Asset Pricing in China:
Is There a Logic?

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Abstract

Like other nascent and emerging markets, China's stock markets are highly imperfect, reflecting inadequate disclosure, ineffectual regulatory supervision, opaque corporate governance and legal framework, ownership restrictions, weak shareholder protection, etc. Reflecting the wide-spread perception, Chinese stock markets are often depicted as something like "casinos driven by fast money flows in and out of stocks with little regard for their underlying value" (*WSJ*, August 22, 2001). In this paper, we formally study the mechanism of asset pricing in nascent Chinese stock markets. The key findings are: First, stocks are priced according to the total risk, not the market (beta) risk, consistent with the observation that investors don't diversify in China for a variety of reasons. Also, investors pay a premium for the liquidity of stocks. Second, investors pay a premium for local shares if there are offshore counterparts (e.g., B- and H-shares) for foreigners. More stringent disclosure/listing requirements and monitoring associated with the offshore share issuance generate favorable externalities for local shareholders. Cognizance of these indirect benefits is imputed in Chinese local A-share prices. Third, investors require a higher return on stocks, the greater is the proportion of tradable shares of the firms, suggesting a downward-sloping demand curve in China. Lastly, as with U.S. and other mature markets, firm size and the book-to-market ratio are systematically related to stock returns. Overall, stocks are priced rather *rationally* in China, given market imperfections.

In recent years, many formerly socialist countries in Eastern Europe, including the Czech Republic, Hungary, Poland and Russia, have launched stock exchanges as they try to nurture market-oriented economies. Similarly in Asia, both China and Vietnam have also opened their own stock exchanges in the 1990s. In particular, China launched two stock exchanges as part of concerted efforts toward market-oriented reform – the Shanghai Stock Exchange in 1990 and the Shenzhen Stock Exchange in 1991.[1]

Since inception, the Chinese stock markets have grown at a phenomenal pace: The number of listed stocks has increased from 13 in 1991 to 1,060 by the end of 2000, and the aggregate market capitalization has risen from US$0.85 billion to nearly US$600 billion during the same period. In terms of market capitalization, the Chinese stock markets are now the second largest in the Asia-Pacific region after Japan, and are ahead of such major markets as Australia, Hong Kong and Korea. Considering China has one of the fastest growing economies in the world and, further, that the government is committed to continuous privatization, the rapid development of Chinese stock markets is likely to continue in the foreseeable future.

Despite this remarkable growth and the critical role that Chinese stock markets play in facilitating the privatization of state-owned enterprises, capital raising, and the propagation of share ownership, few studies have earnestly examined the asset pricing mechanism in China. Previous studies of Chinese asset pricing, e.g., Sun and Tong (2000) and Fernald and Rogers (2000), are mainly concerned with explaining the relative pricing of A-shares versus B-shares. As is well-known, when countries impose restrictions on foreign investment, foreigners pay a premium above the price faced by local investors. China is the only exception to this: B-shares held by foreigners trade at a substantial discount relative to A-shares held by Chinese locals. However, less than 10 percent of companies listed in China have B-shares as well as A-shares.[2] So far, relatively little is known about how A-shares are priced in and of themselves. In this paper, we investigate how domestic A-shares are priced in the Shanghai and Shenzhen stock exchanges, utilizing the data from the first 10-year period of Chinese stock trading. Our findings

[1] It is noted that China had a vibrant stock exchange before the Communist takeover. According to Goetzmann, Ukhov, and Zhu (2001): "By 1935, the Shanghai China Merchant Stock Exchange had grown to become one of the biggest exchanges in the Far East with a list of 190 companies and an annual trading volume from 2 to 5 trillion Yuan." (p. 8). In this paper, we do not address the earlier Chinese stock market.

about asset pricing in China, where domestic capital markets are still nascent and highly imperfect, can have important implications and lessons for similarly nascent and emerging stock markets around the world.

Although China's stock markets have received substantial media coverage in recent years, the general perception of the markets is less than adulatory. The *Wall Street Journal* (August 22, 2001), for instance, describes the Chinese stock markets as casinos: "In ten years since they were founded, China's stock markets have operated like casinos, driven by fast money flows in and out of stocks with little regard for their underlying value." The *Economist* (June 30, 2001), concurs: "Trading, not ownership, is the approach of China's investors…The next step in China's stock market reform is to bring in investors who know what they are doing." In a similar vein, a formal report on China's stock markets compiled by OECD (2001) states:

> "Despite its size and technological complexities, the capital market has not been effective in promoting corporate efficiency. Share prices are not well correlated with corporate results. The market, which is dominated by small retail investors who are concerned primarily with short-term trading profits, has frequently been marred by speculation and market manipulation. Standards of disclosure and corporate governance fall short of global norms."

Overall, various media and research reports tend to depict Chinese stock markets as opaque, chaotic, inefficient, and rather irrational. This widespread perception prompts us to ask the following question: Is there a logic in Chinese asset pricing?

To understand the asset pricing mechanism in China, it is essential to take into consideration several key institutional characteristics of the Chinese stock markets:

First, Chinese stock markets are dominated by numerous speculative, short-term-oriented, and relatively uninformed individual investors, with the total number of retail accounts exceeding 50 million by the end of 2000. It is reported that at least 90 percent of turnover on the stock exchanges is from trades by retail investors with limited funds.[3] As will be discussed later in detail, typical individual investors are unable or unwilling to diversify their investments for a variety of reasons. There exist few institutional investors - such as pension funds, mutual funds, and insurance companies - that may otherwise act as a stabilizing force in the nascent stock

[2] According to China Securities Regulatory Commission (CSRC), there are 1,088 domestically listed companies in China as of the end of 2000. Of these, 86 firms offer B-shares as well as A-shares, whereas a majority of listed firms (974 firms) only offer A-shares. There are 28 firms that issue B-shares only.

markets. Second, the majority of Chinese companies are controlled by government entities, with individuals holding minority stakes. On average, individuals hold roughly one-third of shares outstanding, with the remaining two-thirds (largely non-tradable shares) held by the government entities. This particular ownership structure may allow the government entities to act as the controlling insiders and thus make corporate decisions that could possibly infringe upon the rights of individual shareholders. As is often the case in nascent emerging markets, shareholder rights are not well established in China, reflecting generally opaque corporate governance and legal environments. In addition, the proportion of tradable shares varies greatly across individual firms, allowing us to examine the effect of share supply on the stock returns. Third, the disclosure and listing standards in China are substantially less stringent than those in more mature and advanced markets. As previously mentioned, there exist few institutional investors who can effectively monitor corporate management. Fourth, about 10 percent of the domestically listed companies have shares eligible for foreigners, such as B- and H-shares, with the remaining 90 percent of Chinese-listed companies off-limit to foreigners.[4]

In summary, China's domestic stock markets are highly imperfect and the pricing mechanism is likely to be affected by these imperfections. Based on the key institutional characteristics discussed above, we develop several hypotheses regarding asset pricing in China. We then test these hypotheses using all the available A-share stocks listed on the Shanghai and Shenzhen stock exchanges. We estimate alternative specifications of the asset pricing model using a data set obtained mostly from the *Taiwan Economic Journal*. Our empirical findings can be summarized as follows:

1) Stocks are priced according to total risk, not market (beta) risk. This is consistent with the observation that investors in China don't diversify for various reasons, such as limited funds, scarce investment opportunities, lack of mutual funds, and speculative inclinations.
2) Investors in China pay a premium for the liquidity of stocks. Chinese investors would particularly value the liquidity of stocks since many of them are short-term oriented investors and thus cannot spread transaction costs over a long horizon.

