



SHARE PRICE DISPARITY IN CHINESE STOCK MARKETS^{1, 2}

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Abstract

The presence of price disparity between A- and H- shares suggests that the two markets are segmented and thus allocation of capital is inefficient. In this paper, we attempt to identify the factors contributing to the price disparity, with a view to helping policymakers find solutions to the problem. Our results suggest that the disparity is caused by a combination of micro and macro factors. The fact that some of these factors are found to have played a crucial role in determining the disparity implies that reforms that can remove or reduce the segmentation can potentially bring considerable benefits by improving price discovery and market efficiency.

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Executive Summary:

- *Persistent premium of the A-share over the H-share for the same stock has existed for more than a decade. Given the phenomenal growth of both markets in the recent years, the A-H share price disparity has attracted increasing attention and debates, not only among financial market participants, but also in policy circles.*
- *Empirical work in the literature that studies share price disparity tends to focus on micro factors. The paper adds the macro dimension to such work, combining some micro factors identified from the literature and some widely-argued macroeconomic reasons to explain the A-H share price premium. Our results show that apart from micro factors, renminbi appreciation expectations and monetary expansion have also contributed to the share price disparity.*
- *The results suggest that there exists significant room for improvement in price discovery and market efficiency. Any mechanism or reform would thus be instrumental in alleviating the pressure on financial markets arising from the macroeconomic imbalance of the Mainland, making them less vulnerable to economic shocks.*
- *However, it is imperative to note that a mechanism or reform that allows investors of both or either of the markets to arbitrage the disparity will tend to equalise prices. This means that a process of risk sharing will necessarily take place between the two markets. To the H-share investor, any benefit is likely to come at the expense of greater market volatility, at least initially. Over the long term, however, a well-structured mechanism should be able to pull in additional liquidity. A deeper overall market, other things being equal, should be more conducive to financial stability.*

I. INTRODUCTION

The presence of persistent price disparity between A- and H- shares suggests that the two markets are segmented and thus allocation of capital is inefficient. In this paper, we attempt to answer probably the most fundamental question on the phenomenon, identifying the factors contributing to the price disparity, with a view to helping policymakers find solutions to the problem. This paper complements the analysis of the changes in the price disparity by Peng *et al.* (2007).³

Internationally, when price disparity exists between two shares of the same stock, the one accessible by foreign investors usually commands a premium over the one restricted only to domestic ownership. However, almost all H- shares, which are accessible by foreign investors, are traded at a discount to their counterparts in the A-share market on the Mainland. Nonetheless, this should not be seen as an inconsistency because in most other emerging markets shares accessible by foreign investors are also open to domestic investors – which leaves no opportunity for any discount to exist – while in the Chinese case foreign and domestic investors do not have access to each other's market.⁴

Whether one tries to explain a premium (in the case of other emerging markets) or a discount (in the case of the Chinese markets) should not have any implication for the approaches adopted in empirical studies. Previous studies on price disparity in segmented stock markets are fairly diverse in terms of model specification, due to different hypotheses or explanations. However, despite the diversity, the hypotheses or explanations focus mainly on five factors, namely, market liquidity, shares supply, market risk, information asymmetry and general market conditions – in particular in those studies on the Chinese markets (see Table 1). All of these are plausible factors contributing to the stock price disparity from a micro

³ While identifying the factors affecting the price disparity can also shed light on the changes in the price disparity, the latter paper differs in that it studies the changes or dynamics by examining the statistical properties of the disparity itself.

⁴ Foreign investors have in recent years been able to access the A-share market via the qualified foreign institutional investors scheme but the access has remained very limited. During the period under study, the qualified domestic institutional investors scheme was limited to fixed income products and there was no formal channel for Mainland investors to access the H-share market. However, it was recently announced that this rule will be relaxed, allowing Mainland investors to invest in overseas equities.

perspective. No empirical work has, according to our knowledge, considered the channels through which recent macroeconomic imbalance of China's economy has played an increasingly important role.

The macroeconomic imbalance has arguably impacted the prices of the A- and H-share markets, and hence their disparity, in at least three ways. First, an undervalued currency and thus expectations of future revaluation or appreciation have provided strong motivation for foreign investors to acquire H-shares as a proxy for "renminbi" assets, though H-shares, which are denominated in Hong Kong dollars, are not renminbi assets *per se*. Second, the external imbalance resulting from an undervalued renminbi has been manifested into rising internal imbalance as evidenced by rapidly growing bank deposits. With limited choice of financial products available domestically, stock investment, in addition to real estate investment, has offered a convenient and feasible alternative to bank deposits for the majority of Mainland investors. Finally, as China's trade surplus continues to rise, the opportunities for Mainlanders to retain their foreign currency proceeds outside the Mainland to avoid capital controls have increased. This in turn reflects increased ability of Mainlanders to arbitrage by purchasing the H-share of the same stock whenever they find the discount offered by the H-share attractive enough.

The rest of this paper is organised as follows. Section II examines the relationship between the returns of A- and H-shares in recent years. Section III examines the determinants of the price disparity between the dual-listed A- and H-shares, using a panel data regression model. Section IV concludes.

