The A-H Premium and Implications for Global Investing in Chinese Stocks*

Jennifer N. Carpenter
New York University Stern School

Robert F. Whitelaw
New York University Stern School

Dongchen Zou
University of Pennsyvania Wharton School

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Abstract

Among the 3600 Chinese firms with A shares listed on the Shanghai and Shenzhen Stock Exchanges, about 100 have H shares dual-listed on the Hong Kong Stock exchange. The prices of the A shares have historically exceeded those of H shares by 60% or more on average. Why do Chinese investors price these stocks so much higher than global investors in Hong Kong? Does this imply that global investors seeking to invest in Chinese firms should prefer foreign-listed stocks over domestic-listed stocks more generally? This paper analyzes the cross-sectional and time series determinants of the A-H premium. We find that traditional asset pricing factors have significant explanatory power, but our results suggest that additional factors such as barriers to convergence and home bias also play an important role. Market-level analysis shows that the A-H premium does not imply that H shares are the better investment for global investors once portfolio considerations are taken into account, because H-share returns are much more highly correlated with the global stock market than A shares.

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1 Introduction

Among the more than 3600 Chinese firms with A shares listed on the Shanghai and Shenzhen Stock Exchanges, almost 100 have H shares dual-listed on the Hong Kong Stock exchange, and the prices of the A shares have historically exceeded those of H shares by 60% or more on average. Why do Chinese investors price these stocks so much higher than global investors in Hong Kong? Does this imply that global investors seeking to invest in Chinese firms should prefer foreign-listed stocks over domestic-listed stocks more generally?

To motivate the study of these dual-listed stocks, we begin by establishing that although they have some special characteristics, their A- and H-share returns are similar to returns in the total A- and H-share markets, respectively. Therefore, the differential pricing of dual-listed stocks may have implications for the broader universe of domestic and foreign-listed Chinese stocks. We provide an analysis of the cross-sectional and time-series determinants of the A-H premium, reaching an average cross-sectional R^2 of over 70%. We find that traditional asset pricing factors have significant explanatory power. For example, in the cross-section, stocks with higher A-share betas have lower A-H premia and stocks with higher H-share betas have higher premia, consistent with theory. In the time series, the median A-H premium is higher when the spread of LIBOR over Treasury bills is higher, suggesting that higher USD risk premia lead to relatively lower H-share prices. In addition, the premium is higher for stocks with relatively greater supply of H shares.

At the same time, our results suggest that additional factors such as limits to arbitrage, barriers to convergence, and home bias also play an important role. The A-H premium is higher for stocks with higher A-share volatility and at times when the A-share market is more volatile. The premium is also higher for small stocks and for illiquid stocks, for whom convergence trading may be more risky or costly. Given the magnitude of the median A-H premium and the low USD interests relative to RMB interest rates, we suspect that the prices of A and H shares reflect significant home bias that depresses the prices of H shares, which are foreign stocks from the perspective of global investors.

Our market-level analysis shows that the A-H premium does not imply that H shares are the better investment for global investors once portfolio considerations are taken into account. First, much of the excess return of H shares over A shares over the period 2002-2016 is attributable to the early years when the median A-H premium, i.e., the ratio of A price to H price measured in a common currency, fell from almost 5 to 1.5. Second, in recent years, when the median A-H premium has varied steadily around 1.5, the H market delivered higher excess returns than the A market, but lower four-factor alpha, because of its higher beta with respect to the global market. A bet on H shares vs. A shares is in large part a bet on the convergence of these markets.

Here is an outline of the paper. Section 2 provides an overview of the A- and H-share markets. Section 3 develops models of the A-H premia that capture differential required returns and differential beliefs about dividends. Section 4 presents evidence on the cross-sectional and time-series determinants of A-H premia. Section 5 examines the overall performance of the A- and H-share markets. Section 6 concludes.

2 Market overview

China's A-share market opened in Shanghai and Shenzhen in 1991 under the leadership of Deng Xiaoping as a platform for privatizing state-owned enterprises (SOEs). The Shanghai and Shenzhen Main Boards list larger, mature firms. The SME and ChiNext Boards on the Shenzhen Stock Exchange, which opened in 2004 and 2009, respectively, list smaller, more entrepreneurial firms. Figure 1 of Carpenter and Whitelaw (2017) plots the time series of the number of firms listed and their market capitalization from 1991 to 2016. As of June 2019, there are over 3600 firms listed with a market capitalization of 7.5 trillion USD. China's A-share market has many distinctive features. It is still largely segmented from global financial markets and held almost entirely by mainland Chinese investors. It is dominated by retail investors who account for over 80% of its massive trading volume. It was labeled a casino in 2001. However, Carpenter, Lu, and Whitelaw (2019) find that since 2004, A-share prices have become as informative about future firm profits as stock prices are in the US. See Carpenter and Whitelaw (2017) for a detailed description of the development of China's A-share market.

China's A shares are issuances of firms operating, incorporated, and listed in China. Chinese firms also have a range of other incorporation and listing options and are traded on stock exchanges around the world. Table 1 lists the types of Chinese shares, the stock exchanges where they are listed, their countries of incorporation, the currency denomination, and the approximate number of each type of share traded. For example, B shares are incorporated and listed in mainland China, but are tradable by foreign investors in USD or HKD. B-share issuance has become negligible since the China Securities Regulatory Commission (CSRC) introduced the Qualified Foreign Institutional Investors (QFII) program in 2002, which allows QFIIs to buy A shares. So-called Red-chips and P-chips are issuances of Chinese SOEs and private firms, respectively, incorporated outside mainland China, such as in Hong Kong, the Cayman Islands, the British Virgin Islands, or Bermuda, and listed on the Stock Exchange of Hong Kong (SEHK). N shares are issuances of Chinese firms incorporated outside China and listed on the NYSE or NASDAQ.

