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Short Selling, Floating Constraints, and Cross-Listed Stock Prices

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Abstract

We investigate the joint effects of short selling, floating constraints, and heterogeneous beliefs on stock prices by using a unique data set of cross-listed Chinese stocks. Because domestic A-shares are subject to both short selling and floating restrictions whereas foreign H-shares are not, an H-share price discount represents a price bubble induced by trading restrictions. The H-share price discounts are significantly and positively correlated with short-sale transactions of H-shares and negatively correlated with the non-tradable A-share reform variable, after controlling for market-specific sentiment and other factors. Furthermore, we find that short selling significantly widens the price discounts in bullish but not in bearish market periods, and in market return up days but not in down days. Finally, we find that lagged short-selling activities have predictive power for future H-share price discounts.

Keywords: Short-Sale Constraints, Floating Restrictions, Heterogeneous Beliefs, Sentiment, Cross Listing.
CLC codes: F83, F832

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I. Introduction

Restrictions on both short selling and floating have great impact on stock prices. Miller (1977) argues that in a market with divergent opinions, the marginal buyer of over-valued shares tends to be an optimist. Thus, short-selling constraints lead to an upward bias in stock prices, as the transmission of negative information can be delayed. Chen *et al*. (2002) and Scheinkman and Xiong (2003) show that limitations on the ability of arbitrageurs to short over-valued shares will induce a speculative component in the stock prices. Following the insights of Miller (1977), Hong *et al*. (2006) show that in a model with heterogeneous beliefs and short-sale restrictions, trade of stocks with limited float will induce a price bubble whose size depends on float.

But empirically it is quite complicated to test directly whether in fact a bubble in stock prices induced by trading restrictions exists owing to the difficulties in measuring the fundamental value of stocks (e.g. Mei *et al*., 2005). Many studies identify the price impact either between stocks with or without trading restrictions, or for same stocks before and after the removal of the restrictions (e.g. Diamond and Verrecchia, 1987; Deechow *et al*., 2001; Jones and Lamont, 2002; Greenwood, 2009).

In this paper, we examine the joint effects of short selling, floating constraints, and heterogeneous beliefs on stock prices by using a unique data set of cross-listed Chinese A- and H-shares. A-shares are domestic shares traded in mainland China's stock markets (Shanghai or Shenzhen). H-shares are issued by mainland Chinese firms but listed and traded on a "foreign" exchange, namely the Hong Kong Exchanges and Clearing Ltd (HKEx). Although both A- and H-shares have identical rights, between 1999 and 2007 H-shares enjoyed a 48.1 per cent discount relative to A-shares. This huge price disparity persists, although it can change dramatically and tends to decrease over time. We hypothesise that when investors have heterogeneous beliefs about share prices, the huge H-share price discount will reflect a speculative component induced by trading restrictions in share prices, in addition to market-specific sentiment, liquidity, and risk preference differences between the A- and H-share markets. Specifically, the speculative motive of relatively optimistic domestic A-share investors will induce a more significant speculative component in the A-share than in the H-share price, and this speculative component will correlate positively to short selling and the floating constraints on A-shares.

Our study builds on previous studies regarding the formation of speculative bubbles resulting from the combined effects of heterogeneous beliefs, short-sale constraints, and floating restrictions, as well as on studies regarding the price differentials of twin stocks resulting from market-specific sentiment, liquidity, and risk preference differences (e.g. Eun and Janakiramanan, 1986; Hasbrouck, 1995; Froot and Dabora, 1999; Kim *et al*., 2000).

There are many reasons for choosing the cross-listed Chinese A- and H-shares for this study. First, short sales are allowed in Hong Kong but prohibited in mainland China; thus, H-shares can be sold short but A-shares cannot. Unlike most previous studies, we investigate the price impact of short selling on cross-listed shares. Because arbitrageurs have no way of shorting over-valued A-shares, A-share prices tend to reflect the beliefs of optimistic A-share investors, especially when the market is bullish. On the other hand, because they can short over-valued H-shares in Hong Kong, H-shares prices reflect the opinions of both optimistic and pessimistic investors and tend to be closer to a firm's fundamentals. Since the twin stocks have the same financial fundamentals and rights and are traded at the same time, this provides a great opportunity to examine directly the effect of short-sale constraints on stock prices. Our empirical findings will be less subject to either cross-sectional differences between different stocks or dynamic differences in the same stock resulting from changes in fundamentals or market conditions.

Second, in addition to the publicly tradable A- and H-shares (or B-shares), a typical listed Chinese firm holds a substantial portion of non-transferable shares in the form of state-owned shares, legal person shares, and employee shares. All non-tradable shares are domestic A-shares. Floating restrictions on A-shares contribute to higher prices and volatility in the domestic stock market. During the sample period, the China Securities Regulatory Commission (CSRC) implemented the "split-share structure reform" to convert all non-tradable A-shares to publicly tradable shares. After the restrictions on non-floating shares were removed, the price bubbles burst and the H-share price discounts declined. Thus, the differences in share structures of the domestic A- and foreign H-shares, together with the split-share structure reform during the sample period, provide a unique opportunity to investigate the effect of floating restrictions on cross-listed stock prices.

Third, the market environments of the A- and H-shares are quite different. The HKEx is dominated by institutional investors, is more open and better established than the A-share market, and has a variety of equity derivative products. A recent survey by the HKEx Ltd (2007) indicates that institutional investors dominate the HKEx and contributed 68.7 per cent of the total market trading value between October 2006 and September 2007. Overseas participation originally came primarily from the US and the UK. Additionally, overseas institutional and individual trading accounts for 39.3 per cent and 3.8 per cent of the total market trading value, respectively. On the other hand, the A-share market is dominated by retail investors, is less developed than its counterpart, and has a relatively short history and few equity derivatives.[1] More recent studies emphasise the joint effect of short-sale constraints and heterogeneous beliefs on

[1] For more detailed information regarding the financial derivative markets in mainland China and Hong Kong, please see Wang *et al*. (2009).

stock prices (Boehme *et al*., 2006; Berkman *et al*., 2009), and suggest that significant overvaluation of stocks occurs when both short-sale constraints and differences of opinion exist simultaneously. The different market environments and investor structures enable us to reasonably assume that A-share prices are more likely to be influenced than H-share prices by disagreements over stock valuation among investors and, in turn, more intense speculative trading.

Consistent with our main hypothesis, we find that H-share price discounts are significantly and positively correlated with the short-selling to total-trading volume ratio of H-shares, negatively correlated with the split-share reform variable of A-shares, and significantly correlated with market-specific sentiment variables, after controlling for liquidity, risk preference differences, and exchange-rate risks. Moreover, we postulate that because the price bubble induced by trading constraints tends to be larger in up days (and bullish market periods) than in down days (and bearish market periods), short selling on H-shares tends to be more informative and has a larger downward impact on H-share prices, in turn enlarging the A-H share-price differentials. In addition, the price impact of short selling in down markets is further weakened by the uptick rule imposed in short-sale transactions. Consistent with our postulation, we find that short selling significantly widens the price discounts in market return up days but not in down days, and in bullish market periods but not in bearish market periods. Given that during the current global financial crisis many countries are intending to re-impose short-sale constraints and uptick rules, our finding here suggests that imposing these trading constraints will influence stock prices by delaying the price discovery process in the short run, but have a negative impact on the long-run stability of the financial markets.[2]

Our study also contributes to the international finance literature in terms of understanding the price differences between cross-listed shares. Previous studies attribute foreign share premiums to cross-market differences in liquidity, the risk preferences of investors (Eun and Janakiramanan, 1986), foreign exchange risks (Kim *et al*., 2000), information asymmetry (Chakravarty *et al*., 1998), market-specific sentiment, and noise trader risk (Froot and Dabora, 1999; Scruggs, 2007). We provide empirical evidence that short selling and floating constraints contribute to the price differentials between cross-traded twin stocks.

The paper is organised as follows: Section II introduces the institutional background and presents basic data analysis, Section III provides the empirical results, and Section IV gives the conclusion.

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[2] In the US, to stabilise stock prices, especially those of financial companies, the SEC banned all short selling in financial companies between 20 September and 2 October 2008. Although in a very short period the prices of financial companies went up, they declined even further after short selling in financial companies was allowed again. Another new development in the US market is that on 9 April 2009, the SEC approved the release of five proposals for reinstating the uptick rule.

II. Institutional Background and Basic Data Analysis

2.1 H-share price discounts

We use daily prices, dividend payments, trading volumes, and bid-ask spreads data for all firms issuing both H- and A-shares prior to 31 December 2006 on the HKEx and the Shanghai Stock Exchange (SHSE) or Shenzhen Stock Exchange (SZSE). The sample period starts on the listing date of either the A- or H-shares of each firm, whichever was later, and ends on 31 December 2007. We obtain the trading and share structure data from *DataStream, Bloomberg*, and the CSRC. By the end of 2007, there were 37 pairs of cross-listed A- and H-shares. Table 1 reports the share structure of these sample firms. Over the sample period, publicly tradable A- and H-shares accounted for 14.4 per cent and 30.0 per cent of total number of shares outstanding, respectively, while the non-tradable government and legal person shares accounted for 49.1 per cent and 6.4 per cent, respectively. Because the trade of stocks with limited float will induce a price bubble, obviously the sheer magnitude of non-tradable shares will substantially reduce the free float of the Chinese stock market and have a significant effect on the pricing of Chinese stocks. The percentage of tradable A-shares increased from 11.2 per cent in the first sub-sample period to 16 per cent in the last sub-sample period (1 May 2005 to 31 December 2007), owing mainly to the non-tradable share reform which began in May 2005.

Contrary to the evidence that shares offered to foreign investors trade at a premium relative to shares offered to domestic investors, Bailey (1994) finds that foreign B-shares trade at a discount relative to domestic A-shares in mainland China's equity markets. Using early data up to 28 September 2001, Wang and Jiang (2004) document a large H-share price discount relative to A-shares and find this discount to correlate with market-specific sentiment, relative market illiquidity, and expectation of exchange rate changes. Arquette *et al*. (2008) further confirm that the price discounts of cross-traded American Depositary Receipts (ADRs) and H-shares can be partly explained by investor sentiment and exchange rate expectation.

We define the H-share price discount (or A-share premium) as follows:

$$PD_{it} \equiv \frac{P_{A,it} - P_{H,it} FX_t}{P_{A,it}} ,$$

where $P_{A,it}$ and $P_{H,it}$ are firm i's A- and H-share's closing prices at time t, priced in renminbi (RMB) and Hong Kong dollars, respectively. We adjust the prices for dividend payments. FX_t is the exchange rate between the Chinese renminbi and the Hong Kong dollar.

Table 1 Share Structure of Cross-listed A- and H-Shares

Firm Name	H-Share Code	Listing Date	A-Share Code	Listing Date	Total Shares	State Shares (%)	Legal Person (%)	A Shares (%)	H Shares (%)
Northeast Electric Development	42	07/06/95	000585	12/13/95	873	0.0	25.6	44.8	29.5
Tsingtao Brewery	168	07/15/93	600600	08/27/93	1,308	30.6	1.3	18.0	50.1
Jiangsu Expressway	177	06/27/97	600377	01/16/01	5,038	66.1	2.7	6.9	24.3
Beiren Printing Machinery	187	08/06/93	600860	05/06/94	422	47.8	0.0	28.5	23.7
Shenji Group Kunming Machine Tool	300	12/07/93	600806	01/03/94	425	36.2	6.2	31.1	26.5
Guangzhou Shipyard International	317	08/06/93	600685	10/28/93	495	35.7	0.0	32.5	31.8
Maanshan Iron & Steel	323	11/03/93	600808	01/06/94	6,759	56.7	0.0	17.7	25.6
Sinopec Shanghai Petrochemical	338	7/26/93	600688	11/08/93	7,200	55.6	2.1	10.0	32.4
Angang Steel	347	07/24/97	000898	12/25/97	7,235	67.3	0.0	17.7	15.0
Jingwei Textile Machinery	350	02/02/96	000666	12/10/96	604	32.4	0.0	37.7	29.9
Jiangxi Copper	358	06/12/97	600362	01/11/02	3,023	44.8	0.0	9.3	45.9
China Petroleum & Chemical	386	10/19/00	600028	08/08/01	86,702	70.8	0.0	9.8	19.4
Guangshen Railway	525	05/14/96	601333	12/22/06	7,084	41.0	0.0	38.8	20.2
Shenzhen Expressway	548	03/12/97	600548	12/25/01	2,181	55.7	0.0	10.0	34.3
Nanjing Panda Electronic	553	05/02/96	600775	11/18/96	655	51.1	0.0	12.0	36.9
Beijing North Star	588	05/14/97	601588	10/16/06	3,367	34.5	0.0	44.5	21.0
China Eastern Airlines	670	02/05/97	600115	11/05/97	4,867	59.7	0.0	8.1	32.2

Table 1 Share Structure of Cross-listed A- and H-Shares *(continued)*

Firm Name	H-Share Code	Listing Date	A-Share Code	Listing Date	Total Shares	State Shares (%)	Legal Person (%)	A Shares (%)	H Shares (%)
Shandong Xinhua Pharmaceutical	719	02/31/96	000756	08/06/97	457	41.1	0.0	26.1	32.8
Air China	753	12/15/04	601111	08/18/06	12,251	50.7	0.0	13.4	36.0
ZTE	763	12/09/04	000063	11/18/97	960	32.5	0.0	50.8	16.7
Guangzhou Pharmaceutical	874	10/30/97	600332	02/06/01	811	52.8	0.0	20.1	27.1
Huaneng Power International	902	01/21/98	600011	12/06/01	12,055	51.7	0.0	23.0	25.3
Anhui Conch Cement	914	10/21/97	600585	02/07/02	1,566	37.2	18.4	16.8	27.7
Hisense Kelon Electrical	921	07/23/96	000921	07/13/99	992	0.0	31.7	22.0	46.3
Datang International Power Generation	991	03/21/97	601991	12/20/06	11,729	34.5	0.0	37.6	27.8
Anhui Expressway	995	11/13/96	600012	01/07/03	1,659	42.2	0.0	28.1	29.7
Sinopec Yizheng Chemical Fibre	1033	03/29/94	600871	04/11/95	4,000	0.0	60.0	5.0	35.0
China Southern Airlines	1055	07/31/97	600029	07/25/03	4,374	50.3	0.0	22.9	26.8
Tianjin Capital Environmental Protection	1065	05/17/94	600874	06/30/95	1,427	51.2	0.0	25.0	23.8
Huadian Power International	1071	06/30/99	600027	02/03/05	6,021	57.3	0.0	18.9	23.8
Dongfang Electrical Machinery	1072	06/06/94	600875	10/18/95	817	67.1	0.0	12.1	20.8
Luoyang Glass	1108	07/08/94	600876	10/31/95	500	35.8	0.0	14.2	50.0
China Shipping Development	1138	11/11/94	600026	05/23/02	3,405	46.4	0.0	15.6	38.1
Yanzhou Coal Mining	1171	04/01/98	600188	07/01/98	4,918	52.9	0.0	7.3	39.8

Table 1 Share Structure of Cross-listed A- and H-Shares *(continued)*

Firm Name	H-Share Code	Listing Date	A-Share Code	Listing Date	Total Shares	State Shares (%)	Legal Person (%)	A Shares (%)	H Shares (%)
Industrial and Commercial Bank of China	1398	12/31/06	601398	10/27/06	334,019	71.5	0.0	3.6	24.9
China Merchants Bank	3968	09/22/06	600036	04/09/02	14,705	48.0	1.8	32.0	18.1
Bank of China	3988	06/01/06	601988	07/05/06	253,839	68.0	0.0	2.1	29.9
Average	**# of Stocks**				**Total Shares**	**State Shares (%)**	**Legal Person (%)**	**A-Shares (%)**	**H-Shares (%)**
Whole Sample Period	37				21,543.0	49.1	6.4	14.4	30.0
Sub-period I: 01/01/1999 – 30/11/2002	26				5,536.8	46.5	10.1	11.2	32.2
Sub-period II: 01/12/2002 – 30/04/2005	30				5,352.2	49.9	5.5	13.6	31.0
Sub-period III: 01/05/2005 – 31/12/2007	37				21,685.7	48.5	5.3	16.0	30.1

Note: This table reports the share structure of the 37 sample firms by the end of December 2007. *Total Shares* is the total number of shares outstanding; *State Shares* is the number of state shares; *Legal Person* is the number of non-tradable legal person shares; *A-shares* and *H-shares* are the number of tradable A- and tradable H-shares, respectively. Number of shares is in million shares. % is the percentage of different shares to the total number of shares outstanding. The last four rows repost the average percentages of different shares to the total number of shares outstanding for all sample firms for the whole sample and three sub-sample periods, respectively.