II. PRELIMINARY ANALYSIS

Both the price and quantity data of A- and H-shares are monthly averages of daily data extracted from Bloomberg, covering the period from April 2000 to February 2007.⁵ It is useful to note that this period saw significant growth in

⁵ The earliest available record for all 17 stocks on Bloomberg is April 2000, although the history of dual-listed A- and H-shares dates as far back as 1993. There are two reasons for not covering the whole dual-listing history in this study. First, we want to maintain a higher degree of data consistency by using one data source. Second, and more importantly, the market in the 1990s was too small (compared to the market today) to have any useful policy relevance.

the market, with the number of dual-listed stocks more than doubling from 17 to 36 (Table 2) and, even after controlling for price increases, the size of the market capitalization had expanded 16 times.⁶ In Chart 1, we plot the indices of the market capitalisation of the dual-listed A- and H-shares over time, with all stock prices held constant at their February 2007 levels. As can be seen, in April 2000 the A- and H-share markets – controlled for price changes – were only about 6% as large as in February 2007. This is particularly important when comparing results with previous studies, because the A-H market today is quite different from what it used to be in the 1990s (covered by most other studies).

Next, we compute the Divisia (1925) indices, correlations and variances of the A- and H-shares to provide a simple view of the relationship between their respective returns over time.⁷ When applied in the current context, the Divisia price index is a market-capitalisation-weighted average of logarithmic price changes (returns). In the computation, share prices are adjusted for changes in the exchange rate. Chart 2 presents the scatter plot of the Divisia A- and H-share price indices where each point corresponds to a specific month. The dispersion of the Divisia A- relative to H-share price index and their deviations from the 45-degree line reflect the degree of segmentation between the two markets. There appears to be only a mild positive relationship between the returns of A- and H-shares. This is consistent with Chart 3 which shows that the two indices exhibit a slight tendency to move in tandem, especially from around 2003 Q3.

The Divisia A-H share correlation shows the co-movement between A- and H-shares. As can be seen in Chart 4, their relationship is found to be positively correlated in most of the period. It is also noted that the Divisia correlation averaged about 0.2 initially and then trended higher from around the beginning of 2003, reaching about 0.6 by the end of the period. Hence, gradual integration between the two markets seems to have taken place over the past four years. This result is consistent with the finding of Peng et al. (2007) that there was relative price convergence between the A- and H-shares of the dual-listed stocks.

⁶ Since February 2007, the number of dual-listed stocks increased has increased to 39.

⁷ We employ the Divisia index instead of other more commonly used indices such as the Paasche, Laspeyre and Fisher indices, because its higher-order moments can capture the relationship among individual stock price changes while others cannot.

The Divisia variance is the second-order moment of individual stock prices, which measures the extent to which the prices of individual stocks change disproportionately. In other words, it is a measure of relative price changes, not absolute price changes. When all prices change by the same proportion, it vanishes. Scatter plots of the monthly Divisia A- and H-share price variances for the past seven years are presented in Chart 5, with the left panel including all observations and the right panel excluding the outliers defined as larger than 0.01. In both cases, there are about two-thirds or 66% of observations lying above the 45-degree line. In other words, for the dual-listed stocks, A-shares tend to have a smaller Divisia variance than do H-shares, indicating that the prices of A-shares tend to move more in tandem, when compared with those of H-shares. There must exist some common forces that drive stock prices in the A-share market to go in one direction or the other, resulting in a smaller dispersion of price movements. What possibly are these common forces? The rest of the paper will shed some light on this question.

III. MODEL SPECIFICATION

To examine the relevance of the various possible factors leading to the price disparity, we employ a fixed effect panel data model in our estimation. Panel data model allows us to analyse the disparity for a large number of firms simultaneously using time series data, while a fixed effect structure can help control for unobservable firm-specific effects, so that differences across companies can be captured.⁸

Specifically, the regression model is as follows:

$$\begin{aligned} PREM_{it} = & \alpha_0 + \alpha_1 LQ_{it} + \alpha_2 SP_{it} + \alpha_3 RK_{it} + \alpha_4 INF_{it} + \alpha_5 MC_{it} \\ & + \alpha_6 CUR_{it} + \alpha_7 M2_{it} + \alpha_8 TR_{it} + \alpha_9 PREM_{it-1} + \eta_i + \varepsilon_{it} \end{aligned} \quad (1)$$

where subscripts i and t denote stock i and time t respectively. The dependent

⁸ See Domowitz (1997) and Hsiao (1996) for details.

variable *PREM* represents the price disparity of stock *i*, defined as the price premium of stock *i* in the market of A-shares over the same stock in the market of H-shares at time *t*. *LQ*, *SP*, *RK*, *INF*, and *MC* denote respectively the five popular factors identified in previous studies, namely, liquidity, supply, risk, information asymmetry, and market conditions of the two markets (all in relative terms). To take into account the indirect impact of the macroeconomic imbalance, we introduce into the model three other variables *CUR*, *M2* and *TR* which denote the 3-month renminbi non-deliverable forward (NDF) rate, money supply M2 of the Mainland, and the trade balance of the Mainland respectively.⁹ How these variables can influence the A- and H- share prices and their disparity is discussed in detail in the context of the Gordon (1962) growth model in the Appendix.

The lagged price premium is included to reflect the trend of the price premium and filter out the autocorrelation (Domowitz, et al., 1997).¹⁰ The coefficient vector $\alpha = (\alpha_0, \alpha_1, \dots, \alpha_9)'$ is fixed over time and across stocks by assumption.¹¹ The variables η_i are the individual effects capturing the unobserved idiosyncratic features of stock *i* and the variables ε_{it} are the disturbances.

Table 3 provides the data details of each explanatory variable used in the estimation. For each stock, the price premium *PREM* is measured by the logarithmic value of the average monthly A-share price P_A minus that of the average monthly H-share price, i.e., $PREM = \log(P_A) - \log(P_H)$.¹² The liquidity factor *LQ* is proxied by the relative turnover rates of the two markets, where the turnover rate is defined as the monthly trading volume to the total number of shares outstanding in the

⁹ To avoid the problem of collinearity between levels of money supply of China and renminbi's NDF rate which are shown to be monotonic increasing, the ratios of the current value over its lag X_t/X_{t-1} (i.e., with the variables in change form instead of level when taking logarithm) are considered in the estimation.