The focus of this paper is on A shares and H shares, which are both issuances of firms that are incorporated in mainland China. A shares are listed on the mainland exchanges, traded in RMB, owned primarily by mainland Chinese investors, and subject the lengthy and risky approval process of the CSRC, which requires that firms clear a three-year earnings threshold and has occasionally suspended IPOs altogether for long periods of time.* A shares are also effectively subject to RMB capital controls by the Chinese government. H shares are listed on the SEHK and traded in HKD by a global investor clientele. The SEHK, which opened in 1986, has a lower earnings threshold and faster processing time than the Shanghai and Shenzhen Stock Exchanges (SSE and SZSE).†

In particular, we focus on the so-called "dual-listed" stocks with twin listings of A shares in the mainland and H shares in Hong Kong that are in principle claims to an identical cash flow stream, with dividends paid out in the two currencies according to the prevailing exchange rate. The first dual-listed stock was that of Tsingtao, listed as a H share in July 1993 and listed as an A share in August 1993. Figure 1 shows the time series of the number of H-share listings and their total market capitalization, for both dual-listed and non-dual-listed firms. As the figure shows, the H-share market has grown rapidly from the first issuance in 1993 to almost 250 listings with a market capitalization of almost 800 billion USD in 2016. The dual-listed stocks tend to be larger stocks: they represent only about 100 listings, but about 550 billion USD of market capitalization in 2016.

To give a sense of the significance of the dual-listed stocks, Table 2 lists the ten largest Chinese stocks by market capitalization in May 2017, based on data from Bloomberg. Dual-listed firms make up seven of these top ten. They are principally state-owned banks, insurance companies, and oil companies headquartered in Beijing or Shenzhen. With market capitalizations over 100 billion USD, these stocks represent some of the largest firms in the world.

What is most striking about these dual-listed stocks is the large differential between their A-share price and their H-share price. Our sample period begins in 2001, when the number of dual-listed stock first exceeded 20. Figure 2 plots the time series of the median A-H premium, where a stock's A-H premium is defined as the ratio of its A price to its H price, measured in a common currency. As the figure shows, the A shares typically trade at a higher price than the H shares. The median ratio fell from 5 in 2001, to about 1.5 in 2004, and has fluctuated around that level ever since. The price differential does not represent an arbitrage opportunity, which would require being able to buy an H share and short an A share indefinitely, but it does represent a severe violation of the law of one price. The

*See Cong and Howell (2018) for a study of the adverse effects of IPO suspensions on innovation in China.
†See Table 1 of Carpenter and Whitelaw (2017) for more details of these listing requirements.

reason for this violation is that the A- and H- share markets are segmented and priced by different investor clienteles. Investors in these markets may perceive the cash flows of these stocks to be different, and they may also discount them differently. Although we know of no other study of the A-H premium, a number of authors have studied the A-B premium and relate it variously to information asymmetry across domestic and foreign investors, liquidity differences, relative supply of A shares, differential short sale constraints, and political risk.[‡]

To address the question of whether dual-listed stocks are representative of the broader A- and H-share markets, Table 3 presents performance measures for A shares, H shares, and dual-listed stocks, based on annualized monthly tradable-value-weighted portfolio excess USD returns over the period 2002-2016. The stock return data are from CSMAR, WIND, and CRSP. As the table shows, the means and volatilities of the returns of dual-listed A and H shares are quite similar to those of the A- and H-share markets as a whole, only slight lower, reflecting the fact that these are larger stocks. In addition, the correlations of the dual-listed stocks with the US and global markets are quite similar to those of the A- and H-share markets as a whole. The returns of dual-listed stocks are also highly correlated with the returns of the broader A- and H-share markets. In particular, the correlation between dual-listed A shares and the full universe of A shares is 82%, while the correlation between dual-listed H shares and the full universe of H shares is 99.6%. We conclude that our results on the pricing of dual-listed stocks have implications for the full universe of A and H shares.

3 Models of the A-H premium

To formalize the intuition underlying the empirical specifications used later, this section develops several tractable models of the A-H premium in which the price of the firm's stock in each market is as in a generalized Gordon growth model. The models are still rich enough to capture a "home-bias discount" in H-share prices, motivated by evidence of substantial under-diversification of international equity portfolios.

Suppose stock i delivers a continuous stream of cash flows $C_{i,t}$ described by

$$\frac{dC_i}{C_i} = g_i\, dt + \sigma_i dB_i \ , \tag{1}$$

where B_i is a standard Brownian motion and the cash flow growth rate g_i and volatility σ_i are constants. Suppose that in each market $j = A$ or H, there is a riskless asset appreciating

[‡]See, for example, Chakravarty, Sarkar, and Wu (1998), Chen, Lee, and Rui (2001), Fernald and Rogers (2002), Chan and Kwok (2005), Chan, Menkveld, and Yang (2008), Mei, Scheinkman, and Xiong (2009), and Karolyi, Li, and Liao (2009).

at rate r_j.

3.1 Differential required returns

This section develops the baseline model of the A-H premium in which the A-H price differentials stem from differential required returns in the A- and H-share markets.

3.1.1 One priced risk factor

For ease of exposition, first assume that in each market $j = A$ or H, there is a single priced risk factor represented by a standard Brownian motion B_j, and a factor-mimicking portfolio with value X_j that evolves according to

$$\frac{dX_j}{X_j} = \mu_j \, dt + \sigma_j \, dB_j \ . \tag{2}$$

For example, we can interpret this as the market portfolio in a CAPM. The Sharpe ratio paid by the priced factor in market j is $\theta_j = (\mu_j - r_j)/\sigma_j$ and the stochastic discount factor process M_j that summarizes pricing in market j is

$$M_{j,t} = e^{-r_j t - \theta_j B_{j,t} - \theta_j^2 t/2} \ , \tag{3}$$

in the sense that at any time t investors in market j price a given payoff C_u at time $u > t$ as

$$V_t = \mathrm{E}_t\{\frac{M_{j,u}}{M_{j,t}} C_u\} \ . \tag{4}$$

Suppose the correlation between stock i's cash flow and market j's priced risk factor is $\rho_{i,j}$. As in a standard CAPM, we can decompose stock i's cash flow shocks into the component that is perfectly correlated with priced factor j and an uncorrelated residual:

$$\frac{dC_i}{C_i} = g_i \, dt + \sigma_i(\rho_{i,j} \, dB_j + \sqrt{1 - \rho_{i,j}^2} dZ_{i,j}) \tag{5}$$

where $Z_{i,j}$ is a standard Brownian motion uncorrelated with B_j. By assumption, $Z_{i,j}$ is not a priced risk in market j, and the cash flows of stock i are priced according to equation (4). So the price process $P_{i,j}$ of stock i in market j is

$$P_{i,j,t} = \int_t^\infty \mathrm{E}_t\{\frac{M_{j,u}}{M_{j,t}} C_{i,u}\} \, du \ . \tag{6}$$

