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Evidence on the effect of 'Claw-Back' provisions on IPO share allocation and underpricing in Hong Kong

Anna P. I. Vong^a and Duarte Trigueiros^b

^aUniversity of Macau, Taipa, Macau, China; ^bUniversity Institute of Lisbon, Lisbon, Portugal

ABSTRACT

The article examines share allocation practices of over 300 initial public offerings (IPOs) in Hong Kong during the years immediately following the enacting of a 'Claw-Back' provision for IPO share reallocation. The examination of exhaustive micro-level data reveals that small (uninformed, retail) investors earn higher initial returns than large investors. Before the enacting of the 'Claw-Back' provision, small investors were unfavourably treated in relation to large investors. The pattern now prevailing in the proportion of shares allocated to small and large investors also differs from that observed previously. When attempting to isolate the determinants of IPO underpricing in Hong Kong, the article also shows that both the 'informed demand' hypothesis and the signalling effect of underwriters' reputation are significant determinants of underpricing. Such result, not visible when pooled OLS regressions are used, becomes apparent through the use of a system of simultaneous equations.

KEYWORDS

Initial public offerings; share allocation; ex-ante uncertainty; subscription rate; underwriters' reputation

JEL CLASSIFICATION

G24; G32

I. Introduction

The underpricing of initial public offerings (IPOs) is well documented in the finance literature. Numerous studies have shown that a significant first-day (or 'initial') return can be earned by investors during IPOs. Loughran, Ritter, and Kristian (1994) provide a comprehensive survey of IPO underpricing in companies going public in 25 countries including 7 Asian countries. A more recent study by Ritter (2003) reports the extent of underpricing in 38 countries and confirms that average initial returns (IRs) of Asian IPOs are significantly higher than in the US. When compared with other Asian countries, IRs observed in Hong Kong IPOs during recent periods are modest. Moreover, when results reported by Dawson and Hiraki (1985), Dawson (1987), McGuinness (1992), Chen and Mohan (2001), Cheng, Cheung, and Po (2004), Cheng, Cheung, and Tse (2006), Vong (2006), Vong and Zhao (2008) and others are compared with those obtained in the present article, it is concluded that underpricing in Hong Kong has experienced a significant decrease from the year 2001.

Most of the theoretical literature on IPO underpricing attributes this market inefficiency to information asymmetry amongst the various groups of market participants: issuers, investors and underwriters. Other explanations are, amongst others, the need of protection against future litigation from investors, the marketing function and the broadening of ownership base after an IPO. Recently, much empirical research has been devoted to examining how new shares are allocated between individual (small) and institutional (large) investors and the impact on IRs of the allocation scheme adopted (Hanley and Wilhelm 1995; Benveniste and Spindt 1989; Lee, Taylor, and Walter 1996; Aggarwal, Prabhala, and Puri 2002; Ljungqvist and Wilhelm 2002; Amihud, Hauser, and Kirsh 2003; Ljungqvist 2007; Vong and Trigueiros 2009). In the US, IPOs follow the 'book-building' approach in marketing and selling new shares whereby underwriters obtain information from institutional investors which is useful for the pricing of an offer. By contrast, many Asian countries like Singapore and Hong Kong have adopted an even-handed IPO share allocation (Loughran, Ritter, and Kristian 1994). But owing to

the popularity of IPO investment in those countries, subscription rates (SRs) are frequently high and rationing of new shares is common. Underwriters are discouraged to discriminate amongst orders of the same size, but discrimination between investors on the basis of application size is frequent. Thus, investors' expectations regarding the level of IRs are contingent on both the allotment ratios (the number of shares distributed relative to the number of shares applied for in a particular application order size) and the sizes of applications.

In Hong Kong, IPOs are required to have their allocation schemes publicly announced. Details concerning the subscription level, the number of applications received, the amount of shares requested from investors and, most importantly, how new shares are rationed and distributed across various application order sizes are all made public. This allows a thorough examination of interesting issues relating to IPO share allocations, namely ascertaining who receives IPO allocations and how could allocation affect IRs. Such micro-level share allocation data is not made available in other exchanges, namely in the US and UK exchanges.

Drawing on allocation data for 324 IPOs during the period 2002–2007, the article presents direct evidence that more IPO shares are now distributed to individual (small) investors than to institutional (large) investors, a finding which contradicts earlier IPO studies in Hong Kong, in which it was shown that institutional investors were favoured in IPO allocations. It is found that allotment ratios decline with application order sizes, suggesting that the more shares an investor applies for in an IPO, the smaller the relative amount of shares he/she actually receives. For small-sized applications (<100 lots¹), allotment ratios range between 50% (for an order size of 2 lots) and 20% (for 99 lots), but for order sizes exceeding 30,000 lots, allotment ratios fluctuate at around 2% only. It is also found that an IPO IR of 11.29% is expected during the period, but, when allotment is taken into account, returns are much lower, ranging from 0.26% (for 70,000 lots) to 3.19% (for 2 lots). It is also shown that small-sized applications (between 2 lots and 20 lots) generate higher returns than those of higher application sizes. For

application sizes exceeding 10,000 lots, a lower but significant return can be earned and, actually, with lessened variability.

The above findings may have resulted from the effect of a new reallocation scheme put forth by the Securities and Futures Commission in Hong Kong (SEHK) in 2000, known as the 'Claw-Back' provision. Recognizing that small retail investors are frequently crowded out in heavily subscribed new offerings, the SEHK has since long tried to amend and improve the rules governing IPO share allocation. Eventually, in 2000, a new allocation rule² was issued whereby, whenever an IPO proves to be popular (high SR), there should take place a transfer of new shares from institutional investors' tranche into the public offer tranche, so as to ensure that retail investors' demand will not be disregarded, ultimately causing a broadened ownership basis which, regulators believe, would contribute to the quality of the aftermarket. According to the new provision, the initial allocation of shares to public subscription is 10% of the shares offered in the IPO, but it may experience a four-level increase depending on public demand. Namely, the public tranche will increase to 30% when public demand is 15 times but less than 50 times the initial allocation; this will further increase to 40% when public demand is 50 times but less than 100 times the initial allocation; and this will further increase to 50% when public demand is 100 times or more the initial allocation. Given the increase in fairness and the reduction in average overpricing observed in Hong Kong's IPOs, the 'Claw-Back' provisions are being considered in other Asian markets such as Singapore (Ko, Revell, and Cotton 2012).