¹⁰ The correlation between the lagged dependent variable and the disturbance gives rise to the biased estimation of coefficients under ordinary least squares estimation. We employ a generalized method of moment (GMM) estimator to correct the standard errors for heteroskedasticity of unknown form in the time-varying error components and to permit efficient estimation.

¹¹ A random effect model, which allows the individual specific effect to change over time, may provide a better explanatory power for the price premium over the fixed effect model. However, the Hausman test suggests that there is no significant difference between the two model specifications. Moreover, the number of parameters increases sharply when the random effect model is considered, which is especially unfavourable for the scarcity of data on the time dimension. In view of this, the fixed effect model is chosen.

¹² All A-share prices originally denominated in renminbi are converted to Hong Kong dollar.

markets.^{13, 14} To reflect the relative supply of the two markets, two proxies, namely, (i) the ratio of the number of free-floating A-shares to the number of H-shares (denoted by $SP(1)$) and (ii) the ratio of the number of outstanding A-shares to the number of outstanding H-shares (denoted by $SP(2)$), are considered.¹⁵ The ratio of the variances of returns is used to reflect the relative risk levels RK .¹⁶ Information asymmetry is proxied by the relative market capitalisation of free-floating shares (denoted by $INF(1)$) and that of total outstanding shares (denoted $INF(2)$) of the two markets.¹⁷ Some descriptive statistics of the variables are presented in Tables 4 and 5.

IV. EMPIRICAL RESULTS

Equation (1) is estimated by the generalized method of moments (GMM) so that it can avoid any bias when variables are endogenous.¹⁸ Two regression models, Models A and B, are estimated. Model A is (1) using $SP(1)$ and $INF(1)$ as the supply and information asymmetry variables respectively and is estimated for the period from October 2005 to February 2007.¹⁹ Model B is the same as Model A except that $SP(2)$ and $INF(2)$ are used as the supply and information asymmetry variables respectively. Given that more data are available for $SP(2)$ and

¹³Such measures are commonly used in the literature and they are more powerful in explaining price discounts than others in empirical analysis. See Ma (1996), Domowitz et al. (1997), and Wang et al. (2003). The bid-ask spread is also a natural proxy of liquidity (See Guo et al., 2006). However, Amihud et al. (1986) found that assets return are an increasing and concave function of the spread. Therefore, some nonlinear properties should be imposed in the model when the bid-ask spread is used in the estimation.

¹⁴A joint cross-correlation test is considered to examine the lead-lag relationship between the price premium and the turnover rate (i.e. the proxy of liquidity ratio). The joint cross-correlation test shows that the price premium leads the turnover rate significantly, while the turnover rate does not lead the price premium significantly. These results suggest that the issue of reverse causality (i.e. turnover rate leading price premium) is not significant in the analysis.

¹⁵The free-floating H-shares is defined as the number of shares that are available to the public, while the free floating A-shares is defined as the number of current shares outstanding that are tradable or listed on the stock exchange.

¹⁶They are the 30-day price volatility which equals the annualized standard deviation of relative price change of the 30 most recent trading days closing price. The volatility is the standard deviations of day-to-day logarithmic price changes.

¹⁷Since larger firms have more information disclosure, the firm size proxied by the market value of total outstanding shares may reflect the availability of information. Chan and Kwok (2005) commented that the market capitalization of total shares outstanding may also be a good indicator of the availability of information on the firm. However, their estimation results suggested that the market capitalization of free-floating shares is a better indicator to reflect such factor.

¹⁸In the estimation, we transform equation (1) into first differences with the “white period GMM weight” which provides correct estimates of the coefficient covariances in the presence of heteroskedasticity of unknown form.

¹⁹Such information is only available since October 2005.

INF(2), Model B is estimated for a longer period from April 2000 to February 2007. Both models have their advantages because Model A contains variables that are arguably more able to capture the effects of supply and information asymmetry, while Model B covers a longer period.

The estimation results are reported in Table 6. The Portmanteau test statistics show that the residuals of the two models have insignificant serial correlation, suggesting that both models are adequately fitted.²⁰ The coefficients have same signs in both models, except that information asymmetry in Model B is found to be different from that in Model A. Our key findings for each variable are discussed below.

On the five popular factors identified from the literature

- The price premium is positively related to the relative liquidity of A-shares over H-shares (*LQ*). This finding suggests that a more liquid A-share (H-share) market tends to increase (reduce) the price premium and vice versa. This is consistent with the theoretical prediction – that investors tend to demand a smaller (larger) compensation for lower (higher) trading cost associated with a more (less) liquid market – as well as the findings in other empirical studies.²¹
- The price premium is found to be negatively associated with the relative supply of A-shares over H-shares (*SP*) in Model A. This result highlights the relative scarcity of A- over H-shares as an important factor in explaining the price premium, reflecting the lack of substitutes for stock investment on the Mainland.
- The price premium is positively related to the relative risk ratio (*RK*) in both

²⁰All residuals of Model A have insignificant correlations at a 0.05 level of significance. In Model B, all but two firms' residuals have insignificant correlations at a 0.05 level of significance. The two firms are found to have significant correlations among residuals because there were some violent fluctuations during early 2000. As the majority of the firms have already passed the Portmanteau test and the hypotheses for two firms are just marginally rejected, no dummy variable is introduced in the model.