For the purpose of computation, this can be written as

$$P_{i,j,t} = \lim_{T\to\infty} \int_t^T \mathrm{E}^*_{j,t}\{e^{-r_j(u-t)} C_{i,u}\}\, du \ , \tag{7}$$

where the expectation is under the risk-neutral measure $\mathcal{P}^*_{j,T}$ given by

$$\frac{d\mathcal{P}^*_{j,T}}{d\mathcal{P}} = e^{r_j T} M_{j,T} \ , \tag{8}$$

under which

$$B^*_{j,t} \equiv B_{j,t} + \theta_j t \tag{9}$$

is a Brownian motion with zero drift. Equation (5) can be rewritten as

$$\frac{dC_i}{C_i} = (g_i - \sigma_i \rho_{i,j} \theta_j)\, dt + \sigma_i(\rho_{i,j}\, dB^*_j + \sqrt{1-\rho^2_{i,j}} dZ_{i,j}), \tag{10}$$

so under $\mathcal{P}^*_{j,T}$, the growth rate of C_i is

$$g^*_{i,j} = g_i - \sigma_i \rho_{i,j} \theta_j = g_i - \beta_{i,j}(\mu_j - r_j) \ , \tag{11}$$

where

$$\beta_{i,j} = \rho_{i,j} \sigma_i / \sigma_j \tag{12}$$

is stock i's beta with respect to market j's factor-mimicking portfolio. Substituting

$$\mathrm{E}^*_{j,t}\{C_{i,u}\} = C_{i,t} e^{g^*_{i,j}(u-t)} \tag{13}$$

into equation (7) gives

$$P_{i,j,t} = \frac{C_{i,t}}{r_j - g^*_{i,j}} = \frac{C_{i,t}}{r_j + \beta_{i,j}(\mu_j - r_j) - g_i} = \frac{C_{i,t}}{r_j + \sigma_i \rho_{i,j} \theta_j - g_i} \ , \tag{14}$$

assuming $g_i < r_j + \beta_{i,j}(\mu_j - r_j)$. Moreover,

$$\frac{dP_{i,j,t}}{P_{i,j,t}} = [(r_j + \beta_{i,j}(\mu_j - r_j)) - \frac{C_{i,t}}{P_{i,j,t}}]\, dt + \sigma_i(\rho_{i,j}\, dB_j + \sqrt{1-\rho^2_{i,j}} dZ_{i,j}) \tag{15}$$

or

$$\frac{dP_{i,j,t}}{P_{i,j,t}} = r_j dt + \beta_{i,j}(\frac{dX_{j,t}}{X_{j,t}} - r_j\, dt) - \frac{C_{i,t}}{P_{i,j,t}}\, dt + \sigma_i \sqrt{1-\rho^2_{i,j}} dZ_{i,j} \tag{16}$$

as stock i is priced by construction to deliver a normal return with respect to the factor X_j.

Therefore, the A-H premium for stock i is

$$\frac{P_{i,A,t}}{P_{i,H,t}} = \frac{r_H + \beta_{i,H}(\mu_H - r_H) - g_i}{r_A + \beta_{i,A}(\mu_A - r_A) - g_i} = \frac{r_H + \sigma_i \rho_{i,H} \theta_H - g_i}{r_A + \sigma_i \rho_{i,A} \theta_A - g_i} \ , \tag{17}$$

from which it follows that the premium should be increasing in $r_H, \beta_{i,H}$, and $\mu_H - r_H$ and decreasing in $r_A, \beta_{i,A}$, and $\mu_A - r_A$. Or equivalently, all else equal, the A-H premium should be increasing $r_H, \rho_{i,H}$, and θ_H, and decreasing in $r_A, \rho_{i,A}$ and θ_A. If the premium is greater than one, it is increasing in g_i and if it is less than one, it is decreasing in g_i.

3.1.2 Multiple priced risk factors

Now, to accommodate the multiple sources of risk that are evidenced in stock returns, suppose there are K risk factors in market j, with mimicking portfolios given by

$$\frac{dX_{j,k}}{X_{j,k}} = \mu_{j,k}\, dt + \sigma_{j,k}\, dB_j \tag{18}$$

for $k = 1, \ldots, K$, where the $\sigma_{j,k}$ are row vectors and B_j is K-dimensional vector of independent Brownian motions. Then we obtain a multi-dimensional version of the one-factor model above. The stochastic discount factor process that summarizes pricing in market j is

$$M_{j,t} = e^{-r_j t - \theta' B_{j,t} - |\theta_j^2| t/2} \ . \tag{19}$$

where

$$\theta_j = \sigma_j^{-1}(\mu_j - r_j 1) \ , \tag{20}$$

σ_j is the matrix whose kth row is $\sigma_{j,k}$, and μ_j is the vector of the $\mu_{j,k}$. We can write the evolution of firm i's cash flow stream in terms of the components that are perfectly correlated with the K risk factors and a residual component as follows:

$$\frac{dC_i}{C_i} = g_i\, dt + \sigma_i(\rho_{i,j}\, dB_j + \sqrt{1 - |\rho_{i,j}|^2} dZ_{i,j}) \tag{21}$$

where $\rho_{i,j}$ is a row vector of the $\rho_{i,j,k}$, the instantaneous correlations of firm i's cash flows with the K risk factors in market j. Following the same logic as in the case of a single priced risk factor above,

$$P_{i,j,t} = \frac{C_{i,t}}{r_j - g_i^*} = \frac{C_{i,t}}{r_j + \sigma_i \rho_{i,j} \theta_j - g_i} \ . \tag{22}$$

If $\sigma_{j,k}$ is diagonal, i.e., if the factors are independent, then this becomes

$$P_{i,j,t} = \frac{C_{i,t}}{r_j - g_i^*} = \frac{C_{i,t}}{r_j + \sum_k \beta_{i,j,k}(\mu_{j,k} - r_j) - g_i} \ , \tag{23}$$

where $\beta_{i,j,k} = \rho_{i,j,k}\sigma_i/\sigma_{j,k}$.

