Partial Liberalization of the B-Share Market:
Impact and Implication

Qian Sun
Research Center
Shanghai Stock Exchange
528 South Pudong Road
Shanghai 200120, China

and

Division of Banking and Finance
Nanyang Business School
Nanyang Technological University
Singapore 639798
Tel: (65) 7904661
Fax: (65) 7913697
Email: aqsun@ntu.edu.sg

Wilson H. S. Tong
Department of Accountancy
Faculty of Business and Information Systems
The Hong Kong Polytechnic University
Hung Hom, Kowloon
Hong Kong
Tel: (852) 2766-4399
Fax: (852) 2356-9550
Email: acwtong@inet.polyu.edu.hk

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Abstract

China's B-share market was partially opened up in February 2001 to Chinese local investors. This development can be viewed as a controlled experiment in cross-border trading on a small scale. We find mild but positive effects on the B-share market, with higher volumes, lower levels of volatility, lower bid-ask spreads, and more liquidity after liberalization. All of these variables also tend to converge with those of the A-share market. Furthermore, price disparities between A- and B-shares have narrowed, the return correlation has become higher, and the cointegrating relationship stronger and tighter. The flow of information between the two markets has also become more balanced. Based on the aggregate data, we observe a surge in the number of individual investors entering the B-share market after liberalization. However, there was no sign that these investors switched from the A-share market or they crowded out existing institutional investors in the B-share markets. Overall, the liberalization measure has helped to improve the quality of the B-share market and not at the expense of the A-share market.

Keywords: Partial liberalization, Cross-market trading, Market quality, Market segmentation, China

JEL classification: G14; G15

1. Introduction

We examine the opening up of the B-share market in China to local investors in 2001. Chinese companies can issue both A-class and B-class shares with identical features. The only exception is that only local Chinese were permitted to invest in A-shares and only foreigners were allowed to invest in B-shares. Thus, the two classes of shares used to be completely segmented. However, the B-share market experienced only light trading and was viewed as being practically dead. Aiming to revitalize the market, the Chinese government announced on February 19, 2001 that the B-share market would open up to local Chinese with foreign-currency accounts in Chinese banks. The policy was implemented 10 days later.

This development can be viewed as a controlled experiment in cross-border trading on a small scale. It controls for all legal, political, social, economic, even firm-level differences across the two markets. It experiments with the lifting of the trade barrier on order flow dynamics through time to see how this affects the quality and, hence, the development of the two markets. There can be several outcomes. The best outcome occurs when the capital inflow from local investors can be sustained, so that the activated B-share market can continue to attract more foreign investors. Better information linkages between the A and B markets also attract new capital to the A-share market. A positive feedback dynamics will develop across the two markets so that the efficiency, liquidity and volume of both markets will improve. Notice that as no order flow from B- to A-share markets is possible, any improvement in the quality of the A-share market must come from a better information flow and better price discovery process.

Another outcome can be a simple order migration from the A-share market to the B-share market. In this case, the quality of the B-share market improves due to both the information effect and order flow effect. However, the B-share market prospers at the expense of the A-share market.

The worst outcome is that the original foreign investors are still pessimistic and take the opportunity to cash out, leaving the B-share market essentially occupied by Chinese local investors with foreign-currency accounts. Owing to the differences in the trading costs of the two markets, the Chinese traders eventually desert the one with higher costs, presumably the B-share market; the "strong" market, presumably the A-share market, then wins most of the orders, as analyzed in Chowdhry and Nanda (1991).[1] In fact, the common view was that foreign investors would cash out of the B-share market, and this fear constituted a major criticism of the liberalization policy. The general opacity of the Chinese market, the weak requirements for disclosure, and the poor sense of corporate governance in Chinese firms have made foreign investors distrustful of Chinese firms.

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[1] It is because only those with foreign currency accounts are able to get into the B-share market but all Chinese investors can get into the A-share market.

The low liquidity of the B-share market was more a consequence than a cause of the stale market. As such, increasing the liquidity of the B-share market by opening it up to Chinese local investors would not help to retain the existing foreign investors, let alone attract new ones. Hence, it is interesting and of practical importance to investigate if this has indeed been the end result of the liberalization policy.

We take a short-term, event-study approach as well as a long-term, two-year time-series approach to do a relatively comprehensive study. Our results generally show that there have been some mild, but positive, effects of the partial liberalization of the B-share market. The B-share market has exhibited higher volumes, lower volatility, lower returns, lower bid-ask spreads, and more liquidity after liberalization. In addition, the returns, volumes, volatility, spreads, and liquidity of the B-share market have been tending to converge with those of the A-share market. In fact, after the liberalization, the price disparities between A- and B-shares have narrowed, the return correlation between the two markets has become higher, and the cointegrating relationship between the two markets stronger and tighter. The flow of information between the two markets has also become more balanced.

Interestingly, based on the aggregate data, we observed a surge in the number of individual investors entering the B-share markets both in Shanghai and Shenzhen following liberalization. However, we also observed a mild increase in the number of individual investors entering the A-share market after liberalization. Hence, there is no sign that the increased number of investors in the B-share market has switched from the A-share market or that they have crowded out the existing institutional investors in the B-share markets of the two exchanges. Hence, the pessimistic view that foreign investors would cash out of the B-share market is not sustained. All in all, improvements in the quality of the B-share market can be seen after liberalization, although such improvements are limited, which is consistent with the nature of partial liberalization.

The paper proceeds as follows. The institutional background is presented in Section 2. Data and methodology are given in Section 3. The results are discussed in Section 4. Section 5 concludes the paper.