Table 2 Basic Statistics of the Cross-listed Sample A-and H-shares

	Whole Period	Sub-period I	Sub-period II	Sub-period III
	Mean	Mean	Mean	Mean
EW A-share Price	9.1606	7.6476	6.5977	10.4361
EW H-share Price	5.0366	1.4380	3.2504	7.2086
H-share Price Discount (*PD*)	0.4807**	0.7863**	0.5152**	0.3339**
Changes in H-share Discount (ΔPD)	-0.0001	-0.0003**	-0.0008**	0.0002
Hang Seng Index Return (*HK*)	0.0006	-0.0004	0.0004	0.0010
Shanghai Stock Index Return (*SH*)	0.0012	-0.0004	-0.0004	0.0023
Shenzhen Stock Index Return (*SZ*)	0.0013	-0.0004	-0.0006	0.0026
Short-Selling Ratio (*SSR*)	0.0312	0.0059	0.0191	0.0412
A-share Turnover	0.0267	0.0202	0.0156	0.0334
H-share Turnover	0.0106	0.0098	0.0107	0.0104
Turnover Ratio ($TR_{A/H}$)	0.0161	0.0104	0.0049	0.0230
A-share Bid-Ask Spread (SPR_A)	0.0151	0.0144	0.0151	0.0159
H-share Bid-Ask Spread (SPR_H)	0.0304	0.0202	0.0282	0.0404
Spread Differential (SPR_{A-H})	-0.0160	-0.0070	-0.0149	-0.0244
$Range_A$	0.1140	0.1035	0.1050	0.1237
$Range_H$	0.1156	0.1243	0.1110	0.1130
Relative Risk Aversion ($RRA_{A/H}$)	1.0673	0.9206	1.0226	1.1695
RMB/US$	8.0372	8.2804	8.2815	7.8452
RMB/HK$	1.0319	1.0627	1.0631	1.0079
Pairs of A- and H-Shares	37	26	30	37

Note: This table presents the basic statistics of the cross-listed sample stocks and related market indexes. ΔPD is the H-share price discount; SH_t (SZ_t) and HK_t are the Shanghai (Shenzhen) stock exchange composite index returns and the Hang Seng Index returns, respectively; SSR is the short-selling volume to trading volume ratio of H-shares. $TR_{A/H} = \log(1 + turnover_{A,it}) - \log(1 + turnover_{H,it})$, is the relative turnover ratio between A- and H-shares. SPR_t is the bid-ask spread difference between A- and H-shares; $RRA_{A/H}$ is the relative risk aversion measure between A- and H-share investors; RMB/US$ and RMB/HK$ are the exchange rates. **, *, and † indicate significance of the *t*-test statistics at the 1%, 5%, and 10% significance levels, respectively.

For the 37 pairs of the sample A- and H-shares over the nine-year sample period, we have more than 46,000 firm-day observations. Table 2 reports the basic statistics for the 37 firms' dual-listed H- and A-share stocks. Over the whole sample period, A-shares have higher prices than H-shares. For example, the averages of the equally weighted A-share and H-share prices are RMB9.16 and RMB5.04, respectively. On average, H-shares enjoy a 48.07 per cent discount relative to A-shares. These results are consistent with the arguments of Hong *et al*. (2006) that in a market with heterogeneous beliefs and short-sale restrictions, trade of stocks with limited float will have higher prices.

To investigate the dynamic behaviour of the H-share price discount, we plot in Figures 1 and 2 the equal-weighted H-share price discount series (*PD*) and the first-differenced series (ΔPD) of the sample stocks over the sample period, respectively. The level of the average H-share price discounts starts at about 85 per cent in January 1999, fluctuates, and then decreases slowly to about 70 per cent in late 2002. It then drops dramatically to about 20 per cent in mid-2005. After that, it fluctuates and eventually bounces up to about 50 per cent by the end of 2007, when the market becomes overheated.

Figure 1 Equal Weighted A-H Share-Price Differentials (1 January 1999 – 31 December 2007)

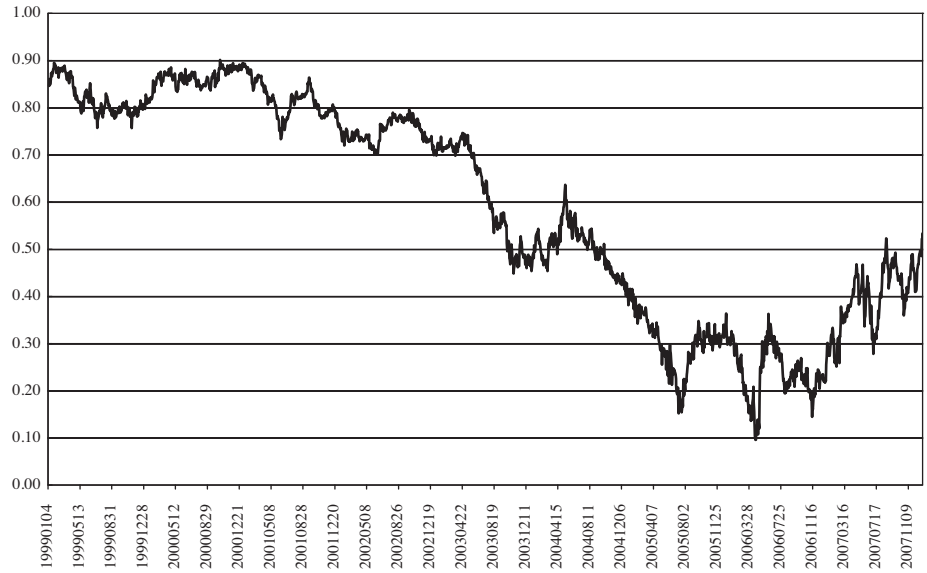
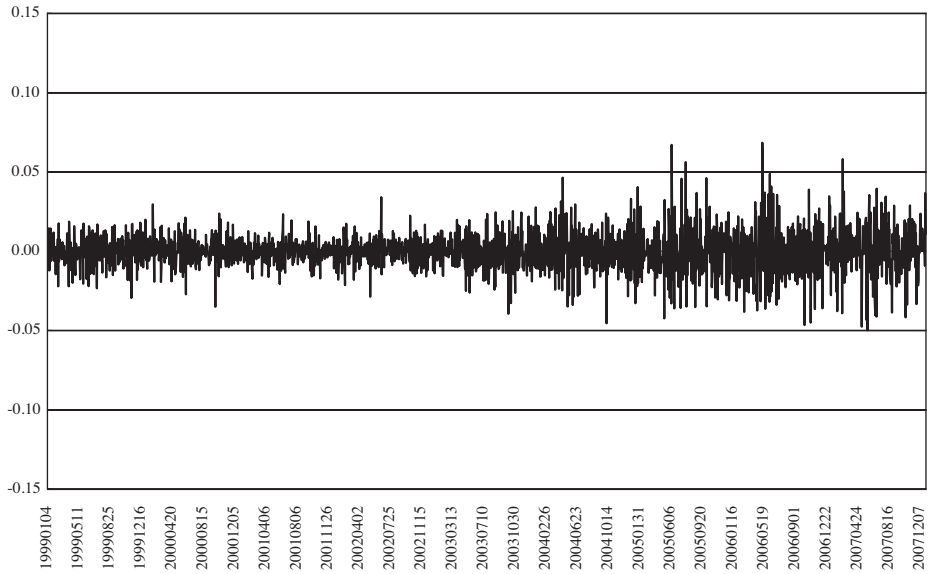


Figure 2 First-Differenced Series of A-H Share-Price Differentials (1 January 1999 – 31 December 2007)



Many studies find that stock price series tend to have a unit root. In this study, we also find that the H-share price discount series (PD_{it}) are non-stationary, while their first differenced series (ΔPD_{it}) are stationary, as shown by Figures 1 and 2 and the Augmented Dicky-Fuller (ADF) unit-root test results in Table 3. Therefore, throughout the paper, we use ΔPD_{it}, which represents changes in the H-share price discounts, in all regressions.[3]

Table 3 Unit Root Test of the H-share Price Discount Series Using Augmented Dicky-Fuller Regression (ADF)

$$\Delta\chi_t = \mu + \alpha\chi_{t-1} + \sum_{i=1}^{k} w_i \Delta\chi_{t-i} + e_t$$

Firm Name	H-share Code	*PD*	Δ*PD*
		τ(α)	τ(α)
Northeast Electric Development	42	-2.359	-32.484**
Tsingtao Brewery	168	-1.635	-35.655**
Jiangsu Expressway	177	-1.374	-30.389**
Beiren Printing Machinery	187	-1.972	-30.617**
Shenji Group Kunming Machine Tool	300	-1.991	-21.429**
Guangzhou Shipyard International	317	-1.761	-32.886**

[3] Alternatively, we also use the return differentials as the dependent variable; the empirical results are generally the same.

Table 3 Unit Root Test of the H-share Price Discount Series Using Augmented Dicky-Fuller Regression (ADF) *(continued)*

Firm Name	H-share Code	*PD*	Δ*PD*
		τ(α)	τ(α)
Maanshan Iron & Steel	323	-1.541	-35.454**
Sinopec Shanghai Petrochemical	338	-1.883	-33.258**
Angang Steel	347	-1.530	-34.075**
Jingwei Textile Machinery	350	-1.939	-31.475**
Jiangxi Copper	358	-1.567	-30.304**
China Petroleum & Chemical	386	-2.059	-28.432**
Guangshen Railway	525	-3.052*	-11.329**
Shenzhen Expressway	548	-1.558	-27.800**
Nanjing Panda Electronic	553	-3.218	-31.246**
Beijing North Star	588	-2.779	-12.661**
China Eastern Airlines	670	-2.300	-34.109**
Shandong Xinhua Pharmaceutical	719	-1.860	-33.511**
Air China	753	-0.994	-13.674**
ZTE	763	-1.545	-19.056**
Guangzhou Pharmaceutical	874	-2.005	-30.178**
Huaneng Power International	902	-2.175	-26.250**
Anhui Conch Cement	914	-2.232	-28.601**
Hisense Kelon Electrical	921	-1.624	-27.369**
Datang International Power Generation	991	-1.894	-9.197**
Anhui Expressway	995	-1.965	-25.664**
Sinopec Yizheng Chemical Fibre	1033	-2.787†	-33.306**
China Southern Airlines	1055	-1.395	-20.607**
Tianjin Capital Environmental Protection	1065	-1.865	-34.167**
Huadian Power International	1071	-1.533	-17.388**
Dongfang Electrical Machinery	1072	-1.299	-31.948**
Luoyang Glass	1108	-1.637	-30.613**
China Shipping Development	1138	-1.982	-27.780**
Yanzhou Coal Mining	1171	-1.728	-31.790**
Industrial and Commercial Bank of China	1398	-1.621	-13.203**
China Merchants Bank	3968	-1.407	-14.828**
Bank of China	3988	-0.558	-15.497**

Note: This table presents the Augmented Dicky-Fuller Regression (ADF) unit-root test statistics of the H-share price discount series. *PD* is the original H-share price discount series; Δ*PD* is the first-differenced H-share price discount series. **, *, and † indicate significance of the unit-root test statistics at the 1%, 5%, and 10% significance levels, respectively.

2.2 Short-selling constraints

Short selling was prohibited in Hong Kong until 3 January 1994, when the Hong Kong Stock Exchange launched a pilot scheme that allowed 17 designated securities to be short sold. Since 1996, the Hong Kong stock market has made the transition from a regime that prohibited short selling to a regulated short-selling system. Nevertheless, only those securities that have been so designated by the Hong Kong Stock Exchange (now the HKEx) are eligible for short selling. The Exchanges revise and announce the number of designated securities on a quarterly basis.[4] Over the sample period, about 80 per cent of the cross-listed H-shares are eligible for short selling, although this percentage changes from time to time. To prevent selling sprees that feed upon themselves, an uptick rule was established stating that all short-sale transactions must be conducted at a price above the current best-ask price.[5] Under this regulated system, stockbrokers are required to identify and report short-sale activities to the HKEx on a daily basis. The HKEx then aggregates the total daily trading shares and market value of short-sale transactions for individual designated stocks and discloses this information to the public the next day via its Web site and the newspapers. We extract the short-selling announcement and transaction data of H-shares from the *Daily Short Selling Database* of the HKEx. Since the daily short-sales data are not available from the HKEx until 1 January 1999, the sample period starts on 1 January 1999 for firms listed before that day. The final sample consists of all dual-listed A- and H-shares on the mainboard markets by the end of 2007.

To measure the impact of short selling on the price differentials, we use the H-share short-sell volume to H-share trading volume ratio (*SSR*):

$$SSR_{i,t} = \frac{SSV_{H,it}}{V_{H,it}},$$

where $SSV_{H,it}$ is the short-sell volume for firm i on day t. Table 2 shows that the level of the short-selling ratio (*SSR*) increases over the sample period, from 0.59 per cent in the first sub-period to 4.12 per cent in the last sub-period.

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[4] For detailed institutional background on the short-selling mechanism in Hong Kong, please refer to Chang *et al*. (2007).

[5] The Hong Kong Exchanges abolished the uptick rule in 1996 for two-and-a-half years before reinstating it on 7 September 1998 in response to changes in market conditions. Since then, as a precaution against overly heavy short-selling pressure, the uptick rule has applied to all short-selling transactions except for those in which stock option market makers conduct market-making activities for hedging a portfolio risk.

Because A-shares cannot be sold short but H-shares can, short selling tends to deflate the prices of those designated short-selling H-shares but not the prices of the corresponding A-shares.[6] In turn, the H-share discounts are enlarged. Our first hypothesis is as follows:

H1: The short-selling activities of cross-listed H-shares will be positively correlated with the H-share price discount.

Table 4 reports the correlation matrix between the H-share price discount and the independent variables, respectively. Consistent with Hypothesis 1, we find that ΔPD is positively correlated with *SSR* (0.020) at the 1 per cent significance level.

2.3 Floating constraints and the non-tradable shares reform

On 29 April 2005, the CSRC announced a reform plan to convert all non-tradable A-shares to publicly tradable shares "to eliminate the discrepancies in the A-share transfer system". This reform process was formerly known as the split-share structure reform. The main procedure of the reform has been to convert previously non-tradable state and other legal-person shares to tradable A-shares, and to compensate existing tradable A-share holders by additional A-shares or cash. The non-tradable A-share reform is a significant and further step toward the privatisation of listed state-owned enterprises (SOEs). This reform has stimulated the A-share market by increasing liquidity and investment opportunities, removing uncertainties related to the fate of non-tradable A-shares, and bringing A-share prices closer to their fundamentals. It has also helped to deflate A-share price bubbles, especially after the lock-up period of the former non-tradable A-shares.

A direct measure of the limited investment opportunities resulting from the floating restriction would be the change in the number of tradable A-shares. However, firms can also increase their number of tradable A-shares by seasoned offerings, rights offerings, and stock dividends. Therefore, we distinguish changes in the total number of tradable A-shares as resulting from either the split-share structure reform (*Type*1) or from reasons other than the share reform (*Type*2):

$$Type1_{i,t} \equiv \begin{cases} 1, & \text{if the number of tradable A-shares changes as a result of the split Share reform;} \\ 0, & \text{otherwise} \end{cases}$$

$$Type2_{i,t} \equiv \begin{cases} 1, & \text{if the number of tradable A-shares changes as a result of the split Share reform;} \\ 0, & \text{otherwise} \end{cases}$$

We identify the reasons for the changes in the number of tradable A-shares by using the sample firms' announcements on share structure changes. Note that *Type*2 changes

[6] Investors can also hedge equity trading risk by trading stock futures or options. However, the H-share stock futures and option were not introduced until 8 December 2003 and 14 June 2004, respectively. And only two H-shares have stock futures or options during the sample period.

Table 4 Correlation Matrix

	ΔPD	ΔPD_{t-1}	SH	HK	SSR	$Type1$	$Type2$	$\tau_{A/H}$	SPR_{A-H}	$VA_{A/H}$	ΔFX
ΔPD	1.000										
ΔPD_{t-1}	-0.048**	1.000									
SH	0.301**	-0.031**	1.000								
HK	-0.208**	-0.027**	0.217**	1.000							
SSR	0.020**	0.008	-0.025*	-0.048**	1.000						
$Type1$	-0.190**	0.006	-0.001	0.003	-0.004	1.000					
$Type2$	-0.002	-0.002	0.002	-0.001	-0.007	-0.001**	1.000				
$TR_{A/H}$	0.118**	0.117**	0.075**	-0.017**	0.021	0.099**	0.046	1.000			
$SPR_{A/H}$	0.002	-0.010	-0.026**	0.015*	-0.047**	-0.005	-0.007	-0.032*	1.000		
$RRA_{A/H}$	0.041**	0.003	-0.008	0.033**	0.039**	0.044**	0.033*	0.342**	0.037*	1.000	
ΔFX	-0.032**	0.028**	-0.013**	0.004	-0.023**	-0.000	-0.009	-0.008	0.020*	-0.006	1.000

Note: This table presents the correlation matrix of the dependent and independent variables. ΔPD is the H-share price discount; SH_t and HK_t are the Shanghai (Shenzhen) stock exchange composite index returns and the Hang Seng Index returns, respectively; SSR is the H-share short-selling volume to H-share trading volume ratio; $Type1$ is a dummy variable that takes a value of 1 if the change in the number of tradable A-shares is attributable to the split-share structure reform; $Type2$ is a dummy variable that takes a value of 1 if the change in the number of tradable A-shares is attributable to reasons other than the split-share structure reform. $TR_{A/H} = \log(1 + turnover_{A,it}) - \log(1 + turnover_{H,it})$, is the relative turnover ratio between A- and H-shares, where SPR_t is the bid-ask spread difference between A- and H-shares. $RRA_{A/H}$ is the relative risk aversion measure between A- and H-share investors; ΔFX is the change in the RMB/HK$ exchange rate. **, *, and † indicate significance of the t-test statistics at the 1%, 5%, and 10% significance levels, respectively.

happen over the whole sample period; *Type*1 changes happen only after May 2005. Our second hypothesis states the following:

H2: The removal of the floating constraints on non-tradable A-shares (*Type*1) will help to reduce the H-share price discounts.