The A-H-premium of stock i is

$$\frac{P_{i,A,t}}{P_{i,H,t}} = \frac{r_H + \sigma_i\rho_{i,H}\theta_H - g_i}{r_A + \sigma_i\rho_{i,A}\theta_A - g_i} \ , \tag{24}$$

and if the factors are independent then this can be written as

$$\frac{P_{i,A,t}}{P_{i,H,t}} = \frac{r_H + \sum_k \beta_{i,H,k}(\mu_{H,k} - r_H) - g_i}{r_A + \sum_k \beta_{i,A,k}(\mu_{A,k} - r_A) - g_i} \ . \tag{25}$$

The price of stock i satisfies

$$\frac{dP_{i,j,t}}{P_{i,j,t}} = (r_j + \sigma_i\rho_{i,j}\theta_j - \frac{C_{i,t}}{P_{i,j,t}})\, dt + \sigma_i(\rho_{i,j}\, dB_j + \sqrt{1 - |\rho_{i,j}|^2} dZ_{i,j}) \ , \tag{26}$$

and if the factors are independent this can be written as

$$\frac{dP_{i,j,t}}{P_{i,j,t}} = r_j dt + \sum_k \beta_{i,j,k}(\frac{dX_{j,k,t}}{X_{j,k,t}} - r_j\, dt) - \frac{C_{i,t}}{P_{i,j,t}}\, dt + \sigma_i\sqrt{1 - |\rho_{i,j}|^2} dZ_{i,j} \ . \tag{27}$$

3.1.3 Multiple priced risk factors and home bias

Cooper, Sercu, and Vanpe (2013) document severe home bias in international equity portfolios, which they attribute to a combination of factors including information asymmetries, behavioral aspects, barriers to foreign investment, and governance issues. Since, as mainland Chinese stocks, H shares are foreign stocks from the viewpoint of investors outside of mainland China, it seems likely that their prices reflect home bias in the form of a reduction relative to the price of an otherwise similar "home stock" in the globally integrated financial market.

We can capture the price reduction caused by home bias simply by treating home bias as an increase in investors' discount rate associated with exposure to a "home-bias risk-factor" that is present in the H-share price but not in the A-share price, because A-shares are home stocks for mainland Chinese investors. With this home-bias discount, the form of the H-share prices and A-H premia remain the same as above, but we interpret one of the risk factors $X_{H,k}$ in the H market as the home-bias factor-mimicking portfolio and we interpret the risk premia on the H shares, $\sigma_i\rho_{i,j}\theta_j$, to include a positive term representing compensation for home-bias risk.

3.2 Differential beliefs about dividend processes

Another reason why A- and H-share investors might disagree about the value of dual-listed stocks is that they perceive their dividend processes to be different.

3.2.1 Differential dividend growth rates

Suppose A- and H-share investors perceive the growth rates of their dividends to be different. To model this simply, suppose A-share investors dogmatically believe the dividend growth rates of dual-listed stocks are $g_{i,A}$ and H-share investors dogmatically believe they are $g_{i,H}$. Then the A-H-premium of stock i is

$$\frac{P_{i,A,t}}{P_{i,H,t}} = \frac{r_H + \sigma_i \rho_{i,H} \theta_H - g_{i,H}}{r_A + \sigma_i \rho_{i,A} \theta_A - g_{i,A}} \ , \tag{28}$$

and if the factors are independent then this can be written as

$$\frac{P_{i,A,t}}{P_{i,H,t}} = \frac{r_H + \sum_k \beta_{i,H,k}(\mu_{H,k} - r_H) - g_{i,H}}{r_A + \sum_k \beta_{i,A,k}(\mu_{A,k} - r_A) - g_{i,A}} \ . \tag{29}$$

Another form of home-bias might be $g_{i,A} > g_{i,H}$, which would boost the A-H premium.

3.2.2 Differential dividend levels

Yet another reason why these investors might disagree about values is that they experience the dividends differently. Suppose H-share investors experience incremental costs to holding H-shares, such as incremental information, attention, or transaction costs, that A-share investors do not. For simplicity, suppose that these costs effectively reduce their dividends from stock i by a factor $\delta_i < 1$. Then the H-share price of stock i becomes

$$P_{i,H,t} = \frac{\delta_i C_{i,t}}{r_H + \sigma_i \rho_{i,H} \theta_H - g_{i,H}} \ , \tag{30}$$

and the A-H premium becomes

$$\frac{P_{i,A,t}}{P_{i,H,t}} = \frac{r_H + \sigma_i \rho_{i,H} \theta_H - g_{i,H}}{\delta_i (r_A + \sigma_i \rho_{i,A} \theta_A - g_{i,A})} \ . \tag{31}$$

If the factors are independent, this can be written as

$$\frac{P_{i,A,t}}{P_{i,H,t}} = \frac{r_H + \sum_k \beta_{i,H,k}(\mu_{H,k} - r_H) - g_{i,H}}{\delta_i(r_A + \sum_k \beta_{i,A,k}(\mu_{A,k} - r_A) - g_{i,A})} \ . \tag{32}$$

If $\delta_i < 1$, it boosts the A-H premia.

3.3 Barriers to convergence

The models developed above treat the A- and H-share markets as completely segmented. However, as channels for foreign investment in A shares and mainland Chinese investment in foreign shares have opened up, and shorting A shares has become easier in some cases, convergence trading, or at least cross-market ownership, has become increasingly possible. Convergence trading might be as simple as mainland Chinese investors selling their A shares and buying H shares, or more complicated, with foreign investors buying H shares and shorting A shares. Such trading should in theory drive down A-H premia, whether they result from differential discount rates or differential beliefs about dividends. At the same time, the ease of convergence trading might vary in the cross-section or in the time series. For example, it might be more difficult to manage convergence trades when the stock or the overall market is more volatile, or for stocks that are smaller or less liquid. While we don't model convergence pressure and barriers to convergence formally, we hypothesize that the barriers to convergence listed above should increase the A-H price differential.