2. Institutional Background

A company may issue five different types of shares in China, but only A-class shares and B-class shares are tradable. A-shares are equivalent to ordinary equity shares as generally accepted in other equity markets. They are exclusively available to Chinese citizens and domestic institutions. When a company makes its initial public offering (IPO), tradable shares are required to account for no less than 25% of total outstanding shares.

B-shares are issued to attract foreign capital. The first B-class shares were available to the outside world when Shanghai Vacuum Electron issued RMB420 million (around US$67 million net of issuing costs) of shares at 17.44 P-E ratio. The shares began trading on February 21, 1992. Since the RMB is not convertible under the capital account, B-shares are traded in either US dollars (in the SHSE) or HK dollars (in the SZSE).[2] B-shares can only be subscribed by, and traded among, foreign investors. Also, firms can only choose to list their B-shares in either the SHSE or the SZSE, but not in both.[3]

Unlike the A-share market, the B-share market is never active, and the B-share prices have been trading at a discount to their corresponding A-share prices since the early days. In fact, the B-share discount has increased from about 25% in 1993 to 86% right before liberalization. Various measures have been introduced by the Chinese government to vitalize the market, such as lowering the trading stamp duty on B-shares, allowing non-state-owned firms to issue B-shares, establishing joint B-share funds, and so forth. However, these measures have not been very effective. Then, on February 19, 2001, the China Securities Regulatory Commission (CSRC) and the State Foreign Exchange Administration Bureau (SAFE) announced that, starting from February 28, 2001, Chinese nationals with existing foreign currency deposit accounts with a domestic commercial bank would be allowed to trade B-shares in the SHSE and SZSE. Those who opened a foreign currency deposit account with a domestic bank after February 19 would be only allowed to trade from June 1, 2001 onwards. The B-share market was closed for a week after the announcement, and resumed trading on February 28th. Our analysis focuses on two events: the period February 19-28, 2001 and that of June 1, 2001.

3. **Data and Methodology**

We examine paired firms. A total of 86 firms issued both A-class and B-class shares at the end of 2000; however, only 83 pairs have enough trading data during our sample period from February 14, 2000 to June 14, 2002. Among them, 41 pairs of stocks trade on the Shanghai Stock Exchange (SHSE) and 42 trade on the Shenzhen Stock Exchange (SZSE). We divided our sample period into three sub-periods. The pre-liberalization period indicates the period on or before February 4, 2001, while the post-liberalization period indicates the period on or after June 16, 2001. Days in between belong to the liberalization period, which contains the two event windows of our

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[2] B-shares are still denominated in RMB norminally but quoted and traded in USD or HKD.
[3] There are also *H-shares* listed in Hong Kong since 1993. *N-shares* listed on the New York Stock Exchange are in the form of IPOs or American Depository Receipts (ADRs). N-shares were first issued in September 1992 but the market is very thin. To limit foreign ownership, the Chinese government allows no more than 49% of a company's convertible shares to be B, H or N shares until very recently.

study. Singling out this sub-period of liberalization is also important for our more long-term analyses on the lasting impact of the liberalization policy, because this is a transitional period during which both the A-share and B-share markets may be quite volatile. Including this period into the post-liberalization period will likely contaminate the analyses. We mainly use daily data from the Taiwan Economic Journal (TEJ) database. For some aggregate monthly data, we use the CEIC DRI database from McGraw-Hill.

We focus on six basic market variables, namely stock return, trading volume, return volatility, price premium, liquidity, and bid-ask spread. Stock return is the logarithmic difference of daily stock prices. Trading volume is the number of shares traded divided by the total number of outstanding tradable shares. Return volatility is the standard deviation of daily returns. The B-share price premium is defined as $(P_B - P_A)/P_A$. The liquidity (or rather illiquidity) measure is the no-trading ratio, which is the ratio of trading days with a zero return over the total number of trading days over the sample period. The idea is that if a stock is more liquid, it will have fewer no-trading days. The bid-ask spread is defined as $(Ask - Bid)/(Ask + Bid)\frac{1}{2}$, where the bidding and asking prices are the daily closing bid and ask quotes, respectively.[4]

Our first set of tests looks at the immediate impact of the partial liberalization measures. We carry out event studies to examine the mean-adjusted average abnormal returns (AAR) and the mean-adjusted cumulative average abnormal returns (CAAR) during the two event windows. We expect that the AAR and CAAR in the B-share market are significantly positive, especially in the first event window.

Our second set of tests is based on the two-tailed Wilcoxon rank-sum test and the t-test to detect possible changes in the median and mean, respectively, of the six impact variables across three sub-sample periods. If the partial liberalization has improved the quality of a market, there will be an increase in trading volume and liquidity; and a decrease in volatility, spread and stock return. In addition, the price differences between A- and B-share markets should be narrower. Since these changes in the A-share and B-share markets occurred simultaneously and are likely to be related, we also run cross-sectional, seemingly unrelated regressions with some control variables to control for firm-specific characteristics as follows:

$$\Delta Y_{a,i} = \alpha_o + \alpha_1 Size_{a,i} + \alpha_2 Leverage_{a,i} + \alpha_3 ROA_{a,i} + \alpha_4 ST_{a,i} + \alpha_5 RS_{a,i} + \alpha_6 SHSE + \varepsilon_{a,i}$$

$$\Delta Y_{b,j} = \beta_o + \beta_1 Size_{b,j} + \beta_2 Leverage_{b,j} + \beta_3 ROA_{b,j} + \beta_4 ST_{b,j} + \beta_5 RS_{b,j} + \beta_6 SHSE + \varepsilon_{b,j} \qquad (1)$$

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[4] Lesmond, Ogden, and Trzcinka's (1999) have constructed a limited dependent variable model to measure transaction costs, which is found to be superior to other frequently used measures.