As we expect, Table 4 shows that the correlation coefficient between Δ*PD* and the share-reform dummy variable *Type*1 is significantly negative (-0.190) at the 1 per cent level, and that the correlation between Δ*PD* and *Type*2 is negative, but not significantly.

2.4 Other considerations

Similar to the market-specific sentiment argument of Froot and Dabora (1999), changes in the H-share price discount capture the optimism or pessimism of mainland Chinese investors relative to their Hong Kong counterparts. Therefore, the H-share price discount should be correlated with the relative stock market shocks. Table 4 shows that H-share discounts (Δ*PD*) are positively correlated with the Shanghai (Shenzhen) market index returns (0.301), and negatively correlated with the Hong Kong market index returns (-0.208).

The liquidity hypothesis implies that the observed foreign share discounts are the result of their lower liquidity and higher trading costs. Following previous studies (Amihud and Mendelson, 1986; Datar *et al*., 1998), we define two liquidity variables. The first, $TR_{A/H}$, is a volume-based liquidity proxy, which is the relative logarithmic turnover ratio between A- and H-shares: $TR_{A/H,it} = \log(1 + turnover_{A,it}) - \log(1 + turnover_{H,it})$ The second, SPR_{A-H}, is a proxy for the transaction cost-based liquidity measure and is defined as the bid-ask spread difference between A- and H-shares: $SPR_{A-H} = SPR_A - SPR_H$ (*RMB/HK$*). Table 2 shows that the daily average turnover for A- and H-shares is 0.0267 and 0.0106, respectively. With an average of 240 trading days annually, the annual average turnovers for A- and H-shares are roughly 640 per cent and 254 per cent, respectively. A-shares trade on average 386 per cent more than the corresponding H-shares. A-shares also have a lower bid-ask spread than H-shares, although the difference is small. The average bid-ask spread difference between A- and H-shares (SPR_{A-H}) is negative for the whole period and all three sub-periods, suggesting higher transaction costs for the H-shares. All these results indicate that A-shares have greater liquidity than the corresponding H-shares. If investors have heterogeneous beliefs about asset fundamentals and are constrained by short sales, there will be a positive relationship between the speculative component in asset prices and the turnover of shares (Mei *et al*., 2005). If we believe that relative to H-share prices, the corresponding A-share prices will have a significant speculative component, we should observe that the H-share discounts will be positively correlated to the average turnover ratio between A- and H-shares ($TR_{A/H}$). Indeed, the correlation matrix in Table 4 shows that Δ*PD* is significantly and positively correlated with $TR_{A/H}$ (0.118).

The differential risk hypothesis suggests that domestic investors and foreign investors have different levels of risk aversion, and that the foreign share price discount relates to the ratio of the aggregate risk aversion of domestic investors to that of foreign investors (Eun and Janakiramanan, 1986). We use the intra-day high-low price range estimator (Parkinson, 1980) as a proxy for the risk level,[7] and define the relative level of risk between A- and H-share investors as $RRA = Range_A / Range_H$. Table 2 shows that $RR_{A/H}$ is quite close to 1, except for the third sub-period. This suggests that there may not be a significant difference in the risk aversion levels between A- and H-share investors, except in the late sample period when the market becomes overheated and A-share investors may tolerate higher risks in their investment.

Finally, we use the percentage change in the exchange rate between the renminbi and the Hong Kong dollar, ΔFX, to test the effect of exchange rate changes on H-share price discounts. Because H-shares are issued by firms in mainland China and dividends are paid in renminbi, any revaluation (or expected revaluation) of the renminbi relative to the Hong Kong dollar will alter the present value of expected future cash flows on H-shares in Hong Kong dollar terms. Because the Hong Kong dollar is pegged to the US dollar and the official exchange rate between the renminbi and the US dollar is "managed" by the Chinese government, if exchange rate parity holds, the percentage change of the cross-rate between the renminbi and the Hong Kong dollar will also reflect the impact of the renminbi revaluation against the US dollar. As we expected, ΔPD is negatively correlated with ΔFX.

III. Empirical Results

Our main hypothesis here is that when investors have heterogeneous beliefs about share prices, the huge H-share price discount will reflect a speculative component to share prices induced by trading restrictions, in addition to market-specific sentiment, liquidity, risk preference differences, and exchange rate risks.

3.1 Panel data regressions

To test Hypotheses 1 and 2, we estimate the following regression:

$$\begin{aligned}\Delta PD_{it} = {} & b_0 + b_1 \Delta PD_{it-1} + b_2 SH_t + b_3 HK_t + b_4 SSR_{it} + b_5 Type1_{it} + b_6 Type2_{it}, \\ & + b_7 TR_{A/H,it} + b_8 SPR_{A-H,it} + b_9 RRA_{A/H,it} + b_{10} \Delta FX_t + u_{it}\end{aligned} \tag{1}$$

where SH_t and HK_t are the SHSE (SZHE) Composite Index returns and the Hang Seng Index returns, respectively. Other variables are defined in Section 2. The HKEx closes one hour later than the SHSE and the SZSE, so that news occurring between the close

[7] A range estimator has been extensively used in financial literature (see, for example, Alizadeh *et al*., 2002).

of the SHSE (SZSE) and that of the HKEx could affect the H-share price but not the A-share price.[8] Previous studies also demonstrate that the autocorrelation in the daily returns of stocks is too large to be the result of non-synchronous trading alone (Lo and MacKinlay, 1990). The correlation matrix reported in Table 4 also indicates that ΔPD_t is significantly and negatively correlated to $\Delta PD_{it\text{-}1}$ at the 1 per cent level. Therefore, we include the first-order autoregressive term, $\Delta PD_{it\text{-}1}$, in equation (1) to control for the autocorrelation in the daily price discounts.

Because we have a longer time period and a smaller number of sample firms, following Domovitz *et al*. (1997) we use a panel data analysis to examine the cross-sectional and time-series determinants of the H-share discounts. A number of studies suggest that the residuals in financial panel data may be correlated across firms or across time. Peterson (2009) suggests that to solve this problem, the robust clustered standard error estimator of Cameron, Gelbach, and Miller (2006) and Thompson (2006) is to be preferred. In this study, we adopt the robust estimation method for standard errors by Thompson (2006) and Cameron *et al*. (2006), which allows for correlations among different firms in the same time period and different time periods within the same firm, and leads to more accurate inferences in panel regressions. Specifically, the variance estimate for a regression estimator is given by

$$\hat{\mathbf{V}}\mathbf{ar}(\hat{\beta}) = \hat{\mathbf{V}}_{firm} + \hat{\mathbf{V}}_{time,0} - \hat{\mathbf{V}}_{white,0},$$

where $\hat{\mathbf{V}}_{firm}$ and $\hat{\mathbf{V}}_{time,0}$ are the estimated variances that cluster by firm and time, respectively, and $\hat{\mathbf{V}}_{white,0}$ is the White heteroscedasticity-robust variance matrix. We use this robust clustered standard error estimator in all regressions in this paper.

Table 5 summarises the results of the univariate regressions with each of the 10 explanatory variables and the multivariate regressions, using all or a subset of the explanatory variables based on the panel data regression model (1). Consistent with the argument of Lo and MacKinlay (1990), the first univariate regression shows that the price discount has significantly negative first-order autocorrelations.

The second and third univariate regressions show that ΔPD has a significant and positive coefficient with the Shanghai (Shenzhen) market index returns, and a significant and negative coefficient with the Hong Kong market index returns for the whole sample period. These results are consistent with the market-specific sentiment hypothesis. An interesting difference between our finding and that of Wang and Jiang (2004) is that while they find that the Hong Kong market plays a more important role in explaining the H-share price discounts in the early years (between 1996 and 2001), we find the opposite for our sample period (between 1999 and 2007). The adjusted R^2 for regressions

[8] Daily trading on the Shanghai and Shenzhen Stock Exchanges starts at 9:30 a.m. and ends at 3 p.m., Beijing time. The Hong Kong exchange opens at 10 a.m. and closes at 4 p.m. There is no time difference between Beijing and Hong Kong.

Table 5 Panel Data Regressions

Model	1	2	3	4	5	6	7	8	9	10	11	12	13
Intercept	-0.0003	-0.0005**	-0.0002	-0.0004*	-0.0002	-0.0003	-0.0011**	-0.0001	-0.0013*	-0.0003	-0.0016**	-0.0016**	-0.0017*
	(-1.266)	(-2.577)	(-0.849)	(-2.075)	(-0.960)	(-1.246)	(-4.556)	(-0.331)	(-2.567)	(-1.441)	(-3.266)	(-3.353)	(-3.404)
ΔPD_{t-1}	-0.0565**										-0.0657**	-0.0662**	-0.0664**
	(-3.919)										(-6.059)	(-6.024)	(-6.030)
SH		0.3294**									0.3617**	0.3590**	0.3592**
		(12.619)									(13.169)	(13.141)	(13.133)
HK			-0.2740**								-0.3539**	-0.3535**	-0.3531**
			(-9.703)								(-10.674)	(-10.773)	(-10.790)
SSR				0.0068*							0.0050*		0.0047*
				(2.460)							(2.506)		(2.300)
*Type*1					-0.1399**							-0.1461**	-0.1461**
					(-5.931)							(-6.237)	(-6.229)
*Type*2						-0.0026							-0.0025
						(-0.974)							(-0.964)
$TR_{A/H}$							0.0720**				0.0605**	0.0707**	0.0705**
							(7.409)				(7.154)	(8.463)	(8.447)
SPR_{A-H}								0.0059*			0.0102**	0.0099**	0.0102**
								(2.448)			(6.351)	(5.813)	(6.284)
RRA_H									0.0012*		0.0006	0.0007†	0.0007
									(2.510)		(1.470)	(1.718)	(1.614)
ΔFX										-0.4982†	-0.3697†	-0.3724†	-0.3665†
										(-1.861)	(-1.781)	(-1.793)	(-1.762)
Adj. R^2	0.0033	0.0770	0.0387	0.0005	0.0291	0.00003	0.0113	0.0003	0.0024	0.0008	0.1472	0.1791	0.1794

Note: This table reports the estimates of the following regression model (1) by using the robust clustered standard error estimator (Thompson, 2006; Cameron, Gelbach, and Miller, 2006):

$$\Delta PD_{it} = b_0 + b_1 \Delta PD_{it-1} + b_2 SH_t + b_3 HK_t + b_4 SSR_{it} + b_5 Type1_{it} + b_6 Type2_{it} + b_7 TR_{A/H,it} + b_8 SPR_{A-H,it} + b_9 RRA_{A/H,it} + b_{10} \Delta FX_t + u_{it} \quad (1)$$

ΔPD is the H-share price discount; SH_t and HK_t are the Shanghai (Shenzhen) stock exchange composite index returns and the Hang Seng Index returns, respectively; SSR is the H-share short-selling volume to H-share trading volume ratio; *Type*1 is a dummy variable that takes a value of 1 if the change in the number of tradable A shares is attributable to the split-share structure reform; *Type*2 is a dummy variable that takes a value of 1 if the change in the number of tradable A-shares is attributable to reasons other than the split-share structure reform. $TR_{A/H}$ is the relative turnover ratio between A- and H-shares; SPR_t is the bid-ask spread difference between A- and H-shares; $RRA_{A/H}$ is the relative risk aversion between A- and H-share investors; ΔFX is the change in the RMB/HK$ exchange rate. The *t*-values in parentheses are calculated based on robust standard errors. **, *, and † indicate significance of the t-test statistics at the 1%, 5%, and 10% significance levels, respectively.

2 and 3 is 7.7 per cent and 3.87 per cent, respectively, suggesting that in recent years, Chinese A-share markets have played a more important role in explaining the H-share discounts. This finding is consistent with the fact that mainland China's stock market has become much larger and more important in international equity markets than the Hong Kong stock market in recent years.

More importantly, consistent with our main hypothesis, univariate regression 4 shows that the coefficient of *SSR* is significantly positive (0.0068); additionally, univariate regressions 5 and 6 show that the coefficient of *Type*1 is significantly negative (-0.1399), while the coefficient of *Type*2 is negative (-0.0026) but not significant at the 5 per cent level. These results indicate (1) that the short selling of H-shares deflates H-share prices and therefore enlarges the price differentials since A-shares cannot be sold short, and (2) that the split-share reform has removed the floating restrictions and reduced the speculative component in A-share prices, thereby narrowing the H-share discounts.

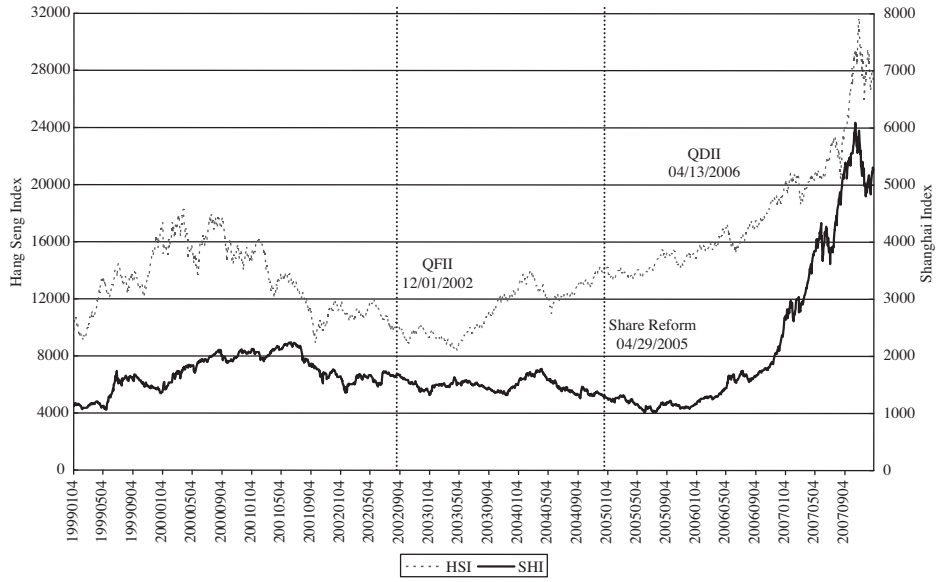
Consistent with the liquidity hypothesis, regressions 7 and 8 show that the coefficients of both $TR_{A/H}$ and SPR_{A-H} are significantly positive, implying that the H-share discount is a function of relative liquidity. Consistent with the differential risk hypothesis, regression 9 shows that the estimated coefficient of the relative risk-aversion proxy ($RRA_{A/H}$) is significantly positive, but when other independent variables are added into the regressions, it becomes positive but not significant at the 5 per cent level. The coefficient of the percentage change in the exchange rate is negative at the 10 per cent level in univariate regression 10 and in the multivariate regressions, suggesting that the devaluation of the Hong Kong dollar (US dollar) relative to the renminbi tends to enlarge H-share price discounts.

Multivariate regressions 11, 12, and 13 show that the coefficients of the trading restriction variables (*SSR* and *Type*1) and the market-specific sentiment variables (*SH* and *HK*) remain significant after all other control variables are included. For example, multivariate regression 13 shows that ΔPD has a significant and positive coefficient with the Shanghai (Shenzhen) market index returns (0.3592), and a significant and negative coefficient with the Hong Kong market index returns (-0.3531). These results are consistent with the market-specific sentiment hypothesis. The coefficient of *SSR* is significantly positive (0.0047) and that of *Type*1 significantly negative (-0.1461), further confirming our Hypotheses 1 and 2. Note that relative to the short-selling restraint, the floating restriction plays a bigger role in explaining the H-share price discounts. Finally, consistent with Figure 1 and the basic statistics in Table 2, the H-share discounts show a declining time trend over the sample period, as indicated by the negative intercept in all regressions.

3.2 Short sales in bearish and bullish market periods

The regression results of Table 5 clearly indicate that the H-share price discounts are significantly related to the overall market conditions of both the SHSE (SZSE) and the HKEx. To examine further the dynamic relation between H-share discounts and market conditions, Figure 3 plots the Shanghai Stock Index and the Hang Seng Stock Index.

Figure 3 Hang Seng Stock Index (HSI) and Shanghai Stock Index (SHI) (1 January 1999 – 31 December 2007)



We split the sample into three sub-periods based on market trends in mainland China and Hong Kong as well as several important government policy changes: 1 January 1999 to 30 November 2002, 1 December 2002 to 30 April 2005, and 1 May 2005 to 31 December 2007. In sub-period I, the mainland markets were mainly bullish while the Hong Kong market was still recovering from the 1997 Asian financial crisis. Therefore, H-share discounts tended to decrease but still maintained a very high level (78.6 per cent, Table 2).

The major event dividing sub-period I from sub-period II is publication on 5 November 2002 of the *Provisional Measures on Administration of Domestic Securities Investments of Qualified Foreign Institutional Investors* (QFII) by the CSRC and the People's Bank of China, which was officially implemented on 1 December 2002. Its implementation is generally viewed as a milestone in the opening up of the Chinese domestic security markets to foreign investors. Although introduction of the QFII program sought to attract foreign investors in order to stimulate the bearish A-share markets at that time, initially A-share prices showed little positive response. Instead, with the sequential opening up of the foreign B-share markets to domestic investors in

February 2001 and the opening of A-share markets to QFIIs in late November 2002, the A-B share-price differential narrowed dramatically.[9] Speculations over the possibility that eventually A- and H-shares would be merged stimulated H-share prices. Expectations of a revaluation of the renminbi further amplified the speculative activities on H-shares, and the H-share index started to rebound in late 2002. Because the A-share markets were mainly bearish while the Hong Kong market was bullish, the average H-share price discounts decreased significantly to 51.5 per cent in sub-period II.