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[3] www.chinaonline.com.

[4] As of the end of 2000, there are 114 B-share stocks listed on the Shanghai and Shenzhen stock exchanges, with 86 having A-share counterparts. There are 52 H-share stocks traded at the Hong Kong Stock Exchange, 19 of which have A-share counterparts listed domestically.

3) Chinese investors require a lower return on a company's local (A-) shares if the company has an offshore-share program (e.g., B- and H-shares) for foreigners, reflecting the benefit spillover for local investors. The existence of offshore shares thus has a positive valuation effect on local A-shares.

4) There exists a positive and significant relationship between the proportion of tradable shares and stock returns. Ceteris paribus, shares of firms with higher proportions of publicly tradable shares are trading at a discount, leading to higher returns. This result is consistent with the notion of a downward-sloping demand curve in China.

5) As with US and other stock markets, there exist significant firm-size premiums as well as value premiums in China. Incidentally, we also document an interesting seasonal pattern in Chinese stock returns: August has the highest mean return of the year and December the lowest (actually, negative), with no January effect.

Overall, our findings indicate that given various market imperfections, stocks tend to be priced rationally in China, in spite of the frequent media reports to the contrary.

The remainder of this paper is organized as follows. Section I provides an institutional briefing on the Chinese stock markets and Section II outlines our main hypotheses regarding asset pricing in China. Section III describes the methodology and the data. Empirical findings are presented in Section IV. Lastly, Section V offers concluding remarks.

I. Chinese Stock Markets: Institutional Overview

In this section, we review some of the key institutional characteristics of Chinese stock markets, with a view toward developing testable hypotheses pertaining to asset pricing in China.

A. The Growth of Chinese Stock Markets

As previously mentioned, China launched two stock exchanges - the Shanghai Stock Exchange in 1990 and the Shenzhen Stock Exchange in 1991 - with no dual listings between the exchanges. The two exchanges share the same listing requirements. However, there exist some differences with regard to the profiles of listed companies, especially in earlier years. Compared with Shanghai-listed companies, many of which are heavily involved in the domestic market, Shenzhen-listed companies tend to be more export-oriented and have closer ties with Hong Kong and Guangdong, the province that has received the most foreign investment and enjoyed the

fastest economic growth in China. As China becomes an increasingly market-oriented economy, the two stock exchanges have become a major source of capital for Chinese firms and also function as a key mechanism for privatizing the state-owned enterprises (SOEs).

Table I documents the impressive growth of Chinese stock markets in terms of both the total number of listed stocks and the market capitalization during the first decade of their existence. As can be seen from Table I, the total number of listed stocks rose from 13 in 1991 to 1,060 in 2000, registering a compounding annual growth rate of 63 percent. The total market capitalization increased from US$0.85 billion to US$580 billion during the same period, growing at a compounding annual rate of 97 percent. The average annual turnover, a measure of market liquidity, was 587 percent during the 10-year period, far exceeding the turnover ratios observed in other markets. Table I also shows that during the 10-year period studied, the Shanghai and Shenzhen exchanges were comparable to each other in terms of the number of listed stocks, market capitalization, and the turnover ratio.

Initially, stock trading was conducted with a floor-based open outcry system at both the exchanges. Trading now takes place in a fully automated environment, with centralized quotations, liquidation, and registration. There are no market makers or specialists in the exchanges. Instead, an automatic order-matching and execution system is used. Authorized foreign brokers may be involved in the trading and clearing of B-shares. Despite foreign exchange controls effective in China, proceeds from trading B-shares can be freely repatriated. Transaction fees were formerly 0.3 percent per trade but were raised to 0.5 percent per trade in 1997 in an effort to discourage speculation. Under the current *Individual Tax Act* legislated in 1995, cash dividends are subject to a 20 percent flat income tax, whereas capital gains are not taxable at all.[5]

B. Share Ownership Structure

During three decades of centralized economic planning, i.e., the 1950s through the late 1970s, the majority of Chinese firms were transformed into SOEs. The government not only owns major parts of firms' assets but also is directly involved in many aspects of corporate management, including personnel, financing, and production. Firms may also have investments

[5] Provision 5, Article 3, "*Individual Tax Act of the People's Republic of China*," 1995.

from other SOEs such as banks, resulting in an interlocked ownership structure for many Chinese firms. Consequently, before a firm is privatized via an IPO, it must first sort out and clarify its ownership structure among all parties involved.

Currently, there are three types of domestic shares in China: (i) state shares, (ii) legal entity shares, and (iii) public shares. *State shares* represent the part of the firm owned by the state. These shares are held by the State Asset Management Bureau (SAMB) and are not tradable on the stock exchanges.[6] *Legal entity shares* represent the part of the firm owned by other state entities. Like state shares, legal entity shares cannot be traded on the stock exchanges.[7] *Public shares* are the ordinary A-shares that are freely tradable on the stock exchanges. Table II provides a summary of the ownership structure of China's listed companies during the period January 1995 through December 2000. The (time-series) average proportion of public shares varies a great deal across firms: The proportion varies from 1.5 percent to 76.0 percent, with a mean of 32.6 percent. Thus, on average, about one-third of the total domestic shares are freely tradable on the stock exchanges. The mean value of the proportion of state shares is 38.1 percent and that for legal entity shares is 25.5 percent. This implies that on average, the state and state-related entities control about two-thirds of shares outstanding of Chinese firms, with individuals holding minority stakes. Table II also shows that the ownership structure is very similar between Shanghai- and Shenzhen-listed companies.

In addition to shares for domestic investors, a small proportion (about 10 percent) of listed companies have issued *offshore shares* for foreign investors as a means of raising foreign capital. Foreigners are legally prohibited from buying A-shares; only local residents are eligible to hold these shares. On the other hand, locals can neither purchase Chinese offshore shares, nor invest in foreign securities due to China's foreign exchange and capital account restrictions.[8] There are two alternative ways of issuing offshore shares: (i) issuing B-shares on domestic stock exchanges and (ii) listing shares on foreign stock exchanges.

Upon approval from the government, an A-share company listed on either the Shanghai or Shenzhen stock exchange may simultaneously issue B-shares to foreign investors on the same exchange. B-shares carry the same voting rights and claims on the firm's earnings and assets. In

[6] In June 2001, the State Council unveiled a plan that would allow public companies to sell a portion of state shares to raise social security funds.

[7] However, since August 1992, legal entity shares have been allowed to float among qualified institutions on a special market in the Beijing-based Securities Automatic Quotation System.

order to issue B-shares, however, a company must report financial statements in accordance with International Accounting Standards (IAS), in addition to the Chinese accounting rules (PRC GAAP). B-shares are quoted in Chinese yuan but settled in foreign currencies, with US$ in Shanghai and HK$ in Shenzhen. Foreign brokerage houses are allowed to take seats in both the stock exchanges and are directly involved in B-share trading, thereby increasing exposure of B-shares to foreign investors.

