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Location of trade, ownership restrictions, and market illiquidity: Examining Chinese A- and H-shares

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Abstract

We examine Chinese companies that issue both A-shares in mainland China and H-shares in Hong Kong. A-shares are restricted to mainland Chinese investors, while H-shares are available to Hong Kong and international investors. We find that H-shares exhibit significant exposure to Hong Kong market factors and behave more like Hong Kong stocks than mainland Chinese stocks. However, H-shares retain significant exposure to their domestic market and therefore provide foreign investors with diversification opportunities. We find a large time-varying H-share price discount relative to A-shares, and this discount is highly correlated with domestic and foreign market factors and relative market illiquidity.

JEL classification: G10; G15
Keywords: Cross-listing; Ownership restriction; Market sentiment; Illiquidity

1. Introduction

Over the last several decades, many companies have raised capital outside of their home countries by listing their stocks on several international exchanges. If international capital markets are perfectly integrated, then cross-listed shares, which are presumably driven by the same long-term fundamental values, should have the same

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return and risk characteristics, and their prices should not be affected by the trading location (Jorion and Schwartz, 1986; Gultekin et al., 1989). However, in reality, restrictions on foreign ownership, information asymmetry between domestic and foreign investors, language and cultural differences, and other direct or indirect barriers lead to segmented markets.

Previous studies (e.g., Errunza and Losq, 1985; Eun and Janakiramanan, 1986; Bodurtha et al., 1995) show that if the markets are segmented, then the prices of cross-listed securities are quite different, and can be influenced by the market movement of the country in which the securities are traded (Froot and Dabora, 1999). In this study, we examine Chinese companies that issue both H-share stocks in Hong Kong and A-share stocks on either the Shanghai Stock Exchange (SHSE) or the Shenzhen Stock Exchange (SZSE). [1] The headquarters and business activities of firms that issue both A- and H-shares are located in mainland China. The trading activities of A-shares take place in their home markets, the SHSE or the SZSE, while the trading activities of H-shares are in a "foreign" market – the Stock Exchange of Hong Kong (SEHK). Although the two classes of shares have the same stream of underlying future cash flows, H-shares are available to both Hong Kong residents and international investors, but A-shares are restricted to mainland Chinese investors. Thus, the Chinese A and H "twin" shares provide an ideal opportunity for examining how the behavior of cross-listed share prices is affected by trading and business location under ownership restrictions. If markets are perfectly integrated, then a firm's A- and H-share prices, which depend on the same stream of future cash flows and the same discount rate, should not be affected by the different trading locations. However, if markets are segmented, then A- and H-share prices are subject to the market-specific risks and investor sentiments in different trading locations.

The purpose of this paper is twofold. First, we investigate the relationship between H-share and A-share returns and the Shanghai (Shenzhen) and Hong Kong markets. Because firms that issue both A- and H-shares are located in mainland China, an interesting question is whether the dynamic movements of H-shares are more closely related to the Hong Kong market in which they trade, or to the markets in mainland China, where the firms are domiciled and conduct business. Second, we examine competing hypotheses on why H-shares sell at huge discounts relative to A-shares. We find that over our sample period, the average daily price discount of H-shares relative to A-shares is 75.7%. The average daily H-share price discount is 69.2% if the corresponding A-shares are listed on the SHSE, and 85.2% if the corresponding A-shares are listed on the SZSE. In other words, on average, investors in Hong Kong can purchase the same future cash flows promised by A-shares for HK$0.24 on the dollar by buying H-shares instead. To our knowledge, this study is the first attempt to systematically document and investigate the H-share price discount, and hence will extend the existing international financial markets literature.

[1] As of December 31, 2001, the SHSE listed 646 companies and the SZSE listed 508 companies. With the exchanges combined, the total market capitalization was over RMB5.2 trillion (about US$630 billion). There were 66.5 million stock accounts in China, representing about 5% of the entire population.

Our study differs from previous studies in several important ways. First, most of the studies on the return dynamics of cross-listed shares and the price discount for restricted securities focus on developed markets such as the US and the UK. Among the exchanges that we consider in this study, the SEHK is one of the "oldest" open emerging stock markets, while the SHSE and the SZSE are among the youngest emerging stock markets with government imposed ownership restrictions. By investigating the dynamic relation between H- and A-shares and these exchanges, we illuminate the price behavior of cross-listed shares on emerging markets with different degrees of openness.

We also use daily stock returns of dual-listed stocks instead of index or portfolio returns. Using individual firm returns enables us to investigate the dynamic behavior of foreign share discounts and examine competing explanations at the firm level. Furthermore, the dual-listed stocks that previous studies examine are usually traded more actively in their home market than in foreign markets. However, for the Chinese A and H "twins", most firms have much larger trading volumes and numbers of shares outstanding in the H-share market than in the A-share market. Thus, our study is less subject to a "thin trading" problem. Finally, because there is no time difference between Shanghai (Shenzhen) and Hong Kong, and because the trading hours for these markets overlap each other to a large extent, our study has little, if any, problems with nonsynchronous trading.

The paper is organized as follows. Section 2 introduces the previous studies that form part of the background to our study. In Section 3 we discuss the institutional background of A- and H-shares. We also present our basic data analysis. Section 4 discusses our empirical results relating to the co-movement of A- and H-share returns and the sources of H-share price discounts. Section 5 summarizes our main conclusions.

2. Previous studies

2.1. Co-movement of cross-listed securities and the markets

Garbade and Silber (1979) provide one of the earliest studies of the short-run behavior of the prices of identical assets that are trading in different markets. They test whether prices of securities that are dual-traded on the New York Stock Exchange and regional stock exchanges share a common equilibrium price, and conclude that although the New York Stock Exchange is the dominant market, prices on regional exchanges contain information that is relevant to New York traders. Hasbrouck (1995) treats the observed price as a multiple market extension in which the implicit efficient price is common to all markets, and shows that the sources of variation in this efficient price can be attributed to different markets.

Bodurtha et al. (1995) note that the characteristics of closed-end country funds (i.e., that their asset values are established in foreign markets and that they can be examined in relation to more than one market factor) allow us to separately evaluate the time-variation in share prices and their net asset value components in the context of

both foreign and US market movements. Using a two-factor market model, Chang et al. (1995) find that although most closed-end country funds retain significant exposure to their respective home market factors, closed-end country funds exhibit significant exposure to the US market factor and act more like US securities than their underlying assets. The authors suggest that the co-movement of country fund premiums with the US market reflects a US-specific risk or US market sentiment.

Froot and Dabora (1999) study pairs of "Siamese twin" companies whose stocks are traded around the world but have different trading and ownership habitats. They find that the relative price of a twin stock is highly correlated with the market on which the twin stock is traded most actively, and that the location of trade and ownership appear to influence prices. Kim et al. (2000) examine pricing factors for American Depository Receipts (ADRs) and find that although the underlying share price is the most important factor, the exchange rate and the US market index also have significant effects on ADR prices. In a recent study, Chan et al. (2003) investigate the price behavior and market activity of the Jardine Group companies after they were delisted from the SEHK. Although the trading activity of the Jardine Group moved to Singapore, the core business remained in Hong Kong and mainland China. Chan et al. find that the Jardine stocks are correlated less with the Hong Kong market and more with the Singapore market after the delisting, and conclude that the stock price fluctuations are affected by country-specific investor sentiment.

2.2. Sources of foreign share premiums (discounts)

If financial markets are segmented, then the prices of cross-listed securities can be quite different. Previous studies document the price discount on closed-end funds (Zweig, 1973; De Long et al., 1990; Lee et al., 1991), the price discount or premium on closed-end foreign country funds (Bodurtha et al., 1995), and the foreign share premiums relative to domestic shares (Eun and Janakiramanan, 1986; Hietala, 1989; Bailey and Jagtiani, 1994; Stulz and Wasserfallen, 1995). Contrary to the existing evidence that shares offered to foreign investors trade at a premium relative to shares offered to domestic investors, Bailey (1994) finds that the Chinese foreign class B-shares trade at a discount. In this paper, we document the H-share price discount relative to domestic A-shares.

2.2.1. Market-specific investor sentiment and location of trade

Bodurtha et al. (1995) argue that different risk factors affect the US and foreign markets, and that these risks are reflected in closed-end country fund premium movements. Using a multifactor model that accommodates both market segmentation and investor sentiment, they find that individual closed-end country fund premiums move together, primarily because of the co-movement of their stock prices with the US market. They conclude that international equity prices are affected by local risk factors or country-specific sentiment.

Froot and Dabora (1999) examine three pairs of twin stocks traded on the US, the UK, and the Dutch markets, and find that the difference between the prices of twin stocks is highly correlated with the market on which one of the twin stocks is traded

more actively. For example, when the US market moves up relative to the UK market, the price of a stock that is extensively traded in New York tends to rise relative to the price of its twin stock that is extensively traded in London. The correlation between twin stock price differentials and market indices are present at both long and short horizons. Therefore, the location of trade appears to matter for pricing.

2.2.2. Liquidity, transaction costs, and nontradable shares

The liquidity hypothesis implies that the observed foreign share discounts are due to their lower liquidity and higher trading costs. Amihud and Mendelson (1986) use the quoted bid–ask spread as a proxy for illiquidity, and suggest that relatively illiquid stocks have a higher expected return and are priced lower to compensate investors for increased trading costs. Datar et al. (1998) use the turnover as a proxy for liquidity and find that the liquidity measure plays a significant role in explaining the cross-sectional variation in stock returns. As a complement to the cross-sectional positive return–illiquidity relationship, Amihud (2002) shows that over time, expected market illiquidity also positively affects stock excess returns. He suggests that liquidity is not directly observable, and has a number of aspects that cannot be captured in a single measure.