In addition to the effect of the mentioned reallocation regulation, Cheng, Chan, and Mak (2005) also mention that Asian underwriters believe that large investors are short-term profit takers, frequently selling the proceeds of an IPO on the listing day. As a result, underwriters, when distributing new shares, tend to allocate more shares to individual (small) investors in order to alleviate the downward pressure on prices created by large investors. This is necessary since it is common for underwriters to provide a price support for new shares during the initial listing

¹1 lot equals to 1000 shares.

²The new allocation rule is known as the Practice Note 18.

period (Aggarwal 2000; Ellis, Michaely, and O'Hara 2000). Moreover, allocating new shares to a large number of small investors would not only widen the ownership base in an IPO (Lee, Taylor, and Walter 1996) but also entice small investors to participate in subsequent IPOs by the same underwriters. This enhanced demand for new offerings can strengthen the reputation of underwriters which is beneficial for their future underwriting business. When these facts are put together, the result is that more shares are now allotted to retail investors in Hong Kong.

The finding of an average IPO underpricing level of 11.29% supports the argument, put forward by Subrahmanyam and Titman (1999), that a large number of small investors, once aggregated in the public market, are able to provide a more informative stock price than the price obtained from a smaller group of institutional investors. Hong Kong IPO studies examining previous periods found underpricing levels exceeding 15%; however, we find an improvement in primary market efficiency in Hong Kong coincident with the privileging of small investors. Indeed, since, for a given IPO, the activation of or not of the reallocation ('Claw-Back') provision depends on the subscription level of a public offer, it follows that a higher demand from individual investors becomes a signal of the direction of their private information: their bidding behaviour translates into better price discovery and lower underpricing. Moreover, the problem of adverse selection under the Rock (1986) model can also be alleviated: when subscription is high, more new shares, rather than a discounted number of shares, are distributed to individual investors.

The article is also able to offer a more comprehensive view on factors influencing IPO's IRs. Previous authors employ OLS regressions where events differently scaled in time, and the corresponding explanatory variables, are pooled into one single cross-section equation. This type of modelling ignores causality and structure issues, namely the fact that the rate of subscription, which is disclosed before the actual offer takes place, incorporates information previously available to investors, thus preventing variables embodying such information from attaining significance in pooled regressions. On the other hand, it is clear that the rate of subscription also contains information of its own and

cannot be withdrawn from the set of variables explaining IRs. The article shows that a system of seemingly unrelated equations is able to overcome this difficulty, showing, rather than hiding, variables which, at a given moment of the IPO process, significantly influence IRs through an increase or decrease in the rate of subscription. Namely, the article demonstrates that, besides the rate of subscription, the underwriter's reputation, the number of underwriters and the IPO's offered price may also change returns significantly upwards or downwards, in spite of the fact that, in pooled regressions, only the former shows up as a significant influence.

The article is organized as follows: Section II presents a review of the literature on IPO share allocation; Section III discusses the data and methodology used; Section IV reports empirical findings; and the conclusion section summarizes results.

II. Literature review

When explaining IPO underpricing, the asymmetric information model of Rock (1986) assumes the existence of two groups of investors, namely informed (large or institutional) and uninformed (small or individual). Rock asserts that new shares are underpriced in order to compensate uninformed investors for receiving a disproportionately large portion of overpriced offerings. Using proxies for informed demand, numerous studies have confirmed the adverse selection problem identified by Rock. Alternatively, Benveniste and Spindt (1989) develop a model of IPO pricing and allocation supposedly used by underwriters to induce informed investors to truthfully reveal their information. The expected profit for revealing truthful information consists of a trade-off between the level of IRs and the IPO allocation. Benveniste and Wilhelm (1990) further extend this model and demonstrate the importance of the market mechanism in understanding underpricing. Indeed, discriminatory IPO pricing and allocation could be used to extract private information from investors, but due to the regulatory requirement of uniform pricing (either in the US or in the UK offerings), most often discriminatory allocation is adopted by underwriters, especially in countries where allocation data is not publicly disclosed. To sum up, whether the adverse selection or information gathering is the dominant source of

underpricing, both theories predict that informed (large or institutional) investors capture a lion share of the more underpriced IPOs.

The US 'book-building' approach in marketing and selling IPOs gives underwriters considerable discretion over IPO allocation. The non-disclosure of allocation schemes allows underwriters to decide who will receive an allocation. Such flexibility allows them to extract valuable information from large investors but at the expense of small investors since large investors must be compensated with a sizable allocation of underpriced offerings. Drawing on a sample of IPOs managed by a single underwriter, Hanley and Wilhelm (1995) notice that approximately 70% of the underpriced offerings are allocated to institutional investors, allowing them to capture a large fraction of short-run profits associated with IPOs. This favoured status, nevertheless, carries a quid pro quo expectation that such favoured investors will participate equally in less attractive offerings. Enlarging the data set of the US offerings, Aggarwal, Prabhala, and Puri (2002) provide support for the existence of information-gathering activities by underwriters where institutional investors are rewarded with an increased allocation in other, more underpriced offerings. Such a level of institutional allocations, however, cannot be explained solely by the book-building theory itself. Similar results are reported by Levis (1990) and Cornelli and Goldreich (2001) when examining IPOs in the UK. Levis (1990) shows that large applicants stand a better chance of receiving new shares while Cornelli and Goldreich (2001) find that frequent investors such as institutional investors are favoured in IPO allocations. Keloharju (1993) examines IPOs in Finland and shows that uninformed investors obtain, in average, a larger allocation from overpriced than from underpriced offerings. Ljungqvist and Wilhelm (2002) analyse institutional allocation across a panel of countries, France, Germany, the UK and the US, and conclude that institutional investors are indeed rewarded with above-normal allocations in 'good' offerings.

