high initial returns. Seen in this light, the high initial returns earned by certain institutional investors are not due to their information or stock picking ability but the investor sentiment effects. To control for this possibility, I construct an abnormal search volume index (ASVI) as in Da *et al.* (2011). This search-based variable measures the changes in market-wide attention in a timely fashion using the technology of "Google Trend". As Google was banned on March 2010 in China, I therefore use Baidu, the biggest search engine in China[19], to quantify the search volume of investors in my study.

[Insert Figure 2]

[19] According to iResearch, a Chinese consulting firm, Baidu controlled 63% of Internet search revenue in China (Barboza 2010).

Figure 2 presents the average search volume index (SVI calculated by natural logarithm) around the release day of the bidding information (day zero is the day on which information is released). Because the media coverage from the road shows and the raw prospectus before the release day has captured investors' attention significantly, SVI shows a general decline during the whole ten-day period. Nevertheless, a very slight bump can still be observed on day one after the information has been released. I define abnormal search volume index (ASVI) using two windows as follows.

$$ASVI(5) \equiv \frac{1}{5}\sum_{t=0}^{4} \log(SVI_t) - \frac{1}{5}\sum_{t=-5}^{-1} \log(SVI_t),$$

and

$$ASVI(2) \equiv \frac{1}{2}\sum_{t=0}^{1} \log(SVI_t) - \frac{1}{2}\sum_{t=-2}^{-1} \log(SVI_t),$$

where SVI_t is the average search volume index on day t. $ASVI(5)$ denotes the difference between the average SVI_t in the five days after and before the release day[20]. $ASVI(2)$ is the variable using a two-day window. If the bidding information on the release day has attracted the attention of investors, these two variables are expected to increase. The definition here is different from that in Da *et al.* (2011), who use the average SVI in the IPO week less the median value of SVI during the prior 8 weeks. My analysis constructs these variable to quantify whether the release of bidding information boost investors' sentiment[21]. I include these two variables in the regressions at both the bid-level and the issue-level analyses. Results are presented in Table 8.

[Insert Table 8]

After controlling for the effect of increased investors' attention, the coefficients of past performance are still significant across all model specifications. The

[20] The five days after the release day include the day of release day.

[21] The sentiment variable following Da *et al.* (2011) cannot be constructed as a control variable in my main tests because the SVI data is mostly not available pre-IPO. First, company name and ticker from the CSRC may not be used by individual investors to search for the stock in Baidu. Second, similar to Google, Baidu truncates the output and returns missing values for SVIs with insufficient searches. But the exact criteria used by Baidu to determine the truncation threshold are not available.

insignificant effect of abnormal search volume is consistent with the slight change in investors' attention as shown in Figure 2.

6.3 High bids and low bids

Performance persistence may arise from persistent behaviors of institutional investors. If IPOs are in general underpriced, persistent submissions of high bids will create an average positive performance. At the same time, if other investors consistently submit very low bids, they will obtain a low performance on the average. Under these circumstances, the performance gap may exist between these two groups of investors. But this gap is not due to the information differences but driven by their distinct bidding strategies. To rule out this possibility, I construct two variables. Highbid is a dummy equal to one if the bid is above the midpoint of the filing range. Lowbid is a dummy equal to one if the bid is below the lower limit of the filing range[22]. These two variables are included in the bid-level regression. In addition, two corresponding variables at issue-level, Highbid_ave and Lowbid_ave, defined as average of Highbid and Lowbid for each subscriber in an IPO respectively, are also constructed. I include these two variables in the regression models for predicting IPO initial and subsequent returns. As shown in Table 9, the inclusion of these variables does not significantly change the effect of past performance on current performance and IPO returns.

[Insert Table 9]

6.4 Industry-specific expertise

Another interesting issue is whether the performance gap is caused by the institutional investors who have industry-specific expertise. For these investors, the number of their participations in a particular industry should be positively correlated with their overall performance. I construct one variable Ind_N as the number of past participations in the same industry as that of the current issue. The

[22] The definition of Low bid as bids lower than the midpoint of the filing range will cause perfect multicollinearity problem.

results, as reported in Table 10, indicate that the persistent performance is unlikely to be caused by industry-specific expertise but more likely by generic skills and knowledge.

[Insert Table 10]

6.5 Robustness checks

In this section, I present the results of a robustness check. This robustness check builds on an alternative definition of two-period in which the sample is divided into two periods with equal durations instead of equal number of issues in each period. The new definition results in 286 issues in the first period and 191 issues in the second period. Although the numbers of IPOs in the two periods are different from those in my main analyses, the results under the new definition still offer consistent evidence to support my hypotheses (as reported in Table 11).

[Insert Table 11]

Chapter 7. Conclusion, limitations and directions for future works

By using full bid information for 477 bookbuilt IPOs in China, this study documents the first evidence of performance persistence for institutional investors in the IPO market. Specifically, I find that the performance of institutional investors persists from period to period. This pattern can still be observed for institutional investors with good past performance, whereas not for ones with bad past performance. I further construct an index capturing past performance of institutional investors who participate in an IPO and find it to be informative of the IPO's initial and subsequent returns. These results are robust after ruling out the influences of underwriters and including numerous control variables such as the conventional predictors of initial returns, year and industry dummies. I attribute the underlying causes of the observed performance persistence to the existence of information heterogeneity among institutional investors. Specifically, I identify four features of institutional investors with good past performance, which are consistent

with the hypothesis that investors with good past performance are relatively more informed than those with bad past performance. These features are: (1) they are more likely to subscribe to IPOs with high underpricing; (2) they display stronger bid shaving ability; (3) their bids contribute to a more elastic demand curve and (4) they show a lower tendency of naïve reinforcement learning.

My study contributes to the existing literature and has practical implications. Firstly, my study extends the analysis on performance persistence of institutional investors from the secondary market to the IPO market. Secondly, my evidence on the existence of performance persistence confirms the existence of information heterogeneity among institutional investors in the IPO market, which enhances our understanding of the information environment of IPO market. Thirdly, the past performance of institutional investors may serve as a predictor of an IPO's initial and subsequent returns. This new predictor can provide sophisticated investors with valuable information to reap superior returns in the immediate aftermarket of new issues. Lastly, this study also suggests the "hybrid" method proposed by the recent studies on IPO methods appears to be effective in soliciting information from informed investors even in the presence of uninformed investors.

My study also suffers from several limitations that invite future works. Firstly, long-run performance of new issues has not been investigated yet. My sample period ends at Oct 2012. The trading data so far does not allow me to measure long-run performance. When more trading data are available, I will conduct additional analysis to further investigate whether the shares subscribed to by informed investors will maintain superior performance or experience price reversal in the long run.

Secondly, the detailed information on the trading transactions of institutional investors is not available. This has prevented me from conducting research on the several important issues on the aftermarket dynamics such as the flipping behaviors and investment horizons of different institutional investors in the post IPO market. Evidence on these issues can further enhance our understanding on the information possessed by different investors in IPO market.

Thirdly, Chemmanur *et al.* (2012) investigate whether value creation by investment banks in acquisitions arise primarily from reputation, culture, and other institutional strengths of a given investment bank or from the human capital accumulated by the individual investment bankers that have been employed by that bank. In my research, the observed persistence can also be driven by the organizational capital where the institutional investors were employed (organizational-specific) or alternatively by the individuals such as mutual fund managers (individual-specific). To address this question in the future, more detailed data on the turnover and performance of mutual fund managers are needed to be collected. Then the performance explained by organizations and individuals can be identified and compared.

