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Abstract: Many companies on China's stock markets have separate, restricted classes of shares for domestic residents and foreigners. These shares are identical other than who can own them, but foreigners pay only about *one-quarter* the price paid by domestic residents. We show that plausible differences—about 4 percentage-points—in expected rates of return by foreign and domestic investors can account for the generally higher level and volatility of prices for domestic shares relative to foreign shares. We attribute low Chinese expected returns to the limited alternative investments available in China. We then explore the extent to which various company characteristics can explain cross-company differences in the relative price paid by foreigners. For example, foreigners pay a lower relative price for companies with a higher proportion owned by the state—reflecting, surprisingly, a *higher* absolute price paid by *both* foreigners and domestic residents. Several puzzles remain. For example, we are unable to explain why Chinese investors in Shanghai paid lower prices in 1994 and 1995 for companies with their foreign listings in Hong Kong rather than Shanghai.

Keywords: emerging markets, segmented stock market, China

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Equity markets in China have expanded rapidly over the past decade. Shortly after securities markets opened in Shanghai and Shenzhen in the early 1990s, China opened the market to foreign investors. In part out of concern that inflows and outflows might "destabilize" markets, China established separate classes of shares for domestic Chinese residents and for foreigners. Other than who can own them, these shares are legally identical, with the same voting rights and dividends. Nevertheless, the law of one price fails dramatically—foreign shares are far cheaper. In this paper, we seek to understand the sources of this violation, as well as other puzzling features of China's markets.

Domestic-only shares (known as A shares) are issued in either Shanghai or Shenzhen; foreign-only shares are issued in Shanghai or Shenzhen (B shares), or in Hong Kong (H shares). For H-share companies, the domestic A share generally trades in Shanghai; otherwise, the A and B shares trade in the same market. In 1997, about 90 companies had both a domestic and a foreign class of shares. Legally, foreigners cannot buy the domestic-only shares; domestic residents can neither purchase the foreign-only shares, nor, given China's capital account restrictions, generally invest in assets abroad.[1]

Figure 1 shows the average relative price paid by foreigners in the three markets. A relative price of 1 implies foreigners pay the same price as Chinese residents. Although at times there have been wide differences across markets—indeed, Hong Kong shares in 1994 and 1995 traded at roughly parity—foreigners in all three markets in late 1997 and early 1998 typically paid less than one-quarter the price paid by Chinese residents for the corresponding share. China thus contrasts with most markets with investment restrictions, where foreigners pay a premium.[2]

Domestic-share prices have also tended to be much more volatile, as shown in Table 1 and Figure 2. Stocks in most emerging markets are volatile, but the difference in volatility between two seemingly similar assets is surprising. In Shanghai and Shenzhen, for example, A-share prices have daily standard

[1] Many markets have restricted foreign ownership, often by limiting the total amount of foreign investment or allowing only approved institutional investors. Other countries (e.g., Finland, Mexico, the Philippines, and Switzerland) have had "restricted" shares, for domestic residents only, and "unrestricted" shares, available to all investors. China differs from these cases in that *both* Chinese classes of shares are restricted. At the end of 1994, only China and the Philippines restricted foreigners to special classes of shares (IFC 1995); by the end of 1996, only China had them (IFC 1997). Claessens and Rhee (1994) provide an overview of investment restrictions.

[2] On the typical foreign "premium," see, for example, Hardouvelis, La Porta, and Wizman (1994), Domowitz et al. (1997), and Bailey and Jagtiani (1994). On the Chinese foreign discount, see, for example, Barings (1992), Bailey (1994), and World Bank (1995).

deviations of around 3-1/4 percent, compared with about 2 percent for B-shares. Before 1996, the difference is particularly pronounced—domestic shares were two to three times more volatile than foreign shares. Figure 2 shows that volatility has been more similar since late 1996, reflecting in part (though not completely, given the timing) foreigners' response to the 1997 Asian financial crisis.

In this paper, we first explore the ability of a simple asset pricing model to explain the generally higher level and volatility of domestic prices. We calibrate the standard dividend-discount model, using estimates of the dividend-payout rate and price-earnings ratios, which were around 10 for foreigners and 40 for domestic residents as of early 1998. Plausible differences in expected rates of return by foreign and domestic investors—about 4 percentage points—can account for the four-fold difference in the level of foreign and domestic share prices. This difference in expected returns can also account for the generally higher volatility of domestic shares: If domestic residents discount the future at a lower rate, then domestic prices respond proportionately much more to news about the future.

We attribute Chinese investors' lower required rates of return primarily to the lack of alternative investments. The main alternative is bank deposits, since financial markets remain poorly developed and Chinese capital controls make it difficult to invest overseas. Bank deposits tend to pay interest rates below world levels. In addition, Chinese investors may have a low equity premium, because stocks offer one of the few opportunities available to diversify their investments at all.

With this simple model as an organizing framework, we then look at a panel of companies with domestic and foreign shares, from 1993 through 1997. We estimate how various company characteristics affect the relative price paid by foreigners as well as earnings-price ratios, which indicate whether these characteristics affect the relative price through the domestic price or the foreign price.

We find, for example, that foreigners pay a lower price relative to the domestic price for small firms, and for those with greater state ownership. However, this finding does not indicate any aversion by foreign investors to such firms. Indeed, both foreign and domestic investors pay *higher* prices for small firms, and for firms with a higher share owned by the state. The lower relative prices paid by foreigners reflects the proportionately larger effect on the domestic price. These results are consistent with small firms and those with high state ownership having high expected growth rates: Chinese investors, with lower expected returns, value future dividends proportionately more highly than foreign investors.