Companies with approval from the government as well as the relevant foreign exchanges may list their stocks on the Hong Kong Stock Exchange as H-shares, or on the New York Stock Exchange as N-shares. N-shares are trading as American Depositary Receipts (ADRs). H-share companies must report financial statements in compliance with International Accounting Standards (IAS) or Hong Kong standards (HK GAAP), in addition to the Chinese standards. In other words, all H-share companies' accounting reports must have two sets of figures - figures based on the Chinese accounting rules and figures based on either HK GAAP or IAS - with explanations for any differences between the two. Unlike the case of B-shares, H-shares may have different voting rights from A-shares and provisions are in place for arbitration between the two when a dispute arises. Dividends for H-shares must be paid in Hong Kong dollars. Companies seeking to list shares on the New York Stock Exchange, on the other hand, must provide financial statements in accordance with U.S. GAAP and register the offerings under the U.S. Securities Act. The disclosure and listing requirements at the New York Stock Exchange are among the most stringent in the world.

Some N- and H-share companies bypass the home-country bourse altogether and raise all of their equity capital abroad. Since these companies do not have A-shares locally listed in China, they are not included in our study. Likewise, a few B-share companies without A-shares are excluded from our study.

C. The Legal and Regulatory Environments

In the early stage of China's stock market development, multiple government agencies competed over the right to regulate the nascent stock markets, with unclear mandates for each of

[8] Note, however, that since early 2001, Chinese investors with foreign currency accounts may purchase B-shares.

the agencies.[9] As a result, significant leeway and gaps existed in the listing requirements and the supervision of trading activities. The problem was more pronounced for domestic A-shares than for offshore shares. The China Securities Regulatory Commission (CSRC), established in 1992, had sole jurisdiction over overseas issues from its inception. The CSRC made efforts to conform to international standards and thus imposed rather stringent requirements over companies seeking overseas listing. In October 1997, the central government, in an effort to strengthen financial regulation in the wake of Asian financial crisis, granted the CSRC the sole regulatory authority for all the activities in the stock as well as bond markets in China.

The first accounting standard, *Disclosure of Related Parties,* became effective in May 1994. All listed companies are required to release their half-year statements by the end of August and report their annual statements by the end of the first quarter of the following year. The calendar year is commonly used as the fiscal year by Chinese firms. The first securities law was introduced in 1992, but it subsequently went through many changes and amendments. A comprehensive and unified national law on securities was finally passed in December 1998 and became effective on July 1, 1999. The *Securities Law* addresses issuance and trading of securities, takeover of listed companies, stock exchanges, securities firms, securities intermediaries, and regulatory authorities.

Before the adoption of new Securities Law of 1999, there were no market-driven listing procedures for IPOs; rather, the government maintained a quota and approval system. As a response to the market fluctuations in early years, the central government implemented an IPO quota system to control the supply of new equities. By regulating the overall IPO quota, the government effectively controlled the supply of new stocks.[10] The central government allocated quotas among the provinces through active bargaining among the ministries and regions. However, the allocation process often allowed local governments to list well-connected but poorly performing firms. Some companies even paid bribes to local officials to secure permission for their share offerings.[11] Under the new law of 1999, a market-driven process for stock listing has been adopted. An independent committee within the CSRC was established to

[9] The regulatory government agencies included the nation's central bank (People's Bank of China), the State Planning Commission, the China Securities Regulatory Commission, the Provincial Securities Offices and other local authorities.
[10] For examples, the quota for new listings in 1997 was 30 billion yuan, while that for 1996 was 15 billion yuan.
[11] "China discovers high level of IPO bribes," Financial Times, June 11, 2002.

decide whether companies have met the listing requirements. This change, along with tighter disclosure rules, largely succeeded in de-politicizing the listing process.

In a mature stock market, suspension or delisting of unqualified companies is a necessary measure to ensure the market's quality. However, until April 2001, no firm had been suspended or delisted in China because of financial failures.[12] In February 2001, the CSRC announced that it would start delisting companies that had lost money for three consecutive years.[13] To monitor the money-losing firms, the stock exchanges categorize those companies that have recorded two consecutive years of losses into the so-called "special treatment" (ST) shares. Interestingly, the new policy received immediate response from the stock market. Following the announcement, most of the A-shares under "special treatment" fell by nearly five percent,[14] the maximum allowable daily price change.[15] Formerly, investors were insensitive to financially distressed companies, buying them in the belief that the government would offer the distressed firms a helping hand rather than remove them from the stock exchanges.

D. Investor Profiles

During the decade-long history of Chinese stock markets, individual investors, who have dominated stock trading, have been driven by speculative sentiments. Prior to the inception of the stock markets, bank savings and treasury bonds were the only investment instruments available for Chinese residents. With a gross domestic annual savings rate of about 40 percent, China maintains one of the highest proportions of income savings in the world.[16] However, double-digit inflation in the late 1980s often sent the real interest rates on bank savings into negative territory. Because of low real interest rates and scarce investment alternatives, the introduction of stocks as a new investment options has attracted a great deal of attention. Investor

[12] In several cases the government suspended trading on a few stocks to investigate abnormal price movements. For example, in May 1997, trading was suspended on four companies upon investigation of abnormal price movements; the suspensions were lifted several days later. Suspensions were also placed on a number of companies engaging in asset restructuring, in cases where speculation was rampant. In May 1998, for instance, six companies, five of which are textile firms, had trading suspended for one month because of activities related to asset restructuring.

[13] In April 2001, a washer machine manufacturer in Shanghai became the first public company to be delisted because of its financial losses.

[14] Financial Times, February 22, 2001.

[15] The two Chinese stock exchanges impose a price limit to control volatility. Both exchanges allow share prices to fluctuate by a maximum of 10 percent in either direction per day. However, “ST” companies are limited to five percent daily fluctuation.

[16] The savings rate was reported to be 41.5 percent in 2000 according to Asian Development Bank’s Country Economic Review - the People’s Republic of China, November 2001.

desire for quick gains from holding stocks, coupled with lax market regulations, has fostered a speculative atmosphere in the stock markets. A series of media reports attests to the speculative nature of Chinese stock markets. Based on interviews with individual investors, the *Financial Times* (July 11, 1997) reports that interviewees never held shares for more than one month and that they acted on tips from friends, newspapers, and daily stock market programs on the state-run television. Similarly, the *International Herald Tribune* (July 2, 1999) reports that typical small investors held only a couple of stocks for less than a month before selling them. Our own inquiry with Shanghai-based brokerage firms in June 2001 indicates that typical Chinese investors generally hold no more than several stocks. In the past, investors held even fewer stocks as they had smaller funds available for investment.

Mutual funds were not available to investors until the late 1990s. A number of closed-end investment funds emerged after the government passed the *Provisional Measures of the Administration of Securities Investment Funds*, the guideline for institutional stock trading in November 1997.[17] Nevertheless, institutional investors are still playing a rather limited role in the often-volatile stock market where long-term investors are scarce and speculators abound.

To summarize, Chinese investors tend to be short-term traders seeking speculative profits. Given their limited investment capital and the lack of mutual funds, they are either unwilling or unable to diversify their investment portfolios. Apparently, the lack of mutual funds makes diversification very difficult for those investors who have limited funds but wish to diversify.