Fourthly, Hoberg (2007) investigates the coverage of analysts on the IPOs which are underwritten by underwriters of high underpricing and low underpricing respectively. The evidence shows that underwriters of high underpricing can provide better quality service in terms of analyst coverage and so on. In my context, it will also be interesting to explore whether the good performers also have better performance in other non-IPO investments. I will also work on this issue in my further work. Specifically, I will collect the data of mutual funds (because only data of mutual funds in the secondary market is available) and construct variables that capture the performance of the good performance in the secondary market rather than IPO market.

Fifthly, although some efforts have been made to pinpoint the sources underlying the observed performance persistence, the precise roots have not been thoroughly uncovered. Specifically, I attribute the persistence phenomenon to the information heterogeneity among institutional investors, but I cannot fully differentiate whether the performance persistence is due to superior skills or private information of the institutional investor. The distinction between these two sources is difficult. Nevertheless, I will collect more specific data that are related to this issue and conduct more additional analysis in my future work.

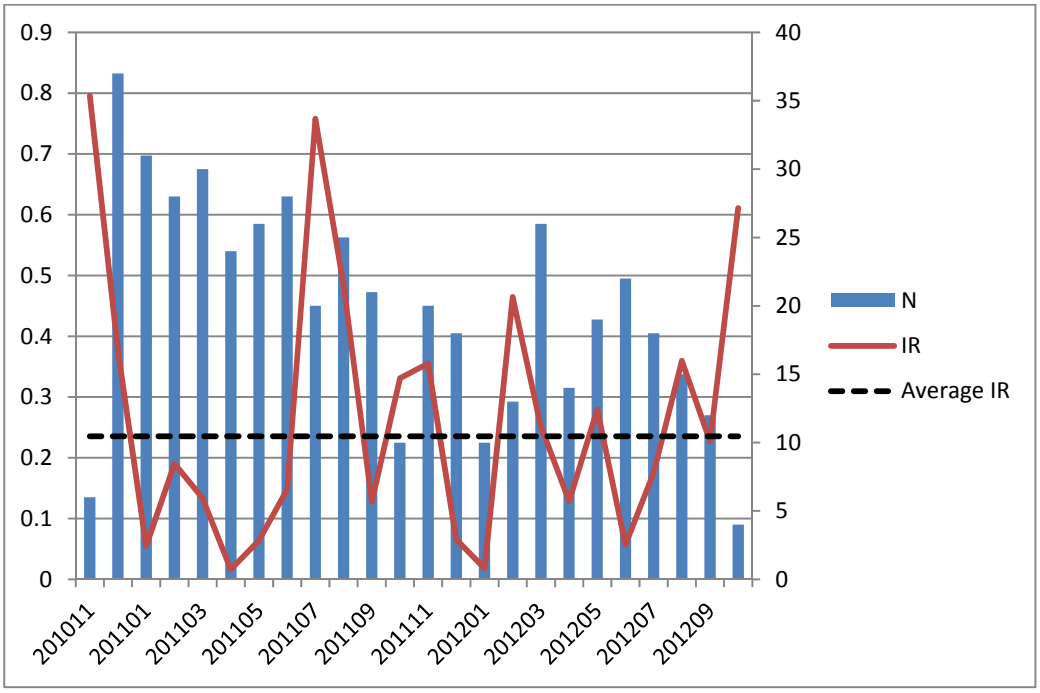
Sixthly, the inclusion of the perspective on governance will improve the quality of the paper, but the current version does not contain such an analysis. As the theoretical linkage between corporate governance and performance persistence has not yet been addressed by prior literature. I'll first figure out the theoretical mechanisms in my future work and then collect more relevant data to examine the relation between corporate governance and performance persistence.

Appendix: Variable definitions

Variables	Definitions
General	
IR	Initial return, equal to the market price adjustment from offer price to the closing price on the issue date
Adj-IR	Market adjusted initial return, equal to the initial return adjusted by market return (CSI 300)
BHAR10d	10-day buy-and-hold abnormal return using the CSI 300 return as the market benchmark
BHAR3m	3-month buy-and-hold abnormal return using the CSI 300 return as the market benchmark
BHAR6m	6-month buy-and-hold abnormal return using the CSI 300 return as the market benchmark
BHAR1y	1-year buy-and-hold abnormal return using the CSI 300 return as the market benchmark
Perf	A performance measure, equal to initial return if the bid is no less than the offer price, zero otherwise
Part	A dummy equal to one if the investor participates in issues in the second period
Perf1 (Perf2)	The average of Perf in the first period (second period) for each investor
Win1 (Win2)	Winning probability in the first period (second period) for each investor
Alloc	Allocation probability in the first period for each investor
PastPerf	Bid-size weighted average of Perf1 for institutional investors that participate in an IPO
Controls	
Mkt15	Average market return (CSI 300) for the 15-trading days preceding the issue date
PriorIR30	Average of initial return of IPOs issued in the 30 days before the issue date
Overhang	Number of shares retained by the entrepreneur divided by number of shares to be sold
PriceRev	Offer price relative to the midpoint of filing range
Amount	Natural logarithm of the filing amount (number of shares to be sold in 10 thousand)
InvPrice	Equal to the reciprocal of the filing midpoint
UwCap	Natural logarithm of capital raised by the underwriter in the last year
Age	Number of years from the establishment date to issue date
Size	Natural logarithm of the total assets before the IPO year
ROA	Total profit divided by total assets
Lev	Total debt divided by total assets
SOE	A dummy equal to one if the firm is state-owned enterprise based on the ultimate controller
ChiNext	A dummy equal to one if the IPO is listed in the ChiNext market of China
Additional	
Entry_G	Oversubscription rate of investors with good (bad) past

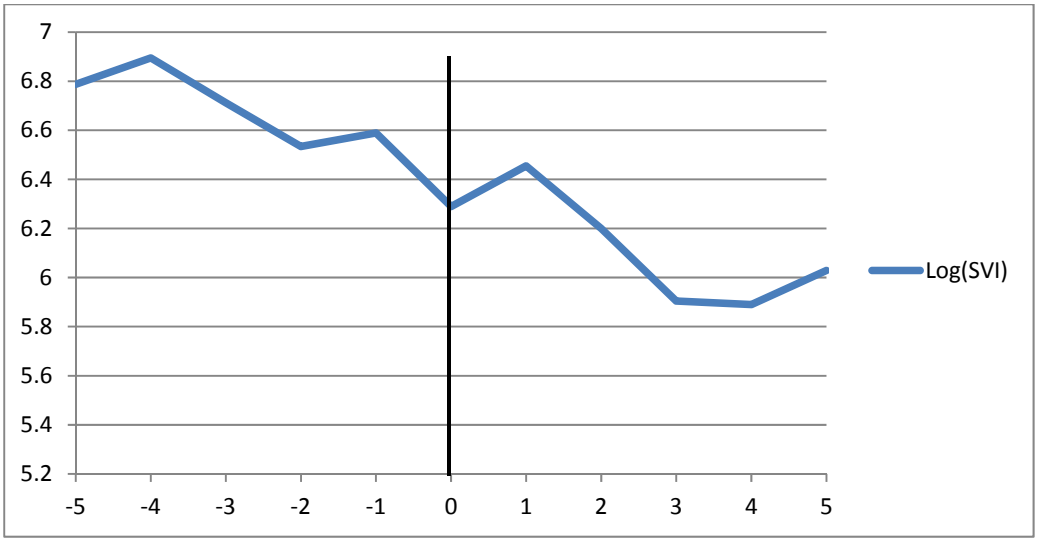
(Entry_B)	performance
Bidpremium_G (Bidpremium_B)	Bid-size weighted average of bids relative to the midpoint of the filing range from institutional investors with good (bad) past performance
Elas	Elasticity of the demand curve in the bids for an IPO
Order	Participation order for each investor
Discount	The offer price relative to the market clearing price
Connect_N	The number of participations in the first period that involves the same pair of underwriter and investor
Ave_connect_N	The average of Connect_N for all subscribers in an IPO
ASVI(5) / ASVI(2)	The difference between the log of average search volume index during the five / two days after and before the release day of bidding information
Highbid	A dummy equal one if the bid is above the midpoint of filing range
Lowbid	A dummy equal one if the bid is below the lower filing range
Highbid_ave	Average Highbid at issue-level
Lowbid_ave	Average Lowbid at issue-level
Ind_N	The number of past participations in the same industry as that of the current issue

Figure 1 Number of IPOs and average initial returns by calendar month



The figure shows the number of IPOs and average initial returns by calendar month over the sample period in this study, Nov 2010 to Oct 2012. The sample consists of 477 issues in 24 calendar months with the average initial return of 24% indicated by the dashed line. Histograms and the solid line show the number of issues and average initial returns by month, respectively.