2.2.3. Differential risk hypothesis

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). Ma (1996) claims that because the Chinese stock markets are speculative, and because speculative investors can tolerate higher levels of risk than can foreign investors, price differentials between the A- and B-shares can be partly explained by the investors' attitude toward risk.

2.2.4. Asymmetric information

Under a noisy rational expectation framework that incorporates both asymmetric information and market segmentation (Grossman and Stiglitz, 1980), Chakravarty et al. (1998) claim that the B-share price discount can be largely explained by market segmentation and information asymmetry between domestic and foreign investors. Due to language barriers, different accounting standards, and the lack of reliable information about the local firms, foreign investors have an information disadvantage in trading B-shares relative to domestic investors trading A-shares, therefore, the returns on A-shares lead the returns on B-shares. Contrary to Chakravarty et al. (1998), Chui and Kwok (1998) show that foreign investors receive news about China faster than do domestic Chinese investors because of information barriers in China. They find that the direction of information flow is mainly from the B-share market to the A-share market, and as a result the returns on B-shares lead the returns on A-shares. However, Chen et al. (2001) suggest that the asymmetric information hypothesis does not provide a convincing explanation for the source of the B-share price discount.

3. Institutional background and data

3.1. Background of A- and H-shares

China reopened its stock markets in the early 1990s. The Shanghai Stock Exchange – the first stock market of the People's Republic of China – opened on November 26, 1990. On April 11, 1991 the Shenzhen Stock Exchange opened.

Currently, there are three classes of shares issued by Chinese firms: A-, B-, and H-shares. Both A- and B-shares are listed and traded on the SHSE and SZSE. A-shares are domestic shares that are restricted to domestic investors. B-shares are foreign shares that until February 2001 were only available to foreign investors. However, Chinese citizens are now allowed to trade B-shares if they have the foreign currency required (i.e., US dollars for Shanghai B-shares and Hong Kong dollars for Shenzhen B-shares).

Chinese companies are also allowed to list shares overseas, thus enabling them to conduct external financing. Most Chinese offshore stocks are traded on the SEHK (H-shares), although there are now some Chinese stocks traded on the New York, London, and Singapore stock exchanges. Although both B- and H-shares are foreign shares, one important difference is that B-shares are listed and traded on the home market, but H-shares are not.

It is a well-established fact that investors can benefit from international diversification. However, in reality, international investors may find it difficult to directly invest in the mainland Chinese security markets due to ownership restrictions, language and culture barriers, and excessive transaction and information costs. H-shares are listed and traded on the SEHK but are issued by companies that operate and have headquarters in mainland China. Most of these companies are state-owned enterprises (SOEs). Many H-share issuing companies have subsequently listed A-shares on either the SHSE or the SZSE. H-shares provide Hong Kong and international investors with opportunities to invest in Chinese stocks without having to be concerned about various investment barriers and excessive costs for investing directly in the A-share market.

The market environments of the H- and A-shares are quite different. The SEHK is well established, more open, and more rigorous in terms of listing requirements and information disclosure than are the mainland Chinese exchanges. For example, the SEHK has introduced additional listing requirements for issuers that are incorporated in mainland China. Lacking ownership restrictions and currency control, H-shares are attractive to institutional and individual investors from Hong Kong and overseas. A recent survey by the Hong Kong Exchanges and Clearing Limited (2002) indicates that although local investors still dominate the SEHK, overseas investors, mainly institutional investors, contributed 40% of the total market trading value between October 2000 and September 2001. The major origins of overseas participation are the UK and the US. Local and overseas institutional trading contributes 57% of the total market trading value.

The A-share market has a relatively short history, has government imposed ownership restriction for local Chinese investors, and is dominated by retail investors.

Table 1
Basis statistics of Chinese stock markets: number of listed firms and number of shares (1994–2000)

	1994	1995	1996	1997	1998	1999	2000
Number of listed firms							
Firms that issue A-shares Only	227	242	431	627	727	822	955
Firms that issue both A- and H-shares	6	11	14	17	18	19	19
Firms that issue both A and B-shares	54	58	69	76	80	82	86
Firms that issue B-shares Only	4	12	16	25	26	26	28
Total number of A-share Firms	287	311	514	720	825	923	1060
Total number of B-share Firms	58	70	85	101	106	108	114
Total number of firms	291	324	530	745	851	949	1088
Number of shares (in 100 million shares)							
State-owned shares	296.47	328.67	432.01	612.28	865.51	1116.07	1475.13
	(43.31%)	(38.74%)	(35.42%)	(31.52%)	(34.25%)	(36.13%)	(38.90%)
Sponsor's legal person's shares	73.87	135.18	224.63	439.91	528.06	590.51	642.54
	(10.79%)	(15.95%)	(18.42%)	(22.64%)	(20.90%)	(19.12%)	(16.95%)
Foreign legal person's shares	7.52	11.84	14.99	26.07	35.77	40.51	46.20
	(1.10%)	(1.40%)	(1.23%)	(1.34%)	(1.42%)	(1.31%)	(1.22%)
Private placement of legal person's shares	72.82	61.93	91.82	130.48	152.34	190.10	214.20
	(10.64%)	(7.30%)	(7.53%)	(6.72%)	(6.03%)	(6.15%)	(5.65%)
Staff shares	6.72	3.07	14.64	39.62	51.70	36.71	24.29
	(0.98%)	(0.36%)	(1.20%)	(2.04%)	(2.05%)	(1.19%)	(0.64%)
Others	1.10	6.27	11.60	22.87	31.47	33.20	35.07
	(0.16%)	(0.74%)	(0.95%)	(1.18%)	(1.25%)	(1.07%)	(0.92%)
A-shares	143.76	179.94	267.32	442.68	608.03	813.18	1078.16
	(21.00%)	(21.21%)	(21.92%)	(22.79%)	(24.06%)	(26.33%)	(28.43%)
B-shares	41.46	56.52	78.65	117.31	133.96	141.92	151.56
	(6.06%)	(6.66%)	(6.45%)	(6.04%)	(5.30%)	(4.59%)	(4.00%)
H-shares	40.82	65.00	83.88	111.45	119.95	124.54	124.54
	(5.96%)	(7.66%)	(6.88%)	(5.74%)	(4.75%)	(4.03%)	(3.28%)
Total number of shares	684.54	848.42	1219.54	1942.67	2526.79	3088.95	3791.71
	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)

Source: China Securities Regulatory Commission. Number of shares is in hundred millions, and percentages are in parentheses.

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

Table 1 shows the rapid development of the mainland Chinese stock markets between 1994 and 2000. The number of A-share firms increased from 287 in 1994 to 1060 in 2000. The number of firms issuing both A- and H-shares increased from six in 1994 to 19 in 2000. Although the number of H-share issuing firms was much smaller than that of B-share issuing firms, the total numbers of H- and B-shares outstanding were almost the same.

In addition to the publicly tradable A-, B-, and H-shares, a typical listed Chinese firm has a substantial portion of nontransferable shares in the form of state-owned (government) shares, legal person shares, and employee shares. By the end of 2000, publicly tradable shares accounted for 35.7% of total number of shares, and the nontransferable government and legal person shares accounted for 38.9% and 18.2%, respectively. Thin trading in markets where investors cannot trade desired amounts of securities can result in substantial price discounts (Longstaff, 2001). [2] Obviously, the sheer magnitude of nontransferable shares reduces the free float of the Chinese stock market substantially, and has a significant effect on the pricing of Chinese stocks.

3.2. Data and preliminary analysis

In our analysis we use daily prices, dividend payments, trading volume, and bid–ask spread data for all firms that issued both H- and A-shares prior to December 2000 on the SEHK and SHSE (or 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 September 28, 2001. As the bid and ask prices for A-shares are not available from the Datastream database until June 9, 1995, the sample period starts on June 9, 1995 for firms listed before that day. We eliminate three stocks from the 19 dual-traded stocks because their daily open prices or trading volumes are not available for most of the sample period.

Table 2 reports the basic statistics for the daily returns of the 16 firms' dual-listed H- and A-share stocks. We define the daily returns of each firm's H- and A-shares, $r_{\mathrm{H},it}$ and $r_{\mathrm{A},it}$, as

$$r_{\mathrm{H},it} = \frac{P_{\mathrm{H},it} + D_{i,t}}{P_{\mathrm{H},it-1}} - 1,$$

$$r_{\mathrm{A},it} = \frac{P_{\mathrm{A},it} + D_{i,t}}{P_{\mathrm{A},it-1}} - 1, \quad i = 1, 2, \ldots, 16,$$

where $P_{\mathrm{H},it}$ and $P_{\mathrm{A},it}$ are firm i's H- and A-share's closing price at time t, and are priced in Hong Kong dollars and RMB, respectively, and $D_{i,t}$ is the dividend payment at time t. We note that both the H- and A-shares of a firm receive the same

[2] Longstaff (2001) shows that the price discounts due to this type of illiquidity can be as high as 90%.