In Asian primary markets, underwriters bringing IPOs to market follow a 'fixed-price' approach³ in which offer prices (OPs) are determined well in advance and new shares are allocated using

predefined, non-discretionary schemes. Underwriters are required to allocate shares evenly to investors within an application order size; but across different application sizes, uneven allocation is permitted. Thus, an IPO allocation is contingent on both the allotment ratio in an application and the size of an application. Koh and Walter (1989) examine allocation data from Singapore, finding a systematic preference for small investors in IPO allocations. However, when new offerings are divided into overpriced and underpriced, the chance of an allocation for small investors in overpriced offerings is more than three times that for large investors. Similar results are reported by Lee, Taylor, and Walter (1996) when examining a more recent sample of Singaporean new offerings. They notice that small investors have a higher chance of receiving shares in overpriced offerings as large investors are far less likely to apply for these. But when an offering is underpriced, then small investors' chance of receiving shares is small.

Many studies have been published on Hong Kong IPOs, but most of them do not contemplate IPO allocation, which requires the gathering of micro-level data, an onerous task. Studies which examine IPO allocation have been conducted by McGuinness (1993), Vong and Trigueiros (2009) and Cheng, Chan, and Mak (2005). McGuinness (1993), while examining the period 1980–1990, finds that the chance of receiving an allocation increases with application sizes, showing that investors, in order to secure an allocation, must apply for a relatively large application order. Moreover, for small investors, the chance of receiving an allocation in overpriced offerings is more than twice that observed in underpriced offerings. The allocation of oversubscribed offerings demonstrates a bias towards large investors. Based on a larger sample of IPOs during the period 1988–1995, consistent results are reported by Vong and Trigueiros (2009) although the difference reported by these authors in the chance of an allocation between overpriced and underpriced offerings to small investors is narrower than that reported by McGuinness (1993). Cheng, Chan, and Mak (2005) examine the period 1993–1997, introducing two measures of allotment ratios for small investors, and conclude that underwriters in IPO

³The variable offer pricing mechanism is becoming more common.

allocation prefer small to large investors due to reasons such as the lack of a trusting relationship with large investors and the non-existence of an effective mechanism to monitor block-trading activities.

III. Data and methodology

Data sources

A total of 324 companies were listed between 2002 and 2007 in Hong Kong as recorded in the fact books published by the Hong Kong Exchanges and Clearing Limited. The pre-listing characteristics of an IPO, such as the OP, offer size, subscription deadline, refund date,⁴ date when the allocation scheme is determined and date of listing, are collected from IPO prospectuses. IPO allocation schemes which detail the chance of receiving an allocation and the proportion of shares to be received are hand-collected from newspaper announcements. Given that IPO applicants are required to pay their subscription funds up-front, they incur financing charges or opportunity costs which will effectively reduce the actual IPO returns. The lending rate offered by banks⁵ is used as a proxy for this subscription cost. The listing-date closing prices of IPOs as well as the interest cost are retrieved from DataStream.

Methodology

Measurement of IRs

Following conventions, first-day returns (IR) are computed as the difference between the closing price on the first day of trading and the offering price, divided by the offering price. This IR is the real return only in cases where investors obtain the whole number of new shares applied for. In many cases, this is not so as the number of shares allocated to each investor depends on the SR of a new offering.⁶ When an offering is oversubscribed (a SR greater than 1), some rationing methods are applied and the expected rate of return, $E(\text{IR}_i^A)$, conditional on application order size, is

$$E(\text{IR}_i^A) = N_{r,i}^A \times (P_{c,i} - P_{o,i}) / N_i^A \times P_{o,i}, \quad (1)$$

where $E(\text{IR}_i^A)$ is the expected rate of return from an application of order size A in issue i ; $N_{r,i}^A$ is the

number of shares received from an application of order size A in issue i ; $P_{c,i}$ is the closing price on the first day of trading in issue i ; $P_{o,i}$ is the offering price of an issue i ; and N_i^A is the number of shares applied for in issue i .

IPO applicants in Hong Kong are required to pay their subscription funds upon the submission of applications, and these funds will be locked-up for 1 to 2 weeks without interest. Such a settlement mechanism imposes a certain cost on IPO applications which will effectively reduce IRs. For unsuccessful applicants, subscription funds will be refunded within a week, but for successful applicants wishing to cash out their position, more than 2 weeks may elapse before their allocation can be sold. The subscription cost therefore depends not only on the application size and daily interest rate but also on the number of days funds are tied up. The subscription costs (SC_i^A) for a particular application of order size A in issue i is thus

$$\text{SC}_i^A = (N_i^A - N_{r,i}^A)P_{o,i}[(1+r)^{t1,i} - 1] + N_{r,i}^A \times P_{o,i}[(1+r)^{t2,i} - 1], \quad (2)$$

where SC_i^A is the subscription cost for an application of order size A in issue i ; r is the Hong Kong and Shanghai Banking Corporation's best quoted lending rate (expressed as a daily rate); $t1,i$ is the number of days from the closing of applications for issue i to the date at which subscription funds are refunded to the applicant; and $t2,i$ is the number of days from the closing of applications for issue i to the first day of public trading. Other terms were previously defined.

After taking into account the IPO allocation as well as the cash settlement mechanism, the expected level of net returns from an application of order size A in issue i becomes

$$E(\text{NIR}_i^A) = N_{r,i}^A \times (P_{c,i} - P_{o,i}) - \text{SC}_i^A / N_i^A \times P_{o,i}. \quad (3)$$

Explanatory variables used in the prediction of IRs

In addition to analysing the IPO allocations across various application order sizes and their impact on

⁴The date at which a cheque in respect of a wholly or partially unsuccessful application is refunded.

⁵In order to minimize the difference between interests lost on saving and interest charged on bank loans, the prime rate (the rate charged to the most favoured customers) is used in the study.