Figure 2 Average search volume index (SVI) around the release day of participation information



The figure show the average search volume index (SVI) around the release day (day 0) of institutional investors' bidding and participation information. The solid line in the figure indicates the average log of SVI on day *t*.

Table 1 A typical timeline for the pre-market of IPOs conducted in China

Day	Event
T-6	Announcement of the institutional and retail tranche arrangement
T-5 ~ T-3	Road show and bid collection for the institutional tranche
T-2	Issuer and underwriter determine the offer price
T-1	Announcement of the updated prospectus including offer price
T	Subscription of the retail tranche
T+1	The allocation of the institutional tranche is determined
T+2	Announcement of allocation result for the institutional tranche (the detailed bid information is released). The allocation of the retail tranche is determined by lottery.
T+3	Announcement of allocation results for the retail tranche
T+N	Listing day

In a typical process of bookbuilt IPOs in China, the information is required to be released by the underwriter and issuer through the announcement files. As new shares are divided into institutional and retail tranches, the subscription processes for these two groups of investors proceed separately. The day *T* is the subscription day for retail investors. On day *T+N*, the new shares are officially traded. There is approximately ten days between these two days. The full bid information used in this study is based on the announcement of institutional allocation results on day *T+2*.

Table 2 Summary statistics

Panel A						
Initial return	N	Mean	Q25	Med	Q75	S.D.
Total	477	0.24	0.00	0.16	0.35	0.33
2010	43	0.43	0.15	0.31	0.57	0.41
2011	281	0.21	-0.03	0.14	0.32	0.30
2012	153	0.23	-0.01	0.17	0.34	0.33
First period	239	0.24	-0.02	0.15	0.35	0.35
Second period	238	0.24	0.01	0.18	0.36	0.31
CSRC industry						
Agriculture	7	0.24	0.07	0.17	0.31	0.28
Mining	8	0.42	0.08	0.13	0.39	0.74
Manufacturing	339	0.21	-0.03	0.14	0.32	0.32
Utilities	2	0.26	0.09	0.26	0.43	0.24
Construction	13	0.40	0.15	0.23	0.56	0.46
Transportation	6	0.32	0.07	0.37	0.54	0.27
IT	59	0.25	0.05	0.21	0.45	0.29
Wholesale	14	0.25	0.03	0.24	0.44	0.31
Finance	4	0.34	0.13	0.29	0.55	0.26
Real estate	0	-	-	-	-	-
Social Services	17	0.22	0.07	0.21	0.32	0.24
Communication	8	0.42	0.25	0.38	0.51	0.22
Comprehensive	0	-	-	-	-	-

The sample for issue-level consists of 477 IPOs. The sample is divided into two parts with 239 and 238 IPOs respectively. Initial return is equal to the market price adjustment from offer price to the closing price on the issue date.

Table 2 (continued)

Panel B *Issue-level variable (2nd period)*						
	N	Mean	Q25	Med	Q75	S.D.
Adj-IR	238	0.24	0.01	0.18	0.37	0.31
BHAR10d	238	0.19	-0.03	0.12	0.30	0.33
BHAR3m	238	0.12	-0.08	0.07	0.28	0.30
BHAR6m	238	0.13	-0.13	0.03	0.31	0.39
BHAR1y	238	0.21	-0.16	0.03	0.41	0.69
PastPerf	238	0.16	0.15	0.16	0.17	0.02
Mkt15	238	0.00	0.00	0.00	0.00	0.00
PriorIR30	238	0.26	0.14	0.22	0.40	0.15
Overhang	238	0.77	0.75	0.75	0.75	0.05
PriceRev	238	-0.12	-0.22	-0.11	-0.03	0.15
Amount	238	8.13	7.60	7.93	8.52	0.83
InvPrice	238	0.06	0.04	0.05	0.06	0.03
UwCap	238	10.46	10.18	10.64	10.93	0.62
Age	238	11.05	8.06	10.76	13.94	4.76
Size	238	20.31	19.59	20.00	20.84	1.18
ROA	238	0.18	0.12	0.16	0.23	0.10
Lev	238	0.45	0.32	0.46	0.56	0.17
SOE	238	0.07	0.00	0.00	0.00	0.25
ChiNext	238	0.44	0.00	0.00	1.00	0.50

The issue-level sample in the second period consists of 238 IPOs. Adj-IR is the market adjusted initial return using the CSI 300 return as the market benchmark. BHAR10d, BHAR3m, BHAR6m, BHAR1y are the buy-and-hold abnormal returns using the windows of ten-days, three-month, six-month and one-year, respectively. The index, PastPerf, is constructed as the bid-size weighted average of past performance for all the institutional investors in the current issue. Mkt15 is average market return (CSI 300) for the 15-trading days preceding the issue date. PriorIR30 is average initial return of IPOs issued in the 30 days before the issue date. Overhang is shares retained by the entrepreneur divided by shares filed. PriceRev is offer price relative to the midpoint of filing range. Amount is natural logarithm of the number of shares to be sold in ten thousand. InvPrice equals to the reciprocal of the filing midpoint. UwCap denotes natural logarithm of capital raised by the underwriter in the last year. Age is the number of years from the establishment day to the listing day. Size is the natural logarithm of the total assets before the IPO year. ROA is total profit divided by total assets. Lev is total debt divided by total assets. SOE is a dummy equal to one if the firm is state-owned enterprise based on the ultimate controller. ChiNext is a dummy equal to one if the IPO is listed on the ChiNext market of China.

Table 2 (continued)

Panel C										
	Full sample			Good past performance			Bad past performance			Difference
	N	Mean	S.D.	N	Mean	S.D.	N	Mean	S.D.	mean(good)-mean(bad)
Perf1	648	0.17	0.15	324	0.28	0.13	324	0.06	0.05	0.22***
Perf2	648	0.17	0.18	324	0.19	0.18	324	0.15	0.17	0.04***
Perf (full period)	36591	0.12	0.28	17348	0.15	0.31	19243	0.09	0.24	0.06***
Perf (first period)	19541	0.13	0.28	8859	0.19	0.33	10682	0.09	0.22	0.10***
Perf (second period)	17050	0.11	0.28	8489	0.12	0.29	8561	0.10	0.27	0.02***

The investor-level sample consists of 648 investors. They are divided into two subsamples with good (bad) performance in the first period. Each subsample has 324 investors. The performance is measured at the bid-level, Perf is equal to the initial return if the bid is not less than offer price, zero otherwise. Perf1 and Perf2 are defined as the average of Perf in the first and second periods indicating the performance for each period. The bid-level sample consists of 36591 bids in the full period and 19541 and 17050 in the first and second periods. The difference in performance is significant at the 0.01 level in both the investor-level and bid-level samples, indicated by ***.