II. Main Hypotheses

Based on the key characteristics of Chinese stock markets discussed in the previous section, we derive the following testable hypotheses, (H1) – (H5), pertaining to asset pricing in China.

Hypothesis 1: *As investors don't diversify their investments in China, stocks will be priced according to total risk, rather than systematic risk.*

Assuming perfect capital markets where investors fully diversify their portfolio holdings, the Sharpe-Lintner CAPM shows that securities will be priced solely with reference to the systematic (beta) risk. However, Chinese investors don't diversify much due to a combination of

[17] For example, in April 1998, the first two closed-end funds emerged with 20 percent of their capital in bonds and 80 percent in stocks. In July 1999, the CSRC gave a green light to two active index funds, each of which invest 50

factors such as limited investable funds, lack of mutual funds, and speculative tendencies. Merton (1987) derives a CAPM under imperfect markets where investors only hold stocks that they 'know about.' The Merton model demonstrates that when investors don't fully diversify, securities may be priced according to both systematic as well as unsystematic risks. We check this possibility for China, although Chinese investors do not appear to diversify to the extent that the Merton model may become relevant. The Merton model can be viewed as addressing an 'intermediate' case where investors diversify substantially but not fully.

Hypothesis 2: *Short-term-oriented, speculative investors in China will pay a premium for the liquidity of stocks.*

Using U.S. stock market data, Amihud and Mendelson (1989) show that investors are willing to pay a premium for stocks' liquidity, another departure from the classical CAPM. Liquidity will be valued even more in a situation where investors tend to be short-term traders, as many in China seem to be. As shown in Table I, the average annual turnover ratio in the two Chinese stock markets is above 500 percent over the period from 1991 to 2000. This ratio is much higher than that in many developed markets, likely reflecting speculative trading behavior.[18] Obviously, transactions costs cannot be spread out very much over a short horizon. As a result, we hypothesize that Chinese investors will be particularly willing to pay a premium for the liquidity of stocks.

Hypothesis 3: *Investors will pay a premium for dividend-paying stocks as dividends signal the management's willingness to return cash flows to outside shareholders, rather than expropriate them.*

Apart from some "Anglo-Saxon" countries, such as the United States, Canada, and the United Kingdom, shareholder wealth maximization is not a wholeheartedly embraced goal of corporate management. The problem is more acute in nascent/emerging/transitional markets where the legal codes, in general, and corporate governance, in particular, are less developed. In these markets, outside shareholders can be vulnerable to expropriation by controlling insiders (the state and state-affiliated institutions in the Chinese context), with the former having little recourse.

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percent of their funds in the Shanghai and Shenzhen composite indices. As of June 2000 there were 22 closed-end funds with total assets of 50.5 billion Yuan operated in the stock and bond market.

[18] According to the NYSE website www.nyse.com, for example, the NYSE annual turnover rate is 94 percent for 2001.

Facing this situation, investors would be expected to prefer those stocks returning cash flows to shareholders to those that do not. We thus hypothesize that investors will pay a premium for stocks that pay dividends to outside shareholders, ceteris paribus. Previous studies, e.g., La Porta, Lopez-de-Salines, Shleifer, and Vishny (2000) and Faccio, Lang and Young (2001), have examined the role of dividends in limiting insider expropriation. These studies view dividends as an instrument for resolving the agency problem between the controlling insiders and outside shareholders by removing cash flows from insider control.

Hypothesis 4: *Investors will require a lower return on a stock if the company has offshore shares for foreigners, as this signals more stringent disclosure-listing requirements and more rigorous monitoring of the company, generating favorable externalities for local shareholders.*

As discussed in the previous section, some domestic companies made IPOs mainly through their political connections, rather than owing to their financial merits. By contrast, the issuance of offshore shares, such as B-, H-, and N-shares, is subject to much more stringent disclosure and listing standards. As a result, local shareholders can benefit from the information externality generated by offshore shares. Foreign shareholders, especially institutional investors, also may provide more rigorous monitoring of management, thereby further benefiting local shareholders. In addition, as the company can raise foreign capital at a competitive rate, it can undertake more profitable investment projects, further enhancing firm value. We thus expect that local shareholders will be willing to pay a premium for A-shares if the company offers offshore shares.

Hypothesis 5: *Given that the proportion of tradable public shares varies greatly across individual firms in China, ceteris paribus, the lower the proportion of public shares of a firm, the higher the price investors will pay for the shares.*

As shown in Table II, the proportion of public shares available for investors varies from 1.5 percent to 76.0 percent, with the mean of 32.6 percent for our sample firms. This means, of course, that the availability of shares for outside investors varies a great deal across firms. If the demand for stocks is downward-sloping, the proportion of tradable shares will systematically affect the prices and thus returns of Chinese shares. The fact that the supply of shares to the public varies a great deal across firms provides us with an opportune context for testing the presumption of a downward-sloping demand curve in the Chinese markets. Previously, Shleifer

(1986) shows that the supply of shares is negatively related to share prices, reflecting the downward-sloping demand curve. When the Chinese government announces its plan to sell additional shares to the public out of its holdings of state shares, public share prices tend to react negatively, sometimes forcing the government to cancel or postpone the plan. This observation suggests that share prices are negatively related to the supply of shares in China.

III. Methodology and the Data

A. Test Methodology

Our empirical method is based on the traditional two-pass regression approach used by Fama and MacBeth (1973) and Fama and French (1992). In the first-pass regression, the market beta for each asset is estimated from time-series data. In the second-pass regression, excess stock returns are regressed cross-sectionally against the estimated betas and other explanatory variables in order to estimate the risk premiums for different pricing factors.

In the presence of a risk-free asset, the classical CAPM predicts the following cross-sectional relationship between the ex ante risk premium and the βs:

$$E(\widetilde{R}_i) = \beta_i E(\widetilde{R}_m), \text{ and}$$

$$\beta_i = \frac{Cov(\widetilde{R}_i, \widetilde{R}_m)}{Var(\widetilde{R}_m)}, \tag{1}$$

where $\widetilde{R}_i$ is the return on security *i* in excess of the risk-free rate, $\widetilde{R}_m$ is the excess return of the market portfolio and β_i is the amount of market risk of asset *i*. Once the betas are estimated, the CAPM can be tested by estimating a series of cross-sectional regressions of realized excess returns on betas. Specifically, at each point of time, which is measured in monthly intervals in this study, the regression model is:

$$R_{it} = \theta_{0t} + \theta_{1t}\beta_{it} + \varepsilon_{it} \ , \qquad i = 1,2,\ldots N \tag{2}$$

where R_{it} is the realized excess return on asset *i* at time *t*, N is the total number of assets at each point of time, which may vary over time, θ*'s* are the coefficients and ε is the residual from the regression. Fama and French (1992) extended equation (2) to include additional explanatory variables:

$$R_t = I_N\theta_{0t} + \beta_t\theta_{1t} + F_t\Theta_{2t} + \varepsilon_t \tag{3}$$

where $R_t = (R_{1t}, \ldots, R_{Nt})'$ is the vector of returns in excess of the risk-free rate for N assets, $\beta_t = (\beta_{1t}, \ldots, \beta_{Nt})'$ is the vector of market betas, F_t is an (N × K) matrix of additional explanatory variables, Θ is a vector of coefficients and ε_t is a vector of idiosyncratic errors with zero mean vector and a homoskedastic covariance matrix. If the CAPM holds, the risk premium for market risk (β), i.e., θ_1, should be positive and significantly different from zero, whereas θ_0 and the risk premiums for the other explanatory variables, i.e., Θ_2, should not be significantly different from zero.

