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9-4-2003

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Recommended Citation
Fung, Joseph K.W.; Cheng, Louis T. W.; and Chan, Kam C., "The Impact of the Costs of Subscription on Measured IPO Returns: The Case of Asia" (2003). *GFCB Working Paper Series.* Paper 2.
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JCR-v9

The Impact of the Costs of subscription on Measured IPO Returns: the Case of Asia

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Acknowledgements:

This research is supported by a grant from Hong Kong Baptist University and a departmental research grant from Hong Kong Polytechnic University (G-S 852). We are grateful to Ann Sherman for her valuable input to the research design and Castor Pang for his excellent research assistance. We also thank an anonymous referee and Jeffry Netter, the Editor, for their helpful comments. We are responsible for any remaining errors.

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Abstract

Asian initial public offerings (IPOs) require investors to pay subscription funds up-front upon submission of applications, and these funds are locked-up for one to three weeks without interest. Hence, the IPO process entails an explicit financing cost (opportunity cost) whether investors borrow funds or use their own funds to apply for IPO shares. The IPO subscription costs are not trivial, especially in a high interest rate environment or when an IPO is highly oversubscribed. These costs should be considered in any comparison of IPO returns across countries.

JEL classification: G3

***Keywords*: Initial public offerings; Asian IPOs; Non-discretionary allocation**

1. Introduction

There is considerable research on the underpricing of initial public offerings (IPOs). The level of underpricing is typically measured by the IPO listing-day return, that is, the rate of return in terms of the market price of the IPO on its listing-day compared to its subscription price. In a comprehensive study, Loughran, Ritter, and Rydqvist (1994) compare the first-day returns of IPOs for 25 countries and conclude that IPO underpricing is an international phenomenon. Among Asian IPOs, Hong Kong, Singapore, and Taiwan have average listing-day returns of 18%, 27%, and 45%, respectively. Ljungqvist and Wilhelm (2002) report average IPO underpricing of 16.5% in France, 40.2% in Germany, and 39.6% in the UK.

One major difference among Asian, US, and most European IPOs is the widespread adoption of a non-discretionary IPO allocation process among Asian underwriters.[1] Asian IPO subscription processes require investors to pay IPO subscription funds up-front. The funds are then locked-up (paying no interest) for a certain time until the IPO share allocation process is completed.

International comparisons of IPO underpricing that include Asian IPOs must account for this locked-up period in the share allocation process. If an Asian IPO is oversubscribed, any portion of funds not allocated to shares will be refunded at face value without interest to the applicants. It will take from one to three weeks from application for subscribers to receive these refund checks. Beyond any refund date, subscribers must wait until the listing day to cash in the successfully subscribed shares. This lengthy process entails significant financing costs or opportunity costs of funds for IPO bidders that effectively reduce the investors' actual IPO returns. There are also other costs associated with the IPO process. These costs include

[1] Chowdhry and Sherman (1996) provide an excellent comparison of US and Asian IPO processes.

commissions paid to underwriters and transaction costs to sell the IPO shares. Failure to incorporate the financing cost and other costs would result in overstatement of the listing-day IPO returns.

Generally, what we see as supernormally high listing-day IPO underpricing for Asian IPOs is partially offset by the financing and transaction costs. As interest rates, oversubscription rates, the IPO fund locked-up time, and transaction costs can vary substantially for IPO issues across countries, a simple comparison of IPO returns across countries may be biased. This bias can be economically significant.

The objective of this paper is to examine the effect of IPO subscription cost (including financing and transaction costs) on the underpricing of initial public offerings. We derive a formula to calculate an adjusted IPO return that explicitly incorporates the total cost of IPO subscription. We then use a sample of IPOs in Hong Kong to demonstrate application of the formula.

This article proceeds in the following manner. Section 2 explains the various cost components in the Asian IPO process and derives the formula. Section 3 provides an application of the formula. Section 4 summarizes the conclusions.

2. Calculation of IPO returns with various subscription costs

Basic Equation

We define the total IPO subscription cost of obtaining an IPO share as the all-in-cost of funds per share. The total subscription cost consists of the financing cost and the transaction costs involved in receiving the IPO shares and selling them on the first day.

We assume that the subscriber borrows P_s $(1 + f_1)$ from a bank (or withdraws that amount) on the application deadline to subscribe for one share, where P_s is the offer price of the IPO issue, and f_1 is the per dollar up-front exchange fee and handling charges. The investor sends in an application only at the last moment before the deadline for IPO application. Interest begins to accrue from the deadline for application, t_0. If the IPO offer is undersubscribed, the investor will receive one share before the listing day, t_2.