Table 2
Basic statistics of dual-listed H- and A-share stocks

Stock code	Firm name	Return series	Mean return	Standard deviation	Skewness	Kurtosis	ρ_1	LB(10)	$LB^2(10)$	$(P_A - P_H X)/P_A$	Mean turnover	VO_H/VO_A	SPR_{H-A}
Panel A: Basic statistics													
SHSE													
600115	Eastern Airlines	H	−0.00027	0.0470	0.56*	3.25*	0.004	34.75*	54.73*	0.798	0.0128	10.949	0.0005*
		A	−0.00075	0.0201	0.54*	2.44*	−0.049	15.94†	99.36*		0.0124		
600600	Tsingtao Brewery	H	0.00039	0.0433	0.92*	13.86*	0.028	17.10†	142.06*	0.644	0.0033	1.372	0.0206*
		A	0.00104	0.0281	1.18*	6.51*	−0.032	17.35†	63.79*		0.0206		
600685	Guangzhou Shipyard	H	0.00007	0.0495	0.80*	5.60*	0.060*	14.70	198.66*	0.702	0.0073	0.904	0.0146*
		A	0.00097	0.0287	0.98*	8.41*	−0.035	20.41*	126.27*		0.0204		
600775	Panda Electronic	H	0.00164	0.0594	0.60*	3.30*	0.091*	17.07†	76.53*	0.859	0.0129	9.139	−0.0009
		A	−0.00063	0.0257	0.16*	1.42*	−0.029	13.16	103.01*		0.0118		
600806	Kunming Machine	H	0.00050	0.0598	1.07*	6.37*	−0.066*	16.48	9.86	0.781	0.0053	0.376	0.0202*
		A	0.00052	0.0344	0.53*	2.51*	−0.066*	12.30	127.82*		0.0389		
600808	Maanshan Iron	H	−0.00008	0.0479	1.03*	6.91*	0.015	28.20*	245.09*	0.674	0.0124	6.658	−0.0005*
		A	0.00062	0.0261	1.14*	6.16*	−0.081*	35.14*	150.65*		0.0218		
600860	Beiren Printing	H	0.00072	0.0434	0.14*	4.53*	−0.002	13.20	120.17*	0.775	0.0065	1.196	0.0143*
		A	0.00112	0.0311	0.76*	5.05*	−0.038	15.28	25.32*		0.0267		
600874	Bohai Chemical	H	0.00094	0.0554	1.20*	7.21*	−0.005	9.58	250.27*	0.838	0.0188	4.870	−0.0003
		A	0.00060	0.0280	0.72*	4.13*	−0.046	9.45	265.29*		0.0217		
600875	Dongfang Electrical	H	0.00095	0.0526	0.52*	4.66*	0.041	17.68†	131.37*	0.808	0.0069	2.002	0.0147*
		A	0.00014	0.0279	0.32*	2.12*	−0.106*	32.08*	60.24*		0.0205		
600876	Luoyang Glass	H	0.00030	0.0534	0.63*	4.56*	0.023	21.47*	163.81*	0.830	0.0111	5.116	0.0039*
		A	−0.00044	0.0281	0.24*	2.20*	−0.091*	23.26*	102.65*		0.0240		
SZSE													
0585	Northeast Electrical	H	0.00074	0.0559	0.91*	4.71*	0.028	14.40	179.27*	0.859	0.0136	4.478	0.0016*
		A	0.00176	0.0425	13.40*	344.37*	−0.132*	31.32*	3.52		0.0120		
0618	Jilin Chemical	H	0.00090	0.0583	0.98*	3.63*	−0.014	12.97	100.34*	0.853	0.0212	21.264	−0.0001
		A	−0.00102	0.0309	3.46*	54.82*	−0.101*	25.02*	29.91*		0.0266		
0666	Jingwei Textile	H	0.00099	0.0563	0.79*	4.03*	−0.017	14.82	112.11*	0.881	0.0130	4.820	0.0022*
		A	0.00011	0.0291	−0.10	2.03*	−0.051	29.17*	63.19*		0.0257		
0756	Xinhua Pharmaceutical	H	0.00062	0.0469	0.22*	1.82*	0.017	23.22*	79.14*	0.899	0.0078	6.719	0.0021
		A	−0.00014	0.0242	0.46*	1.73*	−0.077*	15.22	123.98*		0.0082		
0898	Angang New Steel	H	0.00028	0.0523	0.72*	3.04*	0.015	14.56	69.85*	0.781	0.0262	8.104	0.0003
		A	−0.00005	0.0193	0.69*	2.90*	−0.144*	26.28*	69.28*		0.0200		
0921	Guangdong Kelon	H	−0.00241	0.0469	1.49*	12.62*	0.070	5.85	7.31	0.785	0.0105	10.386	0.0188*
		A	−0.00079	0.0172	0.44*	4.40*	−0.002	18.51*	21.72*		0.0100		

Table 2 (*continued*)

Firm	H-shares listing date	A-shares listing date	State-owned shares		Legal person's shares		A-shares		H-shares		Total shares
Panel B: Shares structure of the sample firms (by December 2000)											
SHSE			Number	%	Number	%	Number	%	Number	%	Number
Eastern Airlines	1997/11/05	1997/05/02	3,000,000	(61.6%)	0	(0.0%)	300,000	(6.16%)	1,566,950	(32.2%)	4,866,950
Tsingtao Brewery	1993/07/15	1993/08/27	399,820	(44.4%)	53,300	(5.9%)	100,000	(11.1%)	346,850	(38.5%)	900,000
Guangzhou Shipyard	1993/08/06	1993/10/28	210,800	(42.6%)	0	(0.0%)	126,480	(25.6%)	157,398	(31.8%)	494,678
Panda Electronic	1996/05/02	1996/11/18	355,015	(54.2%)	0	(0.0%)	58,000	(8.9%)	242,000	(37.0%)	655,015
Kunming Machine	1993/12/07	1994/01/03	102,398	(41.8%)	17,610	(7.2%)	60,000	(24.5%)	65,000	(26.5%)	245,008
Maanshan Iron	1993/11/03	1994/01/06	4,034,560	(62.5%)	87,810	(1.4%)	600,000	(9.3%)	1,732,930	(26.9%)	6,455,300
Beiren Printing	1993/08/06	1994/05/06	250,000	(62.5%)	0	(0.0%)	50,000	(12.5%)	100,000	(25.0%)	400,000
Bohai Chemical	1994/05/17	1995/06/30	839,020	(63.1%)	38,485	(2.9%)	112,495	(8.5%)	340,000	(25.6%)	1,330,000
Dongfang Electrical	1994/06/06	1995/10/18	220,000	(48.9%)	0	(0.0%)	60,000	(13.3%)	170,000	(37.8%)	450,000
Luoyang Glass	1994/07/08	1995/11/01	400,000	(36.4%)	400,000	(36.4%)	50,000	(4.6%)	250,000	(22.7%)	1,100,000
SZSE											
Northeast Electrical	1995/07/06	1995/12/13	450,520	(51.6%)	21,300	(2.4%)	143,600	(16.4%)	257,950	(29.5%)	873,370
Jilin Chemical	1995/05/23	1996/10/15	2,396,300	(67.3%)	0	(0.0%)	200,000	(5.6%)	964,778	(27.1%)	3,561,078
Jingwei Textile	1996/02/02	1996/12/10	220,000	(36.4%)	0	(0.0%)	203,000	(33.6%)	180,800	(29.9%)	603,800
Xinhua Pharmaceutical	1996/12/31	1997/08/06	217,440	(51.6%)	16,720	(3.9%)	43,153	(10.1%)	150,000	(35.1%)	427,313
Angang New Steel	1997/07/24	1997/12/26	1,319,000	(67.3%)	0	(0.0%)	300,000	(12.0%)	890,000	(35.5%)	2,509,000
Guangdong Kelon	1996/07/23	1999/07/13	0	(0.0%)	337,916	(34.1%)	110,000	(11.1%)	459,590	(46.3%)	992,007

	Tsingtao Brewery	Guangzhou Shipyard	Panda Electronic	Kunming Machine	Maanshan Iron	Beiren Printing	Bohai Chemical	Dongfang Electrical	Luoyang Glass	Northeast Electrical	Jilin Chemical	Jingwei Textile
Panel C: Cross-correlation matrix among the H-share price discount series (1996/12/10-2001/09/28)												
Tsingtao Brewery	1.0000	0.9021	0.6020	0.8920	0.9416	0.9293	0.8007	0.9189	0.9310	0.8745	0.8034	0.5908
Guangzhou Shipyard		1.0000	0.5464	0.9556	0.9613	0.9518	0.9318	0.9528	0.9522	0.9464	0.8758	0.5945
Panda Electronic			1.0000	0.6406	0.5319	0.5794	0.4824	0.5256	0.6042	0.6100	0.4914	0.6835
Kunming Machine				1.0000	0.9290	0.9596	0.8879	0.9311	0.9543	0.9544	0.8049	0.7447
Maanshan Iron					1.0000	0.9600	0.8842	0.9778	0.9719	0.9326	0.8583	0.5310
Beiren Printing						1.0000	0.8395	0.9692	0.9650	0.9282	0.7874	0.6137
Bohai Chemical							1.0000	0.8577	0.8659	0.9272	0.9404	0.5994
Dongfang Electrical								1.0000	0.9653	0.9260	0.8291	0.5254
Luoyang Glass									1.0000	0.9417	0.8169	0.6174
Northeast Electrical										1.0000	0.8810	0.6997
Jilin Chemical											1.0000	0.4968
Jingwei Textile												1.0000

Returns are the close-to-close returns, including dividends. ρ_1 is the first-order autocorrelation coefficient. LB(10) and $LB^2(10)$ denote the Ljung-Box test of significance of autocorrelations of 10 lags for returns and squared returns, respectively. $(P_A - P_H X)/P_A$ is the average H-share price discount, where X is the exchange rate in terms of RMB/HK$. Mean turnover is the average H- and A-share turnovers (τ_H, τ_A), respectively, where $\tau =$ (daily trading volume)/(number of shares outstanding). VO_H/VO_A is the average daily trading volume ratio of H-shares to A-shares. SPR_{H-A} is the difference between H- and A-share bid–ask spreads. * and † indicate significance at the 5% and 10% levels, respectively.