The major event separating sub-periods II and III is the non-tradable share reform, which started in late April 2005. This reform stimulated A-share prices at the beginning by removing uncertainties related to the fate of non-tradable A-shares. But although the CSRC imposed many restrictions on the sale of formerly non-tradable shares after the 12-month lock-up period,[10] a great downward price pressure on stocks was created when many shareholders cashed in by selling their formerly non-tradable shares over a very short period, significantly reducing the average H-share discount to 33.4 per cent in sub-period III. This period is obviously a bubble, since both markets were overheated and extremely volatile until the bubble burst in late 2007 when the global financial tsunami started.[11]

Another important event that happened during the sample period was institution of the Qualified Domestic Institutional Investors (QDII) regime. To channel its massive foreign exchange reserves into the international capital market, the People's Bank of China issued Decree No. 5 on 13 April 2006 establishing a QDII scheme. The program allows qualified domestic commercial banks, securities institutions, and insurance companies to make limited offshore investments. Combined with the QFII regime, it establishes a two-way channel for capital to flow in and out of China via institutional investors. But because the total quota was limited during the sample period, the impact of the QDII scheme on H-share prices has mainly been psychological.[12]

As a robustness test, Table 6 reports the estimates of regression model (1) for the three sub-sample periods.[13] The regression results of the split samples in Table 6 are consistent with the results of Table 5. ΔPD has a significant and positive coefficient with

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[9] For the impact of the opening of the B-share market to domestic investors on the A-B share premiums, please refer to Mei *et al*. (2005) and Chan *et al*. (2008).

[10] For example, the CSRC requires that former non-tradable shareholders who hold more than 5 per cent of the total shares of a listed company, upon expiry of the lock-up period, may sell their shares, with a maximum of 5 per cent of the total shares of the listed company, within 12 months via the trading system of the stock exchanges, and not more than 10 per cent within 24 months. Additionally, a former non-tradable shareholder selling a relatively large quantity of shares of a listed company may handle the deal by means of a share placement with specific investors.

[11] The Shanghai Stock Index reached its historical high at 6,092 on 16 October 2007, and the Hang Seng Index reached 31,638 on 30 October 2008. Since our main purpose is not to investigate market bubbles and crashes and our sample period ends in 2007, we leave this interesting matter to future studies.

[12] On 11 May 2007, after granting 15 banks and funds the QDII licenses with a total quota of US$14.2 billion, the CSRC announced that it would widen the scope of the QDII investment by permitting banks to offer stock-related products with certain restrictions.

[13] We also conduct a two-period analysis, and the results are generally the same as those of the three-period analysis reported here.

the Shanghai (Shenzhen) market index returns, and a significant and negative coefficient with the Hong Kong market index returns, for all three sub-sample periods. The coefficient of the short-sales variable is significantly positive for sub-periods II and III but not for I,[14] mainly because the Hong Kong market was in a downturn during the first sub-period and short sales were not very active, whereas in the second and third sub-periods the Hong Kong market was in an upturn and short sales were more active. Table 2 shows that the level of short-selling ratios (*SSR*) is 0.59 per cent, 1.91 per cent, and 4.12 per cent in the first, second, and third sub-periods, respectively. Short selling thus plays a more important role in deflating over-valued share prices when the market is bullish.

Because the share reform took place after May 2005, naturally the coefficient of the split-share reform variable (*Type*1) is only significant for sub-period III. The coefficient of ΔFX is significantly negative at the 5 per cent level for sub-period I, and negative but not significant for sub-periods II and III. This result is consistent with the observation that the expectation on renminbi revaluation influences H-share prices only in the early sample period. Once the Chinese government formally started the renminbi revaluation process in 2005, the expectation impact weakened.

3.3 Short selling in up and down markets

Short selling can have different impacts on H-share price discounts in up and down markets. During up days, market sentiment is high, A-share prices tend to reflect more closely the beliefs of optimistic investors, and thus price bubbles induced by trading constraints tend to be larger than in down days. Short selling on H-shares tends to be more informative and has a larger downward impact on H-share prices, which in turn enlarges the A-H share-price differentials.

In down days, market sentiment is low, and since most investors tend to be pessimistic, the speculative component in A-share prices tends to be smaller. Short sales of H-shares can be driven more by market panic than by information. In addition, because the uptick rule used in Hong Kong requires that all short-sale transactions be conducted at a price above the current best-ask price, the price impact of short selling in down markets is further weakened. Therefore, our third hypothesis is as follows:

H3: Short selling in a down market will have less impact on H-share price discounts than in an up market.

To test this hypothesis, we classify all sample trading days into "up" and "down" days based on whether the daily Shanghai (Shenzhen) stock market index return is positive or non-positive:

$$D_t^{Up} \equiv \begin{cases} 1, \ if \ R_{SH,t} > 0; \\ 0, \ \text{otherwise} \end{cases}$$

[14] Alternatively, we also use a short-selling dummy variable, which takes a value of 1 if a sample stock is eligible for short selling at time *t*, and 0 otherwise in regressions. We find that the estimate of this short-selling dummy variable is also significantly positive at the 5 per cent level for the whole sample period, and positive but not significantly at the 5 per cent level for the sub-sample periods. This provides evidence that the actual short-selling transactions are more informative and effective than the fact of whether a stock is eligible for short selling or not.

Table 6 Sub-sample Analysis

	Sub-period I 1 January 1999 – 30 November 2002		Sub-period II 1 December 2002 – 30 April 2005		Sub-period III 1 May 2005 – 31 December 2007	
	Estimate	*t*-value	Estimate	*t*-value	Estimate	*t*-value
Intercept	-0.0009†	(-1.849)	0.0005	(0.587)	-0.0066**	(-6.342)
ΔPD_{t-1}	-0.0207	(-1.113)	-0.0792**	(-5.088)	-0.0624**	(-4.403)
SH	0.1445**	(7.533)	0.3390**	(11.500)	0.5716**	(16.841
HK	-0.1414**	(-8.626)	-0.5148**	(-9.499)	-0.6517**	(-13.639)
SSR	-0.0008	(-0.164)	0.0080*	(2.096)	0.0068**	(2.972)
*Type*1	0.0000		0.0000		-0.1471**	(-6.253)
*Type*2	-0.0032	(-0.862)	-0.0078**	(-2.961)	0.0022	(0.339)
TR_H	0.0412**	(4.363)	0.1098**	(5.895)	0.0831**	(6.079)
SPR_{A-H}	-0.0058†	(-1.698)	0.0156†	(1.731)	0.0089**	(4.992)
RRA_H	0.0004	(0.995)	-0.0013†	(-1.840)	0.0038**	(4.702)
ΔFX	-0.4452*	(-2.060)	-0.3921	(-1.222)	-0.4309	(-1.605)
Adjusted R^2	0.1201		0.1758		0.2582	

Note: This table reports the estimates of the following regression model (1) by using the robust clustered standard error estimator (Thompson, 2006; Cameron, Gelbach, and Miller, 2006):

$$\Delta PD_{it} = b_0 + b_1 \Delta PD_{it-1} + b_2 SH_t + b_3 HK_t + b_4 SSR_{it} + b_5 Type1_{it} + b_6 Type2_{it} + b_7 \mathrm{TR}_{A/H,it} + b_8 SPR_{A-H,it} + b_9 RRA_{A/H,\,it} + b_{10} \Delta FX_t + u_{it} \quad (1)$$

ΔPD is the H-share price discount; SH_t and HK_t are the Shanghai (Shenzhen) stock exchange composite index returns and the Hang Seng Index returns, respectively; SSR is the H-share short-selling volume to H-share trading volume ratio; *Type*1 is a dummy variable that takes a value of 1 if the change in the number of tradable A- shares is attributable to the split-share structure reform; *Type*2 is a dummy variable that takes a value of 1 if the change in the number of tradable A shares is attributable to reasons other than the split-share structure reform. $TR_{A/H}$ is the relative turnover ratio between A- and H-shares; SPR_t is the bid-ask spread difference between A- and H-shares; $RRA_{A/H}$ is the relative risk aversion between A- and H-share investors; ΔFX is the change in the RMB/HK$ exchange rate. The *t*-values in parentheses are calculated based on robust standard errors. **, *, and † indicate significance of the *t*-test statistics at the 1%, 5%, and 10% significance levels, respectively.

We then define the short-selling ratio in up and down days as follows, respectively:

$SSR_{it}^{Up} = SSR_{it} \times D_t^{Up}$; $SSR_{it}^{Down} = SSR_{it} \times (1 - D_t^{Up})$;

Panel A of Table 7 reports the estimates of regression model (2):

$$\begin{aligned}\Delta PD_{it} = {} & b_0 + b_1 \Delta PD_{it-1} + b_2 SH_t + b_3 HK_t + b_4 SSR_{it}^{Up} + b_5 SSR_{it}^{Down} + b_6 Type1_{it} \\ & + b_7 Type2_{it} + b_8 TR_{A/H,it} + b_9 SPR_{A-H,it} + b_{10} RRA_{A/H,it} + b_{11} \Delta FX_t + u_{it}\end{aligned} \quad (2)$$

Consistent with our hypothesis, for the whole sample period, b_4 is significantly positive (0.0157) at the 1 per cent level, whereas b_5 is not significant. The split-sample analysis results in Table 7 are also consistent with the results of Table 6. The results of Panel A in Table 7 thus indicate that short sales significantly widen the price differentials in up days but not in down days.

Alternative explanations for this asymmetric price impact of short sales include the possibilities that short sales are more active in up days than in down days, or that other independent variables behave differently in up and down days. To investigate these alternative explanations, Panel B of Table 7 reports the basic statistics and corresponding *t*-test statistics of the dependent and independent variables for up and down days. First, average changes in the H-share price discounts (ΔPD) are positive in up days and negative in down days, the difference (0.0081) being significantly positive at the 1 per cent significance level. These results are consistent with our argument that in up days the speculative component in stock prices tends to be larger, while in down days it tends to be smaller.

Second, short sales are actually more active in down days than in up days: SSR is smaller in up days (0.0295) than in down days (0.0341), although the difference (-0.0047) is not significant. Finally, the differences between up and down days for all other independent variables are not significant. These results rule out the alternative explanations that the asymmetric impact of short sales could be the result of more active short-selling activities in up days, or that other independent variables behave differently between up and down days.

3.4 H-share discounts and lagged short selling

We find that SSR is positively related to the concurrent H-share price discounts. Here we further test whether short-selling activities also deflate future H-share prices and in turn enlarge future H-share price discounts. To this end, we regress the H-share price discounts on lagged short-selling variables and other independent variables and report the results in Table 8:

$$\begin{aligned}\Delta PD_{it} = {} & b_0 + b_1 \Delta PD_{it-1} + b_2 SH_{t-1} + b_3 HK_{t-1} + b_4 SSR_{it-1} + b_5 Type1_{it-1} \\ & + b_6 Type2_{it-1} + b_7 TR_{A/H,it-1} + b_8 SPR_{A-H,it-1} + b_9 RRA_{A/H,it-1} \\ & + b_{10} \Delta FX_{t-1} + u_{it}\end{aligned} \quad (3)$$

Table 7 Up and Down Markets

Panel A: Estimates of regression (2)

	Whole		Period I		Period II		Period III	
	Estimate	*t*-value	Estimate	*t*-value	Estimate	*t*-value	Estimate	*t*-value
Intercept	-0.0017**	(-3.397)	-0.0009†	(-1.839)	0.0005	(0.589)	-0.0066**	(-6.331)
ΔPD_{t-1}	-0.0656**	(-5.991)	-0.0207	(-1.106)	-0.0789**	(-5.081)	-0.0620**	(-4.392)
SH	0.3461**	(13.084)	0.1433**	(7.493)	0.3324**	(11.470)	0.5622**	(16.492)
HK	-0.3547**	(-10.790)	-0.1414**	(-8.618)	-0.5150**	(-9.491)	-0.6531**	(-13.643)
SSR^{Up}	0.0157**	(5.599)	0.0094	(1.344)	0.0142**	(3.387)	0.0115**	(3.204)
SSR^{Dn}	-0.0069†	(-1.771)	-0.0094	(-1.392)	0.0024	(0.403)	0.0012	(0.291)
*Type*1	-0.1461**	(-6.224)	0.0000		0.0000		-0.1472**	(-6.252)
*Type*2	-0.0026	(-1.009)	-0.0033	(-0.950)	-0.0078**	(-3.072)	0.0021	(0.333)
$TR_{A/H}$	0.0700**	(8.406)	0.0411**	(4.353)	0.1098**	(5.903)	0.0827**	(6.047)
SPR_{A-H}	0.0102**	(6.222)	-0.0058†	(-1.703)	0.0157†	(1.732)	0.0089**	(5.009)
$RRA_{A/H}$	0.0007	(1.609)	0.0004	(0.977)	-0.0013†	(-1.844)	0.0038**	(4.702)
ΔFX	-0.3675†	(-1.763)	-0.4517*	(-2.095)	-0.3928	(-1.226)	-0.4305	(-1.598)
Adjusted R^2	0.1807		0.1206		0.1762		0.2584	

Panel B: Basic statistics of the dependent and independent variables in up and down days

	ΔPD	*SH*	*HK*	*SSR*	$TR_{A/H}$	SPR_{A-H}	$RRA_{A/H}$	ΔFX
Up Market	0.0034	0.0117	0.0026	0.0295	0.0183	-0.0169	1.0687	-0.00012
Down Market	-0.0047	-0.0125	-0.0023	0.0341	0.0131	-0.0150	1.0663	-0.00013
Difference	0.0081	0.0242	0.0049	-0.0047	0.0052	-0.0019	0.0024	0.00001
t-statistics	17.59**	38.66**	12.67**	-0.64	1.45	-0.13	0.10	0.54

Note: This table reports the estimates of the following regression model (3) by using the robust clustered standard error estimator (Thompson, 2006; Cameron, Gelbach, and Miller, 2006):

$$\Delta PD_{it} = b_0 + b_1 \Delta PD_{it-1} + b_2 SH_t + b_3 HK_t + b_4 SSR_{it}^{Up} + b_5 SSR_{it}^{Down} + b_6 Type1_{it} + b_7 Type2_{it} + b_8 TR_{A/H,it} + b_9 SPR_{A-H,it} + b_{10} RRA_{A/H,\,it} + b_{11} \Delta FX_t + u_{it} \qquad (2)$$

ΔPD is the H-share price discount; SH_t and HK_t are the Shanghai (Shenzhen) stock exchange composite index returns and the Hang Seng Index returns, respectively; *SSR* is the H-share short-selling volume to H-share trading volume ratio; *Type*1 is a dummy variable that takes a value of 1 if the change in the number of tradable A shares is attributable to the split-share structure reform; *Type*2 is a dummy variable that takes a value of 1 if the change in the number of tradable A shares is attributable to reasons other than the split-share structure reform. $TR_{A/H}$ is the relative turnover ratio between A- and H-shares; SPR_t is the bid-ask spread difference between A- and H-shares; $RRA_{A/H}$ is the relative risk aversion between A- and H-share investors; ΔFX is the change in the RMB/HK$ exchange rate. The *t*-values in parentheses are calculated based on robust standard errors. **, *, and † indicate significance of the *t*-test statistics at the 1%, 5%, and 10% significance level, respectively.

Table 8 Lagged Regressions

Regression	1	2	3	4
Intercept	-0.0005	-0.0006	-0.0006	-0.0007
	-2.16*	-1.63	-1.43	-1.66^{+}
$\Delta PD_{t\text{-}1}$		-0.0577	-0.0624	-0.0628
		-4.71**	-4.81**	-4.82**
$SH_{t\text{-}1}$		-0.0130	-0.0118	-0.0114
		-0.72	-0.65	-0.63
$HK_{t\text{-}1}$		-0.0118	-0.0140	-0.0134
		-0.70	-0.83	-0.80
$SSR_{t\text{-}1}$	0.0086	0.0083		0.0083
	3.02**	3.16**		3.16**
$Type1_{t\text{-}1}$			-0.0198	-0.0198
			-2.74**	-2.73**
$Type2_{t\text{-}1}$				-0.0020
				-0.55
$TR_{A/H,t\text{-}1}$		-0.0030	-0.0008	-0.0013
		-0.43	-0.11	-0.18
$SPR_{A\text{-}H,t\text{-}1}$		-0.0030	-0.0033	-0.0030
		-1.86†	-1.85†	-1.84†
$RRA_{H,t\text{-}1}$		0.0001	0.0002	0.0001
		0.33	0.56	0.34
$\Delta FX_{t\text{-}1}$		0.0209	0.0081	0.0193
		0.07	0.03	0.06
Adj. R^2	0.0007	0.0044	0.0046	0.0052

Note: This table reports the estimates of the following regression model (3) by using the robust clustered standard error estimator (Thompson, 2006; Cameron, Gelbach, and Miller, 2006):

$$\Delta PD_{it} = b_0 + b_1\Delta PD_{it-1} + b_2 SH_{t-1} + b_3 HK_{t-1} + b_4 SSR_{it-1} + b_5 Type1_{it-1} + b_6 Type2_{it-1} + b_7 TR_{A/H,it-1} + b_8 SPR_{A-H,it-1} + b_9 RRA_{A/H,\,it-1} + b_{10}\Delta FX_{t-1} + u_{it} \quad (3)$$

ΔPD is the H-share price discount; SH_t and HK_t are the Shanghai (Shenzhen) stock exchange composite index returns and the Hang Seng Index returns, respectively; *SSR* is the H-share short-selling volume to H-share trading volume ratio; *Type*1 is a dummy variable that takes a value of 1 if the change in the number of tradable A-shares is attributable to the split-share structure reform; *Type*2 is a dummy variable that takes a value of 1 if the change in the number of tradable A-shares is attributable to reasons other than the split-share structure reform. $TR_{A/H}$ is the relative turnover ratio between A- and H-shares; SPR_t is the bid-ask spread difference between A- and H-shares; $RRA_{A/H}$ is the relative risk aversion between A- and H-share investors; ΔFX is the change in the RMB/HK$ exchange rate. The *t*-values in parentheses are calculated based on robust standard errors. **, *, and † indicate significance of the *t*-test statistics at the 1%, 5%, and 10% significance levels, respectively.