²¹Chen et al (2001), Wang and Li (2003) and Chan and Kwok (2005) find a positive relationship between A-share price premium and relative trading volume/turnover rates of A- over H-shares. The results of Guo and Tang (2006) show a negative relationship between A-share price premium and the relative bid-ask spread of A-H shares – a more liquid market tends to have narrower spreads.

models. This result supports the differential risk hypothesis, which postulates that the price premium can be explained by the relative riskiness of the assets because the A- and H- share investors have different risk profiles. Market commentaries often suggest that mainland investors are more speculative, i.e., having a higher risk appetite or being less risk averse, and hence may be more willing to pay a higher price for an asset at the same level of risk. On the other hand, Hong Kong and international investors tend to be relatively more risk-averse. Our estimation finds the price premium to be larger for stocks with a higher price volatility in their A-shares than in their H-shares.

- Our results provide some but limited support for the information asymmetry (*INF*) hypothesis. This hypothesis states that price disparity can be explained by information asymmetry, which can be caused by factors such as availability of reliable information, speed of information flows, language barriers and different accounting standards. Information asymmetry may result in a certain group of investors being disadvantaged and thus less willing to pay. Many studies in the literature employ firm size as a proxy for asymmetric information because larger firms tend to have better information disclosure and attract more analysts to study their stocks. In Model A, the results for the more recent period show that a larger firm tends to have a lower price disparity. However, Model B yields an opposite outcome. This may suggest that information asymmetry has become a relevant factor only recently, possibly attributable to the listing of some very large firms during 2006.
- Market conditions (*MC*) is found to be positively significant in both models. The stock market indices of the Mainland and Hong Kong are used as proxies for market conditions, to capture the effects of both market sentiment and general economic conditions, which in turn can have an impact on corporate performance.²²

²²Based on historical data, the pairwise correlation between the changes in the H-share prices and the changes in the Heng Sang Index is 0.15, while that between the changes in the H-share prices and the changes in the Shanghai Stock Index is 0.21. These figures suggest that both markets' investment environment may somewhat affect the H-share prices. Better Hong Kong stock market conditions may stimulate market sentiment and provide more incentives for investors to buy discounted H-share stocks so that the price premium will narrow.

On the effects of the macroeconomic imbalance

- Renminbi revaluation or appreciation (*CUR*) has a negative relationship with the price premium. Appreciation or expected appreciation of the renminbi increases the value of renminbi-denominated assets in US dollars. Given current capital controls of the Mainland, H-shares remain the most direct and convenient way for foreign investors to acquire Mainland or renminbi-income-generated assets. Therefore, H-share prices should reflect the effect of renminbi appreciation on the firm's future earnings. The results suggest that an appreciation or expected appreciation of the currency induces H-share purchases, thus squeezing the price premium.²³
- Money supply (*M2*) is found to be positively related to the price premium.²⁴ As the macroeconomic imbalance grows, money supply grows. The range of financial products available for investment or savings is, however, very limited on the Mainland. With deposit rates kept very low for a long time, stocks have become an increasingly attractive investment option. The macroeconomic imbalance has thus indirectly contributed to the demand for local stocks, which have translated into higher A-share prices and large premiums over H-shares. Our results here simply confirm a widely-observed phenomenon.
- The trade balance (*TR*) is estimated to be negative, though the coefficients are insignificant. It is common knowledge that trade flows are often used to camouflage capital flows in the presence of capital controls. The trade surplus, which can capture the opportunities of Mainlanders to keep their foreign exchange earnings outside the country, is used here to proxy the ability of Mainland investors to arbitrage the price differentials of dual-listed A-H stocks in the H-share market. As a result, a rising trade surplus has the effect of lifting the price of H-shares, thus reducing the A-share price premium. The insignificant coefficient may, however, suggest that despite the large trade surplus the impact of Mainland investors on H-share prices remains limited.

²³Note that the A-shares can only be traded by Mainland investors.

²⁴Bank deposits, including demand deposits, time deposits and saving deposits, were also considered in the initial estimations. All results were of similar flavour.

- The coefficient of lagged price premium is estimated to be less than unity, indicating that share price differentials were partially adjusted over the period when other variables are kept constant.

V. FINAL REMARKS

Dual-listed A- and H-shares came into being as soon as the Mainland authorities allowed Mainland companies to be listed in the Hong Kong stock market in the early 1990s. For more than a decade there has existed a persistent premium of the A-share over the H-share for the same stock. Initially, dual-listed A- and H-shares were mostly small Mainland companies, but the last two years saw phenomenal growth of this market segment following the listing of some very large companies. As a result, the A-H share price disparity has attracted increasing attention and debates, not only among financial market participants, but also in policy circles.

This paper has examined the relevance of five micro factors identified from the literature to explain stock price disparity in determining the A-H share price premium. Consistent with most previous studies on the overseas emerging markets and the Chinese markets, our findings suggest that four of the five micro factors – namely, market liquidity, shares supply, risk level and market conditions – are important determinants of the premium. We have also studied the impact of the growing imbalance of the Mainland macroeconomy on the A-H share premium. Our results show that macroeconomic factors (renminbi appreciation expectations and monetary expansion) contributed to the A-H share price disparity through affecting the prices of A-shares, but their influence on the prices of the H-shares was insignificant. This finding is consistent with the earlier observation that the A-shares have a smaller Divisia variance than do the H-shares. Therefore, the common forces behind the implied more synchronised A-share price movements can possibly be attributed to these macroeconomic factors.²⁵

²⁵Note that this is not inconsistent with the finding of Miao and Peng (2007) that macroeconomic conditions are not significant factors explaining the relatively high volatility in the Mainland market. The Divisia variance measures the relative price changes, while volatility is a measure of absolute price changes. Theoretically, there can be extremely high volatility of share prices, but if these changes are of similar proportions, the resulting Divisia variance would remain small.