4 Evidence on determinants of A-H premia

In this section we show how A-H premia vary in the cross-section and the time series with firm characteristics and market-level variables that are associated with discount rates or that plausibly correlate with barriers to the convergence of A- and H-share prices. We work with the log of the premium because it is arithmetically symmetric in the prices. According to our model in Equation (31) and (32), the log of the A-H premium is

$$\log(P_{i,A,t}) - \log(P_{i,H,t}) = \log(r_H + \sigma_i\rho_{i,H}\theta_H - g_{i,H}) - \log(r_A + \sigma_i\rho_{i,A}\theta_A - g_{i,A}) - \log\delta_i \ , \tag{33}$$

and if the factors are independent then this can be written as

$$\begin{aligned}\log(P_{i,A,t}) - \log(P_{i,H,t}) &= \log(r_H + \sum_k \beta_{i,H,k}(\mu_{H,k} - r_H) - g_{i,H}) && (34)\\ &\quad - \log(r_A + \sum_k \beta_{i,A,k}(\mu_{A,k} - r_A) - g_{i,A}) - \log\delta_i \ . && (35)\end{aligned}$$

This leads to the hypothesis that in the cross-section, firms with higher A share risk premia should have lower A-H premia and firms with higher H share risk premia should have higher risk premia. Another consideration, outside our model, is that some stocks may be more prone to convergence of their A- and H-share prices through cross-market convergence trading, while others may face barriers to convergence as convergence traders may deem them too risky to bet on. We hypothesize that smaller, more volatile, and less liquid stocks face greater barriers to convergence and exhibit greater violations of the law of one price.

In the time series, our model leads to the hypothesis that months with higher RMB interest rates should have lower A-H premia and months with higher HKD, or USD, interest rates should have higher A-H premia. Similarly, market level credit conditions could play a role, as could the political climate.

We begin with an examination of the cross-sectional variation of the log of the A-H premium, using the methodology of Fama and MacBeth (1973). Then we run time-series regressions of the median log A-H premium on market level variables.

4.1 The cross-section of the log of the A-H premia

Table 4 presents time-series averages of coefficients from cross-sectional regressions of the log A-H premia on firm characteristics associated with discount rates and barriers to convergence and their Newey-West t-statistics. The theoretically predicted signs of the coefficients appear beneath the variable names. The first two specifications are for simple regressions on firm size and illiquidity, respectively. The last two specifications include all the predictor variables, and the last specification also includes industry dummies.

As our model illustrates, a stock's risk premium should in theory be higher, and its price lower, with a higher market beta. Therefore, as discussed above, the A-H premium should decrease with A-share beta and decrease with H-share beta. Table 4 shows that the coefficients on these betas are of the theoretically predicted sign and highly statistically significant.

Firm size has been shown to be an important factor in equity pricing in a range of contexts. For example, Carpenter et al. (2019) find that size betas predict A-share returns significantly negatively. We also believe that firm size positively affects investors' inclination to bet on convergence of A- and H-share prices, as larger stocks may be easier to hold in large long and short positions. For dual-listed stocks, we measure size as the log of the sum of the values of the A and H shares outstanding. Table 4 shows that the coefficient on firm size is highly significantly negative, and that by itself, firm size explains 45% of the cross-sectional variation in the A-H premium on average over the sample period. This size effect is also illustrated in Figure 2, where the median premium for small firms is always above that for large firms.

Similarly, book-to-market ratio is a well-established predictor of returns. Like size, we measure the book-to-market ratio, BM, for dual-listed firms by combining their A and H shares to get total book value of equity for the numerator and total market value of equity for the denominator. Also like size, book-to-market might affect the pricing of both A and H shares, making its theoretical affect on the A-H premium ambiguous. Empirically, Table 4 shows that book-to-market affects the A-H premium positively.

Illiquidity is also a well-established predictor of returns. For dual-listed stocks, we measure illiquidity, Illiq, as the average of the A- and H-share Amihud illiquidity, measured in USD. Illiquidity of a firm's stock is also likely to be a barrier to the convergence of its A and H prices, as illiquid stocks are costly to trade. Consistent with this idea, Table 4 shows that illiquidity is a highly significant, positive predictor of the A-H premium, explaining on average 33% of the cross-sectional variation in the A-H premium by itself. However, illiquidity is also correlated with firm size, so in the full regression specification, the magnitude of the illiquidity coefficient drops considerably, though it remains highly statistically significant.

We also include the average of the stock's dividend-price ratio across the two markets as an explanatory variable. Our intuition is that for a given required return differential between H and A shares, the bigger the relative dividend, the more of the return differential is in the form of differential dividend yields, the less the return differential need come from price convergence, the lower the A-H premium. Consistent with this intuition, we find that the average dividend-price ratio is strongly negatively related to the A-H premium.

In addition, we capture relative supply effects with the variable Rel. Float, which is equal to the tradable value of A shares minus the tradable value of H shares in RMB. Consistent with the idea that greater relative supply of A shares pushes down their relative price, we find that Rel. Float is strongly negatively related to the A-H premium.

On average, the R-squared from the full regression is 80%. This shows that differential discount rates and barriers to convergence go a long way toward explaining the cross-section of A-H premia.

4.2 The cross-section of H-A return differentials

If differential required returns explain the magnitude of the A-H premium, as opposed to differential perceptions of dividends, then stocks with larger A-H premia in a given month should systematically produce larger differentials between their H- and A-share returns in the following month. We confirm this in Fama-MacBeth cross-sectional regressions of the difference between dual-listed stocks' H- and A-share returns on their prior month log A-H premium:

$$r_{i,H,t+1} - r_{i,A,t+1} = \alpha + \beta \log(P_{i,A,t}/P_{i,H,t}) + \varepsilon_{i,t+1} \tag{36}$$

Table 5 contains time-series averages of the β coefficient estimates above and their Newey-West t-statistics. In the column labeled WLS, coefficients in the time-series average are weighted by the square-root of the number of firms in the cross-section. Both coefficients are significantly positive, suggesting that differential required returns are indeed driving A-H premia. These results also suggest that convergence trades guided by the size of the A-H premium may be profitable on average. Of course, such convergence trades are not without risk.

4.3 The time series of the median log A-H premium

Next, we study the time series of the median log A-H premium. According to our model, variables that describe market-level discount rates should explain time-series variation in the median log A-H premium. In addition, variables that indicate the overall ease of convergence trading should explain the time series of the premium.