Table 8 shows that the H-share discount is also significantly and negatively associated with the one-period lagged *SSR* at the 1 per cent level, after controlling for other independent variables. These results further provide supporting evidence for our main hypothesis. In addition, they suggest that short-selling activities have predicative power for H-share price discounts.

IV. Conclusion

In this paper, we examine the joint effects on stock prices of trading restrictions on short sales and floating and of heterogeneous beliefs by using a unique data set of cross-listed Chinese A- and H-shares.

We find that H-share price discounts are significantly and positively correlated with the short-selling to total-trading volume ratio of H-shares, negatively correlated with the split-share reform variable of A-shares, and significantly correlated with market-specific sentiment variables after controlling for liquidity, risk preference differences, and exchange rate risk. Our results indicate that both the short-sale constraints and the floating restrictions on A-shares contribute to A-share price bubbles, and in turn to H-share price discounts.

We also find that the impact of short selling in price discovery across markets is asymmetric between bullish and bearish market periods, and between up and down days. Short selling significantly widens the price discounts in a bullish market but not in a bearish market period, and in up days but not in down days. This asymmetric impact of short selling on cross-listed stock prices can be attributed to the fact that the speculative component induced by trading restrictions in A-share prices tends to be larger in up markets and smaller in down markets, and that short selling tends to be more informative in up markets than in down markets. Furthermore, the uptick rule imposed in Hong Kong further limits the effectiveness of short selling on the discovery process of share prices in a down market. Finally, we find that lagged short-selling activities have predictive power for future H-share price discounts.

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卖空、流通限制与交叉上市股票价格

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摘要

利用一个独特的中国交叉上市公司数据集，我们考察卖空和流通限制、以及不同观念对股票价格的影响。由于国内A股同时受制于卖空和流通限制，而H股没有此类限制，H股价格折让代表着由交易限制引发的价格泡沫。我们发现，在控制了市场情绪和其它因素后，H股价格折让与H股卖空交易显著正相关，而与A股非流通股改革变量负相关。我们还发现，在牛市和市场回报率上升时，卖空会显著增大股票价格的折让，而在熊市和市场回报率下跌时，卖空则没有这种作用。最后，我们发现前期的卖空活动对未来H股价格折让水平有预测能力。

关键字：卖空、流通限制、不同观念、市场情绪、交叉上市
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一、引言

卖空和流通限制都会对股票价格产生巨大影响。Miller (1977) 认为当市场上存在不同观念时，价值被高估股票的边际购买者一般属于乐观者。由于负面信息的传播可能被推迟，卖空限制会导致股价产生向上偏差。Chen *et al.* (2002)，以及Scheinkman and Xiong (2003)指出，当套利者卖空被高估股票的能力受到限制时，股票价格会产生投机成分。跟随Miller (1977)的见解，Hong *et al.*(2006)指出，在一个具有异质观念和卖空限制的模型中，受流通限制的股票的交易会产生价格泡沫，而泡沫的大小取决于流通程度。

然而，要从实证上直接检验是否存在由于交易限制导致的价格泡沫是非常困难的，因为很难评估股票的基本价值(如, Mei *et al*., 2005)。以往的研究要么考察有无交易限制的不同股票价格是否不同，要么研究相同股票在取消交易限制前后的价格表现是否不同。(如, Diamond and Verrecchia, 1987; Deechow *et al*., 2001; Jones and Lamont, 2002; Greenwood, 2009).

本文利用独特的中国公司交叉上市的A股和H股数据，考察卖空、流通限制、以及不同观念对股票价格的联合作用。A股是在中国内地交易所(上海或深圳)交易的股票。H股是由中国内地公司发行但在境外交易所——香港交易所挂牌交易的股票。虽然A股和H股股东拥有同等权利，但在1999年至2007年期间，H股却比A股有着48.1%的价格折让。这种价格差异虽然随时间改变，而且趋于缩小，但是依然存在。我们假设，当投资者对股价变化有不同看法时，H股的巨大价格折让反映了除市场情绪、流动性以及A股和H股市场风险偏好差异之外，由交易限制引致的投机成分。特别是，相对乐观的国内A股投资者的投机动机，会使A股产生比H股更加显著的投机成分，而这种投机成分与A股的卖空和流通限制呈正相关关系。

我们的研究建立在以往对投机性泡沫形成原因的研究基础之上。这些研究认为不同观念、卖空限制、以及流通限制共同作用的结果导致投机性泡沫的形成。我们的研究还建立在有关交叉上市的孪生股票价格折让因素的基础之上。这些研究通常认为影响股票价格折让的因素包括市场情绪、流动性、以及风险偏好的差异(如, Eun and Janakiramanan, 1986; Hasbrouck, 1995; Froot and Dabora, 1999; Kim *et al*., 2000)。

选择交叉上市的中国A股和H股公司作为本文研究对象有很多原因。第一，由于香港允许卖空但中国大陆不允许，因此H股可以被卖空但是A股则不可以。与以往研究不同，我们考察的是卖空对于交叉上市公司股价的影响。由于投机者不可能卖空被高估的A股，所以A股价格更容易反映乐观的A股投资者的观念，在市场处于牛市时尤甚。而投机者可以卖空在香港市场被高估的H股，H股的价格同时反映了乐观和悲观两种投资者的看法，使H股股票价格更加接近公司的基本价值。由于交叉上市股票具有相同的基本价值和同等权利、而且在同一时间交易，这为我们直接检

验卖空限制对股价的影响提供了良机。我们的实证结果将更少受不同股票之间的横向差异影响，也不会受同一只股票由于市场条件和基本价值变化引起的动态差异的影响。

第二，除了公开交易的A股和H股（或B股）之外，典型的中国上市公司还有很大一部分非流通股份，包括国有股、法人股和职工股。所有非流通股都是国内A股。对A股流通性的限制导致了国内资本市场较高的股价和较大的波动。在我们的样本期间，中国证券监督管理委员会（中国证监会）进行了旨在将所有非流通A股转换为流通股的"股权分置改革"。取消了对非流通股的流通限制后，A股价格泡沫破灭，H股价格折让减少。国内A股和境外H股之间的股本结构差异以及样本期间进行的股权分置改革，为我们检验流通限制对交叉上市公司的股价影响提供了独一无二的研究机会。

第三，A股和H股的市场环境不同。机构投资者主导的香港交易所更开放、架构更完善，并具有一系列的股票衍生产品。香港交易所2007年的调查显示，在2006年10月至2007年9月期间，机构投资者拥有市场主导地位，其交易占市场总交易总值的68.7%。香港交易所的海外投资者主要来自美国和英国。海外机构投资者和个人投资者的交易分别占总市场交易值的39.3%和3.8%。另一方面，A股市场则是散户占大多数，历史相对较短，市场发展尚需完善，且缺少股票衍生产品。[1]近来的研究强调卖空限制和不同观念对股价的共同作用 (Boehme *et al*., 2006; Berkman *et al*., 2009)，认为当卖空限制和不同观念同时存在时，股票价格会被明显高估。不同的市场环境和投资者结构使我们能够合理地假设，A股的价格比H股的价格更可能受投资者对股票价值的不同看法的影响，因而更容易产生大规模的投机性交易。

与我们的研究假设一致，我们发现，当控制了流动性、风险偏好和汇率风险之后，H股价格折让与H股卖空数量对总交易量的比例显著正相关，与A股股权分置改革变量负相关，并与市场情绪变量显著相关。此外我们还推断，由于交易限制导致的股价泡沫在股价上升时（和牛市期间）较下跌时（和熊市期间）大，卖空对H股的信息作用更明显且对H股股价有更大的向下压力，进而导致A股和H股价差增大。另外，当市场下跌时，卖空对股价的影响被限制卖空交易的涨盘卖空规则（up-tick rule）进一步弱化。和预测一致，我们发现在市场回报率上升时和牛市，卖空会显著增大价差，而在市场回报率下跌时和熊市，卖空则没有这种作用。在当前的金融危机中，许多国家有意重新采用卖空限制和涨盘卖空规则，我们的结果说明，虽然卖空限制可以在短期内通过推迟价格发现过程而影响股票价格，但会对金融市场的长期稳定带来负面影响。[2]

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1 关于中国大陆和香港的金融衍生市场的具体信息可参看Wang *et al.* (2009).

2 在美国，为了稳定股价，特别是金融公司的股价，从2008年9月20日到10月2日美国证监会严禁任何对金融公司的卖空。虽然在短期金融公司的股价上升，但是在对金融公司卖空解冻后此类公司股价进一步下滑。美国金融市场另一起新发展是，证监会在2009年4月9日批准了恢复限制卖空规则的五项建议。

我们的研究对有关交叉上市公司股票价差的国际金融研究文献亦有贡献。过往研究将交叉上市的境外股票溢价归因于流动性和投资者的风险偏好(Eun and Janakiramanan, 1986)、汇率风险(Kim *et al*., 2000)、信息不对称 (Chakravarty *et al*., 1998)、市场情绪和噪音交易者的影响(Froot and Dabora, 1999; Scruggs, 2007)。我们的实证分析结果表明，卖空和流通限制也会导致交叉上市公司的股票价格差异。

本文的安排如下：第二部分介绍本研究的市场环境背景及基本数据分析；第三部分给出实证分析结果；第四部分总结全文。

二、制度背景及基本数据分析

2.1 H股价格折让

我们采用2006年12月31日前于香港交易所和上海交易所(或深圳交易所)同时发行A股和H股的所有公司的每日股价、股息、交易量和买卖价差数据进行分析。样本期间自A股或H股上市日(以较迟的时间为准)起至2007年12月31日。交易和股份结构的数据取自DataStream、Bloomberg和中国证券监督管理委员会。截止到2006年年底，有37家公司同时在A股和H股市场交叉上市。表1报告了样本公司的股份结构。在样本期间，可公开交易的A股和H股分别占总股份的14.4%和30.0%；非流通国有和法人股分别占总股份的49.1% 和6.4%。流通受限制的股票交易会导致价格泡沫。很明显，规模庞大的非流通股大大降低了中国股票市场的自由流动性，并对中国股票的价格产生了显著的影响。可流通的A股比例从第一个样本子期间的11.2%增加到最后一个样本子期间(2005年5月1日到2007年12月31日)的16%，这种变化的主要原因是由2005年5月开始的非流通股改革。

Bailey (1994)发现，在中国证券市场交易，对外的B股较对内的A股有价格折让。之前的研究通常发现出售给境外投资者的股票较出售给国内投资者交易的股票有溢价。利用直至2001年9月28日的数据，Wang and Jiang (2004)的研究发现H股较A股有巨大的折让，这种折让与市场情绪、相对市场流动性、以及对汇率变化的预期相关。Arquette *et al*. (2008)进一步确认，投资者情绪和汇率变化预期可以在一定程度上解释交叉上市的ADR与H股的价差。

我们将H股的价格折让(或A股溢价)定义为：

$$PD_{it} \equiv \frac{P_{A,it} - P_{H,it}FX_t}{P_{A,it}} ,$$

其中：$P_{A,it}$和$P_{H,it}$是i公司A股和H股在时间t的收盘价，分别以人民币和港元为单位。股价已调整股息。FX_t是人民币兑港元的汇率。

表1： 交叉上市A股和H 股的股本结构

公司名字	H股代码	上市时间	A股代码	上市时间	总股数	国有股 (%)	法人股 (%)	A股 (%)	H股 (%)
Northeast Electric Development	42	07/06/95	000585	12/13/95	873	0.0	25.6	44.8	29.5
Tsingtao Brewery	168	07/15/93	600600	08/27/93	1,308	30.6	1.3	18.0	50.1
Jiangsu Expressway	177	06/27/97	600377	01/16/01	5,038	66.1	2.7	6.9	24.3
Beiren Printing Machinery	187	08/06/93	600860	05/06/94	422	47.8	0.0	28.5	23.7
Shenji Group Kunming Machine Tool	300	12/07/93	600806	01/03/94	425	36.2	6.2	31.1	26.5
Guangzhou Shipyard International	317	08/06/93	600685	10/28/93	495	35.7	0.0	32.5	31.8
Maanshan Iron & Steel	323	11/03/93	600808	01/06/94	6,759	56.7	0.0	17.7	25.6
Sinopec Shanghai Petrochemical	338	7/26/93	600688	11/08/93	7,200	55.6	2.1	10.0	32.4
Angang Steel	347	07/24/97	000898	12/25/97	7,235	67.3	0.0	17.7	15.0
Jingwei Textile Machinery	350	02/02/96	000666	12/10/96	604	32.4	0.0	37.7	29.9
Jiangxi Copper	358	06/12/97	600362	01/11/02	3,023	44.8	0.0	9.3	45.9
China Petroleum & Chemical	386	10/19/00	600028	08/08/01	86,702	70.8	0.0	9.8	19.4
Guangshen Railway	525	05/14/96	601333	12/22/06	7,084	41.0	0.0	38.8	20.2
Shenzhen Expressway	548	03/12/97	600548	12/25/01	2,181	55.7	0.0	10.0	34.3
Nanjing Panda Electronic	553	05/02/96	600775	11/18/96	655	51.1	0.0	12.0	36.9
Beijing North Star	588	05/14/97	601588	10/16/06	3,367	34.5	0.0	44.5	21.0
China Eastern Airlines	670	02/05/97	600115	11/05/97	4,867	59.7	0.0	8.1	32.2

表1： 交叉上市A股和H 股的股本结构*(续)*

公司名字	H股代码	上市时间	A股代码	上市时间	总股数	国有股 (%)	法人股 (%)	A股 (%)	H股 (%)
Shandong Xinhua Pharmaceutical	719	02/31/96	000756	08/06/97	457	41.1	0.0	26.1	32.8
Air China	753	12/15/04	601111	08/18/06	12,251	50.7	0.0	13.4	36.0
ZTE	763	12/09/04	000063	11/18/97	960	32.5	0.0	50.8	16.7
Guangzhou Pharmaceutical	874	10/30/97	600332	02/06/01	811	52.8	0.0	20.1	27.1
Huaneng Power International	902	01/21/98	600011	12/06/01	12,055	51.7	0.0	23.0	25.3
Anhui Conch Cement	914	10/21/97	600585	02/07/02	1,566	37.2	18.4	16.8	27.7
Hisense Kelon Electrical	921	07/23/96	000921	07/13/99	992	0.0	31.7	22.0	46.3
Datang International Power Generation	991	03/21/97	601991	12/20/06	11,729	34.5	0.0	37.6	27.8
Anhui Expressway	995	11/13/96	600012	01/07/03	1,659	42.2	0.0	28.1	29.7
Sinopec Yizheng Chemical Fibre	1033	03/29/94	600871	04/11/95	4,000	0.0	60.0	5.0	35.0
China Southern Airlines	1055	07/31/97	600029	07/25/03	4,374	50.3	0.0	22.9	26.8
Tianjin Capital Environmental Protection	1065	05/17/94	600874	06/30/95	1,427	51.2	0.0	25.0	23.8
Huadian Power International	1071	06/30/99	600027	02/03/05	6,021	57.3	0.0	18.9	23.8
Dongfang Electrical Machinery	1072	06/06/94	600875	10/18/95	817	67.1	0.0	12.1	20.8
Luoyang Glass	1108	07/08/94	600876	10/31/95	500	35.8	0.0	14.2	50.0
China Shipping Development	1138	11/11/94	600026	05/23/02	3,405	46.4	0.0	15.6	38.1
Yanzhou Coal Mining	1171	04/01/98	600188	07/01/98	4,918	52.9	0.0	7.3	39.8

表1： 交叉上市A股和H 股的股本结构*(续)*

公司名字	H股代码	上市时间	A股代码	上市时间	总股数	国有股 (%)	法人股 (%)	A股 (%)	H股 (%)
Industrial and Commercial Bank of China	1398	12/31/06	601398	10/27/06	334,019	71.5	0.0	3.6	24.9
China Merchants Bank	3968	09/22/06	600036	04/09/02	14,705	48.0	1.8	32.0	18.1
Bank of China	3988	06/01/06	601988	07/05/06	253,839	68.0	0.0	2.1	29.9
平均	**股票数**				**总股数**	**国有股 (%)**	**法人股 (%)**	**A股 (%)**	**H股 (%)**
整个样本期间	37				21,543.0	49.1	6.4	14.4	30.0
子期间I: 01/01/1999-11/30/2002	26				5,536.8	46.5	10.1	11.2	32.2
子期间II: 12/01/2002-04/30/2005	30				5,352.2	49.9	5.5	13.6	31.0
子期间III: 05/01/2005-12/31/2007	37				21,685.7	48.5	5.3	16.0	30.1