$\Delta Y_{a,i}$ ($\Delta Y_{b,i}$)is the change in the relevant variables such as stock return, trading volume, etc. of firm i in the A-share (B-share) market across the three sub-periods. ΔY is the difference in the average values of Y in the pre-liberalization period (i.e., February 5, 2000 to February 4, 2001) with the post-liberalization period (i.e., June 16, 2001 to June 15, 2002). The key firm features that we want to control for are firm size, capital structure, earnings ability, and ownership structure. Size is the natural log of total assets. Capital structure is captured by firm leverage; the ratio of total liabilities over total assets; and the relative B-share supply, RS, which is the ratio of outstanding tradable B-shares to outstanding tradable A-shares. ROA, the return on assets, reflects the earning power of the firm. ST is the percentage of state ownership in the firm. The features captured by these two variables may directly affect the interests of investors in the stock. SHSE is a dummy variable taking a value of 1 if a firm is listed in the Shanghai Stock Exchange, and zero otherwise. All independent variables except SHSE are the three-year average values in 1998-2000.

Our third set of tests is to look into the inter-market information links. An overall measure of the information link between the two markets is the return correlation of the two markets. We use Karolyi and Stulz's (1996) approach and run the following bivariate GARCH model with a constant conditional correlation formulation on A-share stocks and B-share stocks in aggregate. We put in two event dummies to capture possible changes in the correlation structure in the liberalization process:

$$R_{a,t} = \alpha_{ao} + \alpha_{a1}R_{a,t-1} + \alpha_{a2}D_1 + \alpha_{a3}D_2 + \varepsilon_{a,t}$$

$$R_{b,t} = \alpha_{bo} + \alpha_{b1}R_{b,t-1} + \alpha_{b2}D_1 + \alpha_{b3}D_2 + \varepsilon_{b,t}$$

$$h_{aa,t} = \beta_{ao} + \beta_{a1}h_{aa,t-1} + \beta_{a2}\varepsilon^2_{a,t-1} + \beta_{a3}\varepsilon^2_{b,t-1}$$

$$+ \beta_{a4}D_1\varepsilon^2_{a,t-1} + \beta_{a5}D_1\varepsilon^2_{b,t-1} + \beta_{a6}D_2\varepsilon^2_{a,t-1} + \beta_{a7}D_2\varepsilon^2_{b,t-1}$$

$$h_{bb,t} = \beta_{bo} + \beta_{b1}h_{bb,t-1} + \beta_{b2}\varepsilon^2_{a,t-1} + \beta_{b3}\varepsilon^2_{b,t-1}$$

$$+ \beta_{b4}D_1\varepsilon^2_{a,t-1} + \beta_{b5}D_1\varepsilon^2_{b,t-1} + \beta_{b6}D_2\varepsilon^2_{a,t-1} + \beta_{b7}D_2\varepsilon^2_{b,t-1}$$

$$h_{ab,t} = [\rho_{ab,o} + \rho_{ab,1}D_1 + \rho_{ab,2}D_2]\sqrt{(h_{aa,t}h_{bb,t})} \qquad (2)$$

R_a (R_b) is the daily return of the equally weighted *portfolio* of all A (B) stocks in the matched sample. The whole sample period is from February 5, 2000 to June 15, 2002. Given the information link, the above formulation allows the information, as proxied by the unconditional volatility in the variance equations, ε^2, to affect the other market. D_1 and D_2 are the two event dummies. D_1 takes the value of one from February 5, 2001 onward, and zero otherwise; while D_2 takes the value of one

from June 16, 2001 onward, and zero otherwise. If the two markets have become more integrated, $\rho_{ab,2}$ is expected to be significantly positive.

Although the above formulation explicitly examines the extent of market integration, it is not clear, but it is important to investigate, which market is more important in the price discovery process. In other words, it is important to know, given two markets, if informed traders would trade essentially in one market (the argument of winners take all) or in both markets (the argument of splitting the trade to hide their identities). We follow Hasbrouck (1995) and Eun and Sabherwal (2003) to use the vector error-correction model (VECM) to investigate. The model appears as follows:

$$\Delta P_t^a = \alpha_o^a + \alpha_1^a (P_{t-1}^a + \beta * P_{t-1}^b) + \sum_{i=1}^{q} \beta_i (\Delta P_{t-1}^a) + \sum_{i=1}^{q} \gamma_i (\Delta P_{t-1}^b) + \varepsilon_t^a$$

$$\Delta P_t^b = \alpha_o^b + \alpha_1^b (P_{t-1}^a + \beta * P_{t-1}^b) + \sum_{i=1}^{q} \beta_i (\Delta P_{t-1}^a) + \sum_{i=1}^{q} \gamma_i (\Delta P_{t-1}^b) + \varepsilon_t^b \qquad (3)$$

where ΔP_t^a (ΔP_t^b) is the daily A-share (B-share) price for a particular firm. By the nature of the cointegrating relationship, α_1^a and α_1^b have opposite signs. If the absolute value of α_1^a (i.e., $\left| \alpha_1^a \right|$) is greater than α_1^b, the B-share market has a bigger impact on A-share prices than the A-share market. This means that the B-share market takes a more important role in terms of price discovery. This is because the error-correction term is a deviation from the long-run equilibrium of A-share and B-share prices. It exerts a pulling force on the share prices to converge back to the long-run cointegrating relationship. Such adjustments are captured by the coefficients of the error-correction term, α_1^a and α_1^b (and that is why they bear opposite signs). If $| \alpha_1^a |$ is greater than α_1^b, the deviation leads to more changes in the prices of the A-shares than in the B-shares. That is to say, the correction is done more through an adjustment in the prices of the A-shares than of the B-shares. This will occur if new information is incorporated in the B-share market first to cause a temporary deviation in the prices of the A-shares and B-shares from their long-run cointegrating relationship, which should be (1, -1). The above regression is repeated for each firm in our sample in both pre- and post period, respectively.