On policy implications, the fact that the micro factors are found to be important determinants of the price premium implies that there exists significant room for improvements in price discovery and market efficiency. For instance, the A-share market liquidity, which averaged about only 40% of the H-share market liquidity in the period from April 2000 to February 2007, is bound to increase – thereby lowering the transaction cost – if arbitrage or participation by investors from the H-share market is allowed or relaxed. The finding that the macro factors are also found to have contributed to the price disparity suggests that any such mechanism or reform would be instrumental in alleviating the pressure on financial markets arising from the macroeconomic imbalance of the Mainland, making them less vulnerable to economic shocks.

Nonetheless, it is imperative to note that a mechanism or reform that allows investors of both or either of the markets to arbitrage the disparity will tend to equalise prices. This, in turn, means that a process of risk sharing will necessarily take place between the two markets. To the H-share investor, therefore, the benefit is likely to come at the expense of greater market volatility, at least initially. Over the long term, however, a well-structured mechanism would probably be able to pull in additional liquidity and, other things being equal, a deeper overall market should be more conducive to financial stability.

Price disparity in the Gordon Growth Model

The disparity between the prices of the stocks dual-listed in the A- and H-shares markets can be considered in the context of the Gordon (1962) growth model. In the model, the intrinsic value of a common stock in perpetuity depends on the cash flow of dividends over the life of the stock. Based on information concerning the current and prospective profitability of the company, its fair market value is assessed by taking into account: (i) the constant growth rate of dividend per share, representing the growth of the earnings per share; and (ii) the discount rate, representing the appropriate risk-adjusted interest rate or the required return of investors on equity.²⁶

Specifically, the prices of a dual-listed stock can be written as

$$P_A = \frac{E_0^A (1 + g_E)}{r_A - g_E} \quad (A1)$$

and

$$P_H = \frac{E_0^H (1 + g_E)}{r_H - g_E} \quad (A2)$$

where P_A and P_H , are the prices of the stock listed in the A- and H-share markets respectively; E_0^A and E_0^H are dividends denominated in the renminbi and Hong Kong dollar at the time zero respectively; g_E is the growth rate of dividend; and r_A and r_H are the required rates of return in the A- and H-shares markets respectively. Since E_0^H depend on E_0^A and the exchange rate of the Hong Kong dollar vis-à-vis the renminbi, equation (A2) can be expressed as:

²⁶Specifically, the Gordon growth model can be represented by $D_0(1+g)/(r-g)$, where D_0 , r and g are dividend at the initial period, required return rate of investors and the growth of dividend over the life of the selected firm. In market equilibrium, the current market price will reflect the intrinsic value estimates of all market participants. If an individual investor whose estimate of price differs from the market price (P_A or P_H), in effect must disagree with some or all of the market consensus estimates of D_0 , g and/or r . Note that the model assumes dividends to grow continuously at a constant rate over its life and assumes the growth rate to be less than the required rate on equity.

$$P_H = \frac{E_0^A S_0 (1 + g_E)(1 + g_s)}{(1 + r_H) - (1 + g_E)(1 + g_s)} \quad (A3)$$

where S_0 and g_s are the exchange rate of the Hong Kong dollar against the renminbi and the rate of renminbi appreciation respectively.²⁷ To compare the two prices, P_A in equation (A1) is converted to

$$P_A^* = P_A S_0 = \frac{E_0^A S_0 (1 + g_E)}{r_A - g_E} \quad (A4)$$

Using (A2) and (A4), the difference between the prices of the A- and H-share of a dual-listed stock, denominated in Hong Kong dollar, can be represented by:

$$\ln P_A^* - \ln P_H \approx \ln \left[\frac{r_H - g_E - g_s}{r_A - g_E} \right] \quad (A5)$$

Under the theoretical framework of the Gordon growth model stated in equations from (A1) to (A5), the price disparity of the stock is reflected by (i) the different required rates of return of A- and H-shares investors; (ii) the appreciation of the renminbi; and (iii) the growth of dividends per share. Compared with our model specified in equation (1), the price disparity shown in equation (A5) suggests that:

- The micro and macro factors, including liquidity, supply, risk, information asymmetry, market conditions, money supply, and trade balance, can arguably influence the market consensus on the required rates of return in the two markets.
- Renminbi appreciation will result in a smaller price disparity, because a higher renminbi will, other things being equal, inflate the dividends denominated in Hong Kong dollars, hence lifting the price of the H-share.

²⁷The prices of the H-shares specified in equation (A3) are assumed to increase with the renminbi appreciation in the long run. It is reflected by incorporating $S_0(1+g_s)$ into the equation (A2) to value the prices of stocks in perpetuity. Specifically, P_H can be represented by the sum to infinity:

$$\sum_{t=1}^{\infty} E_0^A S_0 (1 + g_E)^t (1 + g_s)^t / (1 + r_H)^t .$$

- Given different required rates of return, A- and H-shareholders will respond differently to the same rate of growth of dividends of the same firm in perpetuity. However, all selected factors discussed in the paper are considered to have less impact on the payout policy and capital structure of the firm as long as dividend changes follow shifts in long-run sustainable earnings.