Table 2 (continued)

Panel D

	Total	Securities	Funds	Trust and insurance	SOE financial firm	Recommended
Average Perf1	0.17	0.16	0.19	0.14	0.17	0.10
Average Perf2	0.17	0.15	0.21	0.09	0.13	0.10
# of investors	648	125	359	95	17	52
% of investors	100	19.29	55.40	14.66	2.62	8.02
# of bids (full period)	36591	9926	18629	5161	1506	1369
# of bids (first period)	19541	5494	9281	3034	972	760
# of bids (second period)	17050	4432	9348	2127	534	609
# of bids per issue (full period)	76.71	20.81	39.05	10.82	3.16	2.87
# of bids per issue (first period)	81.76	22.99	38.83	12.69	4.07	3.18
# of bids per issue (second period)	71.64	18.62	39.28	8.94	2.24	2.56
% of bids with allocation (full period)	18.36	17.42	17.46	24.03	16.53	18.12
% of bids (full period)	100	27.13	50.91	14.10	4.12	3.74
% of bids (first period)	100	28.12	47.50	15.53	4.97	3.89
% of bids (second period)	100	25.99	54.83	12.48	3.13	3.57

The investor-level sample consists of five types of investors, security companies, funds, trust/insurance, SOE financial firms and other investors that are recommended by the underwriter to be included in the bidding process.

Table 3 Performance persistence in the investor-level analysis

Panel A	OLS					
	Full sample		Good		Bad	
	(1)	(2)	(3)	(4)	(5)	(6)
	Perf2	Perf2	Perf2	Perf2	Perf2	Perf2
Perf1	0.154***	0.101**	0.188***	0.123*	-0.123	-0.216
	(3.17)	(2.03)	(2.66)	(1.71)	(-0.66)	(-1.16)
Intercept	0.143***	0.138***	0.134***	0.146***	0.160***	0.150***
	(13.53)	(9.11)	(6.29)	(5.27)	(9.62)	(7.09)
type	no	yes	no	yes	no	yes
N	648	648	324	324	324	324
adj./Ps. R-sq	0.015	0.067	0.016	0.055	-0.002	0.057

The investor-level analysis is conducted using OLS estimation. The dependent variable is the value-weighted average of performances in the second period. Perf1 is the average performances in the first period. The sample is further divided into two parts by the average performance in the first period. The “good” group refers to investors with good performance in the first period, while the “bad” group refers to ones with bad past performance. Values of the t-statistic are calculated by heteroscedasticity-consistent standard errors and reported in brackets. *, **, *** represent significance at the 10%, 5% and 1% levels.

Table 3 (continued)

Panel B	Heckman						
		Full sample		Good		Bad	
	stage 1	stage 2	stage 2	stage 2	stage 2	stage 2	stage 2
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Part	Perf2	Perf2	Perf2	Perf2	Perf2	Perf2
Perf1	0.344	0.113**	0.0995**	0.148**	0.129*	-0.271	-0.240
	(1.12)	(2.28)	(1.99)	(2.12)	(1.77)	(-1.44)	(-1.28)
Win1	-0.146						
	(-0.91)						
Alloc	-0.751***						
	(-5.34)						
mills lambda		-0.149***	-0.0372	-0.148**	0.107	-0.164***	-0.171**
		(-4.49)	(-0.46)	(-2.37)	(0.76)	(-4.34)	(-2.12)
Intercept	0.941***	0.220***	0.153***	0.212***	0.104*	0.251***	0.216***
	(7.92)	(10.38)	(4.53)	(5.73)	(1.73)	(8.57)	(5.70)
type	yes	no	yes	no	yes	no	yes
N	858	648	648	324	324	324	324
adj./Ps. R-sq	0.08	0.043	0.066	0.033	0.054	0.043	0.062

The investor-level analysis is conducted using Heckman (1979) two-stage estimation. Part is a dummy if the investor appears in the second period. Perf1 is the average performance in the first period. Win1 is the probability of submitting bids that are no less than the offer price in the first period. Alloc is the allocation probability in the first period. In the first stage of the Heckman model, Perf1, Win1, Alloc and investor type dummies are included in the selection equation. Mills lambda is calculated by the predicted dependent variable of model (1) using Probit estimation. Values of the t-statistic are calculated by heteroscedasticity-consistent standard errors and reported in brackets. *, **, *** represent significance at the 10%, 5% and 1% levels.

Table 4 Performance persistence in the bid-level analysis

	Full sample			Good			Bad		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Perf	Perf	Perf	Perf	Perf	Perf	Perf	Perf	Perf
Perf1	0.133***	0.139***	0.119***	0.161***	0.172***	0.0955***	-0.0347	-0.0327	0.0840
	(4.59)	(4.49)	(4.55)	(4.32)	(4.28)	(4.54)	(-0.30)	(-0.26)	(0.96)
Mkt15		0.234	-0.347		-1.194	-1.067		1.660	0.409
		(0.03)	(-0.07)		(-0.16)	(-0.21)		(0.26)	(0.08)
PriorIR30		0.119	0.0796		0.153	0.0984		0.0892	0.0606
		(0.70)	(0.58)		(0.86)	(0.71)		(0.55)	(0.44)
Overhang		0.656	0.501		0.787	0.601		0.533	0.404
		(0.96)	(1.05)		(1.08)	(1.22)		(0.84)	(0.87)
PriceRev		-0.524	-0.525**		-0.551	-0.527**		-0.499	-0.523**
		(-1.48)	(-2.50)		(-1.50)	(-2.55)		(-1.46)	(-2.44)
Amount		-0.0336	-0.0294		-0.0300	-0.0281		-0.0374	-0.0305
		(-0.78)	(-0.66)		(-0.67)	(-0.61)		(-0.90)	(-0.69)
InvPrice		1.538	1.334		1.671	1.471*		1.417	1.201
		(1.32)	(1.64)		(1.40)	(1.81)		(1.25)	(1.44)
UwCap		-0.0200	-0.0168		-0.0163	-0.0126		-0.0231	-0.0202
		(-0.89)	(-1.00)		(-0.74)	(-0.73)		(-1.00)	(-1.17)
Age		-0.00261	-0.000617		-0.00301	-0.000834		-0.00227	-0.000531
		(-0.91)	(-0.23)		(-1.02)	(-0.32)		(-0.82)	(-0.20)
Size		0.0166	-0.00481		0.0112	-0.00640		0.0212	-0.00398
		(0.56)	(-0.11)		(0.37)	(-0.15)		(0.72)	(-0.09)
ROA		-0.291	-0.344		-0.350	-0.395*		-0.236	-0.297

		(-1.10)	(-1.60)		(-1.21)	(-1.68)		(-0.98)	(-1.51)
Lev		-0.362	-0.515**		-0.377	-0.545**		-0.347	-0.486**
		(-1.11)	(-2.33)		(-1.11)	(-2.50)		(-1.10)	(-2.18)
SOE		0.0453	0.0407		0.0403	0.0381		0.0498	0.0426
		(0.53)	(0.66)		(0.48)	(0.65)		(0.58)	(0.65)
ChiNext		0.0875**	0.0804**		0.100***	0.0931***		0.0755**	0.0675**
		(2.34)	(2.43)		(2.59)	(2.76)		(2.05)	(2.04)
Intercept	0.0895***	-0.237	0.446	0.0824***	-0.310	0.302	0.103***	-0.155	0.327
	(4.23)	(-0.38)	(0.70)	(4.81)	(-0.47)	(0.40)	(3.64)	(-0.25)	(0.46)
Type	no	no	yes	no	no	yes	no	no	yes
Industry	no	no	yes	no	no	yes	no	no	yes
Year	no	no	yes	no	no	yes	no	no	yes
N	17050	17050	17050	8489	8489	8489	8561	8561	8561
Adj. R-sq	0.003	0.137	0.290	0.003	0.147	0.310	-0.000	0.126	0.268