We follow Eun and Sabherwal (2003) and construct a variable X, which equals to $| \alpha_1^a | /(| \alpha_1^a | + \alpha_1^b)$, and run the following regression to investigate which factors determine the extent of impact:

$$\ln\left(\frac{X}{1-X}\right) = \alpha_o + \alpha_1 \text{Spread} + \alpha_2 \text{Volume} + \alpha_3 \text{Size} + \varepsilon \qquad (4)$$

where "Spread" is the A-share bid-ask spread defined as before. "Volume" is the A-share trading volume relative to the total trading volume in shares of the company, and "Size" is the B-share market capitalization.[5] All independent variables are the daily average in the post-liberalization period for each firm.

4. Empirical Results

4.1 The Event Study

The first event window is from February 5, 2001 to March 10, 2001, to capture the event of the announcement on February 19th of the opening up of the B-share market. Since the B-share markets were closed for a week and reopened on February 28th, the 10 post-announcement dates span from February 28 to March 10, which converts to 16 post-announcement trading dates for the A-share stocks. The second event window runs from May 15 to June 15, 2001 to capture the event that local Chinese investors who opened a foreign currency deposit account with a domestic bank after February 19th would be allowed to trade from June 1, 2001 onwards.

Since our sample firms represent a significant size of the stock markets, especially the B-market, using a market index return to compute abnormal return becomes inappropriate. Hence, for each stock, we compute the mean of its daily returns over the whole sample period, excluding the two event windows. Its abnormal return over the event window is defined as the difference between the raw returns and the mean return. Average abnormal return for A-share stocks, AAR, is the equally weighted abnormal returns of individual A-share stocks. The cumulative average abnormal return, CAAR, is the sum of the daily AAR over the event window. The corresponding abnormal and cumulative abnormal returns of B-share stocks are similarly defined. The results are presented in Table 1.

(Insert Table 1 Here)

Panel A of Table 1 shows the A-share and B-share AAR and CAAR for the first event. The A-share AAR fluctuated from negative to positive and back to negative around the event date, and became statistically insignificant 5 days beyond the event date, leading to a CAAR of −8% over the

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[5] We do not put in volatility and the liquidity variables because both are highly correlated with the trading volume. Similarly, we use B-share size instead of relative size because relative size is highly correlated with relative trading volume.

event window. B-share returns showed much more drastic changes. In the pre-event period, the AAR was significantly negative at the beginning and then became statistically insignificant when getting close to the event date. On the day before the B-share market closed down, the return went up by 2.47%, with a highly significant t-value of 7.19. After the market reopened a week later, the return shot up more than 10% and stayed at such a high level almost throughout the whole post-event period, leading to a CAAR of 43% over the 10-day post-event period. Hence, the further opening up of the B-share market seems to have come as a surprise to the market.

The changes were not dramatic in the second event, as shown in Panel B. There was little change in the A-share market, although the CAAR turned significantly positive a few days after the event date. For the B-share market, it is interesting to see that AAR was significantly positive in the pre-event period but became significantly negative in the post-event period. As a result, CAAR rose gradually before the event date and then declined in the post-event period. The B-share market seemed to have been expecting new capital from investors with new foreign deposit accounts to flow in by June 1, but this did not materialize and the market began to retreat.[6]

Summarizing the results, we found that the opening up of the B-share market affected B-shares the most. B-share returns first shot up and then declined.

4.2 Longer-term Comparisons

We are more interested in the longer-term consequences of liberalization. Hence, we compare the mean and median A-share and B-share figures of the six variables we are interested in over the three periods; i.e., the period before, during and after the opening up of the B-share market to Chinese local investors in February 2001. The results are presented in Table 2.[7]

(Insert Table 2 Here)

The first row shows the comparison of return. For the 83 A-share stocks, the median and mean daily returns before liberalization (i.e., from February 5, 2000 to February 4, 2001) were 0.22% and 0.28%, respectively. The corresponding 83 B-share stocks had median and mean returns of 0.34% and 0.36%, respectively. During the period of liberalization (i.e., from February 5, 2001 to June 15, 2001), the A-share median (mean) return was 0.09% (0.10%), while the B-share median

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[6] Although not reported here, we also examined the change in the B-share price discount relative to it's A-share price. We found that the price discount narrows significantly when the B-share market re-opens on February 19. However, the price gap was not eliminated and in the second event window, it actually tends to widen back a bit in the post-event period.

(mean) return was 1.21% (1.26%). That is to say, the A-share median (mean) return *dropped* by 0.13% (0.18%), while the B-share median (mean) return *rose* by 0.86% (0.89%) upon liberalization. The Wilcoxon tests indicate that such changes in return are significant at the 5% level.[8] The sub-column of "+ve/-ve ratio" under the major column of "During - Before" also indicates that only 23 of 83 A-share stocks showed an increase return during the liberalization period. A big contrast is that all 83 B-share stocks showed an increase in return during the liberalization period.