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Charts & Tables

Table 1. Literature Review on Chinese Stock markets

Author(s)	Markets	No. of Firms	Period	Factors
Ng and Wu (2007)	A-shares	32% of total mkt turnover trade on SH	2001-2002	Risk, market conditions
Guo and Tang (2006)	A- vs H-shares	29 A/H shares	1993-2003	Cost of capital, liquidity
Chan and Kwok (2005)	A- vs H-shares and A- vs B-shares	13 A/H shares 41 A/B shares	1991-2000	Liquidity, supply, risk, information asymmetry
Wang and Li (2003)	A- vs H-shares	16 A/H shares	1995-2001	Liquidity, risk, market conditions, exchange rate
Fung et al. (2000)	A- vs B-shares	20 A/B shares	1993-1997	Dividend yield, exchange rates, bond yield
Sun and Tong (2000)	A- vs B-shares A- vs H-shares	45 A/B shares 10 A/H shares	1994-1998	Risk, bond issued, no.of listed firms, information asymmetry, foreign reserves, inflation, liquidity
Su and Fleisher (1999)	A- vs B-shares	24 A/B shares	1993-1997	Risk, no.of investors, information asymmetry
Chakravarty et al. (1998)	A- vs B-shares	39 A/B shares	1994-1996	Risk, information asymmetry, supply
Ma (1996)	A- vs B-shares	38 A/B shares	1992-1994	Market conditions, Chinese deposit rates, CPIs of China and US
Chen et al. (2001)	A- vs B-shares	36 (SHSE) and 32 (SZSE) A/B shares	1992-1997	Risk, information asymmetry, liquidity
Bailey (1994)	A- vs B-shares	14 A/B shares	1992-1993	Market conditions

Note : The above summary focuses on the modelling of the cross-sectional data in panel data analysis. In the literature, the liquidity factor is represented by the trading volume (or the ratio to market capitalization or the ratio to total trading volume) and bid-ask spread. The risk factor is represented by the volatility of prices and variance-covariance ratios. The supply factor is represented by the total outstanding shares and tradable market shares. The information asymmetry factor is reflected by total market capitalization. The factor of market conditions is proxied by the market returns.

Table 2. The 36 selected companies commonly listed in both markets

No	Company	H Shares ticker	A Shares Ticker
1	Luoyang Glass	1108	600876
2	Nanjing Panda	553	600775
3	Northeast Electric	42	000585
4	Shandong Xinhua Pharmaceutical	719	000756
5	Sinopec Yizheng Chemical Fibre	1033	600871
6	Beijing North Star	588	601588
7	Beiren Printing Machinery	187	600860
8	Jingwei Textile Machinery	350	000666
9	China Eastern Airlines Corp	670	600115
10	Tianjin Capital Environmental Protection	1065	600874
11	Guangzhou Pharmaceutical	874	600332
12	Sinopec Shanghai Petrochemical	338	600688
13	Jiangxi Copper	358	600362
14	China Southern Airlines	1055	600029
15	Guangzhou Shipyard International	317	600685
16	China Petroleum & Chemical Corp	386	600028
17	Guangshen Railway	525	601333
18	Jiaoda Kunji High-Tech	300	600806
19	Dongfang Electrical Machinery	1072	600875
20	Air China	753	601111
21	Bank of China	3988	601988
22	Datang International Power Generation	991	601991
23	ZTE Corp	763	000063
24	Jiangsu Expressway	177	600377
25	Maanshan Iron & Steel	323	600808
26	Yanzhou Coal Mining	1171	600188
27	Industrial and Commercial Bank of China	1398	601398
28	Tsingtao Brewery	168	600600
29	Shenzhen Expressway	548	600548
30	Anhui Conch Cement	914	600585
31	Huadian Power International Corp	1071	600027
32	China Shipping Development	1138	600026
33	Anhui Expressway	995	600012
34	Angang Steel	347	000898
35	Huaneng Power International	902	600011
36	China Merchants Bank Co. Ltd.	3968	600036

Table 3: Description of the Dependent Variable and Explanatory Variables

Variable	Type of Variable / Factor	Description	Expected Effect
$PREM_t$	Dependent Variable	Natural logarithm of A-share price minus natural logarithm of H-share price of the same stock	
LQ	Liquidity	Monthly trading volume to the total number of shares outstanding in the A-share market over monthly trading volume to the total number of shares outstanding in the H-share market (in natural logarithm)	+
$SP(1)$	Supply (1)	Natural logarithm of number of free-floating shares in the A-share market over number of free-floating shares in the H-share market	-
$SP(2)$	Supply (2)	Natural logarithm of number of outstanding shares in the A-share market over number of outstanding shares in the H-share market	-
RK	Risk Level	Natural logarithm of 30-day annualized standard deviation of A-shares over 30-day annualized standard deviation of H-shares	+
$INF(1)$	Information Asymmetry (1)	Natural logarithm of total market capitalization based on all free-floating shares listed in the A-share and H-share markets	-
$INF(2)$	Information Asymmetry (2)	Natural logarithm of total market capitalization based on all outstanding shares listed in the A-share and H-share markets	-
MC	Market Conditions	Natural logarithm of Shanghai Stock Index over Hang Seng Index	+
CUR	Rate of renminbi Appreciation	Natural logarithm of 3-month nondeliverable forward contract of renminbi over its lag	-
$M2$	Growth of China's Money Supply	Natural logarithm of China's Money Supply (M2) over its lag	+
TR	Trade Balance	Natural logarithm of total export over total import in China	-
$PREM_{t-1}$	Lagged Term	The price premium in the previous month	+

Table 4: General Features of the Data^a
(Sample Period: Oct 2005 – Feb 2007; No. of firm: 36; No. of Observations: 482)