Source: Shanghai Stock Exchange (SHSE), Shenzhen Stock Exchange (SZSE), *Datastream*, and *TEJ* (Taiwan Economic Journal Data Bank). Number of shares is in thousands, and percentages are in parentheses.

amount, in RMB, of dividends at the same time. In calculating the H-share returns, we convert the RMB dividend payments into Hong Kong dollars at prevailing spot exchange rates. [3]

In Panel A of Table 2, the first important observation that we make is the existence of a substantial H-share price discount. The H-share price discount, defined as $(P_{A,it} - P_{H,it}X_t)/P_{A,it}$, where X_t is the exchange rate between Chinese RMB and the Hong Kong dollar, ranges from 64.4% to 89.9%. The average discount is 75.7%. We note that for most of the dual-listed stocks in the sample, both the average daily trading volume and number of shares outstanding are often much larger for H-shares than for A-shares. However, the average daily turnover of H-shares (1.19%) is lower than that of A-shares (2.01%). Most H-shares have larger standard deviations and higher bid–ask spreads than those of A-shares. Most of the A- and H-share return series have significant skewness and kurtosis, which indicates that their empirical distributions have heavy tails relative to the normal distribution. The null hypothesis of no serial correlation is rejected by the Ljung and Box (1978) test statistics, $LB(k)$ and $LB^2(k)$ for $k = 10$ lags, at the 5% level for most return and squared-return series. These results indicate that most of the return series exhibit conditional heteroskedasticity, and that a GMM or a GARCH type model is an appropriate specification.

Panel B of Table 2, reports the share structure of the sample firms. Almost all firms have a large proportion of nontransferable state-owned (government) shares. The only exception is Guangdong Kelon, which has instead a large percentage of nontransferable institutional shares.

Although these cross-sectional differences are interesting and deserve further study, our focus is on the time series behavior of the H-share price discounts. Panel C of Table 2 reports the cross-correlation matrix of the H-share price discount series. From December 10, 1996 to September 28, 2001, all of the discount series are positively correlated and the values of the cross-correlation coefficient are high, ranging from 0.48 to 0.96. Note that we use this particular time period so that we can keep more firms and use a longer sample period. We exclude four H-share firms that list after 1996. Our finding that H-share price discounts are highly and positively correlated is similar to the finding of Bodurtha et al. (1995). The synchronous co-movement of H-share discounts could also be driven by common market-wide factors rather than by firm-specific information.

4. Empirical results

4.1. Co-movement of stock returns and the markets

In this section, we examine the dynamic relations between H-share (A-share) returns and the domestic and foreign markets. H-share stocks are listed and traded in

[3] We also estimate and test all of the models in this paper for net returns, i.e., without dividend payment. The empirical results are consistent with, and even stronger than, those reported.

Hong Kong, but the underlying business operation takes place in mainland China. The ownership restrictions in mainland China tend to keep foreign investors in the Hong Kong market, but other barriers, such as the inability to convert Chinese currency RMB and transaction costs, tend to keep local Chinese investors in the Shanghai and Shenzhen markets. Furthermore, we show that H-shares have a huge price discount relative to A-shares. Thus, a natural question is whether H-shares behave more like Hong Kong stocks than mainland Chinese A-share stocks. If so, can Hong Kong and international investors still use H-shares as vehicles to achieve international diversification benefits?

To investigate the dynamic relations between H-share (A-share) returns and the domestic and foreign markets, we regress each firm's H-share (A-share) returns on the SHSE (SZSE) and SEHK's market index returns. To control for the possible exchange rate effect, we also include in the regression the percentage change in the exchange rate between RMB and Hong Kong dollars. The empirical model specifications are as follows:

$$\begin{cases} r_{\mathrm{H},it} = \alpha_{\mathrm{H},i0} + \sum_{-k}^{k} \beta_{\mathrm{H},i1,k}\mathrm{SE}_{t-k} + \sum_{-k}^{k} \beta_{\mathrm{H},i2,k}\mathrm{HK}_{t-k} + \delta_{\mathrm{H},i}\Delta x_t + u_{\mathrm{H},it}, \\ r_{\mathrm{A},it} = \alpha_{\mathrm{A},i0} + \sum_{-k}^{k} \beta_{\mathrm{A},i1,k}\mathrm{SE}_{t-k} + \sum_{-k}^{k} \beta_{\mathrm{A},i2,k}\mathrm{HK}_{t-k} + \delta_{\mathrm{A},i}\Delta x_t + u_{\mathrm{A},it}, \end{cases} \tag{1}$$

where $r_{\mathrm{H},it}$ and $r_{\mathrm{A},it}$ are the H-share and A-share returns for firm i on day t, respectively. SE_t is the market composite index return on the SHSE (or SZSE) on day t, HK_t is the Hang Seng Index return on the SEHK on day t, and Δx_t is the percentage change in the exchange rate between the RMB and the Hong Kong dollar. If the markets are integrated, then H- and A-share returns do not depend on different trading locations, and the dynamic relation between H-shares and the domestic and foreign markets should be similar to that between A-shares and the two markets. If the markets are segmented, then a firm's H- and A-share returns are subject to market-specific risk and investor sentiment in different trading locations.

Dimson (1979) shows that when shares are traded infrequently, beta estimates are often biased severely downward. To alleviate the possible thin trading problem and different closing times of the Hong Kong and mainland Chinese stock exchanges, we use the Dimson (1979) aggregated coefficient method for beta estimation. We define the aggregated coefficient of beta as

$$\begin{aligned} \hat{\beta}_{\mathrm{H},i1} &= \sum_{k}^{-k} \hat{\beta}_{\mathrm{H},i1,k}, \quad \hat{\beta}_{\mathrm{H},i2} = \sum_{k}^{-k} \hat{\beta}_{\mathrm{H},i2,k}, \\ \hat{\beta}_{\mathrm{A},i1} &= \sum_{k}^{-k} \hat{\beta}_{\mathrm{A},i1,k}, \quad \hat{\beta}_{\mathrm{A},i2} = \sum_{k}^{-k} \hat{\beta}_{\mathrm{A},i2,k}, \end{aligned} \tag{2}$$

where $\hat{\beta}_{\mathrm{H},i1,k}$, $\hat{\beta}_{\mathrm{H},i2,k}$, $\hat{\beta}_{\mathrm{A},i1,k}$ and $\hat{\beta}_{\mathrm{A},i2,k}$ are estimates of contemporaneous and k-period led and lagged betas that we obtain from the estimation of Model (1), and k is the number of leads and lags.

To make the estimation parsimonious and the estimates of the betas comparable between A- and H-shares and across different firms, we set $k = 1$, i.e., we introduce one daily lead and one daily lag of each market's index returns variable into the regression estimation along with the contemporaneous variable. We also estimate Models (1) and (2) by using the Akaike (1973) information criterion (AIC) to determine the number of leads and lags. We find no significant differences. The estimates for most of the higher-order leads and lags are not significantly different from zero. To further alleviate the effects of possible heteroskedasticity and autocorrelation on the estimates, we use the generalized method of moments (GMM) in our estimations.

Table 3 reports the estimates and related test results of Eqs. (1) and (2). It shows that for all H-share stocks, their Hong Kong market betas are significantly positive at the 5% level, and for 60% of the H-shares, their corresponding market betas on the SHSE (SZSE) are also significant and positive. All H-share stocks have substantially higher aggregated beta values for the Hong Kong market ($\hat{\beta}_{\mathrm{H},i2}$) than for domestic market ($\hat{\beta}_{\mathrm{H},i1}$). The average value of $\hat{\beta}_{\mathrm{H},i2}$ is 0.8887, as compared to an average value of $\hat{\beta}_{\mathrm{H},i1}$ of only 0.2197. Furthermore, the hypothesis that $\hat{\beta}_{\mathrm{H},i1} = \hat{\beta}_{\mathrm{H},i2}$ is rejected for all H-shares by a significantly negative test statistic. This result implies that the estimated aggregated Hong Kong market beta is significantly larger than that of the corresponding domestic market beta. The significant and substantially higher Hong Kong beta suggests that H-shares behave more like Hong Kong stocks than mainland Chinese stocks. However, the significant mainland market beta for a majority of H-shares, $\hat{\beta}_{\mathrm{H},i1}$, indicates that although H-shares have significant exposure to the Hong Kong market, Hong Kong and international investors can still use H-shares as vehicles to achieve cross-market risk diversification. An interesting example of this is that the Hang Seng Index decreased by 24% in 2001, but the Hang Seng China Enterprise Index, which tracks H-shares, declined by only 8.2%.

Table 3 also shows that for all but two A-share stocks, only the domestic market beta ($\hat{\beta}_{\mathrm{A},i1}$) differs significantly from zero. The average value of $\hat{\beta}_{\mathrm{A},i1}$ is 0.71. Intuitively, since both the trading and underlying business activities take place in mainland China, we expect significant domestic market beta for A-share stocks. The nonsignificant Hong Kong beta for A-shares indicates that the returns of individual A-shares are not significantly exposed to the Hong Kong market risk. For providing information, the Hong Kong market is less important in explaining the dynamic movement of A-shares. Because the Hong Kong dollar is pegged to the US dollar and the official exchange rate between Chinese RMB and the US dollar is "managed" within in a very narrow range [4] by the Chinese government, as we expected the coefficient for exchange rate changes is not significant for all H-shares, and not significant for all but two A-share stocks.