However, the stock prices of both A- and B-shares declined in the post-liberalization period from June 16, 2001 to June 15, 2002. As such, the return in this period is the lowest among the three sub-sample periods. For instance, comparing the returns in the pre-liberalization period with those of the post-liberalization period, the change for the A-share stocks is around -0.35% (the "After - Before" column). This means that the daily return after liberalization is 0.35% lower than before liberalization. Only 1 stock has a higher return in the post-liberalization period. For the returns on B-share stocks, the drop is even more drastic. The median and mean return changes are –0.50% and –0.55%, respectively. The changes are all statistically significant at the 5% level. Also, not a single B-share stock has a return in the post-liberalization period higher than in the pre-liberalization period.

The opening up of the B-share market to Chinese local investors has led to lower return in the A-share market but higher returns in the B-share market. Furthermore, after the opening up, both A-share and B-share markets have had negative returns. Notice that the difference in return between the A-shares and B-shares is smaller in the post-liberalization period than in the pre-liberalization period.

The Wilcoxon test on trading volume changes across periods in Table 2 indicates that the drops in A-share volume are of statistical significance at the 5% level. The situation in the B-share market was different. There was a significant jump in trading volume during the liberalization period. In the "During - Before" column of Table 2A, the median and mean volume increases were around 0.03, with a 5% statistical significance. In fact, all 83 stocks increased in volume during this period. The trading volume is lower in the post-liberalization period. Yet, when comparing the trading volume in the post-liberalization period with that in the pre-liberalization period, there was still a significant increase of 0.27 percent in the median value and 0.16 percent in the mean value. Also, 61 firms had a higher trading volume in the post-liberalization period than in the pre-

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[7] We only report the full-sample results to save space. The results on Shanghai and Shenzhen subsamples are similar. The complete tables are available upon request.

[8] Since the t-test results for mean changes lead to similar inference of statistical significance as the Wilcoxon test results for median changes, we discuss only the Wilcoxon test to save space.

liberalization period. Given all of these, we argue that the liberalization process has helped to activate the B-share market, although some volume may have come from the A-share market.

A-share stocks show a lower volatility while B-share stocks show a higher volatility during the liberalization period. Interestingly, A-share stocks resumed roughly the same level of volatility in the post-liberalization period as in the pre-liberalization period, but B-share stocks became significantly less volatile. In the "After - Before" column of Table 2, the median difference in volatility for B-shares was –0.41, and the mean difference was –0.32. Both have a statistical significance of 5%.[9] This is a sign of an improvement in the quality of the market. Notice the median drop in A-share volatility was 0.10 and that this is only marginally significant at the 10% level. Also, the median values of A-share and B-share volatility were 2.75 and 3.29, respectively, before the liberalization; but became 2.64 and 2.88, respectively after the liberalization. The difference in volatility between A- and B-shares was smaller after the liberalization than before.

The bid-ask spread was reduced, especially for B-share stocks, when the B-share market opened up. Table 2 shows that the A-share spread was reduced by 3 basis points, but that the B-share spread was drastically reduced by 96 basis points ("During - Before" column), and that both reductions bear a statistical significance of 5%. However, the A-share spread widened back to 0.0019 in the post-liberalization period, a figure slightly larger than before the liberalization. The B-share spread, however, showed no significant change in the post-liberalization period. That is to say, the quality of the B-share market did improve after liberalization. Again, the spreads in the A- and B-shares became much more similar after than before liberalization.

The illiquidity shows a pattern similar to the spread plot in that the major drop was in the B-share stocks during the period of liberalization. It is conceivable that when the B-share trading volume surged with the opening up of the market, the stocks had fewer days of no trading. Indeed, in the "During - Before" column in Table 2, the median illiquidity figure showed a big drop of 0.07 and the mean figure dropped even more, by 0.08. Such a reduction in the number of no-trading days occurred across the board for all 83 B-share stocks. It is true that the no-trading figure rebounded a bit in the post-liberalization period; but when compared with the pre-liberalization figure, it was still a drop of 0.06, which is statistically significant at the 5% level (the "After - Before" column). Notice that there were no significant changes in the no-trading figure of A-share stocks across the three time periods. This is further evidence that the improvement in quality in the B-share market

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[9] It is worth-mentioning that in the studies of emerging markets, Bekaert and Harvey (1997, 2000) find no evidence that liberalization increases volatility while Kim and Singal (2000) find volatility decrease after a year of liberalization.

did not come at the expense of the A-share market. On the other hand, the no-trading figures of A- and B-shares are much more comparable now than before liberalization.

There is, as expected, a dramatic narrowing in the price gap between A-share and the B-share prices when the B-share market opened up. This narrowing of the price gap was not reversed in the post-liberalization period. Our Wilcoxon test (not reported here) shows that the gap was significantly narrower in this period than in the liberalization period.

Before concluding, we put the contrasts in a SUR setting and control for some key firm characteristics as in Equation (1). Specifically, we compare the situation between the pre-and post-liberalization periods and present the results in Table 3.[10]

(Insert Table 3 Here)

The focus is on the regression intercepts, which capture the changes in the variables in question after controlling for firm characteristics. Consistent with the univariate comparisons, there was a significant drop in return for both A-share and B-share stocks, the intercept coefficients being –0.88 (t-value of –3.90) and –3.29 (t-value being –9.59), respectively. For trading volume, only B-share stocks had an increase in trading volume, of 0.008, which is marginally significant at the 10% level. Volatility tended to drop for both A-share and B-share stocks after liberalization, but without statistical significance. For the bid-ask spread and illiquidity, only B-share stocks showed a significant reduction. The spread dropped by 0.026 with a t-value of –5.60 and the illiquidity measure dropped by 0.18 with a t-value of –5.04. Both t-values are statistically significant at the 5% level. The price premium (discount) increased (decreased) by 0.46 after liberalization with a highly significant t-value of 5.65. Notice that, in general, the opening up of the B-share market has had a more significant impact on B-share stocks than on A-share stocks.

