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第 45 卷 第 3 ・ 4 合併号

## Segmented Stock Market and the IPO in a Transition Economy: Evidence from Chinese B-Share Firms

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平成 21 年 3 月 1 日 発行

# Segmented Stock Market and the IPO in a Transition Economy: Evidence from Chinese B-Share Firms

Mamoru Nagano<sup>†</sup>

## Abstract

The Chinese stock market has been segmented into those for domestic and foreign investors under its market oriented economic reform process. This paper examines what promotes the former A-share public firms to go initial public offerings in the latter B-share market. Following implications are derived from the empirical analyzes. First, an A-share firm's profitability positively influences the probability of the IPO in the B-share market, but reverses after additional issuances are made. Second, in addition, an A-share firm's IPO in the B-share market consequently relaxed the bank borrowing constraint in the post-IPO period. Third, an A-share firm with high growth opportunity is apt to go IPO in the B-share market. Fourth, size of the A-share firm is positively related to both the probability of IPO and the number of capital stock issued in the B-share market.

*JEL Classification Code: G32; O16; O23*

*Keyword: Corporate Finance, Capital Market, Financial Deregulation, Initial Public Offering*

## 1. Introduction

It is commonly known that there are three stock markets in People's Republic of China, i.e., Shanghai, Shenzhen, and Hong Kong Stock Exchanges. Shanghai and Shenzhen Stock Exchanges respectively have two equity markets, i.e., the A-share market which only allows the participation of domestic investors, and the B-share market which only permits foreign investors<sup>1</sup>. It is considered that this unique bilateral system has not only prevented the rapid increase of foreign capital inflows through the equity market, but also imposed a substantial

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<sup>1</sup> Since February 2001, Chinese Stock Regulatory Commission permitted domestic investors to join the B-share market and allowed only qualified foreign investors to take part in the A-share market since December 2002. However, until now, the principal players in the A-share market are still domestic, and foreign in the B-share market.

administrative burden to domestic firms. This paper focuses on what promotes an A-share firm to go initial public offering (hereafter IPO) and increase the capital stock issued in the B-share market.

There are many previous studies on the determinants of IPOs in the developed countries as represented by Pagano et al. (1998) and Maksimovic and Pichler (2001). However, this paper addresses the uniqueness of the Chinese primary stock market, i.e., a firm goes IPO in the segmented stock market under transitional process from the centrally planned to the market oriented economy. The following hypotheses are empirically verified in this study. First, from a viewpoint of information costs, is an A-share firm's profitability or the internal funding ability influences the B-share IPO decision even in the transitional segmented market. Second, under the remaining strict bank borrowing regulations and serious non-performing loan (NPL) problems increased in the progress of the market economy, is an A-share firm with serious borrowing constraints has incentives to go IPO in the B-share market. Third is that a firm that has better growth opportunity or higher stock price in one market also has incentives to go IPO in another segmented market. Fourth is that the firm size influences the decision to go IPO in the B-share market.

The empirical results indicate that an A-share firm's profitability, a proxy variable for a firm's internal funding ability, is positively related to the decision to go IPO, but shows a negative relationship with the number of capital stock issued in the B-share market. Second, a firm's borrowing constraint is relaxed once the firm issued B-stocks. As a result, debt to equity ratio of B-share firms is averagely higher than that of A-share firms. Third, a firm with higher stock price in the A-share stock market and higher growth opportunity as a result is apt to go IPO in the B-share market. Fourth, a large A-share firm prefers to go IPO under an assumption that large firms have less asymmetric information problems in addition to those large firms were positioned as economic engines in the history of the Chinese national development policy.

## 2. Testing Hypotheses of the IPO in the B-share Market

As of August 2006, the market capitalization of the A-share and B-share markets both in Shanghai and Shenzhen totals 4.9 trillion RMB (613 billion USD) and 90.0 billion RMB (11.3 billion USD), respectively. In addition to these two markets, participation in the Hong Kong H-share market is possible for main land Chinese firms. Requirements of the B-share issuance is that, in addition to the conditions for the issuance of A-shares, a firm must have a stable and relatively adequate source of foreign exchange reserves since the firm must pay annual

dividends abroad in foreign currency after the payment of taxes.