⁶The subscription level is defined as the total number of shares applied for divided by the number of shares on sale in an IPO.

the corresponding level of IRs, the article also tests the plausibility of two popular explanations for the observed cross-sectional variation in IPO underpricing, namely the effect of the ex-ante uncertainty surrounding new offerings and the signalling effect of underwriters' reputation. According to Rock (1986), underpriced offerings attract informed investors' participation, the expected relation between SR, a proxy for the level of informed demand, and IR being thus positive. First used by Beatty and Ritter (1986), the relation between ex-ante uncertainty and underpricing has been well examined. In the present study, both offer size (SIZE) and OP are used to capture the riskiness of an offer. Offer size is gauged as the natural logarithm of funds raised. Since small offerings are, in average, more speculative than larger ones, their first-day returns may be higher (Ritter 1984; How and Low 1993; Vong 2006). Similarly, offerings with lower OP are assumed to be more risky and as such they should impact IRs positively (Ibbotson, Sindelar, and Ritter 1994; Booth and Chua 1996; Cheng, Chan, and Mak 2005; Vong and Trigueiros 2010).

In the extant literature, the impact of underwriters' characteristics on underpricing is assessed using different variables. Corwin and Schultz (2005) notice that offerings with more than one underwriter tend to be less underpriced as information gathering and price-setting activities are more efficient. Thus, the present study examines the effect of the number of underwriters of IPOs (WR_N) on underpricing. Following the extant literature, the article also examines two indicators involving the volume of business of underwriters, generally taken as proxies for their reputation: the market share of an underwriter as a percentage of the number of companies that have been taken public (WR_RP1) and the logarithm of the capital volume of underwritten IPOs (WR_RP2). It is verified, however, that these two variables are strongly correlated. Aside from underwriters' reputation, the certification role of auditors is also important in an IPO (Hogan 1997; Willenborg 1999). Therefore, two similar measures of reputation of auditors are also examined (AU_RP1 and AU_RP2). These two auditor reputation proxies, however, are almost synonymous. Lastly, a dummy variable (H_DUM) which accords a value of 1 for

shares issued in Hong Kong, known as 'H' shares, and 0 otherwise. This dummy controls for the origin of an IPO.

IV. Empirical results

IRs after considering the winner's curse and the settlement mechanism

For the new offerings under review (2002–2007), the article finds an average excess IR of 11.29%. This is the level earned by an investor who faces no rationing. But given the high rate of IPO subscription in Hong Kong, it is not uncommon for issuers to ration new shares. Rationing in turn reduces expectations of IRs. For the entire sample, a total of 303 rationing schemes were gathered. Before examining how shares are rationed across application order sizes, SRs are compared for under- and overpriced IPOs. Results are reported in Table 1. Except for the year 2003, SRs are in general higher for underpriced offerings. Yet, Rock (1986) asserted that underpriced offerings should be associated with higher SRs. The mean SR of underpriced offerings is 193.42, which is three times higher than that of overpriced ones (60.40), and a parametric *t*-test suggests that such difference is, when taken in isolation,⁷ statistically significant.

Having established a link between SRs and IRs, attention is now turned to the allotment schemes. Figure 1 displays the average allotment ratios (the number of shares distributed relative to the number of shares applied for in a particular application order size) for different application order sizes. As

Table 1. Average subscription rates (SR) of new offerings: 2002–2007.

	All IPOs (303)	Underpriced IPOs (216)	Overpriced IPOs (70)
2002	24.18	28.22	19.07
2003	86.3	80.96	130.74
2004	175.57	229.44	78.96
2005	88.71	135.51	11.74
2006	250.45	310.37	84.74
2007	224.18	242.39	79.51
Mean of period	153.75	193.42	60.40
St. Dev.	245.21	272.08	120.13
Min.	0.19	0.19	0.23
Max.	1703.00	1703.00	683.00

This table compares the subscription rate of under- and overpriced new offerings in Hong Kong from 2002 to 2007.

⁷Excluding multiple comparisons (Bonferroni) considerations.

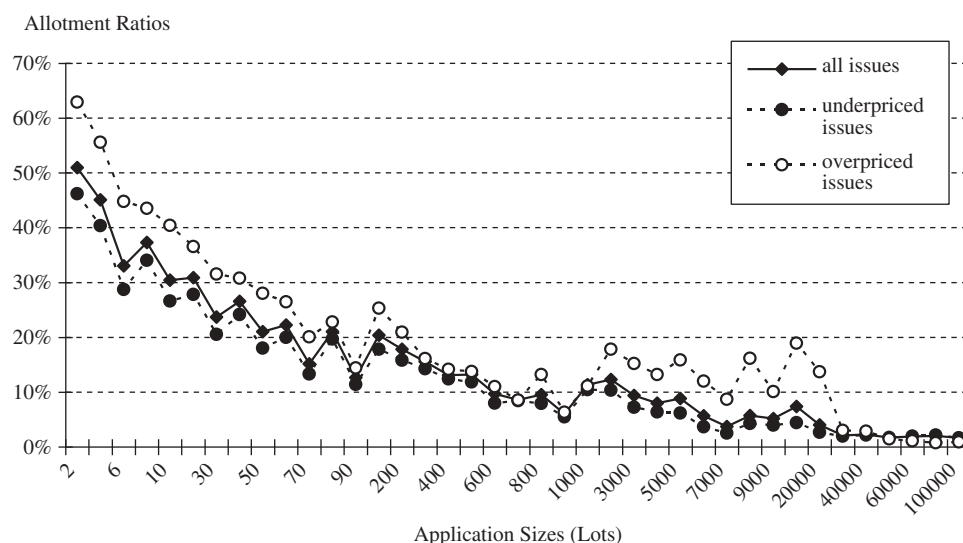


Figure 1. Allotment ratios (AR) for each application size.

observed, allotment ratios are higher for small-sized applications and decline as the size of an application increases. For an application of 2000 shares, an individual (small or uninformed) investor, on average, can receive 1000 shares (50.96%), while for an application of 100,000,000 shares, the allotment ratio is just 1.65%. A close examination of the allotment ratios shows three distinctive patterns. For application order sizes of less than 100,000 shares, allotment ratio fluctuates and decreases abruptly with the size of an application. For application order sizes from around 100,000 shares to 20,000,000 shares, the allotment ratio still drops with the size of an application but in a milder slope. Lastly, for application sizes of 30,000,000 shares onwards, the allotment ratio stabilizes and remains at approximately 2%.