Assuming the investor sells the share immediately on the listing day, the sales proceeds will be available to the seller after two business days (most Asian countries adopt a t + 2 settlement). If the listing day falls on Monday, Tuesday, or Wednesday, money will be available two days later. If the listing day is on Thursday or Friday, however, money will be available four days later on the Monday or Tuesday following. For the purpose of the loan, interest will accrue only for another one or three days, depending on the issue day, because the borrower's debit balance will be immediately reduced at the time a check is deposited. Banks charge interest only on the overnight outstanding balance. For example, if the listing day is on Monday, and the shares are sold the same day, the seller will receive a check two business days afterward. When the check is deposited in the bank on Wednesday, the deposited amount can immediately offset the seller's outstanding balance with the bank, and the interest on the relevant loan will stop accumulating.

If the IPO is oversubscribed and the investor receives only a fraction (q) of a share of the IPO, the investor will receive a refund check on an intermediate day, say t_1 (where $t_0 < t_1 < t_2$), which is a few days after announcement of the IPO share distribution. The investor will receive an amount $(1 - q)$ P_s $(1 + f_1)$ that will be used to offset the (debit) balance or redeposit the money

in the bank. After the refund, interest will continue to accrue on the unrefunded portion of the money, which is the actual amount used to pay for the successfully subscribed share.

Accordingly, the all-in-cost of funds per share for a successful IPO application (with daily compound interest calculation) is:

$$C_{t_2+k} = \frac{1}{q}\left[P_s(1+f_1)\prod_{i=t_0}^{t_1-1}(1+\frac{r_i}{365}) - P_s(1+f_1)(1-q)\right]\prod_{j=t_1}^{t_2+k}(1+\frac{r_j}{365}) \qquad (1)$$

where

C_{t_2+k} = all-in-cost of funds per share of a successful subscription on the settlement day for the listing-day sales proceeds;

t_2 = listing or first trading day;

k = settlement delay due to the settlement conventions; k = 1 if t_2 is Monday, Tuesday, or Wednesday; and k = 3 if t_2 is Thursday or Friday;

q = overall percentage of successful applications;

P_s = offer price of the issue;

f_1 = total exchange and handling charges levied on the new issue;

t_1 = refund day, when excess funds and money from unsuccessful bids are refunded;

t_0 = deadline for application;

r_i *and* r_j = interest rates (local deposit rate or prime rate) for the ith and j^{th} day.

From Equation (1), the all-in-cost of funds per share successfully subscribed is positively related to: the interest rate level, transaction costs, time between the subscription day and the refund day, time between the listing day and the refund day, and the subscription rate. For example, if the subscription rate (1/q) is 100 times, the offering price (P_s) is HK$10, the total exchange and handling charges levied on the new issue (f_1) is 0.5%, the interest rates (both r_i,

and r_j) are steady at 10% (annually), and there are ten days for each of two periods (t_1 - 1 - t_0 and t_2 + k - t_1), the total IPO subscription cost is HK$12.84, which is 28.4% higher than the subscription price.

IPO return equation for IPOs with warrants

It is common for Asian IPOs issues to have warrants attached. The warrants are used as a sweetener to attract IPO subscribers. The equity and warrant package is called a unit IPO, or simply a unit.

Factoring in the possibility that an IPO has warrants attached, the total revenue from selling both the shares and the attached warrants (if any) on the first trading day is:

$$R_{t_2+k} = (P_{t_2} + \omega W_{t_2})(1 - f_2) \tag{2}$$

where

R_{t2+k} = total revenue from selling both IPO shares and attached warrants on the first trading day;

P_{t_2} = price of the stock on the listing day;

ω = number of warrant attached per share;

W_{t_2} = price of the warrant on the listing day;

f_2 = trading cost for selling the stock and the warrants.

Given Equations (1) and (2), the total return (ρ) after adjusting for the all-in-cost of funds, settlement delay, possible attachment of warrants, and the effect of overall stock market movements to the IPO can be written as:

$$\rho = \frac{R_{t_2+k} - C_{t_2+k}}{C_{t_2+k}} - \frac{I_{t_2} - I_{t_0}}{I_{t_0}} \tag{3}$$

where ρ is the market adjusted IPO return, and *I* stands for the level of a stock market index. Equation (3) yields the market-adjusted actual IPO returns explicitly incorporating total subscription cost. If interest rates equal zero, the return in Equation (3) would converge to the conventional IPO return measure.[2]

3. Illustrations using Hong Kong IPOs

To show the differences between conventional IPO returns and IPO returns adjusted for subscription costs, we examine a sample of 136 IPOs in Hong Kong between 1993 and 1995. The data set provides issuer characteristics including offer size, offer price, subscription deadline, date when distribution is determined, listing date, and refund date. The information is collected from local newspapers, the prospectus of the IPO, and various issues of the exchange fact books.