The Chinese State Council issued 28 clauses of national rules concerning equity issuance in early 1996. All issuances of B-shares must be approved by the People's Bank of China (PBC) under its terms. In addition, state owned enterprises that wish to issue B-shares must obtain an approval of the State Council Securities Policy Committee. Among these supervisors, the PBC is a principal of B-share issuances because, with the denomination of trading of B-shares in the Shanghai and Shenzhen Stock Exchanges being US dollar and HK dollar, respectively, issuing companies must open a foreign exchange account at a commercial bank authorized to deal in foreign currencies.

According to Pagano et. al (1998), following advantages and disadvantages of IPOs are pointed out focusing on Italian firms. Advantages of an IPO are overcoming financing constraints, strengthening bargaining power in lending rate negotiations with banks, diversification of corporate shareholders, enhancement of managerial discipline, and recognition of investors, while disadvantages are financial cost of listing procedures and a loss of business privacy. This paper reorganizes hypotheses of these reflecting the Chinese stock market uniqueness.

Our first hypothesis is that the Chinese firm utilizes funds generated from internal sources prior to funds generated from external sources because of its low information cost even under transitional centrally planned economy. In this hypothesis, we assume corporate insiders and foreign investors have large asymmetric information and this causes firms with smaller internal funds to be more aggressive in going IPO in the B-share market, regardless of the decision is influenced by the Securities Regulatory Commission, the State Council or other related government agencies.

The second hypothesis is that the borrowing constraint forces the Chinese A-share firms to go to the B-share market. This paper assumes the causality of these two variables is very remarkable in China. The reason is that as a result of a series of financial reforms in 1990s, the domestic lending market has gotten stagnant because of the high NPL ratios of the four largest commercial banks that have approximately a 70 percent share of domestic lending market. As indicated in Table 3, average debt to equity ratio of the Chinese firms is quite low compared to those in the industrialized countries. With reference to this second hypothesis, this paper also examines the hypothesis that an IPO in the B-share market enable the firm to enhance bargaining power with banks with respect to the determination of borrowing interest rates<sup>2</sup>.

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<sup>2</sup> This derivative hypothesis is based on Rajan (1992). Rajan (1992) notes, firms that have high dependency on single bank borrowing must pay rent to the bank in the form of an additional lending interest rate. However, a firm

Table 1 Overview of the Equity Markets in China

	Shanghai Stock Exchange		Shenzhen Stock Exchange		Hong Kong Stock Exchange	
	A-share	B-share	A-share	B-share	H-share	Red Chip
<b>(a)Market Participants</b>	Domestic Investors	Foreign Investors	Domestic Investors	Foreign Investors	Hong Kong, Foreign Investors	Hong Kong, Foreign Investors
<b>(b)Establishment</b>	November, 1990	February, 1992	August, 1991	February, 1992	July, 1993	July, 1993
<b>(c)Transaction Currency</b>	Chinese Yuan	US Dollar	Chinese Yuan	Hong Kong Dollar	Hong Kong Dollar	Hong Kong Dollar

Source : Author made based on The China Stock Market Web.

Table 2 The Number of Listed Firms and Annual Average of Market Capitalization in Shanghai and Shenzhen Stock Exchange

	A-share Market		B-share Market		
	Shanghai A	Shenzhen A	Shanghai B	Shenzhen B	
<b>1995</b>	Number of Listed Firms	184	127	36	34
	Market Capitalization	47,990	11,342	1,333	750
<b>2000</b>	Number of Listed Firms	559	499	55	58
	Market Capitalization	260,880	221,716	2,611	2,651
<b>2005</b>	Number of Listed Firms	824	531	54	55
	Market Capitalization	283,223	110,960	2,975	4,705

Source: CEIC Database

Note: Firms, Million USD

The third hypothesis concerns the firm's growth opportunity and financial distress. Originated from Rajan and Zingales (1995), firms with promising investment opportunities prefer equity financing to an additional bank borrowing. In China, this third hypothesis is also plausible, because the firms always face serious borrowing constraint as noted the above.