Table 3 also shows that the adjusted R^2 values are lower for H-shares than for corresponding A-shares. The average adjusted R^2 value is 0.142 for H-shares and 0.320

[4] The Hong Kong dollar is pegged to the US$ at HK$ 7.8 to 1. As of September 20, 2002, the official exchange rate between the RMB and the US$ is about RMB¥ 8.27 to 1.

Table 3
Estimates and tests of Dimson's aggregated market betas

Firm	Sample period	H-shares						A-shares					
		Adjusted R^2	$\alpha_{H,0}$	$\hat{\beta}_{H,1}$	$\hat{\beta}_{H,2}$	δ_H	$H_0: \hat{\beta}_{H,1} = \hat{\beta}_{H,2}$	Adjusted R^2	$\alpha_{A,0}$	$\hat{\beta}_{A,1}$	$\hat{\beta}_{A,2}$	δ_A	$H_0: \hat{\beta}_{A,1} = \hat{\beta}_{A,2}$
SHSE													
Eastern Airlines	97/11/05-01/09/28	0.236	−0.0006	0.3053*	1.0670*	−0.0003	−0.7617*	0.311	−0.0012*	0.8413*	0.1053*	0.0150	0.7360*
			(−0.452)	(2.425)	(9.533)	(−0.010)	(−4.678)		(−2.296)	(13.197)	(2.320)	(1.199)	(8.149)
Tsingtao Brewery	95/06/09-01/09/28	0.136	0.0001	0.1113	0.8094*	0.0184	−0.6980*	0.406	0.0003	0.9307*	0.0079	−0.0011	0.9228*
			(0.087)	(1.449)	(7.762)	(0.837)	(−5.729)		(0.475)	(8.517)	(0.206)	(−0.073)	(7.890)
Guangzhou Shipyard	95/06/12-01/09/28	0.112	−0.0003	0.2490*	0.8320*	−0.0152	−0.5830*	0.398	0.0002	0.9145*	0.0217	0.0117	0.8928*
			(−0.247)	(2.445)	(6.781)	(−0.575)	(−3.605)		(0.278)	(8.807)	(0.445)	(0.826)	(7.454)
Panda Electronic	96/11/20-01/09/28	0.154	0.0015	0.2825*	1.0275*	−0.0259	−0.7450*	0.186	−0.0010	0.5751*	−0.0081	−0.0152	0.5832*
			(0.819)	(2.322)	(7.660)	(−0.661)	(−4.436)		(−1.422)	(6.090)	(−0.148)	(−0.943)	(5.681)
Kunming Machine	95/06/09-01/09/28	0.051	0.0001	0.1494	0.7630*	0.0272	−0.6136*	0.269	−0.0003	0.7311*	0.0329	−0.0147	0.6981*
			(0.047)	(1.628)	(5.374)	(0.503)	(−3.703)		(−0.378)	(5.803)	(0.502)	(−0.635)	(4.777)
Maanshan Iron	95/06/12-01/09/28	0.197	−0.0006	0.2714*	1.0343*	0.0246	−0.7629*	0.386	−0.0000	0.7575*	0.0573	−0.0070	0.7002*
			(−0.508)	(3.459)	(8.134)	(0.943)	(−4.931)		(−0.093)	(9.588)	(1.114)	(−0.514)	(6.792)
Beiren Printing	95/06/09-01/09/28	0.104	0.0004	0.1082	0.6675*	0.0200	−0.5593*	0.400	0.0002	0.8818*	0.0444	−0.0045	0.8374*
			(0.354)	(1.287)	(4.986)	(0.668)	(−3.607)		(0.351)	(8.072)	(0.836)	(−0.313)	(6.198)
Bohai Chemical	95/07/31-01/09/28	0.150	0.0048	0.2196*	1.0423*	0.0171	−0.8227*	0.317	−0.0008	0.7028*	0.1041*	−0.0109	0.5987*
			(0.351)	(2.040)	(6.959)	(0.628)	(−4.384)		(−0.125)	(7.752)	(1.996)	(−0.718)	(5.182)
Dongfang Electrical	95/10/20-01/09/28	0.117	0.0006	0.1937*	0.8733*	−0.0099	−0.6796*	0.346	−0.0006	0.7307*	0.0654	−0.0221	0.6653*
			(0.402)	(2.175)	(7.036)	(−0.304)	(−4.525)		(−0.880)	(6.823)	(1.279)	(−1.218)	(5.403)
Luoyang Glass	95/11/02-01/09/28	0.134	−0.0002	0.3155*	0.8776*	0.0003	−0.5621*	0.324	−0.0011†	0.7604*	0.0477	−0.0146	0.7128*
			(−0.117)	(3.419)	(7.202)	(0.993)	(−3.525)		(−1.816)	(7.800)	(0.821)	(−0.998)	(5.893)
SZSE													
Northeast Electrical	95/12/13-01/09/28	0.161	0.0005	0.0638	0.9049*	−0.0327	−0.8411*	0.211	0.0007	0.7606*	0.0141	0.0061	0.7465*
			(0.338)	(0.655)	(7.114)	(−1.150)	(−5.207)		(0.729)	(5.225)	(0.224)	(0.314)	(4.239)
Jilin Chemical	96/10/16-01/09/28	0.160	0.0006	0.3659*	0.8940*	0.0086	−0.5281*	0.336	−0.0014†	0.3411*	0.1460	0.0181	0.1952
			(0.412)	(3.314)	(6.164)	(0.274)	(−3.094)		(−1.916)	(2.041)	(1.493)	(1.181)	(0.785)
Jingwei Textile	96/12/10-01/09/28	0.152	0.0009	0.1579	0.9937*	0.0037	−0.8358*	0.279	−0.0001	0.5589*	−0.0392	0.0072	0.5981*
			(0.571)	(1.319)	(8.096)	(0.011)	(−5.100)		(−0.118)	(4.840)	(−0.762)	(0.708)	(4.630)
Xinhua Pharmaceutical	97/08/08-01/09/28	0.167	0.0006	0.2342†	0.8538*	−0.0139	−0.6196*	0.315	−0.0005	0.7158*	−0.0476	0.0458*	0.7633*
			(0.446)	(1.700)	(9.411)	(−0.345)	(−4.036)		(−0.812)	(8.273)	(−0.999)	(3.231)	(7.995)
Angang New Steel	98/01/06-01/09/28	0.188	−0.0008	0.3660*	0.8288*	−0.0435	−0.4627*	0.219	−0.0031	0.5289*	0.0268	0.0042	0.5022*
			(−0.052)	(2.303)	(5.713)	(1.391)	(−2.149)		(−0.580)	(6.036)	(0.530)	(0.264)	(4.909)
Guangdong Kelon	99/07/15-01/09/28	0.060	−0.0021	0.1222	0.7510*	0.0545	−0.6288*	0.412	−0.0010†	0.6597*	−0.0631	−0.0344*	0.7229*
			(−1.017)	(0.728)	(4.474)	(1.452)	(−2.747)		(−1.651)	(8.548)	(−1.229)	(−2.722)	(8.155)

This table reports the GMM estimates and test results of the following models:

$$\begin{cases} r_{H,it} = \alpha_{H,i0} + \sum_{-k}^{k} \beta_{H,i1,k} SE_{t-k} + \sum_{-k}^{k} \beta_{H,i2,k} HK_{t-k} + \delta_{H,i} \Delta x_t + u_{H,it}, \\ r_{A,it} = \alpha_{A,i0} + \sum_{-k}^{k} \beta_{A,i1,k} SE_{t-k} + \sum_{-k}^{k} \beta_{A,i2,k} HK_{t-k} + \delta_{A,i} \Delta x_t + u_{A,it}, \end{cases} \quad (1)$$

$$\begin{aligned} \hat{\beta}_{H,i1} &= \sum_{k}^{-k} \hat{\beta}_{H,i1,k}; \quad \hat{\beta}_{H,i2} = \sum_{k}^{-k} \hat{\beta}_{H,i2,k}; \\ \hat{\beta}_{A,i1} &= \sum_{k}^{-k} \hat{\beta}_{A,i1,k}; \quad \hat{\beta}_{A,i2} = \sum_{k}^{-k} \hat{\beta}_{A,i2,k}; \end{aligned} \quad (2)$$

r_A and, r_H are the A- and H-share returns, respectively. SE is the composite index return on the SHSE (or SZSE) stock exchange. HK is the Hang Seng Index return on the SEHK. Δx_t is the exchange rate change between the RMB and Hong Kong. $\hat{\beta}_1$ and $\hat{\beta}_2$ are the estimates of Dimson's aggregated market beta for the domestic and Hong Kong markets, respectively. For all estimates, * and † indicate significance at the 5% and 10% levels, respectively. The *t*-values calculated based on robust standard errors are in parentheses.

for A-shares. This finding suggests that H-shares may have higher idiosyncratic risks than A-shares.

Our results indicate that the H- and A-share returns have different dynamic relations with domestic and foreign markets. H-share returns are subject to market-specific risk and investor sentiment in both Hong Kong and Shanghai (Shenzhen), while A-share returns are only subject to these factors in the Shanghai (Shenzhen) market.

4.2. Empirical evidence relating to sources of H-share discounts

We examine the H-share price discount and find that the average of H-share price discounts is, astonishingly, 75.7%. Thus, we investigate competing sources that may induce the H-share price discount.