The listing-day closing prices of the new issue as well as various interest rates including local deposit rates and prime lending rates are retrieved from *Data Stream*. The daily local deposit rate is used as a proxy for the opportunity cost of funds for investors using their surplus cash reserves, and the prime lending rate is used as a proxy for the financing cost for investors who borrow funds to subscribe shares.

The exchange and handling charges, f_1, levied on the new issue are 1.03% of the value of shares applied for in Hong Kong. The total trading cost, f_2, consists of a brokerage commission

[2] IPO studies in the US typically do not include the cost of selling the shares purchased in the IPO (f_2) in the listing-day return calculations. We have two major reasons for incorporating this cost: 1) Asian IPOs have a less transparent cost structure, and 2) more smaller investors participate in the Asian IPO markets. In the US, IPO transaction costs are relatively transparent to investors. In Asian markets like Hong Kong, however, due to market practices of brokers and small investors' perceptions of IPOs as a gamble, the actual impact of various costs including the relatively high financing costs and the selling costs may not be fully understood. As many Asian IPO subscribers are small (uninformed) investors, we should incorporate all the costs in estimating the IPO returns for these markets. In addition, an objective of this study is to show that calculating IPO return in the conventional way

cost of 0.25% of the transaction value; stamp duty of 0.15%; transaction levy imposed by the stock exchange of 0.013%; transfer deed stamp duty of HK$5 per transfer deed; and a transfer fee of HK$2.5 per share certificate transferred. Hence, the total cost for selling the share is approximately 0.415% of the sale transaction value.[3] We use the Hang Seng Index to calculate the market return in Equation (3).

Table 1 shows the summary statistics for the three key variables in our IPO sample. The average total time from the deadline for IPO application to the listing day (t_2 - t_0) is 11.90 days. Compared to US IPOs, the time between listing day and subscription day is much longer in Hong Kong. For the refund period (t_1 - t_0), the average is 8.01 days for investors to collect a refund if their IPO subscriptions are unsuccessful. The average subscription rate (1/q) is 85.39 times and the median 1/q is 17.33 times. The large difference between mean and median 1/q is due to a number of hot IPOs in 1993 and 1994.

The results for the market-adjusted IPO returns (or underpricing levels) of the sample are reported in Table 2. Underpricing levels are calculated under three different interest rate assumptions: zero interest rate, deposit interest rate, and the prime lending interest rate.

The figures corresponding to a zero interest rate provide the conventional IPO returns after adjusting for actual transaction costs. The returns after factoring in the opportunity cost of funds using the deposit interest rate represent the IPO returns to subscribers who use their own

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overstates the genuine IPO return in Asia; we need to incorporate the cost of selling IPO shares. For a meaningful comparison of Asian and US IPOs, readers should deduct the cost of selling IPO shares in the US.

[3] When we compute transaction costs, it is more operational to use a percentage instead of the actual dollar amount. The HK$7.5 (less than US$1) fixed fee is small and we covert this into a percentage by an approximation. We take the actual price data from Hong Kong Shanghai and Banking Corporation (ticker symbol: HSBC; one of the most active stocks in Hong Kong). In early June 2002, HSBC was selling at around HK$94 per share. Each lot of HSBC includes 400 shares. Assuming that the IPO subscription requests 10 lots or 4,000 shares, the total amount invested will be HK$376,000 (HK$94 x 4,000). There is one share certificate transferred and one transfer deed done in this transaction. Thus, the cost is HK$7.5 (HK$2.5 plus HK$5), or 0.00199% (i.e., about 0.002%). Together with 0.25% commission, 0.15% stamp duty, and transaction levy of 0.013%, the total cost of selling the shares is approximately 0.415%.

funds. Finally, the returns after adjusting for the financing cost using the prime lending rate represent the return to subscribers who use borrowed funds. The financing cost is the highest under the prime lending rate, which also results in the lowest level of return or, the least IPO underpricing. Note that other cost components, such as commission costs and stock exchange fees, remain constant across the different financing cost scenarios.