	Mean	Median	Maximum	Minimum	Std. Dev.
PREM	1.6314	1.3090	5.2733	0.7702	0.7936
LQ (A-shares)	0.0062	0.0049	0.0421	0.0002	0.0056
LQ (H-shares)	0.0089	0.0069	0.1000	0.0003	0.0087
SP (1) (A-shares in mn)	541.8	217.8	7183.3	50.0	941.8
SP (1) (H-shares in mn)	2363.0	747.4	65553.4	62.1	7613.7
SP (2) (A-shares in mn)	8207.8	1433.2	250962.3	208.1	29879.8
SP (2) (H-shares in mn)	2920.8	747.5	83056.5	75.1	10954.1
Risk (A-shares, %)	41.3	38.6	172.9	15.3	15.3
Risk (H-shares, %)	40.1	36.9	150.6	0.0	16.1
INFO (1) (A-shares in HKD mn)	3581.0	1504.3	80663.8	124.4	7881.4
INFO (1) (H-shares in HKD mn)	10632.0	2806.3	309070.6	78.4	32404.8
INFO (2) (A-shares in HKD mn)	42833.4	8187.3	1395231.0	629.8	144623.1
INFO (2) (H-shares in HKD mn)	12906.8	2929.7	391593.3	78.4	44465.3
Shanghai Stock Index	1795.0	1689.4	3000.9	1157.8	575.3
Hang Seng Index	17144.1	16661.3	20106.4	14386.4	1811.6
Rate of renminbi Appreciation (%)	1.0030	1.0023	1.0088	0.9979	0.0026
Growth of China's Money Supply (%)	1.0139	1.0143	1.0273	1.0005	0.0079
Trade Balance ^b	1.2290	1.2163	1.4072	1.0469	0.0845

Notes:

^a All figures are not log-transformed in the table.

^b It is the ratio of export over import

Table 5: General Features of the Data^a
(Sample Period: Apr 2000 – Feb 2007; No. of firm: 36; No. of Observations: 2039)

	Mean	Median	Maximum	Minimum	Std. Dev.
PREM	3.7200	2.6771	26.9855	0.7702	3.6536
LQ (A-shares)	0.0036	0.0022	0.0421	0.0000	0.0041
LQ (H-shares)	0.0095	0.0067	0.1126	0.0002	0.0097
SP (2) (A-shares in mn)	4989.8	990.5	250962.3	208.1	18263.8
SP (2) (H-shares in mn)	1699.0	433.2	83056.5	75.1	6045.5
Risk (A-shares, %)	36.8	34.9	172.9	10.2	13.6
Risk (H-shares, %)	47.6	43.1	168.0	0.0	21.6
INFO (2) (A-shares in HKD mn)	24411.2	6970.4	1395231.0	513.2	83050.9
INFO (2) (H-shares in HKD mn)	5577.9	1357.7	391593.3	30.0	23434.2
Shanghai Stock Index	1675.0	1612.3	3000.9	1095.4	392.0
Hang Seng Index	13537.0	13516.9	20106.4	8634.5	2910.9
Rate of renminbi Appreciation (%)	1.0010	1.0005	1.0088	0.9938	0.0030
Growth of China's Money Supply (%)	1.0128	1.0130	1.0296	0.9979	0.0080
Trade Balance ^b	1.1253	1.1139	1.4072	0.8127	0.0967

Notes:

^a All figures are not log-transformed in the table.

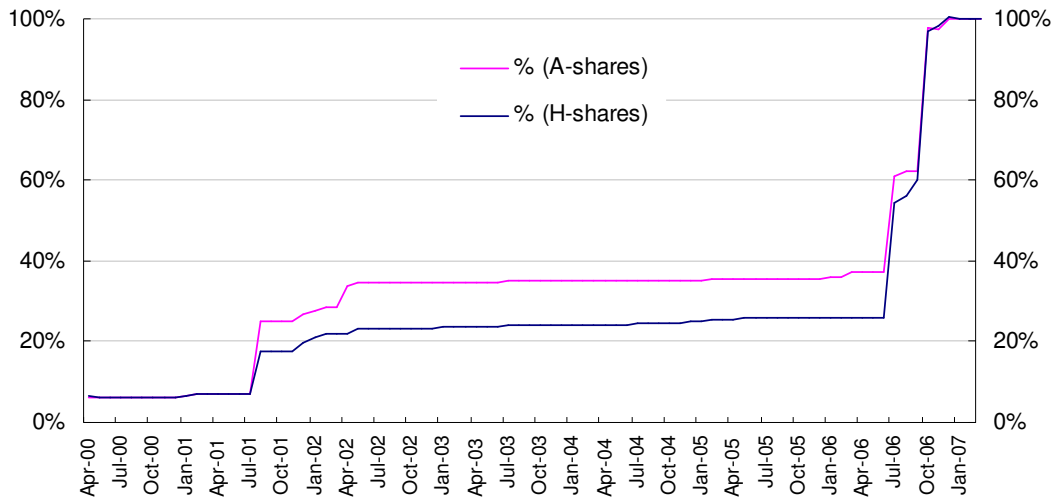
^b It is the ratio of export over import

Table 6: Determinants of Price Premium: GMM Estimates

Variable	Model A	Model B
	Oct 2005 – Feb 2007	Apr 2000 – Feb 2007
	Coeff.	Coeff.
LQ	0.0417***	0.0322***
SP(1)	-0.0779**	
SP(2)		-0.2081***
RK	0.0300**	0.0051
INF(1)	-0.1227***	
INF(2)		0.0728*
MC	0.3300***	0.3478***
CUR	-4.8083***	-1.8233***
M2	0.7166***	0.5178***
TR	-0.0164	-0.0008
PREM(t-1)	0.1911***	0.2931***
Portmanteau test statistics	4.9, 4.5, 5.7, 5.0, 12.0, 1.5, 7.0, 3.8, 10.5, 4.3, 6.2, 7.2, 4.6, 3.9,	4.6, 5.2, 8.9, 5.1, 10.6, 1.2, 4.4, 2.4, 9.3, 9.8, 9.9, 12.2, 1.9, 12.4, 3.3,
Q(6) for all stocks ^{2,3}	4.4, 4.8, (X), 4.0, 1.8, 6.4, 7.1, (X), 2.8, 2.4, 5.7, 5.9, 2.0, 3.2, 2.1, 7.5, 11.8, 7.9, 4.2, 4.5, 6.5, 2.5.	10.3, (X), 16.6, 5.9, 2.1, 6.2, (X), 5.3, 8.7, 4.9, 7.9, 2.0, 2.2, 2.2, 8.2, 7.0, 2.7, 2.5, 18.5, 9.5, 3.7.
No. of stocks	36	36
No. of obs.	482	2039