Two control variables worth mentioning are firm size and the exchange dummy. Firm size enters positively into the return change regressions of both A-share and B-share stocks with t-values of 3.42 and 5.02, respectively. Since the intercepts are negative, the positive coefficients for "Size" mean that firms of larger size experienced a smaller drop in return after liberalization. For the volume change regressions, only the "Size" coefficient of B-share stocks is significant, with a t-value of –1.75. This suggests that larger firms have had less of a volume *increase* than smaller firms. On the other hand, firm size enters positively into the spread and illiquidity change regressions of only B-share stocks, with t-value of 4.28 and 3.81, respectively. This means that smaller firms have

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[10] Since our focus in on the consequential impact, the results on the comparison between the pre-liberalization and the liberalization periods are not reported to save space but available upon request.

experienced more improvements in bid-ask spread and illiquidity than larger firms. All of this seems to indicate that smaller firms benefited more when the B-share market opened up. One possible reason is that the liberalization policy attracted individual local investors to the B-share market. We will come back to this point later.

The exchange dummy, SHSE, carries positive coefficients on return, and premium change regressions and negative coefficients on the volatility change, spread change and illiquidity change regressions of the B-share stocks, all with statistical significance. Hence, the liberalization policy has tended to have a bigger impact on the Shanghai market than on the Shenzhen market.

The results so far suggest that the opening up of the B-share market to Chinese local investors has led to mild improvements in the quality of the B-share market through an increase in trading volume and liquidity and a decrease volatility and bid-ask spread. Also, the price gap between A- and B-share prices has been reduced but not eliminated. From the three-scenario perspective we put forth in the beginning, the liberalization policy has not brought out the best situation, in which both the A-share and B-share markets benefit. Yet it has brought some benefits to the B-share market without having had much of a negative impact on the A-share market.

4.3 Cross-market Linkage

Our next set of investigations is to examine possible changes in information linkage across the two markets. The examination, based on a simple bivariate GARCH(1, 1) formulation, is presented in Table 4.

(Insert Table 4 Here)

The first major column shows the results of portfolios A and B formed from equally weighted A-share and B-share returns, respectively. Consistent with the previous results, the first dummy variable "D1" shows that there was an increase in return when the B-share market opened up. The second dummy variable "D2" shows a decrease in return in the post-liberalization period.

The focus lies on the correlation coefficients. The correlation coefficient of 0.66 with a t-value of 20.46 suggests that the A-share and B-share markets were highly correlated before liberalization, as expected. Interestingly, the correlation was reduced during liberalization, as captured by the interactive dummy "$\rho*D1$". The coefficient is –0.18 with a t-value of –2.04, which is statistically significant at the 5% level. This was not expected, but is conceivable, as this period was particularly volatile. Investors jumped on to the B-share market to take advantage of perceived "under-priced" stocks. Such price pressure was unique to the B-share market and, hence, tended to weaken the information-based linkage between the two markets. Once the situation stabilized and

Chinese investors were in both the A-share and B-share markets, the linkage between the two markets strengthened, as revealed by the coefficient of the second interactive dummy variable, "ρ*D2," which captures the post-liberalization period. The coefficient is 0.27 with a t-value of 2.98, which is statistically significant at the 1% level. Notice that the correlation coefficient has a net increase of 0.08 (= 0.270 – 0.189) from the pre-liberalization period to the post-liberalization period.

A similar situation occurred in the Shanghai sub-group and the Shenzhen sub-group, as shown in the second and the third major columns, respectively, although the liberalization effect was much stronger in the Shenzhen group than in the Shanghai group. The correlation coefficient had a bigger fluctuation in Shenzhen than in Shanghai. The correlation coefficient dropped by 0.24 in Shenzhen but by 0.17 in Shanghai during the liberalization period and rebounded by 0.31 in Shenzhen and by 0.27 in Shanghai in the post-liberalization period. Notice that the t-values of such changes are much bigger for the Shenzhen group than for the Shanghai group, which suggests that the liberalization process had more uniform impact on the Shenzhen stocks than on the Shanghai stocks. Again, there was a net increase in the value of the post-liberalization correlation coefficient for the Shanghai groups (0.1 = -0.17 + 0.27) and the Shenzhen group (0.07 = -0.24 + 0.31).

The parameters in the variance equations also show interesting features. For the overall sample, "D1* $\varepsilon_{i,t-1}^2$" has a coefficient of –0.19 (t-value being –2.33) and 0.01 (t-value being 1.66) in the A-share and B-share portfolio equations, respectively. This means that the (unconditional) A-share volatility dropped during the liberalization period while the B-share volatility increased. "D2* $\varepsilon_{i,t-1}^2$" has a coefficient of 0.18 (t-value being 2.29) in the A-share portfolio equation and – 0.11 (t-value being –1.32) in the B-share portfolio equation. This means the A-share volatility rebounded while the B-share volatility declined in the post-liberalization period. This consistent with what we observed in Table 3.

Again, such changes in volatility across various liberalization stages are more salient in the Shenzhen stocks than in the Shanghai ones, as the coefficients of the interactive dummies of the latter group show a general lack of statistical significance. But for the Shenzhen group, the interactive dummies, "D1* $\varepsilon_{i,t-1}^2$" and "D2* $\varepsilon_{i,t-1}^2$," have coefficients of -0.26 (t-value of -9.64) and 0.23 (t-value of 8.36), respectively in the Shenzhen A-share portfolio equation; and have coefficients of 0.005 (t-value of 0.33) and -0.13 (t-value of -8.17) in the Shenzhen B-share portfolio equation, respectively.