The bid-level analysis is conducted using the sample of IPOs in the second period consisting of 17050 bids in the full sample, 8489 bids from investors in the "good" group and 8561 from investors in the "bad" group. The dependent variable is Perf, equal to the initial return if the bid is no less than the offer price, zero otherwise. The average performance of institutional investors in the first period, Perf1, is the variable of interest. Several control variables are considered. Mkt15 is the average market return (CSI 300) for the 15-trading days preceding the issue date. PriorIR30 is the average of initial return of IPOs issued in the 30 days before the issue date. Overhang is shares retained by the entrepreneur divided by shares filed. PriceRev is the offer price relative to the midpoint of filing range. Amount is the natural logarithm of the number of shares to be sold in ten thousand. InvPrice equals to the reciprocal of the filing midpoint. UwCap denotes natural logarithm of capital raised by the underwriter in the last year. Age is the number of years from the establishment date to issue date. Size is the natural logarithm of the total assets before the IPO year. ROA is the total profit divided by total assets. Lev is the total debt divided by total assets. SOE is a dummy equal to one if the firm is state-owned enterprise based on the ultimate controller. ChiNext is a dummy equal to one if the IPO is listed on the ChiNext market of China. Investor type dummies, industry dummies and year dummies are included in some model specifications. The values of t-statistics in brackets are calculated by standard errors clustered on both investor and calendar month. *, **, *** represent significance at the 10%, 5% and 1% levels.

Table 5 Past performance and subsequent returns

	(1) IR	(2) IR	(3) Adj-IR	(4) Adj-IR	(5) BHAR10d	(6) BHAR10d	(7) BHAR3m	(8) BHAR3m	(9) BHAR6m	(10) BHAR1y
PastPerf	3.211***	2.536***	3.166***	2.483***	3.334***	2.596***	3.917***	3.027***	1.915	2.194
	(3.07)	(2.76)	(3.02)	(2.72)	(3.34)	(3.04)	(3.70)	(2.91)	(1.37)	(1.14)
Mkt15		22.98***		23.11***		31.64***		9.766	11.74	22.67*
		(3.73)		(3.78)		(4.41)		(1.47)	(1.45)	(1.95)
PriorIR30		0.534***		0.537***		0.377**		0.202	0.253	-0.0543
		(4.38)		(4.42)		(2.57)		(1.51)	(1.50)	(-0.26)
Overhang		0.371		0.335		0.144		0.198	0.836	-0.156
		(0.92)		(0.83)		(0.38)		(0.46)	(1.29)	(-0.19)
PriceRev		-0.678***		-0.661***		-0.647***		-0.370*	-0.675***	-0.290
		(-4.17)		(-4.11)		(-3.53)		(-1.93)	(-2.83)	(-0.95)
Amount		-0.200***		-0.202***		-0.192***		-0.106*	-0.139*	0.0434
		(-3.56)		(-3.60)		(-3.23)		(-1.82)	(-1.79)	(0.20)
InvPrice		6.846***		6.841***		6.020***		3.558***	4.309***	2.839
		(8.43)		(8.53)		(6.29)		(4.76)	(4.54)	(1.39)
UwCap		0.00234		0.00260		-0.0236		-0.0194	-0.00271	-0.0190
		(0.08)		(0.09)		(-0.70)		(-0.68)	(-0.07)	(-0.25)
Age		-0.00393		-0.00415		-0.00611		-0.00645*	-0.00729	-0.0201*
		(-1.16)		(-1.23)		(-1.60)		(-1.75)	(-1.59)	(-1.84)
Size		0.0455		0.0482		0.0372		-0.0131	-0.0351	-0.115
		(0.99)		(1.05)		(0.82)		(-0.27)	(-0.52)	(-0.82)
ROA		0.118		0.111		-0.137		-0.152	-0.428	-0.545
		(0.54)		(0.50)		(-0.53)		(-0.54)	(-1.08)	(-0.66)

Lev		-0.356**		-0.361**		-0.362**		-0.258	-0.588***	-0.948*
		(-2.06)		(-2.11)		(-1.97)		(-1.54)	(-2.62)	(-1.93)
SOE		-0.0768		-0.0753		-0.114		-0.0248	0.0421	-0.131
		(-1.11)		(-1.09)		(-1.46)		(-0.34)	(0.40)	(-1.04)
ChiNext		-0.00878		-0.00897		-0.0499		-0.00691	-0.0447	0.0796
		(-0.22)		(-0.23)		(-1.09)		(-0.17)	(-0.85)	(1.01)
Intercept	-0.281*	0.100	-0.274*	0.0870	-0.347**	0.965	-0.512***	1.270	1.844*	3.418**
	(-1.70)	(0.13)	(-1.66)	(0.11)	(-2.20)	(1.21)	(-3.13)	(1.59)	(1.82)	(2.24)
Industry	no	yes	no	yes	no	yes	no	yes	yes	yes
Year	no	yes	no	yes	no	yes	no	yes	yes	yes
N	238	238	238	238	238	238	238	238	238	238
Adj. R-sq	0.037	0.441	0.036	0.442	0.035	0.380	0.062	0.269	0.274	0.176

This issue-level analysis is conducted using the sample of 238 IPOs in the second period. The dependent variables are initial return (IR), the market adjusted initial return using the CSI 300 return as the market benchmark (Adj-IR), the buy-and-hold abnormal returns using the windows of ten-days (BHAR10d), three-month (BHAR3m), six-month (BHAR6m) and one-year (BHAR1y), respectively. The index, PastPerf, is constructed as the bid-size weighted average of past performance for all the institutional investors in the bidding process. Mkt15 is the average market return (CSI 300) for the 15-trading days preceding the issue date. PriorIR30 is the average of initial return of IPOs issued in the 30 days before the issue date. Overhang is shares retained by the entrepreneur divided by shares filed. PriceRev is the offer price relative to the midpoint of the filing range. Amount is the natural logarithm of the number of shares sold in ten thousand. InvPrice equals to the reciprocal of the filing midpoint. UwCap denotes the natural logarithm of capital raised by the underwriter in the last year. Age is the number of years from the establishment date to the issue day. Size is the natural logarithm of the total asset before the IPO year. ROA is the total profit divided by total assets. Lev is the total debt divided by total assets. SOE is a dummy equal to one if the firm is state-owned enterprise based on the ultimate controller. ChiNext is a dummy equal to one if the IPO is listed on the ChiNext market of China. The values of t-statistics in the brackets are calculated by heteroscedasticity-consistent standard errors. *, **, *** represent significance at the 10%, 5% and 1% levels.

Table 6 Information heterogeneity among institutional investors

Panel A	(1) IR	(2) IR	(3) IR	(4) BHAR3m	(5) BHAR3m	(6) BHAR3m
Entry_G	0.0914**		0.0668*	0.146***		0.117**
	(2.16)		(1.65)	(2.80)		(2.31)
Entry_B	0.0612		0.000451	0.0112		-0.0623
	(1.30)		(0.01)	(0.18)		(-1.06)
Bidpremium_G		1.175***	0.965**		1.512***	1.333***
		(2.60)	(2.09)		(3.10)	(2.74)
Bidpremium_B		0.685	0.511		0.600	0.444
		(1.45)	(1.07)		(1.21)	(0.92)
Intercept	-0.727	-0.883	-1.211*	0.376	0.0692	-0.224
	(-0.89)	(-1.23)	(-1.66)	(0.48)	(0.10)	(-0.33)
Controls	yes	yes	yes	yes	yes	yes
Industry	yes	yes	yes	yes	yes	yes
Year	yes	yes	yes	yes	yes	yes
N	238	238	238	238	238	238
Adj. R-sq	0.488	0.522	0.530	0.330	0.383	0.398

Panel A presents the evidence on endogenous entry and bid premium and their associations with subsequent IPO returns. The dependent variable for models (1) to (3) is initial return (IR). The dependent variable for models (4) to (6) is the three-month buy-and-hold abnormal return using the CSI 300 as the benchmark (BHAR3m). Entry_G (Entry_B), defined as the oversubscription rate of investors with good (bad) past performance, represents the endogenous entry of the investors in the "good" ("bad") group. Bidpremium_G (Bidpremium_B) is the average of the bids relative to the midpoint of the filing range from investors with good (bad) past performance. All the control variables are included but not shown for brevity. The values of the t-statistics in the brackets are calculated by heteroscedasticity-consistent standard errors. *, **, *** represent significance at the 10%, 5% and 1% levels.