Because the prices of risks are the expected values of the corresponding regression coefficients in equation (3), the time-series of monthly coefficients estimated from cross-sectional regression is used to test the significance of the price of risk over the sample period. The following t statistic is used to test whether a specific risk premium is significantly different from zero:

$$t_j = \frac{\hat{\theta}_j}{\sigma(\hat{\theta}_j)}, \qquad j = 0,1,\ldots K+1 \tag{4}$$

$$\text{where} \quad \hat{\theta}_j = \frac{\sum_{t=1}^{T} \hat{\theta}_{jt}}{T} \qquad \text{and} \qquad \sigma(\hat{\theta}_j) = \sqrt{\left(\frac{\sum_{t=1}^{T} (\hat{\theta}_{jt} - \hat{\theta}_j)^2}{T(T-1)} \right)}, \tag{5}$$

T is the number of months in the estimation.

In order to extract information efficiently from a rather short time-series of available return data for a relatively small number of stocks and also to allow for possibly time-varying betas, we use a parsimonious bivariate GARCH(1,1)-in-mean process to estimate the β's of individual stocks. This process allows the estimated betas to vary each month based on the previous assessment of risk as well as on the new information arriving in the market. The conditional beta for asset *i* in period t, $\hat{\beta}_{it}$, is estimated by dividing the conditional covariance of the asset with the market by the conditional market variance:

$$\hat{\beta}_{it} = \frac{H_{im,t-1}}{H_{m,t-1}} \tag{6}$$

Previously, Song, Liu, and Romilly (1998) report that the daily and monthly conditional variances of returns in the two Chinese stock markets are best modeled by GARCH (1,1)-in-mean specification. Su and Belton (1998) also find that the volatility of Chinese stock markets is

time-varying. Our own test also confirms that both Shanghai and Shenzhen composite indices and the market value-weighted combined index have autocorrelated error terms and heteroscedastic error variance.[19] We employ a specification proposed by Ding and Engle (1994) and implemented by others, such as DeSantis and Gerald (1997) and Asgharian and Hansson (2000).[20]

B. Description of the Data

B. 1. Sample selection and the proxy for market return

The data used in this paper are from the *Taiwan Economic Journal's* (TEJ) China database which provides daily and monthly stock price information as well as financial statements and macroeconomic data. We use monthly returns in asset pricing tests. TEJ provides returns adjusted for dividends and rights offerings. Since we estimate some of the parameters such as the total risk using returns on a 24-month rolling window, we only include stocks with a minimum of 36 monthly return observations so that the test period can be at least 12 months. This implies that stocks listed in 1998, 1999 and 2000 are not included in our sample.

The 'market' portfolio return series, covering both the Shanghai and Shenzhen exchanges, is not readily available. Although there are several existing indices tracking stocks from both exchanges, they either cover a small number of large companies or do not cover the entire sample period.[21] In this study, we construct a proxy for market returns in the following manner. We first compute the monthly returns of Shanghai and Shenzhen composite A-share indexes separately. We then compute the value-weighted average of the returns using the relative (aggregate) market values of the two exchanges observed at the end of each month as weights. The weighted average market returns thus obtained are used as our proxy for the 'market' returns. We use monthly return on the one-year fixed deposit - the only short term interest rate series available for the entire sample period - as a proxy for the risk-free interest rate.

[19] Results are not reported here for brevity but available upon request.
[20] Details of conditional beta estimation are summarized in Appendix I.
[21] For example, the "Xinhua Stock Index", started in July 1993, only targets 30 stocks from the two exchanges; and the "Huading Index", started on January 3, 2000, tracks 33 key high tech stocks from the two exchanges. Foreign-published indices also have limitations. For example, the Dow-China 88, tracking the two Chinese exchanges, started in 1996. The MSCI China Free Index covers stocks not only from the Chinese exchanges but also H-shares and Red-Chip stocks (Chinese controlled companies that are incorporated and listed in Hong Kong). These indices are thus not suitable for our study.

B.2. Seasonal Pattern in Chinese Stock Returns

Before we move on, we briefly examine the seasonal pattern in Chinese stock market returns. Table III provides the mean monthly returns for Shanghai and Shenzhen A-share indices as well as for the combined A-share index. Below the mean return, t-statistics are provided in parentheses for testing the hypothesis that the population mean is zero. To test the hypothesis that the return in month i (i = January, February, …, December) is equal to the mean return during the rest of the year, we estimate the regression $R_t = \alpha_{0i} + \alpha_{1i}D_i + \varepsilon_t$, where R_t is the monthly index return and D_i is a dummy variable representing the rest of the year.[22] The dummy D_i equals zero in month i and one for the rest of year. If the average return in month i is the same as the average return during the rest of the year, the estimate of α_{1i} shall not be statistically different from zero. If α_{1i} is *negative* (*positive*) and statistically significantly different from zero, then the mean return of month i is significantly *larger* (*smaller*) than the average return during the remaining eleven months of the year. The regression is estimated for each of the 12 months.

It is interesting to note from Table III that December has the lowest mean (negative) return of the year for the combined index as well as for Shanghai and Shenzhen indices. This suggests a major sell-off in December. Since there are no capital gains taxes in China, the December sell-off cannot be related to taxes. Inquiries with knowledgeable people suggest that some SOEs including banks and security firms take illicit positions in stock markets with public funds. They tend to liquidate their positions in December to hide from the government audits that usually take place near the end of the fiscal year that coincides with the calendar year in China. Individual investor liquidity needs before the new year may also reinforce the December sell-off. In contrast, August has the highest mean return of the year. Results of α_{1i} indicate that the August mean return is significantly higher than the mean return over the remaining 11 months for the combined market and for the Shanghai stock market. This August pattern may be information driven. It is recalled that August is the month when the listed firms report their half-year financial statements. Figure 1 illustrates the same monthly return pattern. The December and August effects are highly visible from the figure. Clearly, we do not observe the 'January effect' in China. It is cautioned, however, that we only use eight-year data in this analysis.

[22] Previously, Corhay, Hawawini and Michel (1987) used the same methodology.

C. Explanatory Variables

In asset pricing tests, we consider a set of explanatory variables that are listed and briefly described in Table IV. Summary statistics for some of the variables are provided in Table V. We start the estimation of beta for individual stocks whenever return data are available. To avoid the effect of outliers, we exclude betas outside the interval [-0.5, +4]. This only accounts for a tiny portion of the total observations. Out of 36,577 beta estimates for the two stock markets, there are four cases where beta is greater than 4 and 23 cases where beta is less than -0.5. In addition to market risk, we also compute the measures for residual risk as well as total risk. Details are in the next section.

We construct accounting ratios and then match them with the excess return series in a manner similar to Fama and French (1992). As mentioned before, all publicly listed firms in China are required to release their half-year reports by the end of August and unveil their annual reports by the end of the first quarter in the following year. To ensure that accounting numbers are in investors' information sets whenever they are used in the asset pricing test, we use the market value of equity as of the end of December of year t-1 to measure the accounting ratios. In the cross-sectional regressions, the accounting ratios for individual companies at the end of year t-1 are matched with their stock returns for the months from July of year t to June of year t+1.