The results on cross-market influence are important in understanding the information flows across markets. Back to the full-sample results, for R_a regressions, " $\varepsilon_{j,t-1}^2$ " has a coefficient of – 0.009 with a t-value of –2.96, which is significant at the 1% level. That means the B-share volatility

had a strong, negative influence on the next-day A-share volatility prior to the opening up of the B-share market. When the market opened up, the impact went the other way around. "D1*$\varepsilon_{j,t-1}^2$" has a coefficient of 0.01 (t-value being 1.84), and "D2*$\varepsilon_{j,t-1}^2$" has a coefficient of -0.11 (t-value being -1.29). This means that B-share volatility began to have a positive impact on A-share volatility during the period of liberalization, but then tended to reverse afterwards. There is a similar spillover effect in volatility from the A-share market to the B-share market.

For the Shanghai sub-group, no significant changes were shown in cross-market volatility spillovers when the B-share market opened up, as the coefficients of the four interactive event dummies do not enter significantly into the regression. Significant effects occur only in the Shenzhen sub-group. When the B-share market opened up, the information flows across the two markets were enhanced and the magnitude of the impact was especially strong from the A-market to the B-market. The interactive dummy, "D1*$\varepsilon_{j,t-1}^2$," has coefficients of 0.01 (t-value of 1.78) and 0.03 (t-value of 5.11) in the A-share and B-share portfolio equations, respectively. In the post-liberalization period, "D2*$\varepsilon_{j,t-1}^2$" had coefficients of -0.13 (t-value of -2.18) in the A-share equation, and 0.009 (t-value of 1.20) in the B-share equations. This means the impact of B-share volatility on the A-share market declined while the impact of A-share volatility on the B-share volatility stayed strong after liberalization. All in all, the opening up of the B-share market facilitated information flows across the two markets in the form of more spillover in volatility from one market to the other, especially in the case of the Shenzhen stocks.

To further investigate the information linkages between the A-share and B-share market, we examined the cointegrating relationship of the A-share and B-share prices before and after the liberalization periods. We used Johansen's test (1991, 1995) on all 83 pairs of A-share and B-share prices for both the pre-liberalization and post-liberalization periods. We applied the 5% critical value reported by Osterwald-Lenum (1992) on the Johansen trace statistics to determine if a cointegrating relationship exists. We present only the summarized results in Table 5.

(Insert Table 5 Here)

The first major column of Panel A shows that there are only 13 pairs of Shanghai stocks and 14 pairs of Shenzhen stocks with a cointegrating relationship in the pre-liberalization period. However, after liberalization, the cointegrating pairs jumped to 28 for the Shanghai group and to 33 for the Shenzhen group. This clearly indicates that before the B-share market opened up, many firm

pairs had A-share and B-share prices move according to the same set of information. But as the B-share market began to open up, the information flowed more effectively across the two markets and many more firm pairs started co-moving together. There are more Shenzhen than Shanghai stocks have a cointegrating relationship both before and after.the liberalization.

The second major column of Panel A presents the estimated normalized cointegrating vectors (the "β" value in Equation (3)) averaged in various percentiles over the two liberalization periods. Since only 13 pairs of Shanghai stocks and 14 pairs of Shenzhen stocks in the pre-liberalization period were cointegrated, we provide only the median value of the normalized vectors. For the Shanghai 13 pairs, the figure is -2.22 and for the Shenzhen 14 pairs, it is -1.31. Notice that the theoretical cointegrating vector should be (1, -1), as A-share stock and B-share stock are two classes of shares with equal rights issued by the same company. As the actual vectors are different, the A-shares and B-shares are priced differently. This is especially the case for the Shanghai stocks. Yet, after liberalization, the median value of the cointegrating vector for the Shanghai stocks dropped to –1.50 and that for the Shenzhen stock dropped to –1.11. Hence, the long-run price relationship between the A-share and B-share stocks became tighter after the B-share market opened up. This is evidenced also by the fact that the range of the cointegrating values was relatively tight, from –2.10 and –1.49 of the 5th percentile to –0.89 and –0.88 of the 95th percentile for the Shanghai and Shenzhen groups, respectively. Again, the A-share and B-share price relationship was tighter for Shenzhen firms.

The last major column of Panel A shows the coefficients of the error-correction term in the VECM (the "α" value in Equation (3)) averaged in various percentiles over the two liberalization periods. Again, we only present the median values in the pre-liberalization period due to the small number of cointegrated firms. The median values of the coefficients of the error-correction term for the Shanghai A-share and B-share groups are – 0.0013 and 0.0015, respectively. This means that the relative impact on the A-share and B-share markets was similar. This was not the case for the Shenzhen stocks. The A-share coefficient is –0.0026, whereas the B-share coefficient is 0.0005. Since the absolute value of the A-share coefficient is much larger than the value of the B-share coefficient, the impact of the B-share prices was larger on the A-share prices than vice versa.

However, the situation changed after the B-share market opened up. In the post-liberalization period, the median values of the coefficients of the error-correction term for the Shanghai A-share and B-share groups are – 0.0098 and 0.0171, respectively. The B-share coefficient is now larger than the absolute value of the A-share coefficient. Hence, the A-share market has had a bigger impact on the B-share market than the other way round. For the Shenzhen stocks, the A-share coefficient is –0.0185 and the B-share coefficient is 0.0156. Although the A-

share coefficient is still larger in absolute value, the difference in value between the two coefficients is much less than before liberalization. This also indicates that the impact of the A-share market is larger than before.