Some earlier IPO studies claim that companies which go public tend to favour small investors so that more of their new shares are allotted to them. But when IPOs are divided into those with positive (underpriced) and negative (overpriced) returns, it is observed that small investors suffer from a winner's curse as they receive more of those overpriced offerings than large investors do. Interestingly, another group of investors, those applying for 2,000,000 to 20,000,000 shares, also suffers from the same winner's curse, being allocated a higher proportion of offerings with negative returns. Lastly, for application order sizes of 40,000,000 shares onwards, there is a reversion in the allocation pattern between overpriced and underpriced offerings, allotment ratios in underpriced offerings exceeding those in overpriced

ones. Such large investors are selective, participating only in offerings with clear signs of positive IRs.

Information provided by allotment ratios allows estimation of allocation-adjusted returns for each application order sizes. Such rate of return can be interpreted as the expected return earned after adjustment for Rock's winner's curse. Figure 2 reports expected IRs for application order sizes ranging from 2000 to 100,000,000. As expected, allocation-adjusted returns are now much lower than the average return of 11.29% reported for the period. Indeed, with the consideration of allotment ratios, returns range from 0.26% (for an application of 70,000,000 shares) to 3.19% (for 2000 shares). Results clearly show that small-sized applications (between 2000 and 20,000 shares) generate higher returns than those of other application sizes, and such differences, when taken in isolation, are also statistically significant. For application sizes exceeding 10,000,000 shares, a lower but significant return can be earned and, actually, with lessened variability.

In addition to the allocation bias, the cash settlement mechanism requiring subscription funds to be delivered up-front will again reduce the rate of IRs. In order to compute the interest incurred in by those subscription funds, the observed average number of days between an application closure and the public listing of shares is 8 (*t*2). As for refunded funds, the average number of days is 6 (*t*1). These lengths compare favourably to those reported by McGuinness (1993), Fung, Cheng, and Chan (2004) and Vong and Trigueiros (2009). As shown in

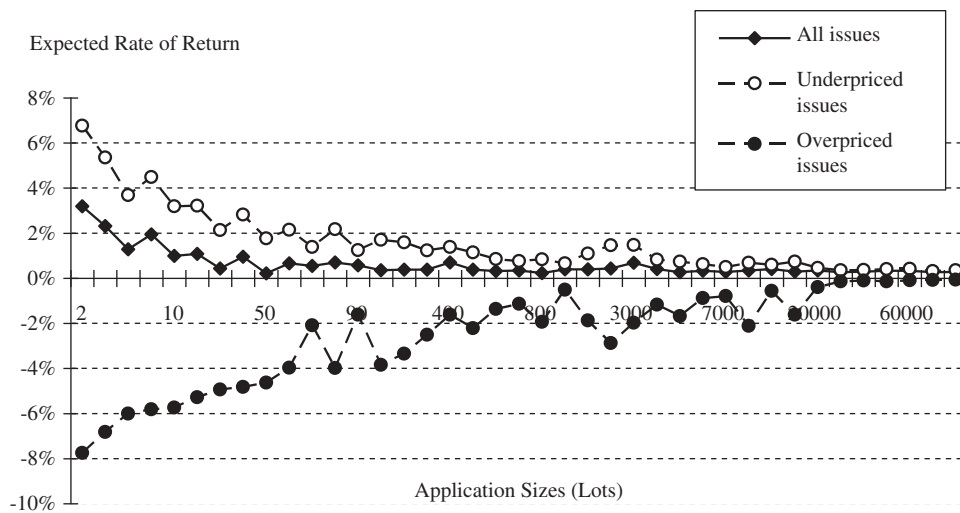


Figure 2. Expected rate of return $[E(IR_i^A)]$ for each application size.

Figure 3, the incorporation of both allotment ratios' expectation and settlement mechanism reduces returns. However, small investors (applications below 10,000 shares) can still earn returns which are significantly higher than those available for other investors. An application in excess of 20,000,000 shares may generate significant returns, but, when compared with small-sized applications, this return is smaller.

The effect of the 'Claw-Back' mechanism on IPO share allocation

When IPOs are divided in the four SR classes defined by the 'Claw-Back' provision, the resulting frequency distribution of IPOs is shown in Table 2.

The majority of new offerings belong to either the first class (offerings with SRs less than 15 times) or the fourth class (SR exceeding 100 times).

Figure 4 shows the pattern of allotment ratios for the four 'Claw-Back' classes. The patterns look similar except for the class with SRs less than 15 times, which fluctuates more than the others. In general, the allotment ratio decreases with the size of an application, and such decrease become flattened with an application in excess of 100,000 shares. The allotment ratios together with cost of the subscription funds paid upon submission of applications determine the expected net rate of return for each application size and for each group. Results from Table 3 show that the group with SR less than 15 times produces returns which are

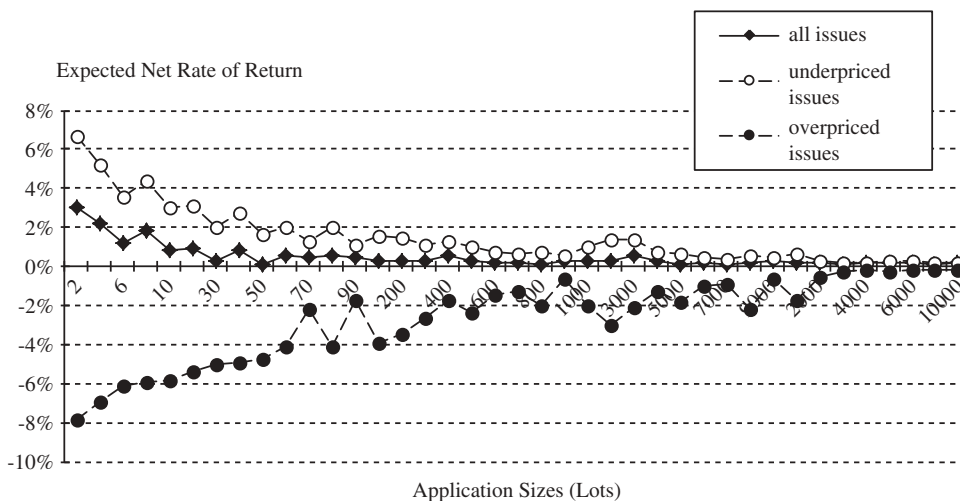


Figure 3. Expected net rate of return $[E(NIR_i^A)]$ for each application size.