The fourth hypothesis of this study is that the size of the firm is positively related to the firm's IPO in the B-share market, but the interpretation of this variable is different from the existing literatures. This hypothesis assumes that a large firm has smaller information

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with diversified financing technique enables itself to minimize this rent because the bargaining power is strengthened.

asymmetry between corporate insiders and foreign participants in the B-share market following the prominent existing literatures like Leland and Pyle (1977), Rock (1986), Chemmanur and Fulghieri (1995). However, this paper also regard that firms with larger size enrolled important under the State Council's national development policy, so that, going IPO in the B-share is promoted.

### 3. Empirical Study

#### 3.1 Data

The data used in this study are obtained from The Net China Limited. The empirical analyses employed two empirical models and datasets. One dataset consists of all the individual A-share firm financial data, excluding finance-related businesses firms. Another dataset consists of both A-share and B-share firm data. The latter data includes the issuance of capital stock data of the individual firms in addition to the former dataset. Sample period of the former is from 1994 to 2001. The latter is from 1997 to 2001, due to the data unavailability of the issuance of capital stock.

Descriptive statistics in Tables 3 and 4 suggest that average of profitability of A-share firms is statistically higher than that of the B-share firms in terms of return on assets. The average of debt to equity ratio of B-share firms is significantly higher than that of A-share firms since 1995, continuously. The ratio of individual firm's interest payment to total liabilities of B-share firms is also averagely higher than that of A-share firms. The MBR ( $=[\text{market value of capital} + \text{book value of liability}] / \text{book value of total assets}$ ) of A-share firms is also higher than that of B-share firms. The size of B-share firms are statistically larger than A-share firms in terms of sales and total assets.

Table 3 Average of Major Financial Indicators of the Sample Firms

		ROA	DER_M	RCC	MBR	ASSET	B_Share	B_IPO
<b>1994</b>	Mean	0.093	0.413	0.917	2.009	6.346	N.A.	18
	S.D.	0.060	0.383	0.587	1.540	0.895	N.A.	
	Max	0.419	2.502	3.092	13.947	9.670	N.A.	
	Min	-0.029	0.003	0.021	0.568	4.160	N.A.	
<b>1995</b>	Mean	0.075	0.548	0.992	1.907	6.407	N.A.	23
	S.D.	0.089	0.510	0.751	1.756	0.968	N.A.	
	Max	0.906	3.887	5.476	22.226	9.786	N.A.	
	Min	-0.142	0.016	0.009	0.505	4.050	N.A.	
<b>1996</b>	Mean	0.076	0.313	1.061	2.529	6.411	N.A.	15
	S.D.	0.071	0.289	0.825	1.031	0.881	N.A.	
	Max	0.556	2.512	6.500	7.837	9.852	N.A.	
	Min	-0.275	0.020	0.001	0.478	4.696	N.A.	
<b>1997</b>	Mean	0.076	0.273	1.208	2.794	6.585	0.311	13
	S.D.	0.069	0.279	0.821	1.355	0.843	0.121	
	Max	0.337	2.728	5.992	10.040	9.948	0.505	
	Min	-0.314	0.005	0.002	0.421	4.428	0.000	
<b>1998</b>	Mean	0.052	0.283	1.061	2.793	6.728	0.309	15
	S.D.	0.080	0.341	0.813	1.266	0.845	0.110	
	Max	0.299	4.170	12.376	9.473	10.010	0.505	
	Min	-0.405	0.007	0.001	0.570	4.723	0.000	
<b>1999</b>	Mean	0.054	0.253	0.850	3.010	6.846	0.304	16
	S.D.	0.067	0.281	0.503	1.557	0.838	0.116	
	Max	0.336	3.422	4.259	14.673	9.996	0.505	
	Min	-0.441	0.006	0.001	0.436	4.809	0.000	
<b>2000</b>	Mean	0.041	0.182	0.823	4.088	6.991	0.314	5
	S.D.	0.068	0.226	0.506	2.121	0.822	0.103	
	Max	0.273	3.574	7.042	19.833	10.570	0.535	
	Min	-0.965	0.001	0.002	0.516	4.664	0.089	
<b>2001</b>	Mean	0.024	0.243	0.916	3.048	7.098	0.331	2
	S.D.	0.085	0.205	1.347	1.978	0.843	0.097	
	Max	0.252	1.774	35.609	43.671	10.969	0.535	
	Min	-1.227	0.004	0.001	0.677	3.891	0.105	
<b>Total</b>	Mean	0.053	0.272	0.960	3.019	6.791	0.471	13
	S.D.	0.077	0.302	0.871	1.783	0.886	0.111	
	Max	0.906	4.170	35.609	43.671	10.969	0.535	
	Min	-1.227	0.001	0.001	0.421	3.891	0.000	

Source: Author's calculation based on financial data of Net China, Inc.