In addition, by controlling for characteristics of the companies in different markets, we attempt to explain why the relative prices paid by foreigners have sometimes differed substantially across markets. Most strikingly, Figure 1 shows that from late 1993 to mid-July 1995, Hong Kong H shares typically traded close to parity, and sometimes well above that. Although it seems plausible that foreign investors might have preferred trading in the larger, more transparent, and more liquid Hong Kong market, we find no evidence that foreigners paid higher prices for H shares.

Instead, the behavior of domestic rather than foreign share prices generally drives cross-market differences in relative prices. Our cross-company regressions show this point clearly, as do the time series of prices in Figures 3 and 4. Figure 3 plots three foreign-only China indices as well as Hong Kong's Hang Seng index. All three foreign indices move closely together. Hence, the divergence in relative prices across markets that opened up in late 1993, and largely disappeared by 1996, did not reflect movements in foreign prices. Instead, as the top panel of Figure 4 shows, movements in domestic share prices explain the Shanghai-Hong Kong divergence. The figure shows that a domestic share index for Shanghai companies with B shares, labeled AB, moves closely with the broader Shanghai A-share index, but that a domestic index for companies with Hong Kong H shares (labeled AH) substantially underperformed from mid-1993 to mid-1994. (Appendix A describes how we constructed these subindices). Similarly, comparing the top and bottom panels of Figure 4 shows that the increasing Shenzhen foreign relative price in 1994 reflects the poor performance of the Shenzhen A index relative to the Shanghai A index. In other words, the higher relative prices paid by foreigners in Hong Kong and Shenzhen over this period largely reflected the sharp declines in domestic share prices in Shenzhen, and for firms that had foreign H shares.

The H-share results are the most puzzling, since the A share traded in Shanghai in any case. Why did Chinese investors pay less in 1994 and 1995 for companies with foreign shares in Hong Kong rather than in Shanghai? It seems unlikely that this anomaly reflects simply the location of the foreign share. More likely, companies with H shares may have been riskier for Chinese investors or have had other characteristics that Chinese investors particularly "disliked" in this period. For example, H-share companies tend to be larger and more concentrated in "heavy industries" such as chemicals and steel. Such characteristics could proxy for a share's riskiness, if the capital asset pricing model does not hold, or if the market CAPM beta is misspecified. However, we are unable to find company characteristics that explain why Chinese investors paid less for companies with H shares rather than B shares.

Section I briefly discusses institutional details, focusing on why neither individuals nor companies arbitrage pricing differences. Section II discusses our asset-pricing model, and analyzes why domestic share prices have higher levels and volatility. Section III uses this model as an organizing framework for looking at cross-company differences in the relative price paid by foreigners.

I. Why Does Arbitrage Fail?

Since the Chinese stock market exhibits such extreme violations of the law of one price, individuals and corporations have an incentive to arbitrage pricing differences. We briefly discuss some of the institutional details that prevent such arbitrage.

To begin, who owns these shares? The majority of domestic shares are non-traded shares owned by the state or by other companies.[3] Foreign shares can generally constitute at most 49 percent of a company's shares, and average about a third. Since the state-owned and company-owned shares are non-traded, only about one-third of all shares are openly tradeable. Most traded A shares are held by small retail investors, since there are few large Chinese institutional investors such as insurance companies or pension funds; by contrast, foreign investors tend to be institutional investors such as mutual funds.

Why don't companies arbitrage pricing differences by issuing only the higher-priced A shares? First, Chinese companies need government approval to list, a highly political process that is subject to aggregate quotas. It appears that aggregate quotas generally bind for A shares. (However, B shares have higher disclosure requirements, so the approval process tends to be slow. The World Bank (1995) and Xu and Wang (1997) describe the listing process.) In addition, firms may want the foreign exchange. Despite reforms to China's foreign-exchange regime in recent years, access to foreign exchange is easier if you earn it yourself, either through exports or through foreign investment. Third, B-share companies are technically joint-ventures, with some tax advantages. Finally, the revenue difference may not be large, since authorities severely restrict A-share initial public offering prices.[4]

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[3]Fan (1997, Table 2) reports that in Shanghai, state ownership averaged 42 percent of shares outstanding for companies with B shares, and 35 percent of shares for companies without B shares.

[4] Su and Fleisher (1997) find that on the first day of trading, A share prices have typically risen 11-fold relative to the IPO price; B shares have typically risen about 1-1/2 fold. Although IPOs

Why don't individuals arbitrage pricing differences between A and B shares? It appears that over time, authorities have varied the strictness with which they enforce restrictions on ownership, and domestic investors often do purchase foreign-only shares.[5] Nevertheless, arbitrage is obviously imperfect, since the wide pricing gap remains. Chinese investors may fear that authorities will tighten restrictions again, and perhaps expropriate the illegally purchased shares.

II. A Simple Asset Pricing Model

We now discuss a simple model of China's segmented stock market. Although stylized, the model provides insight into relative share prices and volatilities.[6]

The price of a stock equals the present discounted value of future dividends. Suppose dividends D_t are expected to grow at constant rate g, and are discounted at constant expected rate of return r. Also, let k equal the ratio of dividends to earnings E_t. Then:

$$P_t = D_t \int_0^{\infty} e^{gs} e^{-rs} ds = \frac{D_t}{r-g} = k \frac{E_t}{r-g} \tag{1}$$

In practice, of course, neither r nor g need to be constant over time. Nevertheless, with appropriate "average" values over the future, equation (1) provides a reasonable approximation.[7] Uncertainty is implicitly incorporated as an equity risk premium in the required return r. We can interpret

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worldwide tend to be underpriced, the A-share underpricing is exceptional. The IPO underpricing ensures that investors' enthusiasm for new share issues remains very high; in addition, Basu and Li (1997) discuss how IPO underpricing provides a means of transferring resources to government officials.