Table 2. Frequencies of new offerings among the four 'Claw-Back' subscription rate classes.

	Subscription rate <15%	Subscription rate between 15% and 50%	Subscription rate between 50% and 100%	Subscription rate >100%
Number of offerings	107	52	27	117

Depending on its rate of subscription, each IPO is placed into a 'Claw-Back' class.

statistically non-significant, whereas the most significant returns (when taken individually) can be earned by investors subscribing for new offerings with SR greater than 100 times. For the latter group, an application size of 2000 shares is capable of generating an average IR of 6.59%. As for the other two groups (SR between 15 and 50 and SR between 50 and 100), some of the applications produce significant returns while the majority of the applications failed to do so.

Cross-sectional variation in underpricing

Before conducting hypotheses testing on relationships that may exist amongst set of variables discussed earlier, some summary statistics on those variables are provided in Table 4. The mean value of SR is 146.56 times, showing that IPOs are viewed as a good investment by investors. In addition, the maximum subscription is 1703 times while the minimum is only 0.19 times, suggesting that the demand for new offerings in Hong Kong varies substantially. The next variable, OP, ranges between HK\$0.18 and

HK\$84, but in fact, the majority of the new offerings (nearly 80%) is priced below HK\$3.00. As for the number of underwriters (WR_N) involved in an IPO, the majority of the new offerings is underwritten by not more than two underwriters although the maximum number of underwriters is five. Finally, the offering size of an IPO falls between HK\$11 million and HK\$124.947 million, while the mean value is HK\$3.033 million.

After summary statistics and before hypotheses testing, natural logarithms are applied to SR, OP and WR_N, variables which originally exhibit extremely high skewedness and kurtosis. Such deviations from normality, if not checked, might generate influential cases and heteroscedasticity in models. Also, the two highly correlated underwriter reputation proxies WR_RP1 and WR_RP2 are collapsed into one single variable via a principal components' rotation followed by the extraction of the first factor (WR_RP) explaining 97% of common variability. The same procedure is applied to the two auditor reputation proxies AU_RP1 and AU_RP2, and the extracted factor, AU_RP, explains 99% of common variability. The number of underwriters, WR_N, is not so strongly correlated with reputation proxies, and no attempt is made to merge its variability into WR_RP. WR_N is thus introduced in the analysis as a separate viewpoint on underwriters. Table 5 shows the correlation matrix of all variables used in predicting IPO IRs.

The methodology employed to test for the existence of significant relationships, namely between IRs and other variables, is a system of five 'seemingly

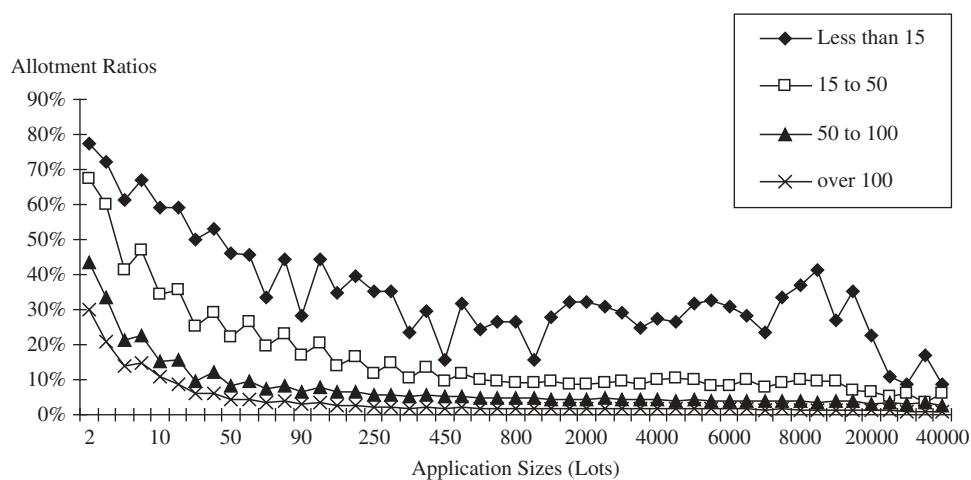
**Figure 4.** Allotment ratios (AR) of application sizes for the four groups of new offerings.

Table 3. Expected net rate of return $[E(NR_t^A)]$ across the range of application sizes for the four groups of offerings.

Application sizes (lots)	Expected net rate of return (%)			
	Subscription rate			
	Subscription rate <15	between 15 and 50	Subscription rate between 50 and 100	Subscription rate >100
2	-1.14	1.63	0.73	6.59*
4	-0.65	1.99	3.68	4.13*
6	-1.53	1.18	0.41	2.96*
8	0.32	1.83*	3.03	2.81*
10	-1.35	0.95	0.08	2.51*
20	-0.65	1.38*	2.54	1.79*
30	-1.22	0.59	0.23	1.27*
40	0.09	1.07*	1.88	1.16*
50	-1.28	0.49	0.08	0.88*
60	-0.37	1.10*	1.51	0.79*
70	0.05	0.45	0.11	0.67*
80	0.20	0.80*	1.28	0.68*
90	0.33	0.46	0.20	0.55*
100	-0.72	0.76*	1.13	0.60*
200	-0.22	0.53	0.93	0.41*
300	-0.14	0.61*	0.71	0.32*
400	1.15	0.50*	0.67	0.29*
500	0.07	0.41	0.55	0.26*
600	0.17	0.14	0.57	0.22*
700	-0.08	0.36	0.33	0.21*
800	-0.17	0.27	0.49	0.20*
900	0.32	0.26	0.43	0.19*
1000	0.45	0.25	0.45	0.20*
2000	0.58	0.28	0.55*	0.18*
3000	1.72	0.37	0.51*	0.16*
4000	0.40	0.34	0.50*	0.16*
5000	-0.37	0.35	0.56*	0.16*
6000	-0.13	0.18	0.55*	0.14*
7000	-1.85	0.20	0.48	0.16*
8000	-0.91	0.41	0.56*	0.18*
9000	1.24	0.08	0.58	0.18*
10,000	-0.16	0.08	0.48	0.19*
20,000	0.35	0.13	-0.01	0.15*
30,000	-0.04	0.10	-0.02	0.18*
40,000	-0.04	0.14	0.09	0.19*
50,000	N/A	0.47	0.00	0.20*
60,000	N/A	0.42	0.09	0.20
70,000	N/A	0.01	0.09	0.16
100,000	N/A	-0.13	0.12	0.21