DER\_M: debt to market value of capital, ROA: EBITDA to total assets, ASSET: logarithm of total assets (Mil RMB), RCC: relative comparative ratio of interest costs to debt to the sample firm average, MBR: book value of assets less the book value of equity plus the market value of equity all divided by the book value of assets, B\_share: Number of B-share stock issued to total number of outstanding stocks, B\_IPO: Number of B share IPO firms

Table 4 Result of t-test of Major Financial Indicators of the Chinese Listed Firms

	ROA	DER_M	DER_B	RCC	MBR	Asset	Number of A-share Firms	Number of B-share Firms
1994	A>=B **			A<=B ***		A<=B ***	143	51
1995	A>=B **	A<B *		A<=B ***		A<=B ***	233	57
1996	A>=B *	A<B ***		A<=B **	A>=B ***	A<=B ***	376	79
1997	A>=B ***	A<=B ***		A<=B ***	A>=B ***	A<=B ***	526	94
1998	A>=B ***	A<=B ***		A<=B ***	A>=B ***	A<=B ***	626	92
1999	A>=B ***	A<=B ***		A<=B ***	A>=B ***	A<=B ***	719	93
2000	A>=B ***	A<=B ***	A<=B **	A<=B ***	A>=B ***	A<=B ***	821	100
2001	A>=B ***	A<=B ***	A<=B ***			A<=B ***	875	99

Note 1: \*\*\*, \*\*, \* indicate 1 percent, 5 percent, and 10 percent significant level as a result of t-test of difference between A-share and B-share firm's average. These indications are preferentially based on t-statistics of ">" or "<" in case that "=" is simultaneously significant.

Note 2: DER\_B: debt to market value of capital

### 3.2 Empirical Model

Using the datasets introduced in the previous section, this paper estimates the following two equations to verify the hypotheses.

$$y_{it} = const + \alpha_1 ROA_{it-1} + \alpha_2 DER\_M_{it-1} + \alpha_3 RCC_{it-1} + \alpha_4 MBR_{it-1} + \alpha_5 ASSET_{it-1} + d_i + u_i + v_{it} \quad (1.1)$$

$$z_{it} = const + \phi_1 ROA_{it-1} + \phi_2 DER\_M_{it-1} + \phi_3 RCC_{it-1} + \phi_4 MBR_{it-1} + \phi_5 ASSET_{it-1} + d_i + u_i + v_{it} \quad (2.1)$$

$y_{it}$  equals 0 if firm  $i$  only stays in the A-share market and equals 1 if it goes IPO in the B-share market. At any time  $t$ , the sample includes all the A-share firms. After a firm went IPO in the B-share market, the firm is dropped from the sample. On the other hand,  $z_{it}$  is the number of B-shares issued as a ratio to total outstanding stock. This sample keeps all the A-share and B-share firms through the sample period even after an A-share firm went IPO in the B-share market.

ROA and DER\_M are the lagged return on assets and debt to equity ratio, respectively. ROA is a proxy variable for internal funds and DER\_M is financial leverage. RCC is the relative cost of credit, i.e.,  $\frac{1+r_{it}}{1+r_t}$  where  $r_{it}$  is the credit cost of firm  $i$  and  $r_t$  is the average of the sample firms at  $t$ . MBR is the sum of market value of capital and book value of liabilities as a ratio of the book value of total assets, and is used as a proxy variable for growth opportunity. ASSET is the natural logarithm of total assets and is a proxy variable for firm size. Year is a calendar year dummy.