[5] Data on Chinese ownership of B shares is mostly anecdotal. If a domestic resident has foreign exchange, it appears to be easy to open a foreign-share account. For example, it appears that any Chinese resident with a passport can open an account. In conversation, a B-share analyst in Shanghai estimated that domestic residents account for about 40 percent of ownership of, and 60 to 80 percent of trading in, B shares. As an empirical matter, he claimed that the price had to differ by a factor of 5 before there was significant flow of money trying to "arbitrage" the difference in price.

[6] Appendix B discusses a consumption CAPM. Although that model has complete micro-foundations, its implications are much less sharp. Therefore, we interpret that model as providing insights into the factors affecting relative "required returns" in the model of this section.

[7] If dividends do not grow exponentially, then the approximate "average" growth rate g depends on discount rates r. Hence, differences in expected returns imply differences in average g. However, simulations confirm the robustness of this section's basic conclusions. Intuitively, the model may approximate prices poorly, yet still capture much of the four-fold difference in prices. Campbell and Shiller (1988) generalize the dividend-discount model, allowing time variation in expected returns and growth rates. Unfortunately, their approximation does not provide tractable insight into relative A- and B-share prices, since it depends on dividend-price ratios, which differ between A and B shares.

r and g as either nominal or real, since only the difference between r and g enters equation (1); we will generally interpret them as real.

Equation (1) implies that the domestic A price is:

$$P_{At} \;=\; k\,\frac{E_t}{r_A - g} \tag{2}$$

Foreign shares are priced in foreign currency—U.S. dollars in Shanghai, and Hong Kong dollars in Shenzhen and Hong Kong—and foreign investors care about foreign-currency returns. Consider a U.S. investor in Shanghai. Let e represent the renminbi/\$ exchange rate, so that $\dot{e}/e$ equals the expected rate at which the renminbi *de*preciates. (If we interpret r and g as real rates, then $\dot{e}/e$ represents the rate of real depreciation.) If P_{Bt} is the foreign price in renminbi, then P_{Bt}/e is the dollar price. Suppose foreigners require a rate of return $\tilde{r}_B$. Then the foreign price is:

$$P_{Bt}/e_t \;=\; k\frac{E_t/e_t}{\tilde{r}_B - (g - \dot{e}/e)}\;, \tag{3}$$

Since g equals the growth rate of renminbi dividends, $(g\text{-}\dot{e}/e)$ is the growth rate of dollar dividends. Equivalently, we can think about foreign investors discounting the stream of renminbi dividends at an exchange-rate-adjusted rate of return r_B, defined as $(\tilde{r}_B+\dot{e}/e)$. We can then write:

$$P_{Bt} \;=\; k\,\frac{E_t}{r_B - g}\;. \tag{4}$$

We are now in a position to consider the stylized facts discussed in the previous section. First, consider the relative price paid by foreigners, which averaged about 1/4 in early 1998 (see Figure 1). From equations (2) and (4), we can write this foreign relative price as:

$$\frac{P_B}{P_A} \;=\; \frac{r_A - g}{r_B - g} \;\approx\; \frac{1}{4} \tag{5}$$

From equation (1), the earnings-price ratio, E/P, equals (r-g)/k. Hence, it follows that:

$$r_A \;-\; r_B \;=\; k\left[\frac{E}{P_B} \;-\; \frac{E}{P_A}\right]. \tag{6}$$

In early 1998, the median domestic earnings-price ratio was about 0.025, compared with a median foreign earnings-price ratio of about 0.10.[8] Hence:

$$r_B - r_A = 0.075k \tag{7}$$

In our sample of companies, the dividend-payout ratio k averaged about 0.5 over the period 1993-1996. Taking 0.5 as the appropriate long-run average ratio, then a difference in required rates of return of around 4 percent can explain the four-fold difference in prices between foreign and domestic investors.

This finding is reassuring, since it seems plausible that a full asset-pricing model—one that seeks to explain r rather than simply taking it as given—can explain a 4 percentage-point difference in required rates of return across investor groups. At the end of this section, we discuss factors affecting r at greater length. Appendix B discusses what is necessary to explain differences in r in a consumption CAPM.

What can we say about volatility? Taking logs of equation (1) gives:

$$lnP = \ln D - \ln(r-g) \tag{8}$$

We will take the initial level of dividends (and earnings) as fixed, and consider fluctuations in r and g. (Conceptually, we take initial dividends and earnings as history, so that at a point in time, the expected growth rate g incorporates expectations about growth from the previous period to the current date). Taking the total differential of (8), assuming the dividend D is history, we find:

$$d\ln(P) = P\cdot\left[(dg-dr)/D\right] \tag{9}$$

Changes in price reflect news about expected returns r or growth rates g, with the percentage change in price proportional to the level of the price. For example, suppose the growth rate of dividends increases by dg. This raises both the A- and the B-share price. But since A-share prices are higher, their percentage change is larger. Hence, the increase in g causes a fall in the foreign relative price $P_B/P_{A.}$ (This can also be verified directly by differentiating equation (5).) Intuitively, since domestic investors discount the future at a lower rate, they value future dividends more highly than do foreign investors.

More generally, equation (8) implies that the relative standard deviation of P_A and P_B is:[9]

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[8] See appendix A. Note that with multiple stocks, the ratio of domestic to foreign earnings-price ratios (whether calculated as a median or as total market earnings over total capitalization) do not correspond exactly to the market-average relative price in Figure 1. But the calibrations are suggestive.