Defining firm size for the Chinese public companies is a bit of a complicated matter. As shown in Table II, the proportion of tradable shares varies across firms. Therefore, the market value of tradable shares, a proxy for firm size commonly used in the empirical studies, may not be comparable across public firms in China since it may not accurately reflect the actual economic scale of a firm. To account for firm size, we construct three proxies: (i) The natural logarithm of a firm's book value of total assets in December of year t-1. This number is from the firm's balance sheet; *(ii)* The natural logarithm of the market value of total tradable shares, measured in June of year t for the regression from July of year t to June of year t+1; and, (iii) The natural logarithm of the value of total outstanding shares including both tradable and non-tradable shares measured in June of year t, computed using the price of tradable shares.

For monthly cross-sectional regressions from July of year t to June of year t+1, the book-to-market ratio is defined by dividing the book value of equity from a firm's annual statement issued in December of year t-1 by the total (including both tradable and non-tradable) value of the firm at end of December of year t-1. Similar to Fama and French (1992), we use the natural

logarithm of the book-to-market ratio in the test. We also use the natural logarithm of the ratio of the total asset (book value) to the total equity (market value) as an alternative proxy for book–to-market ratio. We define leverage as the debt-to-equity ratio, obtained by subtracting one from the ratio of book value of asset to book value of equity. [23] Again following Fama and French (1992), we define *E/P positive* and *E/P dummy* variables in the following manner: When earnings are positive, *E/P positive* is the ratio of total earnings to the total value of A-shares (including tradable and non-tradable shares) and *E/P dummy* is zero. When earnings are negative, however, *E/P positive* is zero and *E/P dummy* is one. This approach allows us to single out the companies with negative earnings. The coefficient for *E/P dummy* in the cross-sectional test captures the risk premium for the firms with negative earnings. To test hypothesis 2, we include a proxy for liquidity, i.e., the lagged monthly turnover ratio as measured by the total trading volume in the month divided by the total number of tradable shares outstanding. Furthermore, we consider dividend yields to test hypothesis 3. The cash dividend is typically paid once a year, with several companies paying twice a year.[24] We compute the dividend yield by dividing the annual dividend payment by the closing price of the trading day prior to the dividend payment. Dividing the annual dividend yield by 12 gives the monthly dividend yield for the year.

Our starting date for the asset pricing test is January 1995. There are two reasons for this choice. First, since we estimate the variance of returns (total risk) and the variance of residual returns (residual risk) on a 24-month rolling window, two years of data are needed for the first estimate. Also, there were too few stocks available for testing in the early years. Second, the *Company Law* that results in a unified accounting standard was enacted in 1994. It requires uniform financial statements for all listed companies and brought an end to incomparable accounting numbers across firms, a situation existing prior to 1994. As mentioned previously, we only include stocks that have a minimum of 36 monthly return observations in our study, with stocks listed after January 1998 being excluded. Taken together, companies included in the monthly cross-sectional regression varies over time, ranging from 188 in January 1995 to 643 in December 2000.

[23] To avoid possible outliers or recording errors in the accounting data, we omit accounting numbers that involve negative assets (17 observations in the two markets). In the calculation of leverage, we also omit the ratios of asset-to-equity that is greater than 30 (seven observations in the two markets) or less than zero (17 observations in the two markets).

IV. Empirical Results

In this section, we first test if the classical CAPM holds in China, with a view toward identifying the relevant risk measures in China. We then expand our asset pricing test by taking into account other explanatory variables. Our expanded tests focus on determining the validity of the hypotheses, (H1) – (H5).

A. Does the CAPM Hold in China?

In testing the CAPM, Fama and MacBeth (1973) focused on the three testable implications of the model. First, the relationship between the expected returns on securities and their systematic (beta) risks is linear. Second, the systematic risk is a complete measure of the risk of security *i.* Third, the market risk premium should be positive.

We start our investigation of the pricing mechanism in China with the following stochastic generalization of the CAPM:

$$\tilde{R}_{it} = \tilde{\gamma}_{0t} + \tilde{\gamma}_{1t}\beta_{it-1} + \tilde{\gamma}_{2t}\beta_{it-1}^2 + \tilde{\gamma}_{3t}S_{t-1}^2(e_i) + \tilde{\eta}_{it} \tag{9}$$

where $\tilde{R}_{it}$ is the excess return on stock *i* at time *t*, β is the systematic risk and $S_{t-1}^2(e_i)$ is the residual risk measured by the variance of the residuals from the market model, with the variance computed over a 24-month rolling window. The residual risk thus computed represents the unsystematic risk in our study. In the context of equation (9), the CAPM implies: (i) $E(\tilde{\gamma}_{1t}) > 0$, (ii) $E(\tilde{\gamma}_{2t}) = 0$, and (iii) $E(\tilde{\gamma}_{3t}) = 0$. Equation (9) thus allows us to test the proposition that both the systematic and unsystematic risks are priced in China.

Table VI reports the time-series averages of coefficients estimated from the cross-sectional regressions of equation (9). The results show that for the overall sample period, γ_1, the coefficient for β_i, is positive but insignificant, whereas γ_2, the coefficient for β^2, is negative and insignificant. In contrast, γ_3, the coefficient for the residual risk, is positive and significant for the entire sample period as well as for each subperiod. This finding contrasts sharply with the Fama and McBeth finding that the residual risk is not priced in U.S. stock markets. As can be seen in Table VI, both β and β^2 appear to be priced during the second subperiod, 1998 through 2000, whereas neither is priced during the first subperiod, 1995 through 1997. Note also that the average value of the adjusted R-squares for the regression is quite low, at 4.0 percent for the

[24] In 1999, for example, 260 of our sample firms paid dividends once, whereas six firms paid twice.

overall period. Considering that only the systematic risk, β, should be priced if the CAPM holds, our findings here are not supportive of the model's relevance in China.

B. Does Total Risk Matter?

Our previous finding, i.e., that the unsystematic risk is priced while the systematic risk is not, is puzzling since no theory would predict this result. According to the Merton model (1987), for example, both the systematic and unsystematic risks will be priced if investors diversify to a limited extent; if they fully diversify, the systematic risk will be priced, but not the unsystematic risk. However, since many individual investors may hold only a few stocks in China, our previous finding points to an intriguing possibility: It may actually be the total risk that is being priced in the Chinese stock markets. In order to explore this possibility, we estimate the asset pricing equations that relate to total risk. As mentioned before, total risk is measured by the variance of individual stock returns computed over a 24-month rolling window.

Table VII presents the average slopes and t-ratios from regressions where the total risk measure ($\hat{\sigma}_i^2$) is considered. As expected, Table VII shows that the systematic risk is not priced in all cases. But the coefficients for both the residual risk and the total risk turn out to be positive and significant for the overall sample period. However, the average adjusted R-square is higher for the regression with the total risk than for the one with the residual risk. In the case of entire sample period, for example, the mean adjusted R-square from the cross-sectional regression is 4.0 percent for the model with total risk and is 2.2 percent with residual risk, implying that total risk does a better job than residual risk in explaining the cross-sectional variation in stock returns in China. This result holds for the overall sample period as well as for each subperiod, regardless of whether the market risk is controlled. Overall, Table VII suggests that stocks may indeed be priced according to the total risk in China.