Table 6 presents results of time series regressions of the median log A-H premium on the repo rate in China, the three-month Treasury bill rate, the TED spread between LIBOR and Treasury bill rates, indicator variables for the opening of the Hong Kong-Shanghai and Hong Kong-Shenzhen Stock Connect programs, the volatilities of the A-share and H-share markets, and political risk. We also include the lagged median A-H premium because the series is highly autocorrelated. The predicted sign of the coefficient is listed beneath each variable name.

According to our model, the short term interest rate for RMB should negatively affect A-H premia, and the short term interest rate for HKD or USD should positively affect premia. We find that the coefficients on these variables have the predicted sign, but they are not statistically significant. However, the coefficient on the TED spread is positive, as would be expected of a variable that is positively related to discount rates in global financial markets where H shares are traded.

Puzzlingly, the opening of the Hong Kong-Shanghai Stock Connect program actually widened the differential between A- and H-share prices. This suggests pent-up demand for A shares by global investors met in the months after the program opened more than offset pent-up demand for H shares by mainland investors.

The volatility of the A-share market is highly correlated with that of the H-share market, making results of regressions with both variables difficult to interpret. However, each volatility variable on its own positively predicts the premium. This is consistent with the idea that volatility discourages convergence trades and creates a barrier to convergence of A- and H-share prices.

5 Are H shares a better buy for global investors?

It might seem obvious that if an H share is priced lower than its twin A share, then as a claim to the same cash flows, it must be the better investment. This would be the case if the share were to be held forever, but not necessarily if it is to be held for a short period. In that case, the short-term holding period return of the H share is the payoff of the investment, so expectations about the future resale price and convergence of the A and H share prices come in to play, along with broader portfolio considerations.

This section makes the simple point that even if H shares have higher expected returns than A shares, they can still have lower alphas with respect to USD benchmark equity portfolios, because their returns are more highly correlated with USD equity returns. This means that H shares can actually be the inferior investment in terms of their impact on the mean-variance profile of the USD investor's portfolio. Table 3 shows that while the H-share market had higher average returns than the A-share market over the period 2002-2016, they also had higher correlations with the US and global equity market portfolios, leaving open the question of their relative alphas.

Table 7 presents annualized alphas and betas of the A- and H-share markets with respect to the Fama-French global four factor portfolios. Newey-West t-statistics are in parentheses below the coefficient estimates. To emphasize the point that the alphas can be ordered differently than the average excess returns, Table 7 reprints the A- and H-share markets' USD excess returns from Table 3. Table 7 shows that over the full sample period, which includes the massive decline in A-H premia from a median of around 5 to a median of around 1.5 during 2002-2005, H-shares outperformed A shares both in terms of average excess return and alpha. However, A shares have consistently lower market betas than H shares, and during the last five-year subperiod, A shares delivered higher alpha than H shares, 3.10% vs. 1.76%, although the average excess return of H shares exceeded that of A shares. The point is that even if the A-H premium results in lower excess returns for A shares, their lower correlation with global markets means they can still deliver the higher alpha and thus represent the better investment from a portfolio mean-variance standpoint. The positive alphas all around suggest that both A and H shares can be mean-variance-improving assets for global investors.

6 Conclusion

With 7.5 and 0.7 trillion USD in market capitalization, respectively, Chinese A and H shares represent economically significant sectors of the global equity markets and are increasingly capturing the attention of global investors. At the same time, the large and persistent premia in the prices of A shares over their twin H shares makes these stocks an important laboratory for the study of asset pricing across segmented markets as well as a challenge for global equity portfolio managers. This paper presents new evidence on the determinants of A-H premia as well as new insights about investing in these stocks.

To formalize intuition about the sources of the discrepancies between the A- and H-prices of dual-listed stocks, we present models of the A-H premium that capture the potential for differential risk exposures and risk premia, as well as differential beliefs about dividends. In the data, we find that the A-H premium exhibits substantial cross-sectional and time-series variation. Moreover, this variation can be explained by factors that proxy for differential discount rates in the two markets and barriers to convergence trading. Conversely, we find that A-H premia predict future H-A return differentials.

Based on a market-level analysis of the alphas and betas of the A- and H-share markets with respect to the Fama-French global four factor portfolios, we find that there are apparent investment opportunities for global investors in both the A share and H share markets. However, the relative attractiveness depends on both the future evolution of the A-H premium and the extent to which the correlations between these markets and other global markets remain stable. Trading to exploit these potential investment opportunities will likely affect both these trends.

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Table 1: Trading venues for Chinese stocks

Designation	Exchange	Country of incorporation	Currency	Approximate number of firms
A shares	SSE/SZSE	China	RMB	3600
B shares	SSE/SZSE	China	USD/HKD	100
H shares	SEHK	China	HKD	250
Dual-listed A, H	SSE/SZSE, SEHK	China	RMB, HKD	100
Red-chips (SOE)	SEHK	HK, CI, BVI, Bermuda	HKD	150
P-chips	SEHK	CI, BVI, Berm.	HKD	600
N shares	NYSE/NASDAQ	Outside China	USD	100
S shares	SGX	Outside China	SGD/USD	100
L shares	LSE	Outside China	GBP	50

Table 2: Ten largest Chinese stocks as of May 22, 2017

Company	Market Cap Billion USD	Share Class	Exchange	Inc	HQ	Industry
Tencent Holding	335	P-chip	SEHK	CI	SZ	TMT
Alibaba	311	N share	NYSE	CI	HZ	TMT
ICBC	254	A, H share	SSE, SEHK	CN	BJ	BANKS
China Mobile	227	Red-chip	SEHK	HK	HK	TMT
China Construction Bank	204	A, H share	SSE, SEHK	CN	BJ	BANKS
PetroChina	196	A, H share	SSE, SEHK	CN	BJ	OIL
Agricultural Bank of China	162	A, H share	SSE, SEHK	CN	BJ	BANKS
Bank of China	153	A, H share	SSE, SEHK	CN	BJ	BANKS
Ping An Insurance	114	A, H share	SSE, SEHK	CN	SZ	INSURANCE
China Life	106	A, H share	SSE, SEHK	CN	BJ	INSURANCE

Table 3: Market-level performance measures 2002-2016

Based on annualized monthly tradable-value-weighted portfolio excess USD returns 2002-2016.