[9] Equation (10) assumes that relative prices are unchanged by shocks to r and g, which they are not. Simulations confirm that for small shocks, this equation is approximately correct.

$$\frac{Std.Dev.(d\ln P_A)}{Std.Dev.(d\ln P_B)} \approx \left(\frac{P_A}{P_B}\right)\cdot\left(\frac{Var(dg) + Var(dr_A) - 2Cov(dg, dr_A)}{Var(dg) + Var(dr_B) - 2Cov(dg, dr_B)}\right)^{1/2} \tag{10}$$

Suppose the only shocks are to the growth rate, dg. Then since domestic prices are about four times higher than foreign prices, their volatility should also be about four times higher. Suppose there are also shocks to required returns, dr_A and dr_B. If these shocks have the same variance, and are uncorrelated with the shocks to the growth rate, then again, domestic prices should be about four times as volatile.

The data are reasonably consistent with these predictions about volatility. Consider Shanghai. Relative prices have varied over time, but from Figure 1, A-share prices have typically been two- to four-times higher than B-share prices. Table 1 and Figure 2 show that A-share standard deviations have tended to be several times higher than B-share standard deviations, particularly before 1996. If anything, however, relative standard deviations have tended to be *closer* than the large difference in relative prices would predict. In terms of equation (10), the explanation must lie in the terms in brackets: Either the variance of dr_A is less than the variance of dr_B, or there is a positive covariance between dg and dr_A.

After mid-1996, two events made dr_B particularly volatile: speculation about enforcement of ownership restrictions and the Asian financial crisis. Press reports suggest that Chinese investors began investing heavily, though illegally, in B shares at that time. In December 1996 and May 1997, Chinese authorities imposed several new restrictions to control "excessive" speculation. Changes in willingness to hold B-shares illegally are like shocks to r_B. New policies also restricted bank lending for stock investment, thereby affecting domestic investors' ability to invest in all stocks, including foreign stocks.

The Asian financial crisis in mid-1997 appeared to raise the risk premium demanded by foreign investors. Foreign share prices fell sharply—by mid-1998, they were less than half their mid-1997 levels. Because domestic shares have been virtually unaffected, the relative price has fallen considerably. Figure 1 shows that the 1997 peak in relative prices was around one-half (larger in Hong Kong, smaller in Shanghai). With earnings-price ratios in mid-1997 of about 0.05 for foreign shares and 0.025 for domestic shares, equation (6) implies that the difference in expected returns was only about 1-1/4 percent. This suggests that the Asian crisis widened the difference in expected returns by about 2-1/2 percentage points. It is, however, unclear why domestic prices haven't changed—the Asian crisis contributes to a slowdown in China, and should affect g and hence domestic prices. Possibly, declines in g were offset by declines in r_A, reflecting precautionary domestic saving or perhaps policy moves to support the market.

Determinants of r_A and r_B

So far, we have taken investors' expected returns r_A and r_B as given. Standard asset pricing models (such as the CAPM, or the Consumption CAPM in Appendix B) suggest several factors that should affect expected returns, as does the literature on the home bias in portfolio investment.

First, and perhaps most important, since Chinese investors have few investment alternatives, they likely have a low required rate of return. In CAPM terms, a lack of investment alternatives suggests a low risk-free rate (see, for example, Appendix B). In China, the main alternatives to the stock market are bank deposits and saving bonds, and neither has a market-determined interest rate. Gordon and Li (1998) argue that, with a closed capital account, the Chinese government effectively "taxes" Chinese savers by setting interest rates below world levels. Since China's tax system works poorly, the government may rely heavily on this saving tax, and hence, set an interest rate well below world levels. Chinese investors may find it worthwhile to save, despite low interest rates, particularly given an aging population with limited pension coverage and substantial uncertainty associated with economic reforms.

From mid-1993 until 1996, China indexed rates for long-term savings deposits and bonds (with maturities of three years or longer) to inflation, thereby guaranteeing a real return of about zero. Suppose we take this as the correct "risk-free" rate. Since the real return on U.S. Treasuries has been around 3 percent, this difference could explain much of the gap in expected rates of return.[10]

Second, the risks for a foreign investor in China seem largely idiosyncratic, while the risks for a domestic investor seem more systematic. That is, shocks to Chinese stock returns that reflect economic and political events should have a low correlation with foreign consumption opportunities, and a relatively large correlation with Chinese consumption opportunities. So one might expect that Chinese investments should be a better source of diversification for foreigners than for domestic residents.

[10] If non-indexed deposits, rather than indexed ones, more accurately reflect the opportunity cost of funds, then this argument is even stronger, since non-indexed real returns were very substantially negative in China from 1993 until at least 1996. (We interpret r_A as a weighted average of future expected returns, so that temporarily large negative real rates need not imply large negative r_A.)

However, the supply of Chinese equities is severely limited, so Chinese investors may find that stocks offer one of the few opportunities available to diversify their investments at all. Hence, they may not require much of an equity premium. After all, China's stock market is still relatively small—stock market float of about $70 billion amounts to only about 6 percent of the value of total bank deposits, compared with 300 percent in the United States. In addition, Bailey (1994) argues that since many foreign investors in China are from Hong Kong, China risk is, in fact, systematic for them. Although diversification considerations suggest these investors should invest in, say, the United States, they may nevertheless invest in China because they have better information about companies and the market.

Third, foreign investors may require a high rate of return to be compensated for exchange-rate risk, since an expected depreciation raises foreigners' yuan-denominated required return. (Equivalently, an expected depreciation lowers expected growth g in dollar terms).