This table shows the expected net rate of return $[E(NR_t^A)]$ across the range of application sizes for the four groups of new offerings. Each group has been classified according to the rate of subscription. 1 Lot = 1000 shares. *Significant at the 5% level.

unrelated' simultaneous equations⁸ where IRs, SR, number of underwriters (WR_N), reputation of underwriters (WR_RP) and reputation of auditors (AU_RP) are simultaneously explained by all the other variables. Dependent variables in one of the five equations are also used as independent variables in the other four equations. Simultaneity is required firstly because of the reverse causality that may exist, namely between initial returns, IR, the rate of subscription, SR, the offered price, OP, underwriters'

Table 4. Summary statistics of initial returns and some explanatory variables.

	Mean	SD	Minimum	Maximum
Initial returns (IRs)	0.113	0.262	-0.873	1.926
Subscription rate (SR)	146.56	240.65	0.19	1.703
Offer price (OP)	3.31	5.88	0.18	84
Number of underwriters (WR_N)	1.49	0.69	1.00	5.00
Offering size (mil)	3.033	10.130	11	124.947

This table shows the summary statistics of new offerings in Hong Kong from 2002 to 2007. IR is computed as the difference between the closing price on the first trading day and offering price divided by the offering price. SR is defined as the total number of shares applied for divided by the number of shares on sale in an IPO. Offer price (OP) is the offering price of an IPO. Number of underwriters (REP1) is defined as the number of underwriters in an IPO. Offering size is the proceeds from an IPO.

Table 5. Correlation matrix of variables used in modelling and hypotheses testing.

SR	0.44						
SIZE	0.25	0.40					
OP	0.15	0.32	0.78				
H_DUM	0.13	0.16	0.48	0.28			
WR_N	0.04	0.08	0.34	0.13	0.28		
WR_RP	0.17	0.25	0.67	0.53	0.35	0.46	
AU_RP	0.19	0.29	0.84	0.68	0.43	0.36	0.84
IR							
SR							
SIZE							
OP							
H_DUM							
WR_N							
WR_RP							

SIZE, OP and WR_N are logarithmic-transformed variables. WR_RP and AU_RP are the first principal components of pairs of underwriter reputation and auditor reputation proxies, respectively. All correlations are positive, denoting a common influence of size.

number, WR_N, reputation, WR_RP, or auditors' reputation AU_RP. Indeed, it may be argued that expectations on future IPO returns are likely to influence the choice of underwriters and their number, the choice of auditors and the offered price. The same reasoning applies to expectations on the rate of subscription. Simultaneity is also required because, importantly, the influence of variables such as OP, WR_N, WR_RP and AU_RP on IRs may not be directly observable. Indeed, such influence may be entirely absorbed into the rate of subscription, SR, which is known by investors in advance of the offer day. If this were so, then a pooled regression explaining IRs in terms of SR and all the other explanatory variables would be unable to unveil any direct link between such IRs and information which investors, in fact, use to place their orders. This would be so in spite of the fact that the influence of such explanatory variables on IRs might exist and be significant. One possible remedy might be to build a structural model contemplating two predicted variables, SR

⁸Many theoretical models require more than one equation. The disturbance terms of these equations are likely to be contemporaneously correlated because unconsidered factors that influence the disturbance term in one equation probably influence the disturbance terms in other equations too. Ignoring this contemporaneous correlation and estimating these equations separately lead to inefficient estimates of the coefficients. However, estimating all equations simultaneously with a generalized least squares estimator, which takes the covariance structure of the residuals into account, leads to efficient estimates. This estimation procedure is called 'seemingly unrelated regression' (Henningsen and Hamann, 2007).

and IR. But this would prevent the direct comparison with previously employed methodologies while not addressing all causality issues. The choice of a system of simultaneous equations is thus justified.

Besides the set of five simultaneous equations, five pooled OLS regressions are run, similarly explaining IR, SR, WR_N, WR_RP and AU_RP in terms of all other variables. OLS regressions are used here in order to correctly interpret results from the system of simultaneous equations. Table 6 compares coefficients, their significance and overall model significance of, respectively, pooled regressions and the system of seemingly unrelated simultaneous equations.

Results confirm that, while pooled OLS regressions explain IRs solely in terms of SR, all other independent variables being non-significant, the system of five simultaneous equations shows that, besides SR, the number of underwrites (WR_N) and their reputation (WR_RP) significantly explain IRs. OP is near significance at 6%. The signs of coefficients show that underwriter reputation tends to increase IRs while both the number of sponsors and OP reduce it in average.

For the remaining four equations, explaining SR, WR_N, WR_RP and AU_RP, results are strikingly similar in pooled and in simultaneous equations. WR_N emerges as a separate underwriter's feature with specific characteristics. By contrast, WR_RP and AU_RP share most of their characteristics. The signs of coefficients are consistent across the different roles assigned to variables.