注释： 此表报告了37个样本公司截止至2007年12月的股份结构。总股数是对外发行的总股数；国有股是国有股总数；法人股是非流通法人股总数；A股和H 股分别是可流通的A股和H 股股数。股数以百万计。% 表示不同的股份和对外发行的总股数的比例。最后四行分别报告的是在整个样本期间和三个子样本期间不同股份与对外发行的总股数的比例的平均数。

我们的数据包括37对A股和H股公司，样本期间为9年，总共有超过46,000个公司－日观测点。表2汇总了37对A股和H股样本的基本统计数据。在样本期间，A股较H股的价格高。例如，A股和H股的平均股价分别为人民币9.16元和5.04元。H股较A股平均有48.07%的折让。这些结果和Hong *et al*. (2006)关于在有卖空限制和观念不同的市场上，有流通限制的股票有较高股价的看法是一致的。

表2： 交叉上市A股和H 股样本基本统计

	整个期间	子期间 I	子期间II	子期间III
	均值	均值	均值	均值
等权重A股股价	9.1606	7.6476	6.5977	10.4361
等权重 H股股价	5.0366	1.4380	3.2504	7.2086
H股价格折让(*PD*)	0.4807**	0.7863**	0.5152**	0.3339**
H股价格折让变化(Δ*PD*)	-0.0001	-0.0003**	-0.0008**	0.0002
恒生指数回报率(*HK*)	0.0006	-0.0004	0.0004	0.0010
上证指数回报率(*SH*)	0.0012	-0.0004	-0.0004	0.0023
深证指数回报率(*SZ*)	0.0013	-0.0004	-0.0006	0.0026
卖空比率(*SSR*)	0.0312	0.0059	0.0191	0.0412
A股流转率	0.0267	0.0202	0.0156	0.0334
H股流转率	0.0106	0.0098	0.0107	0.0104
AH股流转率比($TR_{A/H}$)	0.0161	0.0104	0.0049	0.0230
A股买卖差价(SPR_A)	0.0151	0.0144	0.0151	0.0159
H股买卖差价(SPR_H)	0.0304	0.0202	0.0282	0.0404
AH股买卖差价之差(SPR_{A-H})	-0.0160	-0.0070	-0.0149	-0.0244
$Range_A$	0.1140	0.1035	0.1050	0.1237
$Range_H$	0.1156	0.1243	0.1110	0.1130
AH相对风险($RRA_{A/H}$)	1.0673	0.9206	1.0226	1.1695
RMB/US$	8.0372	8.2804	8.2815	7.8452
RMB/HK$	1.0319	1.0627	1.0631	1.0079
配对A股和H股公司数	37	26	30	37

注释： 此表格呈报了交叉上市样本公司和相关市场指数的基本统计。Δ*PD*是H股价格折让。SH_t (SZ_t)和*HKt*分别是沪市(深市)综合指数回报率和恒生指数回报率。*SSR*是H股卖空交易量和H股交易量的比例；$TR_{A/H} = \log(1 + turnover_{A,it}) - \log(1 + turnover_{H,it})$，是A和H股流转率的相对比率；$SPR_t$是A和H股买卖差价的差异。$RRA_{A/H}$是A和H股投资者的相对风险规避水平。RMB/US$ 和RMB/HK$是人民币兑美元和人民币兑港元的汇率。**、*，和†分别代表*t*检验在1%、5%，和10%的水平上显著。

为了考察H股价格折让的动态行为，图 1 和 2 分别画出了H股等权重平均价格折让序列(*PD*)和它的一阶差分序列(Δ*PD*)。在1999年1月，H股平均价格折让水平约为85%，此后持续波动，继而缓慢减少到2002年末的70%。到2005年年中H股平均价格折让迅速下降到20%。此后，价格折让持续波动并最终反弹到2007年底(该时期市场变得过热)的约50%。

图 1： 等权重A-H 股价格折让序列(1999年1月1日－2007年12月31日)

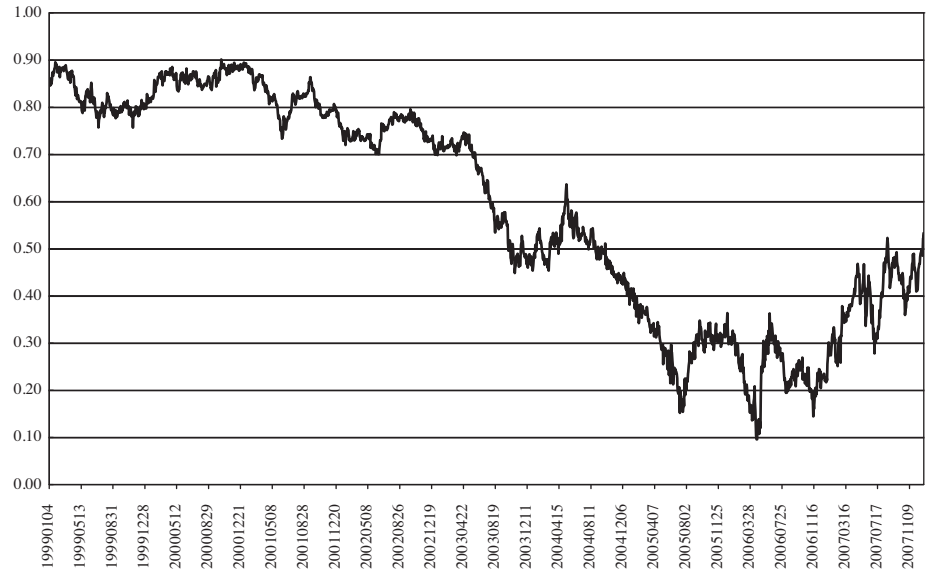

图 2： A-H股价格折让一阶差异序列(1999年1月1日－2007年12月31日)

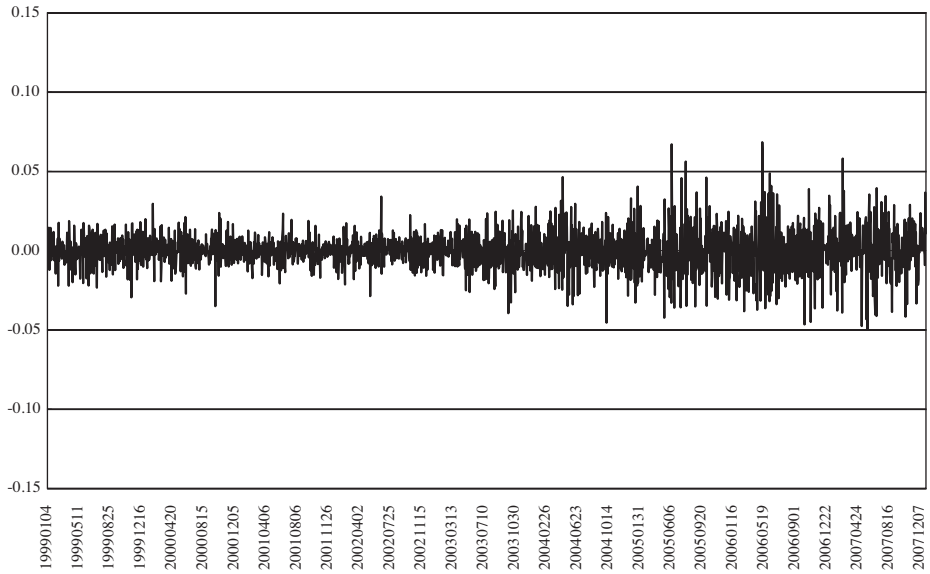

表 3： H股价格折让单位根增强Dicky-Fuller回归(ADF)检验

$$\Delta\chi_t = \mu + \alpha\chi_{t-1} + \sum_{i=1}^{k} w_i \Delta\chi_{t-i} + e_t$$

公司名称	H股代码	*PD*	Δ*PD*
		τ(α)	τ(α)
Northeast Electric Development	42	-2.359	-32.484**
Tsingtao Brewery	168	-1.635	-35.655**
Jiangsu Expressway	177	-1.374	-30.389**
Beiren Printing Machinery	187	-1.972	-30.617**
Shenji Group Kunming Machine Tool	300	-1.991	-21.429**
Guangzhou Shipyard International	317	-1.761	-32.886**
Maanshan Iron & Steel	323	-1.541	-35.454**
Sinopec Shanghai Petrochemical	338	-1.883	-33.258**
Angang Steel	347	-1.530	-34.075**
Jingwei Textile Machinery	350	-1.939	-31.475**
Jiangxi Copper	358	-1.567	-30.304**
China Petroleum & Chemical	386	-2.059	-28.432**
Guangshen Railway	525	-3.052*	-11.329**
Shenzhen Expressway	548	-1.558	-27.800**
Nanjing Panda Electronic	553	-3.218	-31.246**
Beijing North Star	588	-2.779	-12.661**
China Eastern Airlines	670	-2.300	-34.109**
Shandong Xinhua Pharmaceutical	719	-1.860	-33.511**
Air China	753	-0.994	-13.674**
ZTE	763	-1.545	-19.056**
Guangzhou Pharmaceutical	874	-2.005	-30.178**
Huaneng Power International	902	-2.175	-26.250**
Anhui Conch Cement	914	-2.232	-28.601**
Hisense Kelon Electrical	921	-1.624	-27.369**
Datang International Power Generation	991	-1.894	-9.197**
Anhui Expressway	995	-1.965	-25.664**
Sinopec Yizheng Chemical Fibre	1033	-2.787†	-33.306**
China Southern Airlines	1055	-1.395	-20.607**
Tianjin Capital Environmental Protection	1065	-1.865	-34.167**
Huadian Power International	1071	-1.533	-17.388**
Dongfang Electrical Machinery	1072	-1.299	-31.948**

表 3 ： H股价格折让单位根增强Dicky-Fuller回归(ADF)检验*(续)*

公司名称	H股代码	*PD*	Δ*PD*
		τ(α)	τ(α)
Luoyang Glass	1108	-1.637	-30.613**
China Shipping Development	1138	-1.982	-27.780**
Yanzhou Coal Mining	1171	-1.728	-31.790**
Industrial and Commercial Bank of China	1398	-1.621	-13.203**
China Merchants Bank	3968	-1.407	-14.828**
Bank of China	3988	-0.558	-15.497**

注释： 此表呈报了H股价格折让序列单位根的增强Dicky-Fuller回归(ADF)检验。*PD*是原始H股价格序列。*ΔPD*是H股价格折让的一阶差异序列。**, *, 和† 分别表示单位根检验以1%, 5%, 和10%水平显著。

众多的研究发现股价序列有单位根。研究中，我们也发现H股价格折让序列(PD_{it})是不平稳的。但如图 1 和 2 所示，其一阶差分序列(ΔPD_{it})是平稳的。增强的Dicky-Fuller (ADF)单位根检验的结果列于表 3 。因此，我们在本文中所有的回归分析中均用表示H股价格折让变化的ΔPD_{it}进行分析。[3]

2.2 卖空限制

1994年1月3日前，香港禁止卖空。之后，香港交易所开始了允许卖空17只指定股票的试行计划。从1996年开始，香港股票市场从禁止卖空向有监管卖空制度转变。但是只有那些香港联交所(现在的交易所)指定的股票才可以被卖空。香港交易所每季度修改并公布允许卖空的股票名单。[4]在我们的样本期间，约80%交叉上市的H股可以被卖空，当然这个比例会随时间改变。为防止狂热的自我交易，交易所规定，所有卖空交易都应该以高于现时买盘价的涨盘卖空规则进行。[5]按照此制度安排，股票经纪必须每天向香港交易所确认并报告卖空活动。交易所据此合并指定卖空个股全部的每天交易股数和卖空交易值，并于翌日通过网络和报纸向公众披露。H股卖空公告和交易数据取自香港交易所每日卖空数据库(Daily Short Selling Database)。由于直到1999年1月1日才有每日卖空交易的数据，对于在此前上市的公司，其样本期间就从该日开始计算。我们的最终样本包括了直至2006年末所有同时在A股和H股主版上市的公司。

[3] 我们还用回报率差异作为因变量，实证结果基本相同。

[4] 关于香港卖空机制的体制背景，可以参照Chang et al. (2007)。

[5] 香港证券交易所于1996年起取消“涨盘卖空规则”。两年半之后，1998年9月7日为了应对变化的市场情况又重新恢复了这一规则。自此，作为预防过度卖空压力的方法，“涨盘卖空规则”用于所有卖空活动。股票期权做市商为了对冲投资组合风险而进行的交易活动除外。

为了衡量卖空对于价格折让的影响，我们定义H股卖空交易量对H股总交易量的比例*SSR*为：

$$SSR_{i,t} = \frac{SSV_{H,it}}{V_{H,it}},$$

其中$SSV_{H,it}$是股票*i*在*t*日的卖空交易量。表2显示卖空比率(*SSR*)在样本期间一直在增加，从第一个子样本期间的0.59%增加到后一个子样本期间的4.12%。

因为A股不可以卖空但H可以卖空，所以卖空将会降低指定卖空H股的股价，但不影响相应A股的价格，[6]因此，H股的价格折让会增大。我们的第一个假设是：

H1：交叉上市H股的卖空活动和H股价格折让正相关。

表4给出了H股价格折让和独立变量之间的相关矩阵。与第一个假设一致，我们发现Δ*PD*和*SSR*在1%的水平上显著正相关(0.020)。

2.3 流通限制和非流通股改革

2005年4月29日，为了“消除A股转让机制的差异”，中国证监会宣布了旨在将全部非流通股转化成流通股的改革方案。这场改革被正式命名为“股权分置改革”。该改革的主要步骤是将原来国有和其他法人持有的非流通股转为可流通股，并通过提供额外的A股或现金来补偿现有流通A股的持股人。非流通A股改革是上市国有企业私有化改革的重大举措。此项改革通过增加流动性和投资机会，消除非流通A股未来的不确定性，并使A股股价更接近与其基本价值来刺激A股市场。此项改革有助于缩小A股泡沫，特别是在非流通股解禁期以后。

我们用A股可流通股数的变化来直接衡量由于流通限制导致的有限投资机会。由于上市公司还可以通过增发、配股和股票红利等形式来增加可流通A股的数量，我们将由“股权分置改革”(*Type1*)导致的股票数量变化和由其它原因(*Type2*)导致的股票数量变化区分开来：

若流通A股数量变化是由股权分置改革所致，$Type1_{i,t} = 1$，否则为零。

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[6] 投资者也可以利用期货或期权来对冲股票交易风险。但是，H股期货和期权直到2003年12月8日和2004年6月14日才先后引进。在我们的样本期间只有两只H股有期货或期权。

表 4 ： 相关系数矩阵

	ΔPD	ΔPD_{t-1}	SH	HK	SSR	$Type1$	$Type2$	$\tau_{A/H}$	SPR_{A-H}	$VA_{A/H}$	ΔFX
ΔPD	1.000										
ΔPD_{t-1}	-0.048**	1.000									
SH	0.301**	-0.031**	1.000								
HK	-0.208**	-0.027**	0.217**	1.000							
SSR	0.020**	0.008	-0.025*	-0.048**	1.000						
$Type1$	-0.190**	0.006	-0.001	0.003	-0.004	1.000					
$Type2$	-0.002	-0.002	0.002	-0.001	-0.007	-0.001**	1.000				
$TR_{A/H}$	0.118**	0.117**	0.075**	-0.017**	0.021	0.099**	0.046	1.000			
$SPR_{A/H}$	0.002	-0.010	-0.026**	0.015*	-0.047**	-0.005	-0.007	-0.032*	1.000		
$RRA_{A/H}$	0.041**	0.003	-0.008	0.033**	0.039**	0.044**	0.033*	0.342**	0.037*	1.000	
ΔFX	-0.032**	0.028**	-0.013**	0.004	-0.023**	-0.000	-0.009	-0.008	0.020*	-0.006	1.000

注释： 此表格呈报了自变量和因变量的相关系数矩阵。ΔPD 是H股价格折让变化。SH_t (SZ_t) 和 HK_t 分别是沪市(深市)综合指数回报率和恒生指数回报率。SSR 是H股卖空交易量和H股交易量的比率；$Type1$ 虚拟变量，如果可流通的A股数目变化是由于股权分置改革引起的，参数值为 1 。$Type2$ 虚拟变量，如果可流通的A股数目变化是由于除了股权分置改革外其他因素引起的，参数值为 1 。$TR_{A/H} = \log(1 + turnover_{A,it}) - \log(1 + turnover_{H,it})$ ，是A和H股流转率的相对比例；SPR_t 是A和H股买卖差价的差异。$RRA_{A/H}$ 是A和H股投资者的相对风险规避水平。RMB/US$ 和RMB/HK$ 人民币兑美元和人民币兑港元的汇率。ΔFX 是人民币和港元的汇率变化。**、*，和†分别表示 t 检验在1%、5%，和10%的水平上显著。