Fourth, if low turnover makes trading difficult, investors may require a liquidity premium. The problem seems more severe for B-shares. Each stock tends to have small capitalization, so a big order sometimes leads to a large change in price. For institutional investors, who tend to hold large blocks of shares, this is often cited as a problem. (See, for example, World Bank (1995).)

Finally, it is well known that investors do not diversify internationally anywhere near as much as asset-pricing models predict. (Tesar and Werner (1997), for example, report that in 1996, the share of equity portfolios invested in foreign stocks was about 5 percent in Japan, 10 percent in the United States, 18 percent in Germany, and 23 percent in the United Kingdom.) This home bias in portfolio investment may reflect transactions costs, barriers to cross-border investment, or information asymmetries. In our simple framework, r_B incorporates all these factors. In addition, r_B captures any assessment that Chinese reforms will be reversed—or in the extreme case, that investments will be expropriated. (Of course, if reforms reverse, that affects both the foreign and domestic investors. Risk of expropriation, again, matters here to the extent it is different for foreigners and domestic residents.)[11]

Together, these considerations suggest that a 4 percentage-point difference in required rates of

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[11] Chiu and Kwok (1998) argue that foreign investors in China have *better* information than domestic investors because of restrictions on the Chinese press. Consistent with this argument, they find that B-share prices tend to lead A-share prices. Dabora (1996) discusses (and dismisses) political, legal, exchange-rate, accounting, tax, and control considerations for the relative prices.

return between foreign and domestic residents is plausible. Hence, that foreigners pay a lower price—and that foreign shares are ordinarily less volatile—is consistent with a simple asset-pricing model.

III. Econometric Results

Figure 1 showed the average foreign relative price by market. Although these averages are fairly representative, there are differences across companies within these markets. We now use the dividend-price model as an organizing framework for exploring these cross-company variations. We analyze a panel of annual data from 1993 to 1997 for 57 companies with both domestic and foreign shares, including all companies with both a foreign and domestic class of shares as of mid-1994. Appendix A describes our data and provides summary statistics.

The relative price paid by foreigners, from equation (5), is $P_B/P_A = (r_A - g)/(r_B - g)$. Other things equal, the relative price falls if the foreign price falls or the domestic price rises. However, both prices might fall, with P_B falling proportionately more; or both prices might rise, with P_A rising proportionately more. For example, if expected growth g rises, the relative price should fall, since domestic residents have a lower expected return and therefore value the future dividends more highly.

Thus, in exploring the relationship between a variable and the foreign relative price, one must also know why the relative price is affected. For this reason, we explore the cross-company variation in a scaled measure of the level of foreign and domestic prices, the earnings-price ratio. Equation (1) implies that $E/P = (r - g)/k$, where k is the ratio of dividends to earnings. We use earnings-price ratios, rather than price-earnings ratios, since the model is linear in r and g. (For the same reason, we do not run the regression below in logs.) The P-E ratio depends on $1/(r\text{-}g)$, which is highly non-linear.

Our general approach is to identify proxies for companies' expected returns and growth rates. We then run three regressions, relating (i) the relative price, (ii) A-share earnings-price ratios, and (iii) B-share earnings-price ratios to the dividend payout rate and these proxies. Together, the three regressions relate a given variable to the relative price, and then indicate whether the relationship works through the domestic or foreign absolute price. (Note from the relative-price and earnings- price equations that if a variable is uncorrelated with the relative price, it must have a coefficient about three times larger in the foreign earnings-price regression as in the domestic one.)

Recent empirical finance literature relates realized returns to company and share characteristics such as CAPM betas, size, and turnover. If expectations are not systematically biased, these variables matter only if they are correlated with expected returns. The CAPM implies that beta fully captures a stock's expected return premium. However, empirical evidence on beta's importance is at best weak, and other variables appear to have more robust explanatory power for expected returns.[12] For Chinese investors, the stock market beta is even less likely than usual to measure a stock's equity premium, since the small stock market is a poor proxy for total wealth. Among U.S. firms, large firms appear to have lower expected returns (see, for example, Fama and French (1992)), perhaps because they are for some reason less risky (although Daniel and Titman (1997) argue that the data do not support this interpretation). If a stock is illiquid, investors may require a liquidity premium.

Our approach focuses on explaining relative prices, so variables matter if they proxy for either expected returns r or expected growth g. Of course, variables such as beta that proxy for r might also proxy for g. For example, La Porta (1996) finds that U.S. companies with high expected-earnings growth, as measured by analysts forecasts, tend to be smaller and also have higher betas.

We consider several other variables as well. If a firm is export-oriented, its shares may offer investors a hedge against currency depreciation and also provide Chinese investors a way to diversify away from the Chinese economy. The proportion of shares owned by the state may be correlated with a stock's riskiness or expected growth through various channels. These and other company characteristics, such as industry, may also proxy for expected growth.

Specification 1

The first column of Table 2 relates the relative price to year dummies, dummy variables for market location, and two interaction dummy variables: a Hong Kong dummy for the two years 1994-95

[12] For example, in U.S. data, Fama and French (1992) find little role for beta; Kothari, Shanken, and Sloan (1995) do. In emerging markets, Rouwenhorst (1998) finds no role for beta; Claessens, Dasgupta, and Glen (1995) do. Most of these studies find that size is negatively related to returns.

and a Shenzhen dummy for 1994-95.[13] The results capture the essence of Figure 1. The constant term shows the mean relative price in Shanghai for 1997, where B-shares typically traded at about 25 percent of the domestic price. The relative price tended to be higher outside Shanghai, by about 15 percentage-points in Shenzhen and 29 percentage-points in Hong Kong. In 1994 and 1995, the Shenzhen and Hong Kong differences were even larger, as shown by the interaction dummies. The adjusted R^2 indicates that market location and time dummies explain more than half of the variation in relative prices across firms.