Table 6 (continued)

Panel B	(1) Elas	(2) Elas	(3) Elas	(4) Elas	(5) Elas	(6) Elas
PastPerf	5.545***	5.244**	5.979***			
	(3.04)	(2.58)	(2.96)			
Entry_G				0.240**	0.230**	0.312***
				(2.53)	(2.20)	(2.81)
Entry_B				-0.220**	-0.261**	-0.320**
				(-2.09)	(-2.21)	(-2.58)
Intercept	-0.894***	-0.655	-0.669	-0.00752	0.569	0.311
	(-2.96)	(-0.68)	(-0.62)	(-0.13)	(0.68)	(0.30)
Controls	no	no	yes	no	no	yes
Industry	no	yes	yes	no	yes	yes
Year	no	yes	yes	no	yes	yes
N	238	238	238	238	238	238
Adj. R-sq	0.044	0.046	0.068	0.022	0.028	0.059

Panel B presents the evidence on the past performance and endogenous entry of investors and their associations with the elasticity of the demand curve. The dependent variable, Elas, is the elasticity of the demand curve in the bids of an IPO. PastPerf is the bid-size weighted average past performance of all institutional investors that participate in the current issue. Entry_G (Entry_B), defined as oversubscription rate of investors with good (bad) past performance, represents the endogenous entry of the investors in the "good" ("bad") group. The values of the t-statistics in the brackets are calculated by heteroscedasticity-consistent standard errors. *, **, *** represent significance at the 10%, 5% and 1% levels.

Table 6 (continued)

Panel C	(1)	(2)	(3)	(4)	(5)	(6)
	Perf	Perf	Perf	Perf	Perf	Perf
	Full sample		Good		Bad	
Order	-0.000562**	-0.000356*	-0.000524	-0.000292	-0.000567***	-0.000356**
	(-2.27)	(-1.90)	(-1.60)	(-1.16)	(-2.72)	(-2.19)
Intercept	-0.246	0.459	-0.297	0.294	-0.201	0.714
	(-0.35)	(0.55)	(-0.41)	(0.36)	(-0.30)	(1.02)
Controls	yes	yes	yes	yes	yes	yes
Type	no	yes	no	yes	no	yes
Industry	no	yes	no	yes	no	yes
Year	no	yes	no	yes	no	yes
N	17050	17050	8489	8489	8561	8561
Adj. R-sq	0.135	0.285	0.144	0.306	0.127	0.266

Panel C present the evidence of naïve reinforcement learning in both the full sample and subsamples. The dependent variable is the performance measured at the bid-level, Perf. Order is the participation order for each investor. All control variables are included but not tabulated. The values of the t-statistics in the brackets are calculated by standard errors clustered on both investor and calendar month. *, **, *** represent significance at the 10%, 5% and 1% levels.

Table 7 The influence of underwriters

Panel A	Bid-level					
	(1)	(2)	(3)	(4)	(5)	(6)
	Discount	Discount	Perf	Perf	Perf	Perf
Perf1	0.0140	0.0108***	0.109***	0.104***	0.120***	0.123***
	(1.49)	(2.26)	(3.77)	(3.87)	(4.39)	(4.66)
Discount			1.683***	1.417***		
			(3.14)	(4.53)		
Connect_N					-0.00527*	-0.00324**
					(-1.67)	(-2.02)
Intercept	0.120***	0.715**	-0.113**	-0.622	0.113***	0.292
	(12.97)	(2.17)	(-2.10)	(-1.00)	(3.38)	(0.35)
Controls	no	yes	no	yes	no	yes
Type	no	yes	no	yes	no	yes
Industry	no	yes	no	yes	no	yes
Year	no	yes	no	yes	no	yes
N	17050	17050	17050	17050	17050	17050
Adj. R-sq	0.000	0.382	0.335	0.434	0.009	0.288

Panel A presents the influence of the underwriter in the bid-level analysis. The dependent variable for models (1) and (2) is Discount, the offer price relative to the market clearing price. The dependent variable for models (3) to (6) is the performance measure at bid-level, Perf. Perf1 is the average past performance for each investor. Connect_N is the number of participations in the first period that involves the same pair of underwriter and investor. The values of the t-statistics in the bracket are calculated by standard errors clustered on both investor and calendar month. *, **, *** represent significance at the 10%, 5% and 1% levels.

Table 7 (continued)

Panel B	Issue-level					
	(1) Discount	(2) Discount	(3) IR	(4) IR	(5) BHAR3m	(6) BHAR3m
PastPerf	0.746***	0.914***	1.656**	2.526***	1.941**	3.024***
	(2.78)	(3.21)	(2.05)	(2.82)	(2.23)	(2.92)
Discount			0.974***		1.192***	
			(3.50)		(3.09)	
Ave_Connect_N				-0.0178*		-0.00535
				(-1.81)		(-0.62)
Intercept	-0.00726	0.333	-0.112	-0.295	0.909	1.154
	(-0.17)	(1.27)	(-0.16)	(-0.34)	(1.43)	(1.34)
Controls	no	yes	yes	yes	yes	yes
Industry	no	yes	yes	yes	yes	yes
Year	no	yes	yes	yes	yes	yes
N	238	238	238	238	238	238
Adj. R-sq	0.029	0.192	0.490	0.451	0.352	0.270

Panel B presents the influence of the underwriter in the issue-level analysis. The dependent variable for models (1) and (2) is Discount, the offer price relative to the market clearing price. The dependent variable for models (3) and (4) is initial return. For models (5) and (6), the dependent variable is the three-month buy-and-hold abnormal return. PastPerf is the bid-size weighted past performance for all the investors in the current issue. Ave_Connect_N is the average of Connect_N for all subscribers in an IPO. The values of the t-statistics in the bracket are calculated by heteroscedasticity-consistent standard errors. *, **, *** represent significance at the 10%, 5% and 1% levels.

Table 8 Investors' attention

	bid-level		issue-level			
	(1)	(2)	(3)	(4)	(5)	(6)
	Perf	Perf	IR	IR	BHAR3m	BHAR3m
Perf1	0.103***	0.103***				
	(3.76)	(3.75)				
PastPerf			1.870**	1.810**	2.341**	2.166**
			(2.35)	(2.28)	(2.42)	(2.27)
ASVI(5)	-0.00778		0.00928		0.0117	
	(-0.35)		(0.22)		(0.26)	
ASVI(2)		0.0197		0.0244		0.0713**
		(0.75)		(0.73)		(2.32)
Intercept	1.452**	1.378**	0.818	0.793	2.041***	1.966***
	(2.50)	(2.31)	(1.51)	(1.49)	(3.39)	(3.36)
Controls	yes	yes	yes	yes	yes	yes
Type	yes	yes	-	-	-	-
Industry	yes	yes	yes	yes	yes	yes
Year	yes	yes	yes	yes	yes	yes
N	16512	16512	231	231	231	231
Adj. R-sq	0.184	0.186	0.399	0.401	0.245	0.264

The bid-level analysis is conducted using all the bids in the second period with the performance measure as the dependent variable. Perf1 is the average past performance for each investor in the first period. The issue-level analysis uses IPOs in the second period. PastPerf is the bid-size weighted average past performance of subscribers in the bidding process. ASVI(5) and ASVI(2) are the abnormal search volume indexes calculated using 5-day and 2-day windows after and before the release day. Missing values of ASVI make the sample size at the bid-level drop from 17050 to 16512 and that at the issue-level drop from 238 to 231. All control variables and fixed effects are included but not tabulated. The values of the t-statistics in the brackets at the bid-level are calculated by standard errors clustered on both investor and calendar month. The values of the t-statistics in the brackets at the issue-level are calculated by heteroscedasticity-consistent standard errors. *, **, *** represent significance at the 10%, 5% and 1% levels.