To estimate equation (1.1) and (2.1), a random-effects probit model and a random-effects tobit models are employed. Assuming a normal distribution,  $N(0, \sigma_v^2)$ , for the random effects  $v_{it}$ ,



we have

$$\Pr(y_{it} | x_{it}) = \int_{-\infty}^{\infty} \frac{e^{-v_i^2/2\sigma_v^2}}{\sqrt{2\pi\sigma_v}} \left\{ \prod_{t=1}^{n_i} F(x_{it}\beta + v_i) \right\} dv_i \quad (1.2)$$

where

$$F(x_{it}\beta + v_i) = \begin{cases} \Phi(x_{it}\beta + v_i) & \cdots y_{it} \neq 0 \\ 1 - \Phi(x_{it}\beta + v_i) & \cdots y_{it} = 0 \end{cases} \quad (1.3)$$

where  $\Phi$  is the cumulative normal distribution. We can approximate the integral with M-point Gauss-Hermite quadrature

$$\int_{-\infty}^{\infty} e^{-x^2} f(x) dx \approx \sum_{m=1}^M w_m^* f(a_m^*)$$

where  $w_m^*$  denotes the quadrature weights and  $a_m^*$  denotes the quadrature abscissas. The log-likelihood function  $L$ , where  $\rho = \sigma_v^2 / (\sigma_v^2 + 1)$ , is then calculated using the quadrature

$$\begin{aligned} L &= \sum_{i=1}^n w_i \log\{\Pr(y_i | x_i)\} \\ &\approx \sum_{i=1}^n w_i \log\left\{ \frac{1}{\sqrt{\pi}} \sum_{m=1}^M w_m^* \prod_{t=1}^{n_i} F(x_{it}\beta + \sqrt{2\frac{\rho}{1-\rho}} a_m^*) \right\} \end{aligned} \quad (1.4)$$

where  $w_i$  is a user-specified weight for panel  $i$ .

A random-effects tobit model of (2. 1) is also estimated assuming normal distribution,  $N(0, \sigma_v^2)$ , for the random effects  $v_i$ , as in the random-effects probit model of (1.1). However, (1. 3) is replaced by

$$F(\Delta_{it}) = \begin{cases} (-1/\sqrt{2\pi\sigma_\varepsilon^2}) e^{-(z_{it}-\Delta_{it})^2/(2\sigma_\varepsilon^2)} & \text{if } z_{it} \in C \\ \Phi\left(\frac{z_{it}-\Delta_{it}}{\sigma_\varepsilon}\right) & \text{if } z_{it} \in L \\ 1 - \Phi\left(\frac{z_{it}-\Delta_{it}}{\sigma_\varepsilon}\right) & \text{if } z_{it} \in R \end{cases} \quad (2.2)$$

where  $C$  is the set of noncensored observations,  $L$  is the set of left-censored observations, and  $R$  is the set of right-censored observations.

### 3.3 Implications from Empirical Results

The first hypothesis concerning the relationship between firm's profitability and B-share IPO is that a firm's high profitability discourages the intention of going IPO also in the segmented B-share market. Empirical results of Table 5 indicate that A-share firms with higher profitability is apt to go IPO in the B-share market, while that of Table 6 suggest that the number of B-shares issued is negatively influenced by profitability. The difference of these results is considered to have originated from the difference in datasets. The dataset of equation (1.1) eliminates firms from the sample after the first year of the B-share IPO after the B-share IPO, while the dataset of equation (2.1) does not. Therefore, it is inferred, although an IPO of B-share does not explicitly require high profitability, A-share firms effectively have incentives to improve it to be able to go IPO in the B-share market for some reasons which may or may not be related to the legal framework. The results of Table 6 support the original hypothesis that a firm with ample internal funds is passive to do equity issuance in the B-share market once the B-share IPO is achieved.

Second, our hypothesis expects a firm's debt to equity ratio positively related to go IPO in the B-share market, but empirical results of Table 5 do not support this. However, in Table 6, the coefficient of this variable is significant in case independent variable is the number of B-shares issued. In Table 4, t-tests of the average of A-share and B-share firms' debt to equity ratios and relative credit cost indicate that B-share firms significantly have higher average of both variables. In other words, the B-share firms consequently have stronger external funding demand and attain higher ratios of interest payments.

Third, a proxy variable for a firm's growth opportunity has a significant positive relationship with both going IPO and the number of shares issued in the B-share market. Coupled with the empirical results of the second hypothesis, our conclusion is that a firm with high financial leverage and high stock price in the A-share market has an incentive to issue B-shares as well.