Columns 2 and 3 show the corresponding earnings-price regressions. Compared with Shanghai, companies in Shenzhen or with Hong Kong H shares had higher earnings-price ratios for both domestic and foreign investors, although the difference is not significant for foreign investors in Hong Kong.

The coefficients on the Hong Kong and Shenzhen interaction dummies are positive and significant in the A-share regression, but insignificant in the B-share regression. In other words, as noted in the introduction, the high relative price paid by foreigners for Hong Kong and Shenzhen stocks reflects primarily the *low* price paid by Chinese residents for domestic shares with foreign listings in Hong Kong or Shenzhen, rather than the high price paid by foreigners.

The Shenzhen finding could simply reflect a market effect—that Chinese investors particularly disliked trading in Shenzhen for some reason (e.g., transactions costs, taxes, or regulations). By contrast, that Chinese investors disliked stocks with foreign listings in Hong Kong or Shenzhen in 1994 and 1995 is more surprising. After all, for Hong Kong H shares, the domestic A shares trade in the same Shanghai market as the companies with a Shanghai foreign B share, so it is not simply a market effect. One might have expected foreign investors to prefer stocks with foreign listings in the larger, better regulated, and more liquid Hong Kong market. The effect on the foreign price, however, is not significant.

Most likely, Chinese investors disliked the *kinds* of companies with foreign listings in Hong Kong, rather than simply the fact that companies had a foreign listing there. For example, although our sample has only nine H-share companies, they disproportionately represent utilities or heavy industry, and perhaps Chinese investors found those companies more risky for some reason during the beginning of a cyclical

[13] Note that the Hong Kong dummy reflects the location of the *foreign* listing, since the domestic listings for H shares are in Shanghai. For simplicity, we refer to companies with Hong Kong H shares as "Hong Kong" companies, even though they are Chinese companies with domestic listings in Shanghai.

downturn. In later regressions, however, we will not be able to explain the Hong Kong and Shanghai dummies for 1994 and 1995. This failure presumably reflects our inability to identify the relevant factors.

Specification 2

The second set of regressions of Table 2 adds the CAPM beta and the dividend-payout ratio. Betas should be positive in the *E/P* regressions if investors expect higher returns on riskier high-beta stocks. Payout rates should be negative in the *E/P* regressions, since higher payout rates imply faster and larger dividend flows for given earnings flows, thereby raising the share price. [14]

The payout ratio has the expected negative sign in both the A- and B-share earnings-price regressions: Increasing the payout rate by 1 percentage point reduces the A-share earnings-price ratio by about half a percentage-point (significant at the 90 percent level), whereas it reduces the B-share earnings price by nearly 2 percentage-points (significant at the 99 percent level). These two effects roughly cancel out in explaining the relative price, where the (negative) effect is not statistically significant.

In many markets, we expect mature firms to have high payout rates but also low expected growth *g*. Then the dividend-payout rate might proxy for expected growth g. This effect implies that high payout rates should be associated with high earnings-price ratios—opposite to what we find. High payout rates should also be positively correlated with the foreign relative price—again, opposite to what we find. Hence, the growth-signaling effect of dividends is probably not too important

Now consider the coefficients on beta. We estimate foreign betas relative to the S&P 500 and domestic betas relative to the corresponding domestic index, using 5-day differences in the log of prices. We calculate a separate beta for each year. (All results are virtually unchanged using 10-day betas or using the full-sample weekly beta.) The B-share beta has a positive and statistically significant effect on the foreign earnings-price ratio. By contrast, the A-share beta enters the domestic earnings-price regression significantly *negatively*. This suggests that domestic investors require *lower* returns and pay higher prices for riskier companies. Neither beta has a statistically significant effect on the relative price.

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[14] We use the full-sample average payout rate. In principle, we should multiply *E/P* by the payout rate *k*. However, we prefer to enter *k* as a separate linear regressor, since observed values of the dividend-payout ratio measure the true long-run ratio imperfectly. Fewer than half the firms paid a cash dividend each year, and 9 of the 57 companies have never paid a cash dividend. Using *kE/P* as the independent variable, for companies where *k* is non-zero, has no qualitative effect on results that follow.

The A-share-beta anomaly plausibly reflects that high-beta companies are also high-growth companies. To test this explanation for the Chinese market, we added β_A to the B-share E/P regression specification from the last column. If β_A proxies for unobserved growth g, then it should enter the B-share regression negatively. In regressions not shown, it indeed does, with a coefficient of -6.3 (percentage points), and a t-statistic of 2.6. Other variables in the regression are virtually unaffected.

Note, however, that if β_A proxied for growth only, then it should be negative in the relative price regression. Instead, the coefficient is positive (4.57), though insignificant. This is consistent with β_A capturing expected differences in r_A as well as differences in g. Higher g lowers the relative price, but higher r_A lowers the domestic price and raises the relative price; the effects roughly offset.

Specification 3

Table 3 adds several additional proxies for differences in risk and growth. These variables could help control for the extent to which β_A proxies for g, and could also capture company characteristics correlated with market location, thereby helping explain why Chinese investors paid less in 1994 and 1995 for companies with foreign listings in Hong Kong. We add a dummy variable for whether the firm exports a high share of its output; the percentage of total shares that are owned by the state; sales (lagged one period) as a proxy for size[15]; turnover, defined as the average ratio of daily trading volume to shares outstanding; and observed sales growth from 1993-1997. Sales and turnover have different values each year; the export dummy, percent state-owned, and growth rate of sales are taken to be constant over time.