若流通A股数量变化是由其它原因所致，$Type2_{i,t} = 1$，否则为零。

我们用样本公司的股份结构变化公告来区分可流通A股股份数量变化的原因。需注意的是，*Type*2变化发生在整个样本期间；而*Type*1变化仅发生在2005年5月之后。我们的第二个假设是：

H2: 取消对非流通A股的流通限制（*Type*1）有助于减少H股的股价折让。

和我们的预期一样，表4中Δ*PD*和股改虚拟变量*Type*1 (-0.190) 在1%水平上显著负相关，Δ*PD*和*Type*2负相关但并不显著。

2.4 其它考量

类似于Froot and Dabora (1999)关于市场情绪的观点，H股股价折让的变化，反映了相对于香港投资者，中国大陆投资者的乐观或是悲观情绪。所以H股股价折让应该和相对股票市场震荡相关。表4显示，H股股价折让变化(Δ*PD*)与上海（深圳）股票市场指数回报率(0.301)正相关，与香港股票市场指数回报率负相关(-0.208)。

按照流动性假设，境外股票的价格折让是由低流动性和高交易成本造成的。根据以往的文献(Amihud and Mendelson, 1986; Datar *et al.* 1998)，我们定义了两个流动性变量。第一个变量$TR_{A\text{-}H}$以流转率为基础，是A股和H股相对流转率的对数：

$TR_{A/H,it} = \log(1 + turnover_{A,it}) - \log(1 + turnover_{H,it})$。

第二个变量$SPR_{A\text{-}H}$以交易成本为基础，定义为A股和 H股买卖差价之差：

$SPR_{A\text{-}H} = SPR_A - SPR_H$ (*RMB/HK$*)。

表2显示，A股和H股的日平均流转率分别为0.0267和0.0106。按一年240个交易日计，A股和H股的年平均流转率分别为640%和254%。平均而言，A股相对H股多交易386%。A股的买卖价差比H股小，但是差异不大。在整个期间及所有的三个子期间，A股和 H股的平均买卖差价之差($SPR_{A\text{-}H}$)是负的，这说明H股的交易成本较高。所有这些结果都显示A股比相应的H股流动性更大。如果投资者对资产的基本价值有不同观念且受卖空限制，那么股价中的投机成份和股票流转率会存在正相关关系(Mei *et al*., 2005)。如果我们相信相对于H股价格，A股的价格存在显著的投机成份，那么我们应该会发现H股价格折让和A股与H股的平均流转率比率($TR_{A/H}$)正相关。事实上，表4的相关矩阵证明了Δ*PD* 与$TR_{A/H}$显著正相关(0.118)。

按照不同风险假设，国内和境外投资者有不同程度的风险厌恶水平，从而境外股票价格折让和国内投资者与境外股票投资者的风险厌恶比率相关(Eun and Janakiramanan, 1986)。我们采用每天股价的高低价差来估计风险水平(Parkinson,

1980)，[7]定义A股和H股的相对风险水平$RRA = Range_A / Range_H$。表2显示，除第三个子时期外，$RR_{A/H}$非常接近1。这说明，除了最后一个子样本期间外，一般而言A股和H股投资者之间的风险厌恶程度没有显著差别。在第三个子样本期间，市场过热，A股投资者愿意承受较高投资风险。

最后我们采用人民币兑港元汇率的百分比变动ΔFX来检验汇率变化对H股价格折让的影响。由于H股是由国内公司发行的，股息以人民币支付，任何人民币相对港元汇率的重估(或预期重估)，都会改变以港元计价的H股的预期未来现金流量的现值。由于港元盯住美元，人民币对美元的官方汇率受中国政府"管理"，如果汇率平价定律存在，人民币兑港元汇率的比率变化也反映了人民币兑美元的重估。和我们的预期一致，ΔPD与ΔFX负相关。

三、实证结果

我们的主要研究假设是，投资者对股价有不同理念时，H股的巨大折让反映了除了市场情绪、风险偏好差异以及汇率风险之外的由交易限制引致的投机成份。

3.1 面板数据回归

为了检验假设1和2，我们估计以下回归模型：

$$\begin{aligned}\Delta PD_{it} = {} & b_0 + b_1 \Delta PD_{it-1} + b_2 SH_t + b_3 HK_t + b_4 SSR_{it} + b_5 Type1_{it} + b_6 Type2_{it} \\ & + b_7 TR_{A/H,it} + b_8 SPR_{A-H,it} + b_9 RRA_{A/H,it} + b_{10} \Delta FX_t + u_{it}\end{aligned} \tag{1}$$

其中SH_t和HK_t分别是沪市(深市)综合指数回报率和恒生指数回报率。其它变量已在第二部分中定义过。香港交易所较上海和深圳两市晚一个小时收盘，沪深两市收盘后的信息可能影响到H股价格，但对A股价格没有影响。[8]以往的研究显示，股票日回报率存在的自相关不能完全归咎于非同步交易(Lo and MacKinlay, 1990)。从表4中的相关矩阵中也可以看出，ΔPD_t与ΔPD_{it-1}在1%水平上显著负相关。因此我们在模型(1)中加入了一阶自回归项ΔPD_{it-1}，以控制每天价格折让的自相关。

由于我们的样本期间相对较长而样本公司数目相对较少，根据Domovitz *et al*. (1997)，我们用面板数据分析来估计横截面和时间序列上H股价格折让的决定因素。许多研究表明，金融面板数据的残差可能跨时间和跨公司相关。Peterson (2009)提议用Cameron *et al*. (2006) 和Thompson (2006) 稳健聚类方法估计标准差，在本研

[7] 高低价差估计在金融文献中被广泛的应用(见Alizadeh *et al*., 2002)

[8] 沪深两市北京时间早9:30开盘、午后3点收盘。港交所早10点开盘、午后4点收盘。北京和香港之间无时差。

究中，我们使用该稳健估计方法。这种方法允许不同公司在同一时间，以及相同公司在不同时间存在相关性。回归系数的方差估计具体为：

$$\hat{\mathbf{V}}\mathbf{ar}(\hat{\beta}) = \hat{\mathbf{V}}_{firm} + \hat{\mathbf{V}}_{time,0} - \hat{\mathbf{V}}_{white,0}$$

其中$\hat{\mathbf{V}}_{firm}$和$\hat{\mathbf{V}}_{time,0}$分别是按公司和按时间聚类的估计方差，$\hat{\mathbf{V}}_{white,0}$是怀特异方差-稳健方差矩阵。本文中，所有回归都采用稳健聚类标准差估计。

表5概括了用回归模型(1)中总共十个解释变量其中每个变量的一元回归，部分自变量以及全部自变量的多元回归结果。与Lo and MacKinlay (1990)的看法一致，第一个一元回归显示价格折让存在显著负的一阶自相关。

第2和第3个一元回归模型显示，在整个样本期间，ΔPD和沪市(深市)综合指数回报率显著正相关，和香港市场指数回报率显著负相关。此结果和市场情绪假设一致。我们的发现与Wang and Jiang (2004)的结果不同。他们发现在早些年(1996-2001)，香港市场对于解释H股价格折让起更重要的作用；而在我们的样本期间(1997-2001)，结果却刚好相反。回归2和3中，调整R^2分别是7.7%和3.87%，这表明近年来中国A股市场对解释H股价格折让起到更大的作用。这一发现和近年来中国大陆证券市场比香港证券市场规模大，在全球证券市场中更重要这一事实一致。

更重要的是，和我们的研究假设一致，一元回归4显示SSR的系数 (0.0068)显著为正；一元回归5和6 显示$Type1$的系数显著为负(-0.1399)；而$Type2$的系数为负(-0.0026)但在5%水平上不显著。这些结果表明，由于A股不能卖空，H股的卖空行为降低了H股的价格，从而增大了价差；而股权分置改革取消了流通限制，减少了A股价格中的投机因素，因此会缩小H股价格折让。

与流动性假设一致，回归7和8显示$TR_{A/H}$和SPR_{A-H}的系数都显著为正，这说明H股的价格折让是相对流动性的函数。和不同风险假设一致，回归9显示相对风险厌恶程度$RRA_{A/H}$的估计系数显著为正，但是当把其他独立变量加入回归方程的时候，$RRA_{A/H}$的估计系数为正但不显著。在单变量回归模型10中，汇率变化的系数在10%的水平显著为负，这表明港元(美元)相对于人民币的贬值会增大H股的价格折让。

多元回归模型11、12 和13显示，在控制了其他变量之后，交易限制(SSR和$Type1$)变量系数和市场情绪系数(SH和HK)依然显著。比如，多元回归模型13中显示，ΔPD与沪市(深市)市场指数回报率显著正相关(系数为0.3592)。这些结果和市场情绪假设一致。SSR的系数显著为正(0.0047)，$Type1$系数显著为负(-0.1461)，这些结果进一步证实了研究假设 1 和 2 。应注意的是，相对于卖空限制，流通限制对于解释H股的价格折让具有更大的作用。最后，与图 1 和表 2 中的基本统计量一致，在包括所有变量的回归模型中，截距为负，说明在样本期间H股的价格折让有随时间下降的趋势。

表5： 面板数据回归

模型	1	2	3	4	5	6	7	8	9	10	11	12	13
截距	-0.0003	-0.0005**	-0.0002	-0.0004*	-0.0002	-0.0003	-0.0011**	-0.0001	-0.0013*	-0.0003	-0.0016**	-0.0016**	-0.0017*
	(-1.266)	(-2.577)	(-0.849)	(-2.075)	(-0.960)	(-1.246)	(-4.556)	(-0.331)	(-2.567)	(-1.441)	(-3.266)	(-3.353)	(-3.404)
ΔPD_{t-1}	-0.0565**										-0.0657**	-0.0662**	-0.0664**
	(-3.919)										(-6.059)	(-6.024)	(-6.030)
SH		0.3294**									0.3617**	0.3590**	0.3592**
		(12.619)									(13.169)	(13.141)	(13.133)
HK			-0.2740**								-0.3539**	-0.3535**	-0.3531**
			(-9.703)								(-10.674)	(-10.773)	(-10.790)
SSR				0.0068*							0.0050*		0.0047*
				(2.460)							(2.506)		(2.300)
*Type*1					-0.1399**							-0.1461**	-0.1461**
					(-5.931)							(-6.237)	(-6.229)
*Type*2						-0.0026							-0.0025
						(-0.974)							(-0.964)
$TR_{A/H}$							0.0720**				0.0605**	0.0707**	0.0705**
							(7.409)				(7.154)	(8.463)	(8.447)
SPR_{A-H}								0.0059*			0.0102**	0.0099**	0.0102**
								(2.448)			(6.351)	(5.813)	(6.284)
RRA_H									0.0012*		0.0006	0.0007†	0.0007
									(2.510)		(1.470)	(1.718)	(1.614)
ΔFX										-0.4982†	-0.3697†	-0.3724†	-0.3665†
										(-1.861)	(-1.781)	(-1.793)	(-1.762)
Adj. R^2	0.0033	0.0770	0.0387	0.0005	0.0291	0.00003	0.0113	0.0003	0.0024	0.0008	0.1472	0.1791	0.1794

注释： 此表格呈报了采用聚类标准差方法（Thompson, 2006; 以及 Cameron, Gelbach and Miller, 2006）估计的回归模型：

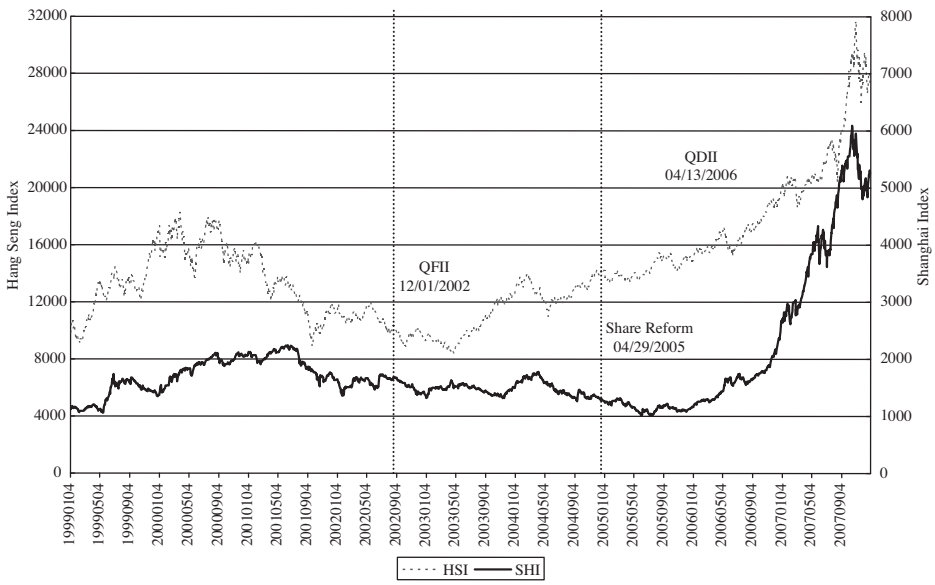
$$\Delta PD_{it} = b_0 + b_1\Delta PD_{it-1} + b_2SH_t + b_3HK_t + b_4SSR_{it} + b_5Type1_{it} + b_6Type2_{it} + b_7TR_{A/H,it} + b_8SPR_{A-H,it} + b_9RRA_{A/H,it} + b_{10}\Delta FX_t + u_{it} \quad (1)$$

ΔPD是H股价格折让变化。SH_t (SZ_t) 和HK_t分别是沪市（深市）综合指数回报率和恒生指数回报率。*SSR*是H股卖空交易量和H股交易量的比率；*Type*1虚拟变量，如果可流通的A股数目变化是由于股权分置改革引起的，参数值为1。*Type*2虚拟变量，如果可流通的A股数目变化是由于除了股权分置改革外其他因素引起的，参数值为1。$TR_{A/H}$是A和H股流转率的相对比例；SPR_t是A和H股买卖差价的差异。$RRA_{A/H}$是A和H股投资者的相对风险规避水平。RMB/US$ 和RMB/HK$人民币兑美元和人民币兑港元的汇率。$\Delta FX$是人民币和港元的汇率变化。括弧中的$t$值是按照稳健标准差计算得来的。**、*，和†分别表示t检验在1%、5%，和10%的水平上显著。

3.2 牛市和熊市期间的卖空行为

表 5 中的回归模型结果清楚表明，H股价格折让与上海（深圳）交易所及香港交易所的市场环境显著相关。为进一步研究H股价格折让和市场环境的动态关系，图 3 画出了上海和香港交易所的价格指数。

图 3： 恒生指数 (HSI) 和上证指数 (SHI)（1999 年 1 月 1 日－2007 年 12 月 31 日）



根据中国大陆和香港市场的趋势以及几个主要有关政策的改变，我们将样本期间划分成 3 个子期间：1999 年 1 月 1 日至 2002 年 11 月 30 日；2002 年 12 月 1 日至 2005 年 4 月 30 日；2005 年 5 月 1 日至 2007 年 12 月 31 日。在第一个子样本期间，中国大陆市场基本属于牛市，而香港市场还处于 1997 年亚洲金融危机后的恢复期。因此，H股的价格折让有减小趋势，但依然保持在非常高的水平（78.6%，表 2）。

划分第一和第二子样本期间的重大事件是 QFII。2002 年 11 月 5 日，证监会和人民银行公布了《合格境外机构投资者境内证券投资管理办法》。QFII 于 2002 年 12 月 1 日正式实施。QFII 的实施被普遍认为是中国国内证券市场向境外投资者开放的里程碑。虽然最初引进 QFII 的目的是希望通过吸引境外投资者来刺激当时处于熊市的 A 股市场，但政策对于 A 股价格却并无太大正面作用。从 2001 年 2 月 B 股市场对国内投资者逐渐开放，随后在 2002 年 11 月末开放向 QFII 开放 A 股市场，之后 A-B 股差价显著缩小。[9] 对于 A 和 H 股合并可能性的推测刺激了 H 股股价。人民币重估的期望进一步加大了 H 股的投机活动，H 股指数从 2002 年末开始反弹。这一时期，由于 A 股主要处于熊市而香港市场处于牛市，H 股平均价格折让显著减少至 51.5%。

[9] 关于向国内投资者开放B股市场对A-B股溢价的影响，参看Mei *et al.* (2005) 和Chan *et al.* (2008)。

划分第二和第三子样本期间的重大事件是始于2005年4月末的非流通股股改。由于消除了非流通股命运的不确定性，这一改革初期刺激了A股价格。另一方面，尽管证监会对于原先非流通股份在禁售期后的销售做出了很多限制。[10]在12个月的禁售期后，由于许多前非流通股股东在很短的时间内沽售原非流通的股票，这会对股票价格产生很大的下跌压力。在第三个时期，H股的平均价格折让显著减少到33.4%。第三个时期是明显的泡沫时期，两个市场都处于过热和极度波动状态。[11]之后，2007年末由于全球金融海啸开始，泡沫破灭。

另一个发生在同一期间内的重大事件是合资格的国内机构投资者(QDII)的提出。为了给大量的外汇储备投资国际资本市场提供渠道，中国人民银行于2006年4月13日发布了旨在设立QDII计划第5号令。QDII计划允许合资格的国内商业银行、证券机构和保险公司进行有限的境外投资。QDII和QFII共同为通过机构投资者实现中国资本的输入和输出建立了双向渠道。但是，由于在样本期间总配额有限，QDII对H价格的影响主要是在心理层面。[12]