Notes:

1. ***, ** and * denote significance at the 1 percent, 5 percent and 10 percent levels respectively.
2. The Portmanteau test, Q(K), checks whether residuals of each firm are jointly zero correlated up to lag K. At 0.05 and 0.01 level of significance, the critical values are 12.6 and 16.8 respectively. Their corresponding stocks (tickers) are: 1108, 553, 42, 719, 1033, 588, 187, 350, 670, 1065, 874, 338, 358, 1055, 317, 386, 525, 300, 1072, 753, 3988, 991, 763, 177, 323, 1171, 1398, 168, 548, 914, 1071, 1138, 995, 347, 902, 3968.
3. (X) denotes that the corresponding stocks are deleted due to missing information in the final estimation.

Chart 1. The Market Capitalization (Feb 2007 = 100%)

Note:

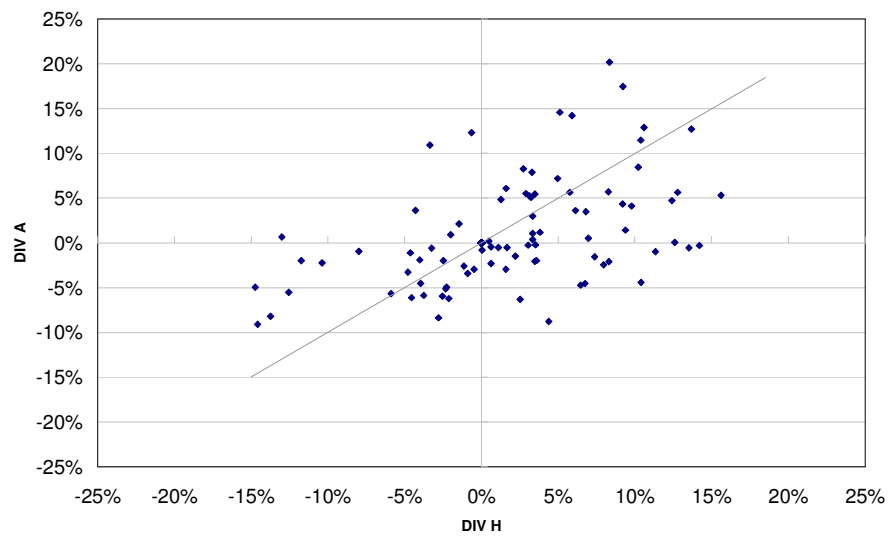
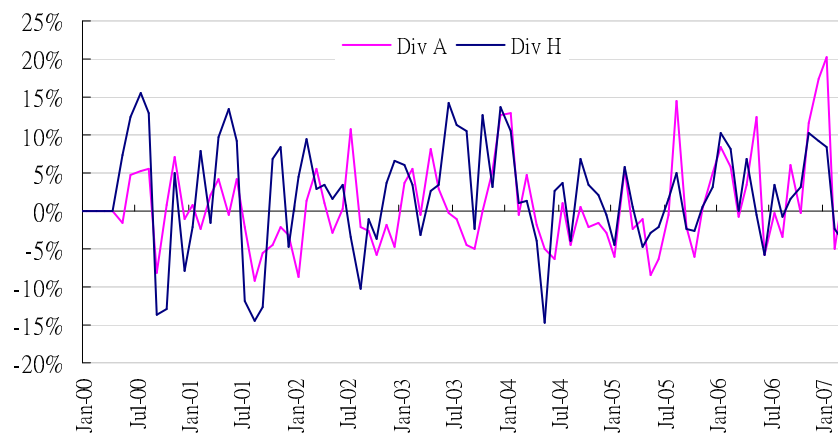
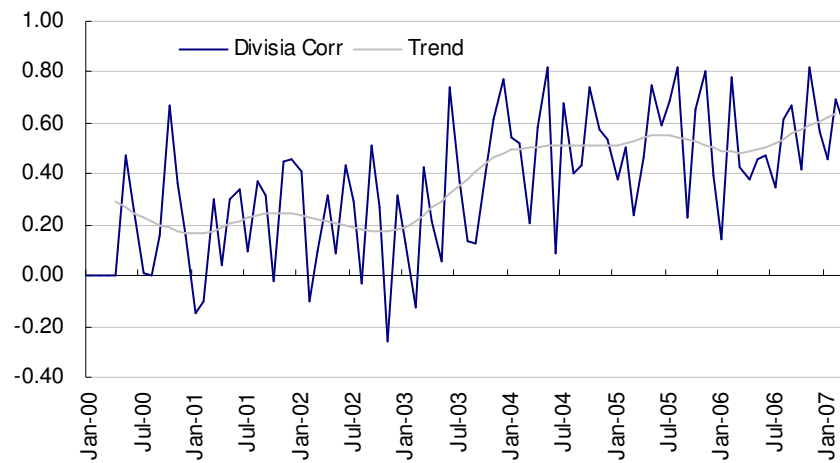
Chart 2. Scatter Plot of Divisia Indices (monthly)**Chart 3. Divisia Indices (monthly)**

Chart 4. Divisia Correlations (monthly)**Chart 5. Scatter Plot of Divisia Variances**