The export dummy, the percent state owned, size, and sales growth are particularly important in almost all of the regressions in Table 3. Foreigners pay lower relative prices for firms that export and with a higher share owned by the state. Interestingly, the lower foreign relative prices reflect higher prices paid by (i.e., lower earnings-price ratios for) domestic shareholders, rather than lower absolute foreign prices. Indeed, the third column shows that foreigners pay higher prices for firms that export and that have a higher share owned by the state.

Export orientation appears more important for domestic residents than foreigners. For foreigners,

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[15] We use sales rather than market capitalization to minimize problems of endogeneity. If, for example, a firm's A-share price is high (and hence, the earnings-price ratio is low) for reasons unrelated to size, that will increase capitalization, giving rise to a spuriously negative relationship.

exports help hedge against exchange-rate depreciation (reducing r_B), but also reduce diversification benefits (raising r_B). By contrast, these firms unambiguously help Chinese residents diversify, which should reduce r_A and raise the domestic price.

Why do all investors pay higher prices for companies with a higher share owned by the state? The state share is probably highest in restructured state-owned-enterprises (SOEs), and SOEs are usually considered poor performers, in part because of poor corporate governance. Xu and Wang (1997) find that listed companies with high state-ownership share tend to have low labor productivity, suggesting poor current performance. However, though these SOEs may be poor performers with low current earnings, investors may expect performance to improve after listing, so they pay high prices relative to current earnings. In other words, there is so much room for improvement that these are regarded as high g companies.[16] Moreover, firms with higher state ownership may also have better political connections, ensuring access to various forms of financial or other support. This access may improve the growth prospects of these companies, in part by minimizing the downside risk of bankruptcy. Alternatively, the state may simply tend to keep a higher share in better quality companies, for which investors pay more.

Results for the sales variable indicate that foreigners pay a statistically significantly higher relative price for larger firms. Larger firms also have higher earnings-price ratios—i.e., lower prices—for both foreign and domestic residents. Hence, the higher relative price reflects the fact that the proportional effect on the domestic price is larger. These results are consistent with larger size proxying for lower expected growth g, since low-growth firms should have higher foreign relative prices.

Kang and Stulz (1997) find that foreign investors in Japan disproportionately hold large stocks, suggesting that foreign investors may require lower returns on such stocks. We cannot directly test this interpretation for China, but it may be that for foreign investors, large size implies lower expected returns r (raising prices), but also lower expected growth g (lowering prices), with the growth-effect dominating.

The World Bank (1995) argues that B-share liquidity is very poor, so that foreign investors may require a liquidity premium. Table 3 shows that daily turnover in the domestic and foreign markets has no significant relationship with earnings-price ratios (columns 2 and 3). Foreign turnover is never economically or statistically significant, suggesting that liquidity is not important in explaining B-share

[16] We thank John Campbell for suggesting this interpretation.

prices. Of course, if low liquidity raised all foreign earnings-price ratios equally, we might not detect its effect. Nevertheless, our results are consistent with the comparable levels of earnings-price ratios in Shanghai's B-share market and Hong Kong's seemingly much more liquid market, as measured by the broad Hang Seng index. The A-share turnover variable is insignificant in the *E/P* regression. Puzzlingly, it is positive and significant in the relative-price regression, even though higher liquidity should raise the A-share price, and hence reduce the relative price. (A-share turnover is not significant if added to the foreign E/P regressions, so feedback across markets cannot explain those results.)

The final variable in the regression is observed sales growth from 1994 to 1997, as a proxy for earnings-growth g. We use growth in sales rather than earnings, since (i) Putting earnings in an earnings-price regression is more subject to endogeneity bias, and (ii) Sales growth has fewer extreme outliers (for example, if earnings are very small, percentage-changes can be large). In any case, results are robust to using earnings growth rather than sales growth, reflecting the statistically significant correlation of 0.4 between the two series, and also to using annual sales growth lagged a year.

We expect higher growth companies to have lower earnings-price ratios (i.e., higher prices), but in Table 3 they have *higher* domestic and foreign earnings-price ratios. Higher growth companies should also have lower foreign relative prices, but we find no relationship. Plausibly, these apparent failures reflect that actual sales growth proxies poorly for expected growth g in our sample, which corresponds to a cyclical downturn in China's business cycle. As policymakers tightened credit after 1993, output growth and inflation slowed steadily. If companies with high expected growth rely disproportionately on credit markets—perhaps because they lack current cash flow—then actual sales growth over our sample could well be negatively correlated with true long-run growth prospects over our sample.

For comparison, we also tried an alternative test of the prediction that companies with high expected growth have lower relative prices. High-growth companies should have low earnings-price ratios. We therefore ran panel regressions of $P_{Bit}/P_{Ait} = c + \delta_B\left(E_{it}/P_{Bit}\right)$, testing whether δ_B is positive. Since P_B is on both sides of the regression, δ_B is biased downwards, against the prediction of our model (reflecting, for example, that higher r_B lowers P_B/P_A but raises E/P_B). The coefficient estimate of 0.86 has a t-statistic of 3.6—supporting the high-growth-low-relative-price prediction. (Using E/P_A gives even stronger results, but that coefficient is biased in our favor.) Thus, to the extent that E/P_B is better than sales growth as a proxy for the true expected growth *g*, it therefore appears that high-growth companies do have lower relative prices.

As a final comment on the first set of regressions in Table 3, note that the puzzles observed in Table 2 remain. That is, the Hong Kong and Shenzhen markets look different in 1994 and 1995, and the A-share beta continues to enter negatively and significantly. However, the interaction dummy is now somewhat less economically and statistically significant in the A-share *E/P* regression.