To gain further insight into the role of total risk in Chinese asset pricing, we form portfolio quintiles based on the ranking of stocks in terms of the total risk (TR), beta risk (Beta), log of tradable market capitalization (Size), and book-to-market ratio (B/M). Stocks are sorted into quintiles based on the ranking of each criterion, independent of other criteria. Stocks belonging to the intersection of two separate portfolio quintiles are used to form each of the 25 portfolios. Table VIII provides the average monthly returns for quintile portfolios. We first compute the equally-weighted portfolio returns for every month and then compute the time-series average of

the monthly portfolio returns. The portfolio is rebalanced each month. The sample period extends from 1997.01 to 2000.12. To retain sufficient stocks in each 'intersection' portfolio, we do not consider earlier periods when fewer stocks were available.

As can be seen from Table VIII, the average return monotonically increases with the level of total risk of the portfolio. The monthly average return for portfolio TR1, the portfolio with the lowest total risk, is 2.34 percent, compared to the average return of 2.91 percent for TR3 and 3.46 percent for TR5, the portfolio with the highest total risk. Similarly, the average return decreases monotonically as the firm size increases. As can be seen in Panel B, the average monthly return is 5.24 percent for portfolio Size1, the smallest portfolio, 2.91 percent for portfolio Size3, and 0.85 percent for portfolio Size5, the largest portfolio sorted by firm size. Clearly, there is a strong firm size effect in China. Panel C of Table VIII shows that as the book-to-market ratio (B/M) rises, the average return goes up initially and then levels off. The average return is 1.91 percent for portfolio B/M1, 3.44 percent for B/M3, and 3.22 percent for B/M5. It appears that the book-to-market ratio has a weaker effect on stock returns than either firm size or the total risk. Panel A of Table VIII shows that the beta risk has no clearly discernable relationship with stock returns. Also, for each portfolio quintile sorted by the beta, firm size, and book-to-market ratio, the average return tends to increase as the level of total risk increases, albeit not monotonically. This implies that the total risk may indeed affect stock returns, independent of other factors.

C. The Pricing of Multiple Factors

Our analysis so far shows that total risk plays a significant role in the risk-return relationship in Chinese stock markets. We now expand our analysis by incorporating additional factors that may affect pricing in China's nascent stock markets. We use Fama and French (1992) as a point of departure and further incorporate those factors that may uniquely affect asset pricing in China.

In this section, we conduct a multi-dimensional analysis similar to Fama and French (1992). In addition to the explanatory variables considered by Fama and French, i.e., firm size, book-to-market ratio, *E/P dummy, E/P positive*, and leverage, we also include a liquidity measure. Amihud and Mendelson (1989) study the role of liquidity, measured by the bid-ask spread, in asset pricing. They find that investors require higher expected returns for less liquid assets in U.S. stock markets. To account for the role of liquidity spelled out in hypothesis (H2), we

include the lagged monthly average turnover ratio -the total trading volume in the month divided by the total number of tradable shares outstanding -as a proxy for liquidity. In addition, we include dividend yield to test hypothesis (H3). To test hypothesis (H4), we include an offshore dummy variable: The offshore dummy is one if a firm has offshore shares (B-, H- or N-shares) and zero otherwise.[25] Lastly, we include the percentage of tradable shares (public shares) in the regression to test hypothesis (H5).

Table IX provides time-series averages of the slopes from month-by-month cross-sectional regressions of stock returns on the explanatory variables for the overall sample period, with t-statistics provided in parentheses. Several results stand out from Table IX. First, as can be seen from the first row of the table, firm size has a significant and negative effect on stock returns. This significant, negative relationship persists, irrespective of which proxies are used for firm size.[26] On the other hand, the book-to-market ratio is found to have a significant and positive effect on stock returns.[27] In other words, investors require higher returns on stocks of firms with higher book-to-market ratios since these firms are likely to be financially distressed as argued by Chan and Chen (1991). Thus, as in U.S. and other stock markets, there exist size and value premiums in China. As can be seen from Table IX, these premiums remain robust to the inclusion of other explanatory variables. Consistent with our previous finding, market (beta) risk is found to have no significant effect on stock returns in any of the specifications.

Second, consistent with our previous findings, total risk is found to have a significant and positive effect on stock returns even if we control for the effects of other variables including beta, firm size, and book-to-market ratio. This finding supports hypothesis (H1) and is consistent with the observation that investors don't diversify in China for a variety of reasons. Note that the average R-square substantially increases from 9.4 percent to 13.5 percent when total risk is added to the three Fama-French factors.

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[25] Our sample includes (i) 84 A-share companies that offer B-shares to overseas investors and (ii) 19 A-share firms that offer H-shares on the Hong Kong Stock Exchange. Three of these 19 companies also have their shares listed on the New York Stock Exchange. They are China Eastern Airlines, Jinlin Chemical and Shanghai Petrochemical.

[26] We use three alternative proxies for firm size in our analysis: the natural logarithm of a firm's book value of total assets, the natural logarithm of the market value of total tradable shares, and the natural logarithm of the value of total outstanding shares including both tradable and non-tradable shares. The results are essentially not affected. For brevity, the results for other size proxies are not reported for brevity but available upon request.

[27] We also use the natural logarithm of the ratio of the total asset (book value) to the total equity (market value) as an alternative proxy for book–to-market ratio. The results are qualitatively the same. For brevity, those results are not reported but available upon request.

Third, the liquidity measure is found to have a significant and negative effect on stock returns, implying that investors are willing to pay a premium for the liquidity of stocks. This is similar to the finding of Amihud and Mendelson (1989) from U.S. stock markets. Given the short-term orientation of Chinese investors, it is not surprising that they particularly value the liquidity of stocks. The coefficients for liquidity remain negative and significant in all model specifications. Moreover, the average R-square increases from 13.5 percent to 16.1 percent when the liquidity variable is added to the regression. Our findings here clearly support hypothesis (H2).

Fourth, the coefficient for dividend yield is found to be negative, as hypothesized, but insignificant. Our findings thus do not lend firm support to hypothesis (H3). This result is in contrast to the findings related to U.S. stock markets, e.g., Litzenberger and Ramaswami (1979), where investors require higher returns on stocks with higher dividend yields for tax reasons. Since the marginal effect of dividend yield on expected return may be related to other firm characteristics, we consider cross-product terms with the offshore dummy variable as well as with the percentage of tradable shares variable. Both cross-product terms turn out to be insignificant. We thus conclude that the role of dividends as a signaling mechanism for shareholder-friendly corporate governance may not have taken root in China.

Fifth, the coefficient for the offshore dummy variable is found to be significantly negative, implying that ceteris paribus, investors require lower returns on A-shares of the companies that have offshore shares than on A-shares without such offshore counterparts. This finding supports hypothesis (H4). As discussed before, companies have to satisfy more stringent disclosure/listing requirements when they plan to issue B-, H- or N-shares to overseas investors, thereby generating favorable information spillover for local shareholders. To the extent that foreign investors, some of whom may be sophisticated and powerful institutions, can provide more effective monitoring of the company management, local shareholders can additionally benefit from improved corporate governance. Clearly, Chinese investors are cognizant of these benefits and this cognizance is imputed in higher stock prices for those firms with offshore shares.