Previous studies show that the Chinese B-share price discount can be explained in part by market segmentation (Fung et al., 2000), investors' different attitudes toward risk (Ma, 1996), information asymmetry between domestic and foreign investors (Chakravarty et al., 1998), and market illiquidity (Chen et al., 2001). However, the H-share price discount issue that we examine differs significantly from the B-share price discount problem. As A- and B-shares trade in the same geographic market but A- and H-shares do not, the H-share discount issue is more complicated than the B-share discount issue. Thus, we focus on the source of H-share price discount movements.

We want to ascertain why H-share prices diverge from A-share prices, and how such movements are related to market returns in the mainland Chinese and Hong Kong markets. In addition to the market-specific sentiment and location-of-trade hypothesis, we examine whether the H-share discount can be explained by market illiquidity and transaction costs (Amihud and Mendelson, 1986), investors' different attitudes toward risk (Eun and Janakiramanan, 1986), information asymmetry (Grossman and Stiglitz, 1980), and exchange rate risk.

Following Bodurtha et al. (1995) and Froot and Dabora (1999), we apply a multifactor model framework and use the market index return on the SHSE (SZSE) and the SEHK as the domestic and foreign market factors. Market integration implies that asset prices are unaffected by country-specific factors (Bodurtha et al., 1995), and the nontrivial H-share price discounts imply the existence of market segmentation.

Our null hypothesis is that if markets are integrated, the H-share discount should be uncorrelated with the relative market shocks. The alternative hypothesis is that the H- and A-share markets are segmented, so that relative market shocks can explain movements in the H-share price discount. If the location of trade matters, then the H-share price discount should be correlated with the relative stock market shocks. For example, when the mainland Chinese market moves up relative to the Hong Kong market, the A-share price tends to rise more relative to the H-share price.

Similar to the argument of Froot and Dabora (1999), the observable H-share price discounts may be informative of unobservable market-specific investor sentiment. Under the investor sentiment hypothesis, changes in the H-share price discount capture the time-varying optimism or pessimism of mainland Chinese investors relative to their Hong Kong counterparts.

4.2.1. Time series analysis of the H-share discount

To test the above hypotheses, we estimate the following ARMA(1,1)-GARCH(1,1) model:

$$\begin{cases} r_{\mathrm{A-H},it} = b_0 + b_1 r_{\mathrm{A-H},it-1} + b_2 \mathrm{SE}_t + b_3 \mathrm{HK}_t + b_4 \frac{V_{\mathrm{H},it}}{\mathrm{TS}_{it}} + b_5 \mathrm{SPR}_{it} \\ \qquad\qquad + b_6 \frac{\sigma^2_{\mathrm{A},it}}{\sigma^2_{\mathrm{H},it}} + b_7 \Delta x_t + b_8 \Delta z_t + \psi u_{it-1} + u_{it}, \\ h_{it} = \alpha_0 + \alpha_1 u^2_{it-1} + \beta_1 h_{it-1}, \end{cases} \tag{3}$$

where $r_{\mathrm{A-H},it}$ is the return differential between firm i's A- and H-shares, and SE_t and HK_t are the market returns on the SHSE (SZSE) and SEHK, respectively.

Table 2 shows that in general, H-shares have higher trading volumes and larger bid–ask spreads but lower turnover relative to A-shares. To examine the different aspects of the liquidity effect on the H-share price discount, we include two liquidity measures in the regression model: a bid–ask spread (or transaction costs)-based measure and a volume-based proxy. SPR_{it} is a proxy for the transaction cost-based liquidity measure, which we define as the difference between the H- and A-share's bid–ask spread. A majority portion of Chinese shares, including A- and H-shares, consists of nontradable government and institutional shares. To account for the illiquidity or how the limited investment opportunities are affected by this large percentage of nontradable shares, we define a volume-based liquidity proxy, $V_{\mathrm{H},it}/\mathrm{TS}_{it}$, as the ratio of daily H-share trading volume to the total number of shares outstanding, including both tradable and nontradable shares. [5] The empirical analysis suggests that this measure is more powerful in explaining the H-share price discounts than other illiquidity measures. We also use relative turnover $(\tau_{\mathrm{H}}/\tau_{\mathrm{A}})$, where turnover $\tau_{\mathrm{H}}(\tau_{\mathrm{A}})$ is defined as the ratio of the daily trading volume in H- (A-) shares to the number of H- (A-) shares outstanding, and the ratio of the H-share volume to the total trading volume of A- and H-shares $(V_{\mathrm{H}}/V_{\mathrm{A+H}})$ as proxies for the relative liquidity in our estimation. The estimate results are the same, and no better than the proxy $V_{\mathrm{H},it}/\mathrm{TS}_{it}$ in terms of log likelihood values. [6]

We use variance of returns as a proxy for the risk level, and define the ratio of variance of A-share returns to H-share returns, $\sigma^2_{\mathrm{A}}/\sigma^2_{\mathrm{H}}$, as the relative level of risk aversion. We adopt a two-stage procedure in estimating the relative level of risk aversion. First, we regress daily A- and H-share index returns on their one-period lagged returns and the market index returns over the sample period, respectively. We then use the squared residuals, obtained from the first stage regressions, as estimated A- and H-share index return volatilities to calculate the relative level of the risk. [7] If the

[5] Intuitively, a direct measure of the limited investment opportunity would be the ratio of the number of tradable shares to the total number of shares issued by a firm. However, at the individual firm level this ratio is basically a constant and is not useful for time series analysis.

[6] The estimates are available upon request. To save space, we do not report these estimates in this paper.

[7] One may also use the simple rolling standard deviation as the estimate of the return volatility. See, for example, Schwert (2002).

differential risk hypothesis holds, then we anticipate a significant and positive relation between the H-share discount and the relative risk level.

We use the percentage change in the exchange rate between the RMB and the Hong Kong dollar, Δx_t, to test the effect of exchange rate changes on the H-share price discounts. As H-shares are issued by firms in mainland China and dividends are paid in RMB, any devaluation (or expected devaluation) of the RMB relative to the Hong Kong dollar will reduce the present value of expected future cash flows on H-shares in HK$ terms. However, as the HK$ is pegged to the US$ and the official exchange rate between the RMB and US$ is "managed" by the Chinese government, ex post, changes in exchange rate are stable over time and may not be powerful in explaining the H-share discounts.

Yet, ex ante, this may not be the case. If a devaluation of the RMB in relation to the Hong Kong dollar has not yet occurred, but is expected to occur in the future, then we would rationally expect the H-shares to sell at a discount, especially because direct arbitrage between H- and A-shares is difficult. After the Asian financial crisis of 1997, when many of the region's currencies were devalued, and the Russian currency devaluation of 1998, many observers expected the Chinese government to devalue the RMB. The potential danger of devaluing the RMB could have imposed a downward pressure on H-share prices. In the absence of expected exchange rate data, we use Δz_t, a simple average of the daily exchange rate fluctuations between six neighboring countries' currencies and the US dollar, as a proxy for the expected devaluation in the RMB. It captures the expected devaluation in the RMB that would not show up directly in the RMB exchange rates over the sample period. [8] The six neighboring currencies that we use are the Indonesia rupiah (Rp), Malaysia ringgit (M$), Singapore dollar (S$), South Korea won (W), Thailand baht (B), and Taiwan dollar (NT$).

We include a first-order moving average error term, u_{it-1}, in Eq. (3) to catch possible negative autocorrelation induced by nonsynchronous trading of the time series concerned (see, for example, McCurdy and Morgan, 1992). The SEHK closes one hour later than the SHSE and the SZSE, so that news which occurs between the close of the SHSE (SZSE) and that of the SEHK could affect the H-share price but not the A-share price. For example, an important piece of positive news will cause the H-share price to rise, thus leading to a negative value of the price differential, followed the next day by a positive value when the A-share price adjusts for the information. This results in a first-order negative autocorrelation. Previous studies demonstrate that the autocorrelation in the daily returns of stocks is too large to be due to nonsynchronous trading alone. Following Lo and MacKinlay (1988, 1990) we also include a first-order autoregressive term, $r_{\mathrm{A-H},t-1}$, in Eq. (3) to control for the possible autocorrelation in the daily return differentials.

Table 4 reports the estimates of the ARMA(1,1)-GARCH(1,1) model (3). The first important result in the table is the existence of significant correlation between the return differentials and the SHSE (SZSE) and SEHK market index returns.

[8] We appreciate an anonymous referee's valuable suggestion on this issue.