		All firms		Dual-listed firms	
		A shares	H shares	A shares	H shares
Mean (%)		11.75	23.60	10.24	21.09
Volatility (%)		30.05	29.09	25.87	27.24
Correlation	US market	0.29	0.52	0.34	0.52
	Global market	0.34	0.60	0.38	0.60
	A shares - all			0.82	
	H shares - all				1.00
	A shares - DL				0.68

Table 4: Cross-Sectional Regressions of Log(A price/H price) 2002-2016

Beta(A)	Beta(H)	Size (tot)	BM (tot)	Illiq (avg)	Vol (A)	Vol (H)	D/P (avg)	Rel. Float	Max (A)	Max (H)	Avg R^2
-	+	-	+	+	+	+/-	-	-	+	-	
		-0.29									0.45
		(-18.76)									
				0.24							0.33
				(14.35)							
-0.06	0.05	-0.21	0.03	0.09	0.12	-0.03	-0.05	-0.08	0.00	-0.01	0.74
(-5.32)	(4.82)	(-8.90)	(2.19)	(6.43)	(6.17)	(-2.09)	(-5.09)	(-6.57)	(0.67)	(-1.09)	
-0.05	0.05	-0.24	0.03	0.07	0.1	-0.03	-0.06	-0.09	0.00	-0.01	0.80
(-3.95)	(5.06)	(-7.54)	(2.64)	(5.00)	(4.07)	(-2.08)	(-6.09)	(-6.46)	(-0.38)	(-0.62)	

Table 5: The cross-section of the H-A return differential 2002-2016

Time-series averages of the coefficient estimates from cross-sectional regressions of the form

$$r_{i,H,t+1} - r_{i,A,t+1} = \alpha + \beta \log(P_{i,A,t}/P_{i,H,t}) + \varepsilon_{i,t+1} \tag{37}$$

and their Newey-West t-statistics. In the column labeled WLS, coefficients in the time-series average are weighted by the square-root of the number of firms in the cross-section.

	OLS	WLS	Avg R^2
Coefficient	2.21	2.24	0.09
t-statistic	(4.25)	(4.74)	

Table 6: Time-series regressions of the median log(A price/H price) 2002-2016

Repo (A)	3-mth T-bill	TED Spd	SH Cnct	SZ Cnct	Vol (A)	Vol (H)	Pol Risk	Lag A-H	R2
-	+	+	-	-	-	+	-	+	
		0.13							0.27
		(6.66)							
					10.57				0.33
					(7.55)				
						12.34			0.42
						(9.20)			
								0.88	0.79
								(20.92)	
-0.01	0.01	0.04	0.06	0.01	-0.39	2.09	0.00	0.69	0.83
(-1.77)	(0.95)	(2.49)	(3.35)	(0.13)	(-0.36)	(1.43)	(-1.39)	(11.07)	

Table 7: Global four-factor alphas

Annualized alphas and betas of the A- and H-share markets with respect to the Fama-French global four factor portfolios based on monthly tradable-value-weighted portfolio excess USD returns over the period 2002-2016. Newey-West t-statistics are in parentheses below the coefficient estimates.

	USD Excess returns		Global four-factor alphas and betas					
	Mean	Vol	Alpha	Mkt	Size	Value	Mom	R^2
Full 15-year sample period 2002-2016								
A - All	11.75	30.05	6.90	0.70	0.17	-0.28	0.12	0.12
			(0.90)	(4.62)	(0.44)	(-0.76)	(0.67)	
H - All	23.60	29.09	13.21	1.19	0.52	0.02	0.21	0.38
			(2.11)	(9.58)	(1.61)	(0.08)	(1.41)	
Last 5-year subperiod 2012-2016								
A - All	9.33	25.29	3.10	0.72	0.98	0.05	-0.30	0.18
			(0.26)	(2.38)	(1.49)	(0.07)	(-0.70)	
H - All	11.21	22.74	1.76	1.02	0.74	0.29	-0.38	0.40
			(0.19)	(4.38)	(1.46)	(0.58)	(-1.16)	