Sixth, the coefficient for the proportion of tradable shares, which represents the supply of shares to the public, is found to be positive and significant, supporting hypothesis (5). This result suggests that the demand curve for stocks is downward-sloping, with stock prices falling with

increasing supply of tradable shares. As a result, the proportion of tradable shares has a positive effect on stock returns.

Lastly, the coefficient for *E/P dummy* is insignificant, but that for *E/P positive* is significantly positive. The insignificant E/P dummy seems to reflect investors' expectations that the government will bail out listed companies when they are in financial difficulties. On the other hand, the positive coefficient for *E/P positive* variable implies that a high E/P ratio (earnings-to-price ratio) may reflect financial distress like a high book-to-market ratio.

We also replicate the tests for subsample periods in order to examine how the asset pricing mechanism might have evolved in China. Table X presents the test results for two equally divided subsample periods, 1995 through 1997 and 1998 through 2000. As can be seen from Panel B of the table, the test results for the second subperiod are qualitatively the same as those from the overall sample period that we have discussed above, with the sole exception that the coefficient for the leverage variable becomes negative and significant. In more recent years, Chinese investors apparently require higher returns on stocks of those firms with higher leverage. All the other results essentially remain the same as those for the entire sample period. Results from the first subperiod, however, are substantially different from those from the second subperiod and, for that matter, from the overall period. For example, only four explanatory variables, i.e., firm size, total risk, *E/P positive*, and the offshore dummy variable, are found to be significant. On the other hand, book-to-market ratio, liquidity, and the proportion of tradable shares are found to be insignificant. Comparing the test results from the two subperiods, one may say that the asset pricing mechanism in China has become more rational in recent years.

V. Concluding Remarks

In recent years, Chinese stock markets have emerged as among the largest and fastest growing emerging/nascent markets in the world. Domestically, these markets have played a critical role in privatizing the state owned enterprises (SOEs) and spreading share ownership among the public. Considering the robust economic growth in China and the government's firm commitment to privatization, Chinese stock markets are likely to continue to grow in the foreseeable future. It is thus of considerable importance to understand how securities are priced in China. Currently, however, there exists a widely shared perception among foreigners and

locals that Chinese stock markets are essentially legalized casinos where no logic prevails for pricing securities.

In this paper, we investigate the asset pricing mechanism in China's nascent stock markets utilizing the data from the first 10-year period of stock trading. Like other nascent and emerging markets, Chinese stock markets are highly imperfect, reflecting limited investment opportunities, weak shareholder protection, ownership restrictions, etc. Our focus is on the effect of these market imperfections on the asset pricing mechanism.

We have obtained several noteworthy results. First of all, stocks are priced according to total risk in China, not the market risk as implied by the classical CAPM. This reflects the fact that Chinese investors don't diversify for a variety of reasons. In addition, short-term, trade-oriented Chinese investors pay a premium for the liquidity of stocks. Third, Chinese investors pay a premium for a stock if it has an offshore counterpart for foreigners, as local shareholders may benefit from favorable externalities generated by offshore shares. Fourth, we found significant firm size and value premiums in the Chinese stock markets, as in other mature markets. Fifth, we found a significant positive relationship between the proportion of tradable shares and stock returns, consistent with the notion of a downward-sloping demand curve in China. Overall, given various market imperfections in China, stocks seem to be priced in a rather rational manner, in spite of the widespread perception to the contrary.

Appendix I
Details of the conditional beta estimation

The specification of conditional variance is the key to GARCH estimation. A full parameterization of GARCH (1,1) for the conditional variance H_t is

$$H_t = C'C + A'\varepsilon_{t-1}\varepsilon_{t-1}'A + B'H_{t-1}B \quad (1)$$

where C is an (N×N) symmetric matrix and A and B are both (N×N) matrices of constant coefficients. Though successful in the univariate GARCH process, the specification becomes less desirable in the multivariate GARCH process because of the difficulty in estimating the large number of unknown parameters. Therefore, in multivariate GARCH estimation, researchers usually either limit the number of assets N and/or impose restrictions on the process generating H_t. We adopt a common restriction, namely that both A and B are diagonal matrices with a conditional variance as follows:

$$H_t = C'C + aa' * \varepsilon_{t-1}\varepsilon_{t-1}' + bb' * H_{t-1} \quad (2)$$

where a and b are (N×1) vectors which include the diagonal elements of A and B respectively, and * is the Hafamard matrix product (element by element). To further simplify our estimation, we adopt a specification proposed by Ding and Engle (1994) and implemented by others, for example, DeSantis and Gerald (1997) and Asgharian and Hansson (2000). This specification of conditional variance assumes that covariance is stationary. Specifically, if the ε process is covariance stationary, its unconditional variance-covariance matrix is equal to

$$H_0 = C'C * (\ell\ell' - aa' - bb')^{-1} \quad (3)$$

Ding and Engle suggested replacing C'C in (3) with $H_0*(\ell\ell' - aa' - bb')^{-1}$. If a consistent estimator of H_0 is available, optimization needs to be performed only with respect to the parameters in *a* and *b*, instead of with respect to the parameters in C'C. This implies that in a diagonal system with N assets, the number of unknown parameters in the conditional variance equation is reduced from 2N + N(N+1)/2 to 2N. Substituting (3) into (2) yields

$$H_t = H_0 * (\ell\ell' - aa' - bb') + aa' * \varepsilon_{t-1}\varepsilon'_{t-1} + bb' * H_{t-1} \tag{4}$$

To account for time-variability in both betas and the market risk premium, we adopt a bivariate GARCH (1,1)-in-mean model so that the estimated beta varies each month based on the previous assessment of risk as well as the new information arriving in the market:

$$\begin{aligned} R_{it} &= \mu_i + e_{it} \\ R_{mt} &= \mu_m + e_{mt} \end{aligned} \tag{5}$$

where R_{it} is the excess return of a firm, and R_{mt} is the excess market return. The conditional variance and covariance matrix H_t is specified as in (4)

$$H_t = \begin{bmatrix} H_{it} & H_{im,t} \\ H_{im,t} & H_{mt} \end{bmatrix} \tag{6}$$

specifically,

$$\begin{aligned} H_{it} &= H_{i0}(1 - a_i^2 - b_i^2) + a_i^2 e_{it-1}^2 + b_i^2 H_{it-1} \\ H_{mt} &= H_{m0}(1 - a_m^2 - b_m^2) + a_m^2 e_{mt-1}^2 + b_m^2 H_{mt-1} \\ H_{im,t} &= H_{im}(1 - a_i a_m - b_i b_m) + a_i a_m e_{it-1} e_{mt-1} + b_i b_m H_{im,t-1} \end{aligned} \tag{7}$$

where H_{i0} and H_{m0} are the unconditional variances for security *i* and the market portfolio, respectively, and H_{im} is the unconditional covariance of security *i* with the market portfolio. The conditional beta for asset *i* in period t, β_{it}, is estimated by dividing the conditional covariance between the asset and the market by the conditional market variance:

$$\hat{\beta}_{it} = \frac{\hat{H}_{im,t-1}}{\hat{H}_{mt-1}} \tag{8}$$

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