Table 4
Estimates of the ARMA(1,1)-GARCH(1,1) model

Firm	b_0	b_1	b_2	b_3	b_4	b_5	b_6	b_7	b_8	Ψ	α_0	α_1	β_1	LB(10)	$LB^2(10)$	Joint
SHSE																
Eastern Airlines	0.0115*	−0.2267*	0.5207*	−0.8556*	−2.9766*	0.2223	0.00127	−0.0172	0.0616	−0.1673*	0.0005*	0.1482*	0.5597*	21.71*	5.09	0.421
Tsingtao Brewery	0.0081*	−0.0760†	0.8736*	−0.5521*	−7.5236*	0.0088	0.00003	0.0008	0.0214	−0.0403	0.0005*	0.1995*	0.5397*	6.84	2.85	0.350
Guangzhou Ship	0.0046*	−0.0622	0.8614*	−0.6136*	−3.3392*	0.1409*	−0.00002	0.0268	0.1064	−0.0236	0.0001*	0.0798*	0.8842*	8.56	5.45	0.428
Panda Electronic	0.0108*	−0.2859*	0.4649*	−0.7529*	−3.0720*	0.0267	0.00001	−0.0208	0.5439*	−0.3173*	0.0001*	0.0730*	0.8951*	6.67	3.32	1.961
Kunming Machine	0.0056*	−0.1992*	0.8663*	−0.5191*	−6.3305*	0.0579	−0.00000	−0.0530	0.3983	−0.1169*	0.0005*	0.2130*	0.6915*	10.92	4.71	0.336
Maanshan Iron	0.0103*	−0.2933*	0.6836*	−0.8123*	−4.2566*	−0.5230*	−0.00004	−0.0375†	0.0899	−0.2797*	0.0002*	0.1772*	0.7363*	21.14*	6.43	1.348
Beiren Printing	0.0049*	−0.0426	0.9752*	−0.5819*	−3.4224*	0.0194	0.00002	−0.0392	−0.0293	0.0242	0.0002*	0.1175*	0.8133*	20.77*	7.42	0.831
Bohai Chemical	0.0090*	−0.2994*	0.6456*	−0.9495*	−3.0597*	0.1375†	0.00000	−0.0100	0.2696	−0.2217*	0.0001*	0.0987*	0.8726*	10.09	2.11	1.890
Dongfang Electric	0.0044*	−0.0743	0.7740*	−0.7081*	−2.8288*	0.0578†	0.00060	0.0237	0.2067	−0.0559	0.0006*	0.2172*	0.5785*	10.77	3.02	0.135
Luoyang Glass	0.0057*	−0.2665*	0.6948*	−0.7575*	−2.3164*	−0.0169	−0.00010	−0.0038	0.2134	−0.2363*	0.0003*	0.1296*	0.7688*	14.07	16.09†	2.266†
SZSE																
Northeast Electric	0.0116*	−0.2158*	0.8728*	−0.8629*	−2.9575*	−0.4095*	0.00014	−0.0061	0.1878	−0.1980*	0.0031*	0.1973*	0.0128	6.32	0.33	0.670
Jilin Chemical	0.0065*	−0.3406*	0.4643*	−0.6824*	−1.7701*	−0.0033	0.00018	−0.0005	0.3477	−0.3131*	0.0006*	0.1618*	0.6208*	9.69	5.22	0.261
Jingwei Textile	0.0058*	−0.2621*	0.6012*	−0.7771*	−1.6331*	−0.0571	0.00000	−0.0032	0.3118	−0.1991*	0.0003*	0.1139*	0.7825*	12.24	13.69	1.663
Xinhua Pharmaceutical	0.0045*	−0.0070	0.5305*	−0.6647*	−2.6136*	0.0872*	0.00028	0.0520	0.2696	0.0923	0.0003*	0.1237*	0.7271*	22.85*	4.05	0.312
Angang New Steel	0.0174*	−0.3740*	0.1510†	−0.7827*	−2.1167*	−0.5102*	−0.00003	−0.0426	0.0284	−0.3793*	0.0002*	0.0763*	0.8350*	17.78*	5.45	0.134
Guangdong Kelon	0.0170*	−0.3262*	0.6381*	−0.5997*	−2.9766*	−0.0874	−0.00001	−0.0604	0.2794	−0.3777*	0.0005*	0.2223*	0.5257*	6.38	10.46	0.765

This table reports the estimates and test results of the following model:

$$\begin{cases} r_{\mathrm{A-H},it} = b_0 + b_1 r_{\mathrm{A-H},it-1} + b_2 \mathrm{SE}_t + b_3 \mathrm{HK}_t + b_4 \frac{V_{\mathrm{H},it}}{\mathrm{TS}_{it}} + b_5 \mathrm{SPR}_{it} + b_6 \frac{\sigma^2_{\mathrm{A},it}}{\sigma^2_{\mathrm{H},it}} + b_7 \Delta x_t + b_8 \Delta z_t + \psi u_{it-1} + u_{it}, \\ h_{it} = \alpha_0 + \alpha_1 u^2_{it-1} + \beta_1 h_{it-1}, \end{cases} \tag{3}$$

$r_{\mathrm{A-H}}$ is the A- and H-share returns differential. SE_t and HK_t are the Shanghai (Shenzhen) stock exchange composite index returns and the Hang Seng Index returns, respectively. $V_{\mathrm{H}}/\mathrm{TS}$ is the ratio between daily H-share trading volume and the total number of shares outstanding; SPR is the difference between H- and A-shares bid–ask spreads. Δx_t is the percentage change in the exchange rate between the RMB and Hong Kong dollar. Δz_t is the average change in six neighboring countries exchange rates. For all estimates, * and † indicate significance at the 5% and 10% levels, respectively. $\mathrm{LB}(k)$ and $\mathrm{LB}^2(k)$ denote the Ljung-Box test of significance of autocorrelations of k lags for return residuals and squared-return residuals, respectively. Autocorrelations are computed for standard residuals. *Joint* is the Engle and Ng (1993) joint sign bias test statistic.

For all firms but one, the return differential has a significant and positive coefficient with the Shanghai (Shenzhen) market index returns, and for all firms the return differential has a significant and negative coefficient with the Hong Kong market index returns. Second, consistent with our liquidity hypothesis, which implies that the H-share price discount is an inverse function of the relative liquidity, the coefficient for the relative liquidity measure (b_5) is significant and negative for all sample firms. Most of the estimates of b_5 have a value of about -2 to -3. Intuitively, a 1% increase in the ratio of (V_H/TS) will reduce the H-share discount by 2–3%, on average. However, only a small number of firms have a significant coefficient (b_5) for the bid–ask spread-based liquidity proxy, and the signs of the coefficient are not consistent across firms.

The differential risk hypothesis implies that the H-share discount is positively related to the risk level. However, the estimated coefficient of the relative risk-aversion proxy (b_6) is not significant for any firm, and has different signs across firms. In other words, the empirical results do not support the differential risk hypothesis. Note that because we use estimated volatility as a proxy for risk, there may be a downward bias in the estimates due to measurement errors. This is a common problem when a proxy is used. However, the estimates have different signs and are not significant for most firms, which implies that the potential bias is unlikely to affect our interpretation.

Consistent with the results in Section 3.1, the coefficient for the percentage change in exchange rate is not significant for all firms. We find the coefficient for the expected devaluation in RMB is significant and positive at the 5% level for only one firm.

Table 4 shows that all the GARCH coefficients except one are significant at the 5% level. The null hypothesis of no serial correlation is not rejected by the Ljung and Box (1978) test statistics at the 5% level for most of the residuals and squared residuals. Because good news and bad news might have different levels of predictability for future volatility, we also apply the Engle and Ng (1993) sign bias test to detect potential asymmetric effects of volatility. We find that the test statistics are not significant for any firm. We also conduct tests for the sign bias, and for negative and positive size biases. The results of these tests are consistent with the joint sign bias test results that are reported in the tables. These diagnostic test results indicate that the ARMA(1,1)-GARCH model specifications are adequate. [9]

4.2.2. Asymmetric information hypothesis and Granger-causality tests

The asymmetric information hypothesis implies that either returns on H-shares lead (or Granger-cause) returns on A-shares, or vice versa. We use Granger-causality tests (Granger, 1969) between A- and H-share returns to test the asymmetric information hypothesis. We use the following bivariate VAR model to test for Granger-causality between A- and H-share returns:

[9] To further explore the dynamic behavior of the H-share price discounts, we also conduct a split-sample analysis of Model (3). The results of the split-sample analysis results are highly consistent with that of the whole-sample analysis. To save space, the results are not reported here.

$$\begin{bmatrix} r_{A,t} \\ r_{H,t} \end{bmatrix} = \begin{bmatrix} c_A \\ c_H \end{bmatrix} + \begin{bmatrix} A_{11}(L) & A_{12}(L) \\ A_{21}(L) & A_{22}(L) \end{bmatrix} \begin{bmatrix} r_{A,t-1} \\ r_{H,t-1} \end{bmatrix} + \begin{bmatrix} e_{A,t} \\ e_{H,t} \end{bmatrix} \quad (4)$$

where $A_{ij} = \sum_{k=1}^{5} a_{ij}(k)L^{k-1}$, for $i, j = 1, 2$. For example, by definition, H-share returns, $r_{H,t-k}$, do not Granger-cause A-share returns, $r_{A,t}$, if the distribution of $r_{A,t}$, conditional on both $r_{A,t-k}$ and $r_{H,t-k}$, is the same as that conditional on $r_{A,t-k}$ alone. If a standard F-test does not reject the hypothesis that $A_{12} = 0$, then H-share returns do not Granger-cause A-share returns. Similarly, if a standard F-test does not reject the hypothesis that $A_{21} = 0$, then A-share returns do not Granger-cause H-share returns.

Table 5 reports the Granger-causality test results along with F-statistics and corresponding significant levels. Among the 16 pairs of A- and H-share returns, only one firm's H-share returns Granger-cause A-share returns, and only one firm's A-share returns Granger-cause the corresponding H-share returns. There is no feedback relation between A- and H-share returns. These results indicate that there is almost no Granger-caused relation between A- and H-share returns, i.e., the past information in A-share returns is not helpful in predicting the movement in H-share returns, and vice versa.

This finding contradicts the asymmetric information hypothesis, which implies that A-share returns Granger-cause H-share returns. Because the majority of investors on the SEHK are local Chinese, there is unlikely to be any significant language barrier between A-share investors and H-share investors. Furthermore, the listing requirements for H-shares are more restrictive than those for A-shares. Therefore, different accounting standards and a lack of reliable information are unlikely to burden H-share investors with a major disadvantage in terms of asymmetric information.