Table 9 High bids and low bids

	bid-level		issue-level			
	(1)	(2)	(3)	(4)	(5)	(6)
	Perf	Perf	IR	IR	BHAR3m	BHAR3m
Perf1	0.0639***	0.0409***				
	(2.61)	(2.81)				
PastPerf			2.850**	1.774**	3.048***	2.107**
			(2.51)	(2.31)	(2.89)	(2.39)
Highbid	0.128***	0.153***				
	(3.70)	(4.72)				
Lowbid	-0.0880***	-0.154***				
	(-3.78)	(-6.26)				
Highbid_ave			0.141	0.271	0.0965	0.141
			(0.74)	(1.60)	(0.40)	(0.68)
Lowbid_ave			-0.0107	-0.322**	-0.156	-0.467***
			(-0.10)	(-2.46)	(-1.25)	(-2.94)
Intercept	0.137***	0.415	-0.232	0.553	-0.268	1.732**
	(4.60)	(0.74)	(-1.12)	(0.83)	(-1.21)	(2.37)
Controls	no	yes	no	yes	no	yes
Type	no	yes	-	-	-	-
Industry	no	yes	no	yes	no	yes
Year	no	yes	no	yes	no	yes
N	17050	17050	238	238	238	238
Adj. R-sq	0.087	0.416	0.037	0.507	0.091	0.360

The bid-level analysis is conducted using all the bids in the second period with the performance measure as the dependent variable. Perf1 is the average past performance for each investor in the first period. Highbid is a dummy set equal to one if the bid is above the midpoint of filing range. Lowbid is a dummy set equal to one if the bid is below the lower limit of the filing range. The issue-level analysis uses IPOs in the second period. PastPerf is the bid-size weighted past performance of subscribers in the bidding process. Highbid_ave is average of Highbid at issue-level. Lowbid_ave is average of Lowbid at issue-level. The values of the t-statistics in the bracket at the bid-level are calculated by standard errors clustered on both investor and calendar month. The values of the t-statistics in the bracket at the issue-level are calculated by heteroscedasticity-consistent standard errors. *, **, *** represent significance at the 10%, 5% and 1% levels.

Table 10 Industry-specific expertise

	Industry-specific expertise	
	(1)	(2)
	Perf	Perf
Perf1	0.106***	0.119***
	(4.24)	(4.50)
Ind_N	-0.00116**	-0.000500***
	(-2.03)	(-3.40)
Intercept	0.129***	0.391
	(3.43)	(0.57)
Controls	no	yes
Type	no	yes
Industry	no	yes
Year	no	yes
N	17050	17050
Adj. R-sq	0.021	0.289

The bid-level analysis is conducted using all the bids in the second period with the performance measure as the dependent variable. Perf1 is the average past performance for each investor in the first period. Ind_N is the number of past participations in the same industry as that of the current issue. The values of the t-statistics in the brackets at the bid-level are calculated by standard errors clustered on both investor and calendar month. *, **, *** represent significance at the 10%, 5% and 1% levels.

Table 11 Robustness checks

	Alternative definition of two-period							
	Investor-level		Bid-level		Issue-level			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Perf2	Perf2	Perf	Perf	IR	IR	BHAR3m	BHAR3m
Perf1	0.212**	0.155*	0.161***	0.146***				
	(2.56)	(1.89)	(4.32)	(3.56)				
PastPerf					4.853***	2.643**	5.828***	3.284**
					(3.45)	(2.42)	(4.18)	(2.51)
Intercept	0.129***	0.121***	0.0852***	0.680	-0.484**	0.114	-0.728***	1.568*
	(8.74)	(6.38)	(3.20)	(0.96)	(-2.44)	(0.15)	(-3.75)	(1.85)
Type	no	yes	no	yes	-	-	-	-
Controls	-	-	no	yes	no	yes	no	yes
Industry	-	-	no	yes	no	yes	no	yes
Year	-	-	no	yes	no	yes	no	yes
N	526	526	12734	12734	191	191	191	191
adj./Ps. R-sq	0.014	0.066	0.002	0.352	0.057	0.464	0.084	0.303

The table presents a robustness check using an alternative definition of two-period. This robustness check divides the sample by the duration of the period resulting in 526 investors in the sample. Perf1 and Perf2 are defined as the average of Perf in the first and second periods indicating the performance for each period. PastPerf is the bid-size weighted average past performance of subscribers in the bidding process. At the investor-level and the issue-level, the values of the t-statistics in the brackets are calculated by heteroscedasticity-consistent standard errors. At the bid-level, the values of t-statistic in the bracket at the bid-level are calculated by standard errors clustered on both investor and calendar month. *, **, *** represent significance at the 10%, 5% and 1% levels.

References

Aggarwal, R., Prabhala, N.R., Puri, M., 2002. Institutional allocation in initial public offerings: Empirical evidence. The Journal of Finance 57, 1421-1442.

Amihud, Y., Hauser, S., Kirsh, A., 2003. Allocations, adverse selection, and cascades in IPOs: Evidence from the Tel Aviv Stock Exchange. Journal of Financial Economics 68, 137-158.

Barber, B.M., Odean, T., 2008. All that glitters: The effect of attention and news on the buying behavior of individual and institutional investors. Review of Financial Studies 21, 785-818.

Barboza, D., 2010. Baidu's Gain from Departure could be China's Loss. In: The New York Times

Beatty, R.P., Ritter, J.R., 1986. Investment banking, reputation, and the underpricing of initial public offerings. Journal of Financial Economics 15, 213-232.

Benveniste, L.M., Spindt, P.A., 1989. How investment bankers determine the offer price and allocation of new issues. Journal of Financial Economics 24, 343-361.

Binay, M.M., Gatchev, V.A., Pirinsky, C.A., 2007. The role of underwriter-investor relationships in the IPO process. Journal of Financial and Quantitative Analysis 42, 785-809.

Bouwman, C.H., 2011. Corporate governance propagation through overlapping directors. Review of Financial Studies 24, 2358-2394.

Bradley, D.J., Jordan, B.D., 2002. Partial adjustment to public information and IPO underpricing. Journal of Financial and Quantitative Analysis 37, 595-616.

Brown, S.J., Goetzmann, W.N., 1995. Performance persistence. The Journal of Finance 50, 679-698.

Busse, J.A., Goyal, A., Wahal, S., 2010. Performance and persistence in institutional investment management. The Journal of Finance 65, 765-790.

Carhart, M.M., 1992. Persistence in mutual fund performance re-examined. Working Paper, Graduate School of Business, University of Chicago.

Carhart, M.M., 1997. On persistence in mutual fund performance. The Journal of Finance 52, 57-82.

Carhart, M.M., Carpenter, J.N., Lynch, A.W., Musto, D.K., 2002. Mutual fund survivorship. Review of Financial Studies 15, 1439-1463.