The numbers of IPOs and the level of underpricing vary across of the total 136 IPOs between 1993 and 1995. In Table 2 Column (A), the mean IPO returns (without financing costs) range from 2.53% in 1995 to 39.10% in 1993. Over the three years, the mean IPO return is 19.47%. This mean return is close to the IPO mean return of 17.60% reported in McGuiness (1992) for IPOs in Hong Kong during the 1980 to 1990 period. In Column (B), the overall mean IPO return after adjusted using the deposit interest rate is 12.42%. After adjusted using the prime lending rate, the mean IPO return becomes 7.05% [Column (C)]. The differences in mean returns are 7.05 percentage points (Column A – Column B) and 12.42 percentage points (Column A – Column C). The overstatement of returns by the conventional IPO return calculations is substantial. Two sample t-tests in the last two columns of Table 2 suggest that the differences of 7.05% and 12.42% are statistically significant at the 10% and 1% levels.

4. Conclusion

Asian IPOs require investors to pay subscription funds up-front when they submit applications. Excess funds from unsuccessful applications are refunded at a later date and only at face value (without interest). Hence, the IPO process entails significant explicit financing costs (or opportunity costs) for investors who subscribe to an IPO. Given that IPO application funds are locked-up for one to three weeks, the total cost (both financing and transaction costs) of IPO

subscription can be substantial, especially in a high interest rate environment and when an IPO is highly oversubscribed.

We develop an IPO return calculation formula that accounts for the total IPO subscription cost. Application of the formula to a sample of Hong Kong IPOs shows that actual IPO returns are economically and statistically significant lower than the simple conventional IPO return measure would indicate. Our results demonstrate that researchers must be careful in comparing IPO returns across markets with different allocation mechanisms and with significant differences in transaction cost levels.

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Table 1. Hong Kong IPO subscription period, refund period, and subscription rates summary statistics

Total period ($t_2 - t_0$) is period from IPO application deadline to listing day. Refund period ($t_1 - t_0$) is period between IPO application deadline to the refund day for unsuccessful IPO application. q is calculated as the total IPO shares allocated to the public divided by total number of shares subscribed.

		Total period ($t_2 - t_0$) days			Refund period ($t_1 - t_0$) days			1/q		
	N	Mean (days)	Std dev (days)	Median (days)	Mean (days)	Std dev (days)	Median (days)	Mean (times)	Std dev (times)	Median (times)
Full sample	136	11.90	2.56	12	8.01	10.21	7	85.39	141.26	17.33
1993	62	11.92	2.18	12	7.06	1.35	7	134.19	161.17	82.49
1994	50	12.48	2.75	13	9.80	16.68	7	62.66	126.42	5.64
1995	24	10.67	2.73	11	6.75	1.75	7	6.67	13.13	2.42

Table 2. Hong Kong IPO returns with market adjustment by year

This table presents the IPO return calculations under different financing costs assumption in Equation (3).

$$\rho = \frac{R_{t_2+k} - C_{t_2+k}}{C_{t_2+k}} - \frac{I_{t_2} - I_{t_0}}{I_{t_0}} \qquad (3)$$

where

$$C_{t_2+k} = \frac{1}{q}\left[P_s(1+f_1)\prod_{i=t_0}^{t_1-1}\left(1+\frac{r_i}{365}\right) - P_s(1+f_1)(1-q)\right]\prod_{j=t_1}^{t_2+k}\left(1+\frac{r_j}{365}\right) \qquad (1)$$

$$R_{t_2+k} = (P_{t_2} + \omega W_{t_2})(1-f_2) \qquad (2)$$

		Conventional IPO return (f_1, r_i, and r_j all equal to zero in Equation (3))			IPO return in Equation (3) using bank deposit rate in all-in-cost calculation in Equation (1)			IPO return in Equation (3) using prime rate in all-in-cost calculation in Equation (1)			t-test for equal means [columns (A) – (B)]	t-test for equal means [columns (A) – (C)]
	N	Mean % (A)	Std dev %	Median %	Mean % (B)	Std dev %	Median %	Mean % (C)	Std dev %	Median %		
Total	136	19.47	34.14	10.98	12.42	25.14	8.30	7.05	21.45	2.66	1.94*	3.59***
1993	62	39.10	38.31	28.53	27.72	27.54	20.56	19.08	24.29	15.85	1.90*	3.42***
1994	50	3.25	20.68	-0.08	-1.44	13.85	-0.87	-5.10	11.28	-3.94	1.33	5.03***
1995	24	2.53	11.26	0.42	1.75	11.02	-0.09	1.26	10.96	-0.52	0.24	0.56

* Significant at 0.1 level.
*** Significant at 0.01 level.