The result seems to be counter-intuitive. When the B-share market opened up and attracted more order flows, its role in the price discovery process should have been enhanced rather than reduced. One plausible explanation is that the B-share market attracted mainly Chinese investors without subsequently drawing in more foreign investors. Given the fact that A-share and B-share stocks were trading at grossly different prices before liberalization, investors in the two markets (i.e. Chinese investors in the A-share market and foreign investors in the B-share market) had quite different pricing formulas for the stocks, for whatever reasons. When Chinese investors moved into the B-share market, they traded according to the A-share pricing formula, so that the influence of the A-share market on the B-share market was enhanced. This is also consistent with the fact that the liberalization is only one-way, i.e., domestic investors are allowed to buy B shares but foreign investors are not allowed to buy A shares

Table 5B shows the regression results of Equation (4). We present results for both the Shanghai and Shenzhen groups combined as well as separated. The coefficients are largely insignificant except for a few terms but the signs are sensible. For instance, the A-share spread coefficient shows up significantly only for the Shenzhen group. It is 3.84 with a t-value of 1.72, which is significant at the 10% level. Recall the dependent variable comes from the ratio of the error-correction coefficients, $|\alpha_1^a|/(|\alpha_1^a|+\alpha_1^b)$. A positive coefficient means that if the A-share spread is larger, the relative value of α_1^a becomes larger, which means that the B-share market is more important in the price discovery process. That is conceivable because Chinese investors will prefer the B-market to the A-market when trading costs in the latter market are greater.

The relative trading volume has coefficients uniformly negative in the combined group as well as in the Shanghai and Shenzhen groups. Higher trading volume associated with smaller relative value of α_1^a means that higher trading volumes in the A-market help the market to reveal price information. However, the variable lacks statistical significance in the regressions.

Size of the B-share firms show up significantly in the Shanghai group. The coefficient is 0.82 with a t-value of 2.17, which is statistically significant at the 5% level. Large size of B-share market capitalization associated with bigger relative value of α_1^a suggests that larger size of the market facilitates it to reveal price information. Overall, the GARCH and cointegration results suggest that opening up the B-share market does improve the information linkage between the A-share and B-share markets, although to a limited extent only.

Previously, we suggested that the opening up of the B-share market attracted Chinese local investors. The monthly plot of number of investors in the A-share and B-share markets through our sample period in Figure 1 shows partial support for our conjecture.

(Insert Figure 1 Here)

In Panel A, the bold solid and dotted lines represent the number of investors in the Shanghai and Shenzhen A-share markets, respectively. The thin solid and dotted lines represent the number of investors in the Shanghai and Shenzhen B-share markets, respectively. It can be seen that when the B-share markets opened up around February 2001, the number of *individual* investors in the B-share markets shot up, especially in the Shanghai B-share market. These investors may be individual Chinese or foreign investors. Since the B-share market was always open to the latter group of investors, the sudden rise in numbers more likely came from the former group of investors. However, these investors did not seem to have switched from the A-share markets, as the number of investors there (the bold lines) has risen steadily through time.

There were no particular changes in the number of *institutional* investors, local and foreign, around the liberalization period. The number rose steadily through time, as shown in Panel B. There is no sign that foreign institutional investors left the B-share markets after the markets were opened up to Chinese local investors, as all lines moved up steadily over time. Unfortunately, we do not have data on the shareholding situation of various groups of investors and, hence, do not know if foreign institutional investors are liquidating their shares to the new incoming Chinese individual investors. But, at least foreign investors would have liquidated *all* of their positions and left the market --- the worst outcome we put forth at the beginning of our discussion does not seem to have occurred.

5. Conclusion

China's B-share market, which used to be restricted to foreign investors, was opened up in February 2001 to Chinese local investors. We regard the development as a controlled experiment on cross-border trading on a small scale. Our study controlled for all legal, political, social, and economic, even firm-level differences across the two markets and experimented with the effects of lifting the trade barrier on order flow dynamics through time. We examined how that, in turn, affected the quality and, hence, the development of the two markets. We found some mild but positive results for the B-share market. The period after liberalization saw higher trading volumes, lower volatility, lower bid-ask spreads and more liquidity. All of these variables also tended to

converge with those of the A-share market. Furthermore, price disparities between A- and B-shares narrowed, the return correlation became higher, and the cointegrating relationship stronger and tighter. The information flow between the two markets also became more balanced. Based on the aggregate data, we observed a surge in the number of individual investors entering the B-share markets after liberalization. There was no sign that these investors came from the A-share market or that they crowded out existing institutional investors in the B-share markets.

Overall, the liberalization measure has helped to improve the quality of the B-share market, and this has not come at the expense of the A-share market. Yet the improvements are quite limited, and there is no sign that the A-share market has benefited much from the liberalization policy. The recent implementation of the Qualified Foreign Institutional Investors (QFII) scheme in China may be perceived as a second and, hopefully, a stronger push to improve the quality of China's stock markets.[11] The scheme allows qualified foreign institutions to bring in foreign currencies and convert them to Renminbi to invest in the A-share stock market, as well as in the bond market. People hope that opening up the markets to foreign institutional investors will boost the confidence of investors and bring fresh liquidity from overseas. So far, the Union Bank of Switzerland, Nomura Securities, Morgan Stanley, Citigroup. Goldman Sachs, HSBC, Deutsche Bank, ABN Amro, Credit Suisse First Boston, and Morgan Chase have obtained QFII status with a total of $1.7 billion quota amount. More regulatory approvals are expected to come It will be very interesting to see how this scheme of opening up the A-share market to foreign investors complements the liberalization policy of opening up the B-share market to Chinese local investors to raise the vigor and quality of China's stock markets.

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[11] The scheme was designed by SAFE and announced by the CSRC on November 5, 2002.

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