Carlson, R.S., 1970. Aggregate performance of mutual funds, 1948–1967. Journal of Financial and Quantitative Analysis 5, 1-32.

Chemmanur, T.J., Ertugrul, M., Krishnan, K., 2012. Is it the investment bank or the investment banker? A study of the role of investment banker human capital in acquisitions.

Chemmanur, T.J., Hu, G., Huang, J., 2010. The role of institutional investors in initial public offerings. Review of Financial Studies 23, 4496-4540.

Chemmanur, T.J., Krishnan, K., 2012. Heterogeneous beliefs, IPO valuation, and the economic role of the underwriter in IPOs. Financial Management 41, 769-811.

Cheung, Y.-L., Ouyang, Z., Tan, W., 2009. How regulatory changes affect IPO underpricing in China. China Economic Review 20, 692-702.

Chiang, Y.-M., Hirshleifer, D., Qian, Y., Sherman, A.E., 2011. Do investors learn from experience? Evidence from frequent IPO investors. Review of Financial Studies 24, 1560-1589.

Chiang, Y.-M., Qian, Y., Sherman, A.E., 2010. Endogenous entry and partial adjustment in IPO auctions: Are institutional investors better informed? Review of Financial Studies 23, 1200-1230.

Choi, J.J., Laibson, D., Madrian, B.C., Metrick, A., 2009. Reinforcement learning and savings behavior. The Journal of Finance 64, 2515-2534.

Cornelli, F., Goldreich, D., 2003. Bookbuilding: How Informative Is the Order Book? The Journal of Finance 58, 1415-1443.

Cumming, D., Dai, N., Hass, L.H., Schweizer, D., 2012. Regulatory induced performance persistence: Evidence from hedge funds. Journal of Corporate Finance 18, 1005-1022.

Da, Z., Engelberg, J., Gao, P., 2011. In search of attention. The Journal of Finance 66, 1461-1499.

Degeorge, F., Derrien, F., Womack, K.L., 2010. Auctioned IPOs: the US evidence. Journal of Financial Economics 98, 177-194.

Elton, E.J., Gruber, M.J., Blake, C.R., 1996. Survivor bias and mutual fund performance. Review of Financial Studies 9, 1097-1120.

Elton, E.J., Gruber, M.J., Das, S., Hlavka, M., 1993. Efficiency with costly information: A reinterpretation of evidence from managed portfolios. Review

of Financial Studies 6, 1-22.

Field, L.C., Lowry, M., 2009. Institutional versus individual investment in IPOs: The importance of firm fundamentals. Journal of Financial and Quantitative Analysis 44, 489-516.

Goetzmann, W.N., Ibbotson, R.G., 1994. Do winners repeat? The Journal of Portfolio Management 20, 9-18.

Grinblatt, M., Titman, S., 1992. The persistence of mutual fund performance. The Journal of Finance 47, 1977-1984.

Hanley, K.W., 1993. The underpricing of initial public offerings and the partial adjustment phenomenon. Journal of Financial Economics 34, 231-250.

Hauser, S., Yaari, U., Tanchuma, Y., Baker, H., 2006. Initial Public Offering Discount and Competition. Journal of Law and Economics 49, 331-351.

Heckman, J.J., 1979. Sample selection bias as a specification error. Econometrica, 153-161.

Hendricks, D., Patel, J., Zeckhauser, R., 1993. Hot hands in mutual funds: Short‐run persistence of relative performance, 1974–1988. The Journal of Finance 48, 93-130.

Hoberg, G., 2007. The underwriter persistence phenomenon. The Journal of Finance 62, 1169-1206

Ibbotson, R.G., Jaffe, J.F., 1975. “Hot issue” markets. The Journal of Finance 30, 1027-1042.

Jagannathan, R., Jirnyi, A., Sherman, A., 2010. Why Don't Issuers Choose IPO Auctions? The Complexity of Indirect Mechanisms. National Bureau of Economic Research.

Jensen, M.C., 1969. Risk, the pricing of capital assets, and the evaluation of investment portfolios. The Journal of Business 42, 167-247.

Kandel, S., Sarig, O., Wohl, A., 1999. The demand for stocks: an analysis of IPO auctions. Review of Financial Studies 12, 227-247.

Kaustia, M., Knüpfer, S., 2008. Do investors overweight personal experience? Evidence from IPO subscriptions. The Journal of Finance 63, 2679-2702.

Keloharju, M., 1993. The winner's curse, legal liability, and the long-run price performance of initial public offerings in Finland. Journal of Financial Economics 34, 251-277.

Koh, F., Walter, T., 1989. A direct test of Rock's model of the pricing of unseasoned issues. Journal of Financial Economics 23, 251-272.

Kummer, D.R., Hoffmeister, J.R., 1978. Valuation consequences of cash tender offers. The Journal of Finance 33, 505-516.

Levis, M., 1990. The winner's curse problem, interest costs and the underpricing of initial public offerings. Economic Journal 100, 76-89.

Lewellen, J., 2011. Institutional investors and the limits of arbitrage. Journal of Financial Economics 102, 62-80.

Liu, Y.J., Wei, K.-C., Liaw, G., 2001. On the demand elasticity of initial public offerings: An analysis of discriminatory auctions. International Review of Finance 2, 151-178.

Ljungqvist, A., 2007. Chapter 7 - IPO Underpricing. In: Eckbo BE (ed.) Handbook of Empirical Corporate Finance. Elsevier, San Diego, pp. 375-422.

Ljungqvist, A., Nanda, V., Singh, R., 2006. Hot Markets, Investor Sentiment, and IPO Pricing. The Journal of Business 79, 1667-1702.

Logue, D.E., 1973. On the pricing of unseasoned equity issues: 1965-1969. Journal of Financial and Quantitative Analysis 8, 91-103.

Lowry, M., Schwert, G.W., 2002. IPO market cycles: Bubbles or sequential learning? The Journal of Finance 57, 1171-1200.

Matallín-Sáez, J.C., Soler-Domínguez, A., Tortosa-Ausina, E., 2014. On the robustness of persistence in mutual fund performance.

Megginson, W.L., Weiss, K.A., 1991. Venture capitalist certification in initial public offerings. The Journal of Finance 46, 879-903.

Petersen, M.A., 2009. Estimating standard errors in finance panel data sets: Comparing approaches. Review of Financial Studies 22, 435-480.

Ritter, J., 2011. Equilibrium in the IPO Market. Available at SSRN 1822542.

Ritter, J.R., Welch, I., 2002. A Review of IPO Activity, Pricing, and Allocations. The Journal of Finance 57, 1795-1828.

Ritter, J.R., Zhang, D., 2007. Affiliated mutual funds and the allocation of initial public offerings. Journal of Financial Economics 86, 337-368.

Rock, K., 1986. Why new issues are underpriced. Journal of Financial Economics 15,

187-212.

Seru, A., Shumway, T., Stoffman, N., 2010. Learning by trading. Review of Financial Studies 23, 705-739.

Sherman, A.E., 2005. Global trends in IPO methods: Book building versus auctions with endogenous entry. Journal of Financial Economics 78, 615-649.

Sherman, A.E., Titman, S., 2002. Building the IPO order book: underpricing and participation limits with costly information. Journal of Financial Economics 65, 3-29.

Tian, L., 2011. Regulatory underpricing: Determinants of Chinese extreme IPO returns. Journal of Empirical Finance 18, 78-90

Tinic, S.M., 1988. Anatomy of initial public offerings of common stock. The Journal of Finance 43, 789-822.

Wermers, R., 1999. Mutual fund herding and the impact on stock prices. The Journal of Finance 54, 581-622.

White, H., 1980. A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. Econometrica, 817-838.