Figure 1: Number and market capitalization of H shares 1993-2016

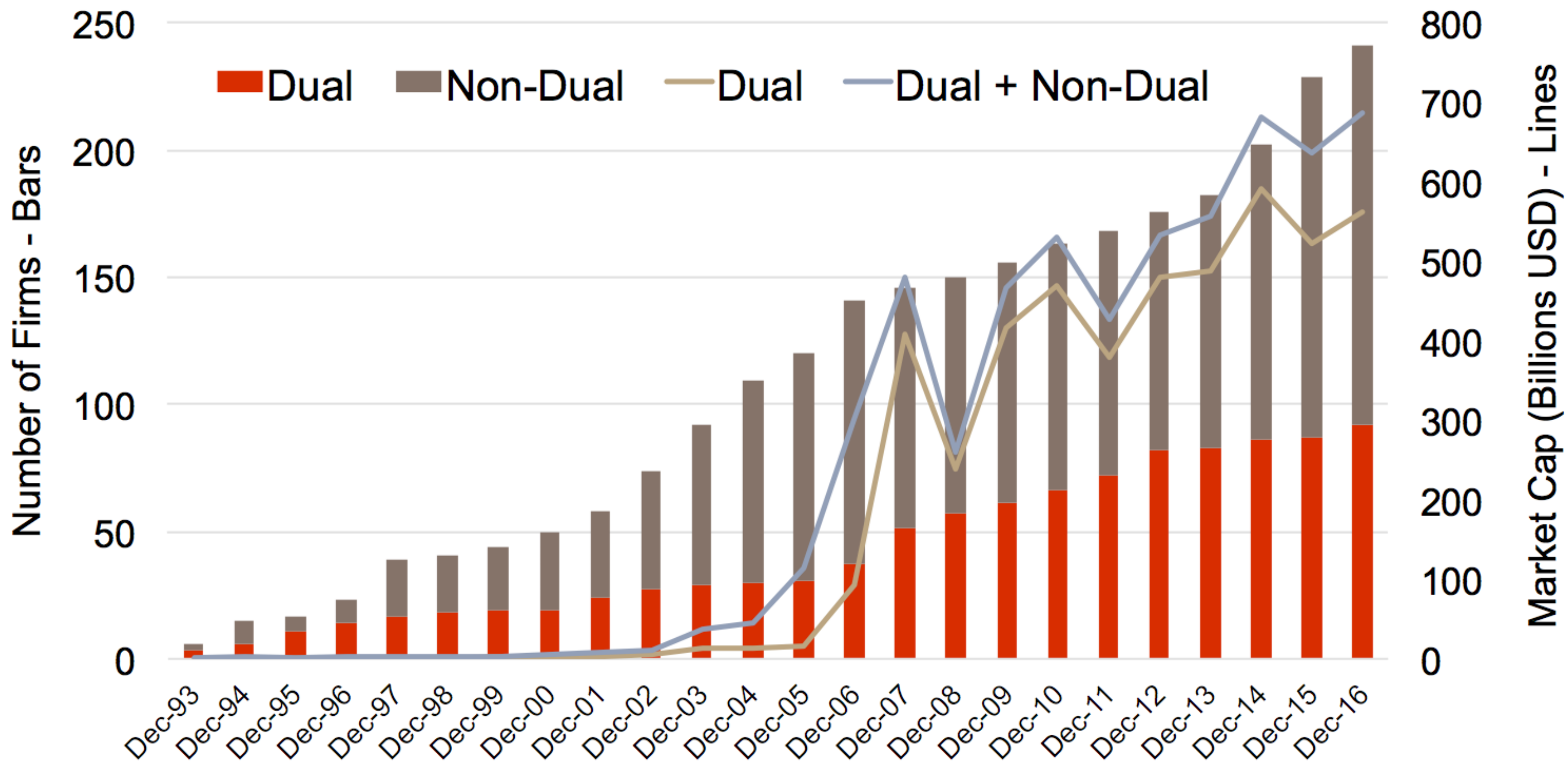
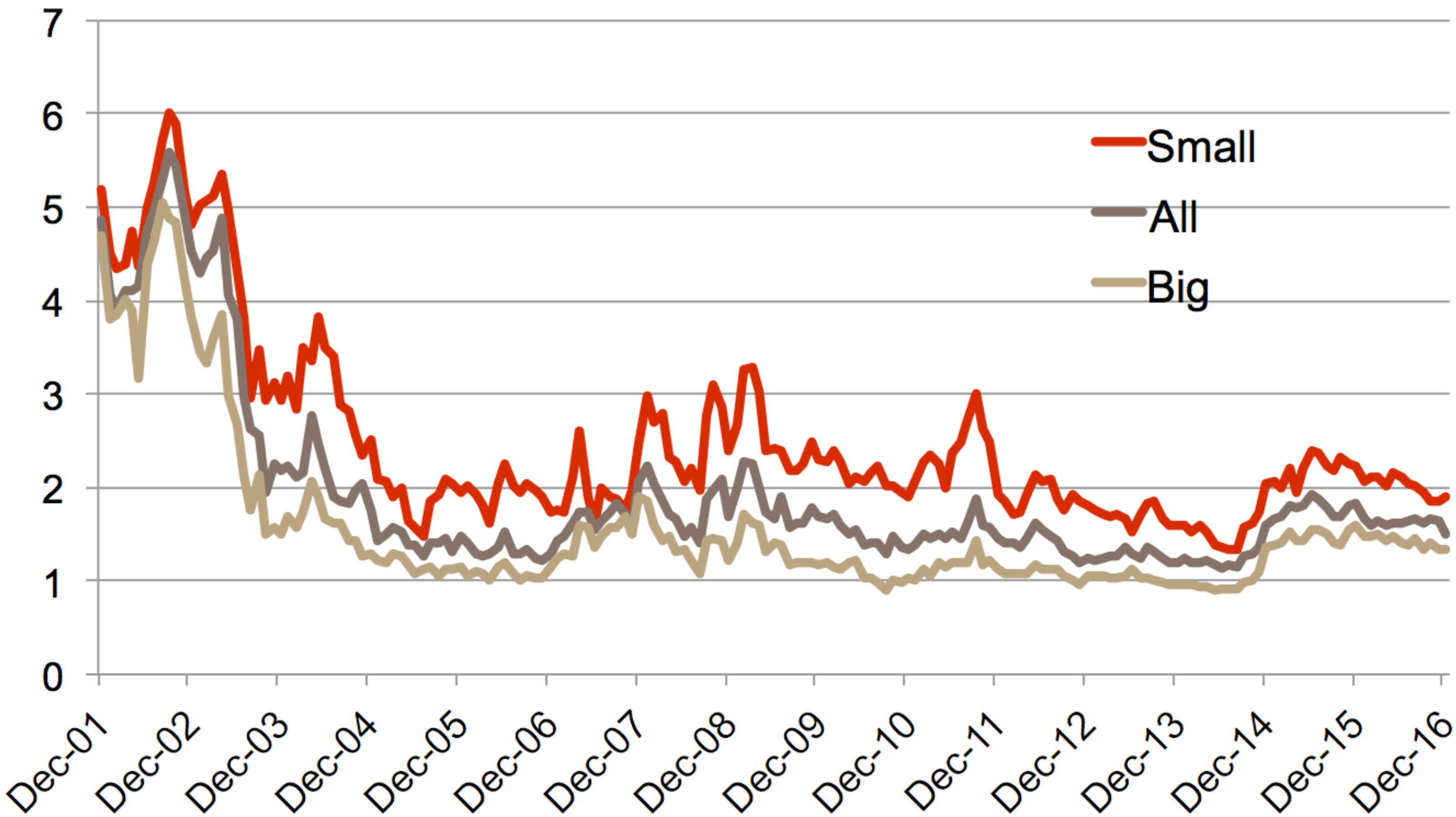


Figure 2: Median A-H premium 2001-2016



Median A-H premium of dual-listed stocks, where a stock's A-H premium is the ratio of its A price to its H price, measured in a common currency. All is the full sample of all dual-listed stocks. Small and Big are the subsamples of the smallest half and the largest half of stocks ranked by market capitalization.