作为稳健性测试，表6报告了3个子样本期间的回归模型(1)的估计。[13]表6中子样本的回归分析结果和表5中的结果一致。对于所有的三个子样本期，ΔPD模型中，沪市(深市)综合指数回报率系数的估计值显著为正，香港市场指数回报率系数的估计值显著为负。卖空变量系数的估计在子样本期间II和III显著为正，而在子样本期间I则不显著。[14]这一结果的主要原因是，香港市场在第一个子样本期间处于下跌态势，卖空活动并不活跃；而在第二和第三个子样本期间，香港市场处于上升态势，卖空交易活跃。表2显示，卖空比率(SSR)在第一个、第二个和第三个子样本期间分别为0.59%、1.91%和4.12%。卖空对于降低牛市期间被高估的股价起着重要的作用。

由于非流通股改革发生在2005年5月之后，很自然，股权分置改革系数($Type1$)只是在第三个亚样本期间才显著。ΔFX的系数在第一个子样本期间为负，显著水平是5%；在第二和第三个字样本期间是负的，但不显著。这一结果和人民币重估预期只是在较早的样本期间对H股有影响的现像是一致的。中国政府2005年正式开始人民币价值重估过程之后，重估期望的影响减弱。

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[10] 比如，证监会要求原持有上市公司超过5%的非流通股股东，一旦禁售期结束，就可以卖出股票。通过股票交易所交易系统交易卖出的股份，在12个月内不超过所有上市公司股份的5%，在24个月内不多于10%。如果原非流通股股东要卖相对大量的上市公司股票，可以通过向特定投资者配售的方式进行。

[11] 上证指数到2007年10月16日升至6,092的历史高位；恒生指数于2008年10月30日升至31,638。由于我们的主要目的不在于考察市场泡沫和市场崩盘，而且我们的样本期间止于2007年年末，我们将这个有趣的课题留给未来研究。

[12] 2007年5月11日，在授予15家银行和基金总配额为142亿美元的QDII资格后，证监会宣布将会拓宽QDII的投资范围，允许银行提供有限度的股票相关产品服务。

[13] 我们也进行了两个时期分析，结果和报告于此的三个时期分析的结果基本相同。

[14] 我们在回归中也利用了卖空哑变量。在时间t如果样本公司是合资格卖空的，我们计为1，否则为0。我们发现卖空哑变量的估计值也在整个样本中在5%的水平上是显著为正，在亚样本期间为正但不显著。这为实际卖空交易比一家股票是否具有卖空资格更加明显和有效提供了证据。

表6： 子样本分析

	子样本期间I 1999年1月1日－ 2002年11月30日		子样本期间II 2002年12月1日－ 2005年4月30日		子样本期间III 2005年5月1日－ 2007年12月31日	
	估计值	*t*值	估计值	*t*值	估计值	*t*值
Intercept	-0.0009†	(-1.849)	0.0005	(0.587)	-0.0066**	(-6.342)
ΔPD_{t-1}	-0.0207	(-1.113)	-0.0792**	(-5.088)	-0.0624**	(-4.403)
SH	0.1445**	(7.533)	0.3390**	(11.500)	0.5716**	(16.841
HK	-0.1414**	(-8.626)	-0.5148**	(-9.499)	-0.6517**	(-13.639)
SSR	-0.0008	(-0.164)	0.0080*	(2.096)	0.0068**	(2.972)
*Type*1	0.0000		0.0000		-0.1471**	(-6.253)
*Type*2	-0.0032	(-0.862)	-0.0078**	(-2.961)	0.0022	(0.339)
TR_H	0.0412**	(4.363)	0.1098**	(5.895)	0.0831**	(6.079)
SPR_{A-H}	-0.0058†	(-1.698)	0.0156†	(1.731)	0.0089**	(4.992)
RRA_H	0.0004	(0.995)	-0.0013†	(-1.840)	0.0038**	(4.702)
ΔFX	-0.4452*	(-2.060)	-0.3921	(-1.222)	-0.4309	(-1.605)
Adjusted R^2	0.1201		0.1758		0.2582	

注释： 此表格呈报了采用聚类标准差方法(Thompson, 2006; Cameron, Gelbach and Miller, 2006)估计的回归模型：

$$\Delta PD_{it} = b_0 + b_1\Delta PD_{it-1} + b_2SH_t + b_3HK_t + b_4SSR_{it} + b_5Type1_{it} + b_6Type2_{it} + b_7TR_{A/H,it} + b_8SPR_{A-H,it} + b_9RRA_{A/H,\,it} + b_{10}\Delta FX_t + u_{it} \quad (1)$$

ΔPD是H股价格折让变化。SH_t (SZ_t) 和HK_t分别是沪市(深市)综合指数回报率和恒生指数回报率。*SSR*是H股卖空交易量和H股交易量的比率；*Type*1虚拟变量，如果可流通的A股数目变化是由于股权分置改革引起的，参数值为1。*Type2*虚拟变量，如果可流通的A股数目变化是由于除了股权分置改革外其他因素引起的，参数值为1。$TR_{A/H}$是A和H股流转率的相对比例；SPR_t是A和H股买卖差价的差异。$RRA_{A/H}$是A和H股投资者的相对风险规避水平。RMB/US$ 和RMB/HK$人民币兑美元和人民币兑港元的汇率。$\Delta FX$是人民币和港元的汇率变化。括弧中的*t*值是按照稳健标准差计算得来的。**、*，和†分别表示*t*检验在1%、5%，和10%的水平上显著。

3.3 上升和下跌市场时的卖空

卖空在上升和回落市场对H股价格折让的影响不同。当市场上升时，市场情绪高涨，A股价格更倾向于反映乐观投资者的观念，所以交易限制导致的泡沫较下跌时期更大。H股的卖空活动包含更多信息，对H股价格有较大的向下压力，从而会加大A股和H股的价格差异。

在市场下跌时，市场情绪较低，许多的投资者倾向于悲观，A股价格中的投机因素较小。H股的卖空多半是由于市场恐慌而非信息所致。另外，由于香港采用的涨盘卖空规则要求所有卖空交易必须以高于现时最好要价的价格进行，卖空在市场下跌时对股价的影响被进一步弱化。因此我们的第三个假设是：

H3: 卖空在市场下跌时对H股的价格折让影响较弱。

为检验这一假设，我们按照沪市（深市）每天市场指数回报率的正负，将所有的样本交易日划分为‘升’和‘跌’日：

$D_t^{Up}=1$，若$R_{SH,t}>0$；否则$D_t^{Up}=0$

我们将‘升’和‘跌’日的卖空比率分别定义为：

$$SSR_{it}^{Up} = SSR_{it} \times D_t^{Up};\ SSR_{it}^{Down} = SSR_{it} \times (1-D_t^{Up});$$

表7的分表A给出了回归模型(2)的估计值：

$$\begin{aligned}\Delta PD_{it} = {} & b_0 + b_1\Delta PD_{it-1} + b_2 SH_t + b_3 HK_t + b_4 SSR_{it}^{Up} + b_5 SSR_{it}^{Down} + b_6 Type1_{it} \\ & + b_7 Type2_{it} + b_8 TR_{A/H,it} + b_9 SPR_{A-H,it} + b_{10} RRA_{A/H,it} + b_{11}\Delta FX_t + u_{it}\end{aligned} \tag{2}$$

和我们的假设一致，在整个样本期间，b_4在1%水平上显著为正(0.0157)，而b_5不显著。表7中子样本分析与表6中的结果一致。表7的分表A显示，卖空显著加大了升日的价差而对跌日没有影响。

其它关于卖空对价格的不对称影响的解释还有，卖空在市场上升时较下跌时活跃，或者是因为其它独立变量在市场上升和下跌期间的表现不同。为了考察这些解释，表7分表B报告了自变量和因变量在市场上升和下跌时的基本统计量和相对应的t检验。首先H股平均价格折让变化(ΔPD)在市场上升时是正的，而在市场下降时是负的，上升和下跌期间的差异（0.0081）在1%的水平上显著为正。这些结果和我们认为在上升期间股价的投机成分较大而在下跌期间比较小的观点是一致的。

表7： 升跌市场

分表A: 回归(2)估计值

	总体		期间I		期间II		期间III	
	估计值	t值	估计值	t值	估计值	t值	估计值	t值
截距	-0.0017**	(-3.397)	-0.0009†	(-1.839)	0.0005	(0.589)	-0.0066**	(-6.331)
ΔPD_{t-1}	-0.0656**	(-5.991)	-0.0207	(-1.106)	-0.0789**	(-5.081)	-0.0620**	(-4.392)
SH	0.3461**	(13.084)	0.1433**	(7.493)	0.3324**	(11.470)	0.5622**	(16.492)
HK	-0.3547**	(-10.790)	-0.1414**	(-8.618)	-0.5150**	(-9.491)	-0.6531**	(-13.643)
SSR^{Up}	0.0157**	(5.599)	0.0094	(1.344)	0.0142**	(3.387)	0.0115**	(3.204)
SSR^{Dn}	-0.0069†	(-1.771)	-0.0094	(-1.392)	0.0024	(0.403)	0.0012	(0.291)
*Type*1	-0.1461**	(-6.224)	0.0000		0.0000		-0.1472**	(-6.252)
*Type*2	-0.0026	(-1.009)	-0.0033	(-0.950)	-0.0078**	(-3.072)	0.0021	(0.333)
$TR_{A/H}$	0.0700**	(8.406)	0.0411**	(4.353)	0.1098**	(5.903)	0.0827**	(6.047)
SPR_{A-H}	0.0102**	(6.222)	-0.0058†	(-1.703)	0.0157†	(1.732)	0.0089**	(5.009)
$RRA_{A/H}$	0.0007	(1.609)	0.0004	(0.977)	-0.0013†	(-1.844)	0.0038**	(4.702)
ΔFX	-0.3675†	(-1.763)	-0.4517*	(-2.095)	-0.3928	(-1.226)	-0.4305	(-1.598)
Adjusted R^2	0.1807		0.1206		0.1762		0.2584	

分表B：升跌市场时自变量和因变量的基本统计

	ΔPD	*SH*	*HK*	*SSR*	$TR_{A/H}$	SPR_{A-H}	$RRA_{A/H}$	ΔFX
升市场	0.0034	0.0117	0.0026	0.0295	0.0183	-0.0169	1.0687	-0.00012
跌市场	-0.0047	-0.0125	-0.0023	0.0341	0.0131	-0.0150	1.0663	-0.00013
差异	0.0081	0.0242	0.0049	-0.0047	0.0052	-0.0019	0.0024	0.00001
t-统计	17.59**	38.66**	12.67**	-0.64	1.45	-0.13	0.10	0.54

注释： 此表格呈报了采用聚类标准差方法(Thompson, 2006; Cameron, Gelbach and Miller, 2006)估计的回归模型：

$$\Delta PD_{it} = b_0 + b_1\Delta PD_{it-1} + b_2 SH_t + b_3 HK_t + b_4 SSR_{it}^{Up} + b_5 SSR_{it}^{Down} + b_6 Type\ 1_{it} + b_7 Type\ 2_{it} + b_8 TR_{A/H,it} + b_9 SPR_{A-H,it} + b_{10} RRA_{A/H,\ it} + b_{11}\Delta FX_t + u_{it} \quad (3)$$

ΔPD是H股价格折让变化。SH_t (SZ_t) 和HKt分别是沪市(深市)综合指数回报率和恒生指数回报率。*SSR*是H股卖空交易量和H股交易量的比率；*Type*1虚拟变量，如果可流通的A股数目变化是由于股权分置改革引起的，参数值为1。*Type*2虚拟变量，如果可流通的A股数目变化是由于除了股权分置改革外其他因素引起的，参数值为1。$TR_{A/H}$是A和H股流转率的相对比例；SPR_t是A和H股买卖差价的差异。$RRA_{A/H}$是A和H股投资者的相对风险规避水平。RMB/US$ 和RMB/HK$人民币兑美元和人民币兑港元的汇率。$\Delta FX$是人民币和港元的汇率变化。括弧中的*t*值是按照稳健标准差计算得来的。**、*，和†分别表示*t*检验在1%、5%，和10%的水平上显著。

表 8： 滞后回归

回归	1	2	3	4
截距	-0.0005	-0.0006	-0.0006	-0.0007
	-2.16*	-1.63	-1.43	-1.66+
ΔPD_{t-1}		-0.0577	-0.0624	-0.0628
		-4.71**	-4.81**	-4.82**
SH_{t-1}		-0.0130	-0.0118	-0.0114
		-0.72	-0.65	-0.63
HK_{t-1}		-0.0118	-0.0140	-0.0134
		-0.70	-0.83	-0.80
SSR_{t-1}	0.0086	0.0083		0.0083
	3.02**	3.16**		3.16**
$Type1_{t-1}$			-0.0198	-0.0198
			-2.74**	-2.73**
$Type2_{t-1}$				-0.0020
				-0.55
$TR_{A/H,t-1}$		-0.0030	-0.0008	-0.0013
		-0.43	-0.11	-0.18
$SPR_{A-H,t-1}$		-0.0030	-0.0033	-0.0030
		-1.86†	-1.85†	-1.84†
$RRA_{H,t-1}$		0.0001	0.0002	0.0001
		0.33	0.56	0.34
ΔFX_{t-1}		0.0209	0.0081	0.0193
		0.07	0.03	0.06
Adj. R^2	0.0007	0.0044	0.0046	0.0052

注释： 此表格呈报了采用聚类标准差方法 (Thompson, 2006; and Cameron, Gelbach and Miller, 2006) 估计的回归模型：

$$\Delta PD_{it} = b_0 + b_1 \Delta PD_{it-1} + b_2 SH_{t-1} + b_3 HK_{t-1} + b_4 SSR_{it-1} + b_5 Type1_{it-1} + b_6 Type2_{it-1} + b_7 \mathrm{TR}_{A/H,it-1} + b_8 SPR_{A-H,it-1} + b_9 RRA_{A/H,\ it-1} + b_{10} \Delta FX_{t-1} + u_{it} \qquad (3)$$

ΔPD 是H股价格折让变化。SH_t (SZ_t) 和 HK_t 分别是沪市（深市）综合指数回报率和恒生指数回报率。SSR 是H股卖空交易量和H股交易量的比率；$Type1$ 虚拟变量，如果可流通的A股数目变化是由于股权分置改革引起的，参数值为 1 。$Type2$ 虚拟变量，如果可流通的A股数目变化是由于除了股权分置改革外其他因素引起的，参数值为 1 。$TR_{A/H}$ 是A和H股流转率的相对比例；SPR_t 是A和H股买卖差价的差异。$RRA_{A/H}$ 是A和 H股投资者的相对风险规避水平。RMB/US$ 和RMB/HK$ 人民币兑美元和人民币兑港元的汇率。ΔFX 是人民币和港元的汇率变化。括弧中的 t 值是按照稳健标准差计算得来的。**, *, 和 † 分别表示 t 检验在 1%, 5%, 和 10% 的水平上显著。

其次，卖空在市场下跌时较上升时(0.0295)活跃：和下跌期间(0.0341)相比，*SSR*在上升期间较小，虽然差异(-0.0047)不显著。最后，所有的其他独立变量在上升和下跌时的差异都不显著。这些结果排除了卖空对价格的不对称影响可能是由于卖空在上升期间更活跃，或是不同期间独立变量不同的解释。

3.4 H股价格折让和前期卖空

我们发现*SSR*和同时期的H股价格折让正相关。在此，我们继续检验卖空行为是否还会进一步推低H股价格，进而加大H股价格的未来折让。为此，我们将H股价格折让对前期卖空变量和其他独立变量做回归，并将结果呈报于表8：

$$\begin{aligned}\Delta PD_{it} = {} & b_0 + b_1 \Delta PD_{it-1} + b_2 SH_{t-1} + b_3 HK_{t-1} + b_4 SSR_{it-1} + b_5 Type1_{it-1} \\ & + b_6 Type2_{it-1} + b_7 TR_{A/H,it-1} + b_8 SPR_{A-H,it-1} + b_9 RRA_{A/H,it-1} \\ & + b_{10} \Delta FX_{t-1} + u_{it}\end{aligned} \tag{3}$$

表8显示，控制了其他独立变量之后，H股价格折让还和前一天卖空变量*SSR*在1%水平上显著负相关。这一结果进一步支持了我们的研究假设。另外，这一结果还表明，卖空行为对H股价格折让有预测能力。

四、结论

在本文中，通过采用一个独特的中国公司交叉上市的A和H股数据集，我们考察了卖空、流通限制、以及不同观念对于股票价格的联合影响。

在控制了流动性、风险偏好和汇率风险之后，我们发现H股价格折让与卖空比率显著正相关，与A股股权分置改革变量以及市场情绪变量显著负相关。我们的结果显示，对A股的卖空限制和流通限制使A股的价格产生泡沫，由此影响H股的价格折让。

我们还发现，卖空对牛市和熊市时期市场价格发现过程的影响不对称。卖空在牛市和价格上升时会显著地增大H股价格折让，在熊市或价格下跌时却不会。卖空对交叉上市股票价格的不对称影响可以归因于由于交易限制导致的A股价格的投机因素在上升期间较大而在下跌期间较小，在上升期间较明显而在下跌期间较不明显。香港的涨盘卖空规则进一步限制了卖空在市场下跌时对于价格发现过程的作用。最后我们发现卖空活动对未来H股价格折让具有预测能力。

参考文献

见第74-76页。