Last, with respect to the relationship between firm size and IPO, empirical results support our hypothesis. Since Table 4 also indicates that B-share firms statistically have higher average firm size in terms of both total assets and sales. Therefore, it is concluded that firm size influences B-share IPO in China. However, it must be recognized that, since the larger firm generally have diversified businesses, it has better reputation and lower probability of bankruptcy. The result contains various interpretations.

Table 5 Determinants of Going IPO in the B-share Market

Variables	Parameter	s.e.	Z-value	Variables	Parameter	s.e.	Z-value
ROA	0.088 ***	0.011	8.102	ROA	▲ 0.002 ***	0.012	▲ 3.333
DER_M	▲ 0.110	0.442	▲ 0.249	DER_M	0.006 **	0.166	2.422
RCC	0.912 ***	0.128	7.144	RCC	0.004 ***	0.132	9.715
MBR	0.105 ***	0.017	6.112	MBR	0.002 ***	0.093	6.441
Asset	0.181 **	0.058	3.140	Asset	0.000 ***	0.078	2.991
Const	▲ 6.944	64.897	▲ 0.107	Const	▲ 0.022 ***	0.522	▲ 7.144
N. Obs			4,082	N. Obs			3,574
Number of firms			951	Number of firms			1,106
Wald $\chi^2$			8932.300	Wald $\chi^2$			77.300
rho			0.100	rho			0.681
Log Likelihood			▲ 254.700	Log Likelihood			▲ 351.300
Likelihood ratio of rho			3.770	Likelihood ratio of rho			51.740

Note: \*\*\* indicates the coefficient is significantly different from zero at the 1 percent level or less; \*\* indicates the coefficient is significantly different from zero at the 5 percent level; \* indicates the coefficient is significantly different from zero at the 10 percent level.

#### 4. Further Discussion from the Institutional Viewpoint

The Chinese Security Law of 1999 that regulates listing rule in the stock market do not particularly prescribe quantitative financial conditions, concretely, but emphasizes an importance of consistency with the government's national development policy effectively formulated by the State Council. The Securities Regulatory Commission is a regulatory and supervisory agency of the Chinese capital market and is concurrently a subordinate organization of the State Council. Therefore, the remaining central planned capital market possibly influenced profitable large firms to diversify funding instruments under the market-oriented reform in the 1990s, institutionally.

Our second discussion is regarding the relationship between the stagnant lending market and capital market development. Although deregulation on bank loans progressed in recent years, there are still many restrictions on lending rates, loan maturities and collaterals in China. Coupled with the stagnant domestic lending market caused by extreme high NPL ratios of the top four largest commercial banks, these bank regulations are possibly among the factors that impose serious financing constraints on Chinese firms. Therefore, both a firm and the government are considered to have intensions to mitigate financial constraint by B-share IPO under economic reform process and the government especially expected issuers to fulfill various financial instruments.

Summarizing the above discussions, most of hypotheses based on information economics of existing literatures are empirically supported in our study, while the historical institutional background in China also facilitated these causalities. In particular, some large B-share firms are still regarded as engines to promote the national development policy, therefore, a firm's decision to go B-share IPO is also institutionally influenced by the government. Under the vague written requirements of IPO in the B-share market, the first empirical result, i.e., bipolar signs of parameters of firm's profitability suggest that invisible screening of the B-share IPO qualification may exist.

#### 5. Conclusion

This paper analyzed the determinants of an IPO and the number of issuance in the segmented B-share equity market in China. What we should recognize about corporate finance in China is that a firm generally has low debt to equity ratio and depends on its internal funds. Under this circumstance, the empirical results of this paper suggest that an IPO in the B-share

market relax borrowing constraint and strengthen bargaining power with banks. These imply that accessibility of the B-share market and the stagnant lending market are the dual issues of external funding methods and the Chinese institutional context has reinforced the tendency.

Listing in the limited internationalized market improves the firm's reputation and it consequently strengthens relationships with investors. In addition, another implication of our empirical study suggested that a firm with large size had smaller information asymmetry between insiders and the government agencies and this also spurred a large firm, as an engine of the economic development, went IPO in the B-share market. Therefore, an additional of financial hierarchy of equity issuance in the segmented stock market that is inferior to the normal equity issuance possibly exists under the transition economy like China.

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(received January 16, 2009)

平成21年3月1日発行

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印刷所 株式会社正鶴堂