4.3. Panel data analysis of the H-share price discounts

One concern about the liquidity hypothesis is that, theoretically, it would be more appropriate to examine the effect of illiquidity on the H-share price discount in a cross-sectional setting. For example, cross-sectionally we expect that relatively liquid H-shares have higher prices, and that there will be a lower H-share price discount. However, the negative relation between the volume-based liquidity measure and the H-share price discount can also be interpreted as the result of the positive relation between demand for H-shares by foreign investors and the H-share prices. That is, an increase in demand for H-shares by foreign investors simultaneously causes an increase in H-share prices and a decrease in H-share price discounts. [10]

Because we only have 16 firms in the sample, cross-sectional tests are difficult to implement. Following Domowitz et al. (1997), we use a panel data analysis to exam-

[10] Stulz and Wasserfallen (1995) suggest that there is a difference between domestic and foreign investors in the demand functions for domestic shares. However, in equilibrium, it is hard to distinguish between measures of supply and demand. Gordon and Li (1999) suggest that the government rather than individual firms has behaved as a discriminating monopolist in Chinese markets. Chen et al. (2001) argue that in Chinese market, outstanding shares are primarily determined by supply rather than by investor demand, and find that the B-share price discount cannot be explained by the differential demand hypothesis.

Table 5
Tests of causal relation between A-share returns and H-Share returns

Code	Firm	F-statistic $H_0 : A_{12}(L) = 0$ $r_H \to r_A$	Significant level	Causal relation	F-statistic $H_0 : A_{21}(L) = 0$ $r_A \to r_H$	Significant level	Causal relation
SHSE							
600115	Eastern Airlines	$F(5, 890) = 2.430$	0.034*	Yes	$F(5, 890) = 1.350$	0.241	No
600600	Tsingtao Brewery	$F(5, 1441) = 1.740$	0.121	No	$F(5, 1441) = 0.493$	0.782	No
600685	Guangzhou Shipyard	$F(5, 1099) = 0.752$	0.585	No	$F(5, 1099) = 2.330$	0.040*	Yes
600775	Panda Electronic	$F(5, 1003) = 0.892$	0.486	No	$F(5, 1003) = 0.621$	0.684	No
600806	Kunming Machine	$F(5, 1044) = 0.868$	0.502	No	$F(5, 1044) = 0.568$	0.725	No
600808	Maanshan Iron	$F(5, 1449) = 1.470$	0.196	No	$F(5, 1449) = 0.815$	0.539	No
600860	Beiren Printing	$F(5, 1255) = 0.219$	0.954	No	$F(5, 1255) = 0.172$	0.973	No
600874	Bohai Chemical	$F(5, 1344) = 1.740$	0.123	No	$F(5, 1344) = 1.080$	0.370	No
600875	Dongfang Electrical	$F(5, 1277) = 1.280$	0.271	No	$F(5, 1277) = 0.306$	0.910	No
600876	Luoyang Glass	$F(5, 1273) = 0.821$	0.534	No	$F(5, 1273) = 0.869$	0.501	No
SZSE							
0585	Northeast Electrical	$F(5, 1241) = 0.422$	0.834	No	$F(5, 1241) = 0.117$	0.989	No
0618	Jilin Chemical	$F(5, 1099) = 0.381$	0.862	No	$F(5, 1099) = 1.250$	0.282	No
0666	Jingwei Textile	$F(5, 1004) = 1.380$	0.231	No	$F(5, 1004) = 0.896$	0.483	No
0756	Xinhua Pharmaceutical	$F(5, 881) = 0.644$	0.666	No	$F(5, 881) = 0.984$	0.427	No
0898	Angang New Steel	$F(5, 847) = 1.190$	0.311	No	$F(5, 847) = 1.780$	0.115	No
0921	Guangdong Kelon	$F(5, 505) = 0.802$	0.549	No	$F(5, 505) = 0.240$	0.945	No

This table reports the test results for Granger-causality tests between A- and H-share returns, based on the following bivariate VAR model:

$$\begin{bmatrix} r_{A,t} \\ r_{H,t} \end{bmatrix} = \begin{bmatrix} c_A \\ c_H \end{bmatrix} + \begin{bmatrix} A_{11}(L) & A_{12}(L) \\ A_{21}(L) & A_{22}(L) \end{bmatrix} \begin{bmatrix} r_{A,t-1} \\ r_{H,t-1} \end{bmatrix} + \begin{bmatrix} e_{A,t} \\ e_{H,t} \end{bmatrix}, \quad \text{where} \quad A_{ij} = \sum_{k=1}^{5} a_{ij}(k) L^{k-1}, \quad \text{for } i, j = 1, 2. \tag{4}$$

r_A = A-share returns and r_H = H-share returns. The numbers in parentheses in the F-statistic are the first and second degrees of freedom, respectively. "Yes" indicates that the Granger causal relation is significant at the 5% level.

ine the cross-sectional and time series determinants of the H-share price discounts as a complement to the time series analysis. Specifically, we use the GMM to estimate the following panel data model:

$$r_{\mathrm{A-H},it} = b_0 + b_1 r_{\mathrm{A-H},it-1} + b_2 \mathrm{SE}_t + b_3 \mathrm{HK}_t + b_4 \frac{V_{\mathrm{H},it}}{\mathrm{TS}_{it}} + b_5 \mathrm{SPR}_{it} + b_6 \Delta z_t + u_{it}. \tag{5}$$

We do not include two independent variables, the ratio of A-share variance of returns to H-share variance of returns ($\sigma_{\mathrm{A}}^2/\sigma_{\mathrm{H}}^2$) and the percentage change in the RMB-Hong Kong dollar exchange rate (Δx_t), as such estimates are not significant in the above analysis.

In Table 6, the reported GMM estimates of the panel models are consistent with the results of the time series analysis reported in Table 4. Consistent with the time series analysis results, we find that the coefficient of the SHSE (SZSE) market index returns (b_2) is significant and positive, the coefficient of the SEHK market index returns (b_3) is significant and negative, the coefficient of the relative liquidity measure (b_4) is significant and negative, and the coefficient of the bid–ask spread (b_5) is not significant. The only difference between the results of the time series analysis and the panel analysis is that the coefficient of the proxy of the expected devaluation in the RMB (b_6) is significant and positive in the panel analysis compared to a very small number of significant results in the time series analysis. This difference may

Table 6
Panel data models

Constant	−0.0002	−0.0003	0.0000	0.0064	−0.0006	−0.0006	0.0065
	(−0.388)	(−0.694)	(0.066)	(12.976)	(−1.287)	(−1.450)	(14.069)
$r_{\mathrm{A-H},t-1}$	−0.0144						−0.0675
	(−1.353)						(−9.614)
$R_{\mathrm{SE},it}$		0.3433					0.3696
		(7.219)					(22.607)
$R_{HK,it}$			−0.6891				−0.6727
			(−15.471)				(−39.038)
$(V_{\mathrm{H}}/\mathrm{TS})_i$				−1.8099			−1.8552
				(−15.652)			(−33.123)
SPR_{it}					0.0610		0.0311
					(2.874)		(0.207)
Δz_t						0.7017	0.1784
						(11.359)	(3.062)
Adjusted R^2	0.0002	0.0206	0.0799	0.0515	0.0008	0.0073	0.1557

This table reports generalized method of moments (GMM) estimates of the following model for the panel data:

$$r_{\mathrm{A-H},it} = b_0 + b_1 r_{\mathrm{A-H},it-1} + b_2 \mathrm{SE}_t + b_3 \mathrm{HK}_t + b_4 \frac{V_{\mathrm{H},it}}{\mathrm{TS}_{it}} + b_5 \mathrm{SPR}_{it} + b_6 \Delta z_t + u_{it}. \tag{5}$$

$r_{\mathrm{A-H}}$ is the A- and H-share returns differential. SE_t and HK_t are the Shanghai (Shenzhen) stock exchange composite index returns and the Hang Seng Index returns, respectively. $V_{\mathrm{H}}/\mathrm{TS}$ is the ratio between daily H-share trading volume and the total number of shares outstanding; SPR_t is the difference between H- and A-shares bid–ask spreads. Δz_t is the average change in six neighboring countries' exchange rates. The t-values in parentheses are calculated based on the robust standard errors.

arise because the effect of the expected devaluation in the RMB is mainly a market-wide macro-economic factor rather than a firm-specific factor. Therefore, it would be easier to detect it in a panel data analysis, which pools all of the sample firm series and tends to provide more efficient estimates of the common factors [11] than in the time series analysis at the firm level.

5. Conclusion

In this paper, we examine Chinese companies that issue both A-shares in mainland China and H-shares in Hong Kong. We find that the H-share and A-share returns have different dynamic relations to their domestic and foreign markets. For all H-share stocks, the Hong Kong market betas are significant and positive, and for about 60% of the H-shares, the corresponding domestic market betas are also significant. However, for all but two A-share stocks, only the domestic market beta is significant. In other words, A-share returns are subject to market-specific risk and investor sentiment that is specific to Shanghai (Shenzhen). H-share returns are subject to market-specific risk and investor sentiment in both Hong Kong and Shanghai (Shenzhen). H-shares behave more like Hong Kong stocks than mainland Chinese stocks. Despite their significant exposure to the Hong Kong market, H-shares retain significant exposure to their home market. Therefore, H-shares provide Hong Kong and international investors with diversification opportunities.

Second, we document a large time-varying H-share price discount relative to A-shares, and this discount is highly correlated with the domestic and foreign stock market indices and relative market illiquidity.

A complementary panel data analysis confirms the above time series analysis results, and provides support for the hypothesis that the H-share price discount is positively correlated with the expected devaluation in the Chinese currency. Due to market segmentation that is mainly induced by ownership restrictions and exchange control in mainland China, the H-share discount may not be easily arbitraged away, at least in the short-run.

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[11] See, for example, Taylor (1980).

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