Given such results, it is suggested that the influence of reputation and number of sponsors plus OP on IRs is hidden from direct scrutiny because the explanatory power of these three variables is absorbed into the previously known rate of subscription. Thus, a structural link may exist, where the rate of subscription is ex-ante significantly predicted by reputation, OP and other variables, but then, after subscriptions are entered and the allotment results are known, the rate of subscription becomes the sole ex-ante predictor of IRs, containing two types of variability: a large amount of variability of its own, strongly influencing IPO returns, plus variability imported from previous sources, some of which influence IPO returns. In summary, of all possible predictors, the two features of underwriters (WR_N and WR_RP) plus OP significantly influence IRs through the corresponding increases and decreases in SR, the rate of subscription, which is also an important source of variability of its own, able to explain IRs.

Previously published studies use pooled regressions to explain IPO's IRs, thus being unable to detect significant relationships anterior and concomitant to the disclosure of the IPO's SR. This article shows that, in order to evidence the whole exchange of information during IPOs, methodologies contemplating an appropriate structure are required.

As a proxy for informed demand, the rate of subscription is positively related to IPO IRs, suggesting that the new issue market displays considerable sensitivity to the expected level of underpricing since

Table 6. Pooled OLS regression results compared with simultaneous equations' results explaining initial returns, subscription rate and features' proxies.

Depend. Var.	IR		SR		WR_N		WR_RP		AU_RP	
	Pooled	Simultaneous	Pooled	Simultaneous	Pooled	Simultaneous	Pooled	Simultaneous	Pooled	Simultaneous
IR			2.880***	4.986***	-0.094	-0.175*	0.099	0.191*	-0.046	-0.089
SR	0.050***	0.086***			-0.005	-0.007	0.003	0.010	-0.014	-0.022*
SIZE	0.027	0.012	0.463***	0.410**	0.096***	0.140***	-0.089**	-0.222***	0.240***	0.225***
OP	-0.036	-0.042	0.147	0.213	-0.120***	-0.102**	0.024	0.043	0.046	-0.002
WR_N	-0.049	-0.091*	-0.142	-0.206			0.538***	0.853***	-0.266***	-0.581***
WR_RP	0.037	0.072*	0.069	0.215	0.388***	0.614***			0.679***	0.868***
AU_RP	-0.020	-0.039	-0.353	-0.558*	-0.224***	-0.488***	0.793***	1.013***		
H_DUM	0.012	0.023	-0.135	-0.116	0.109	0.113*	-0.044	-0.110	0.070	0.087
Constant	-0.442	-0.140	-5.996*	-4.709	-0.220	-0.344	-1.760**	0.774	-2.457***	-1.365**
Adj. R ²	0.190	0.109	0.272	0.204	0.344	0.274	0.798	0.755	0.870	0.853
F-stat.	11.570***		18.090***		24.920***		182.000***		306.600***	

The table compares results of pooled OLS cross-sectional regressions explaining initial returns (IR), subscription rate (SR), number of underwriters (WR_N), underwriter reputation (WR_RP) and auditor reputation (AU_RP), with results obtained from a system of seemingly unrelated simultaneous equations (simultaneous) where the same variables are explained by the other four predicted variables plus IPO size (SIZE), IPO offer price (OP) and type of share on offer (H_DUM). IRs refer to new offerings in Hong Kong during the period 2002–2007, computed as the difference between the closing price on the first trading day and offering price divided by the offering price.

*** depicts significance at the 0.1% level, ** at the 1% level, * at the 5% level and . depicts near-significance below the 10% level.

the demand for underpriced shares increases significantly. The finding of a positive, significant influence of underwriter reputation on the level of excess returns contrasts with earlier studies where reputation was found to reduce the level of underpricing (Titman and Trueman 1986; Migginson and Weiss 1991; Carter, Dark, and Singh 1998). Here it is shown that, while the number of underwriters indeed reduces the level of excess returns (Corwin and Schultz 2005), reputation increases it. It is therefore concluded that the more reputable an underwriter is, the higher the return's level of an IPO will be.

V. Conclusion

IPOs are a privileged test-bed for investigating information interactions between different parties involved in share issuance and trading in stock exchanges. If IPO studies are to some degree out-of-fashion nowadays, this is not because all questions have been answered. Far from that, many interesting questions remain unanswered. It is hoped that the article may act as an incentive to a renewed interest in IPO research.

It is speculated that authors shun this type of studies for three basic reasons. First, micro-level data collection tasks of the type required to perform IPO allocation studies are burdensome; thus, most authors avoid investigating allocation issues which, in turn, are vital for a thorough grasp on IPOs. Second, not all IPO devices employed by stock exchanges generate allocation data. Finally, IPO research is not as methodologically 'flat' as authors seem to suppose, namely requiring the consideration of structure and causality issues, which are out-of-reach of methodologies hitherto employed. This article firstly and decisively shows that micro-level data and a better-suited modelling methodology are required to unveil IPO features.

In doing so, the article also shows that, in Hong Kong IPOs, small investors are now being favoured and are allotted more IPO shares. Findings show that more shares from overpriced offerings are in fact distributed to small investors than to institutional investors. With the institution of the 'Claw-Back' mechanism, which entails a transfer of shares from the institutional tranche into public subscription, the chance of small

investors assessing a larger allocation of underpriced offerings has increased. Since the activation of this reallocation provision depends on the rate of subscription, small investors are induced to signal their private information through their demand behaviour. Such demand information helps IPO companies to properly price an offer and increases investors' chances and magnitude of an allocation. This explains why a lower level of underpricing is documented in the present study and is in fact consistent with the argument, put forward by Subrahmanyam and Titman (1999), that aggregating diverse investor information improves primary market efficiency. Rock's adverse selection model thus seems to be insufficient to explain the levels of underpricing found in Hong Kong.

Although the study documents a positive first-day excess return of 11.29%, the effect of rationing, a common feature in Asian IPO share allocations, reduces this figure to markedly lower values: expected returns range from 0.26% (for an application of 70,000,000 shares) to 3.19% (for 2000 shares). Small investors are able to capture a significantly higher level of returns in relation to large investors except for relatively large-size applications. IPO applicants applying for 400,000,000 shares or more obtain a smaller allocation and lower returns but the associated variability is lower too.

Finally, both the level of informed demand and underwriters' reputation are important predictors of underpricing. Such comprehensive picture is obtained when, instead of pooled OLS regressions, a system of simultaneous equations is used.

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