Specification 4

The regressions so far are misleading if conditions in particular industries contribute to the cross-sectional variability in earnings-price ratios. For example, the state's ownership share is higher in some industries than others. Suppose these industries tend to have high growth rates and low earnings-price ratios; then the state-ownership variable would proxy for that industry effect. To check this, the second set of regressions in Table 3 adds industry fixed effects to the first set. The ten industries are: Chemicals; Food; Services; light Manufacturing; Textiles; Property; Industrial & Steel; Construction; Transportation; and Utilities. Although statistical significance usually falls, especially on the dividend-payout rate, none of the qualitative conclusions are affected. The state-ownership share, in particular, remains robust, indicating that it does not simply proxy for industries that happen to have low earnings-price ratios.

Analysis of Sub-Periods

Table 4 re-estimates the regressions from Table 3 for two sub-periods: 1994-95, and 1996-97. Reducing the sample generally reduces statistical significance, but these sub-period regressions do give insight into why variables have the significance they do in the full regressions. The Hong Kong and Shenzhen dummies now measure the effect during those sub-periods, and are statistically significant in both sub-periods. The significance of the Hong Kong dummy in 1994-95 is further evidence that the puzzle of why Chinese investors paid less in Shanghai for companies with their foreign listings in Hong Kong does not reflect the effects of the variables we have included, since implicitly, these regressions allow the coefficients on those variables to differ across sub-periods.

Some results appear stronger in the first period, others in the second period. The strength of the beta results appears to come almost completely from the 1996-97 period, since neither the A- nor B-share betas are significant in 1994-95. The state-ownership results are relatively robust across time periods, although the relationship with foreign earnings-price ratios appears much stronger in the later period. Size is somewhat more important in the earnings-price regressions in the earlier period, particularly for foreign investors (although in the subperiods, size is never statistically significant in the foreign E/P regressions). Sales growth is more important in the later period.

An Aside on Unit Roots and Cointegration

The model from Section II implies that A- and B-share prices are unlikely to be cointegrated. One might expect two valuations of the same dividend stream to move together, and indeed, if all shocks are to g, they probably will. But shocks to r_A and r_B move P_A and P_B differently. Hence, unless these shocks are stationary, the prices will *not* be cointegrated. Even more clearly, the relative price P_B/P_A should have a unit root, since even shocks to g affect the relative price. Hence, unless shocks to g, r_A, and r_B are stationary, the relative price will have a unit root. (If shocks to g, r_A, and r_B are stationary, then P_A and P_B are both themselves trend stationary.)

For each of our 57 companies we ran augmented Dickey-Fuller (1979) tests for a unit root in the relative price series and Engle-Granger (1987) tests for cointegration between A- and B-share prices. We reject the null of a unit root in the relative price 2 times at the 1 percent level, 5 times at 5 percent, and 10 times at 10 percent. We reject the null of no cointegration 4, 7, and 13 times at the 1, 5, and 10 percent levels, respectively. We therefore reject about twice as often as expected at 5 and 10 percent. However, given concerns about the size of these tests (Stock (1994)), the results do not appear inconsistent with our null of no cointegration between A- and B-share prices and a unit root in the foreign relative price.

III. Conclusion

In China's segmented stock market, the law of one price fails spectacularly—domestic investors pay roughly four times more than foreign investors for essentially identical assets. Nevertheless, in the absence of arbitrage, plausible differences—4 percentage-points as of early 1998, and even lower before the Asian crisis—in expected returns by foreign and domestic investors can explain the generally much higher level and volatility of domestic share prices. We attribute the apparently low expected returns by Chinese investors primarily to the lack of investment alternatives in China. Other factors may also be at work, such as a low equity premium in China; expectations of a Chinese real-exchange-rate depreciation;

or a sizeable home-bias in foreign investment.

In addition, in a panel of Chinese companies, we identify several variables associated with cross-company differences in the relative price paid by foreigners and in earnings-price ratios. Foreigners pay lower prices relative to domestic residents for small firms and for those with a higher share still owned by the state. But these lower *relative* prices do not reflect lower levels of foreign prices. Indeed, both foreign and Chinese residents tend to pay higher prices (as measured by lower earnings-price ratios) for small, export-oriented, high-dividend-paying firms with larger state ownership. In addition, as the CAPM predicts, foreign investors also pay higher prices for firms with lower market betas.

These results are consistent with our asset-pricing predictions, assuming smaller firms with a larger state share tend to have lower expected earnings growth. Since domestic investors discount future earnings at a lower (expected) rate, they value high-growth companies proportionately more. Indeed, when we take foreign earnings-price ratio as a proxy for expected growth, we find that that high-growth companies do have lower relative prices.

Several anomalies remain. Most notably, why did Chinese investors in Shanghai pay less in 1994 and 1995 for companies with their foreign listings in Hong Kong? We try, but fail, to identify characteristics of companies with Hong Kong H shares that can explain the domestic pricing.

A broader puzzle is the failure of arbitrage, given the four-fold difference in prices. As we discussed, it appears anecdotally that despite legal barriers, domestic investors can easily purchase the foreign shares, and often do. Shleifer and Vishny (1997) argue that in most markets, arbitrage relies on a small number of highly specialized agents, which makes arbitrage difficult. But the Chinese market is much more like the textbook model, where millions of small investors are very well-informed about the pricing differences (prices, after all, are posted almost instantaneously), and so could each take a tiny position against mispricing. Shleifer and Vishny, among others, note that arbitrage often fails because mispricing might persist, causing arbitragers to lose money in the short run. But in China, the domestic investors would, at a minimum, earn much higher dividend yields, which compensates them somewhat for the risk that foreign shares underperform in the short run. Hence, though the legal barriers often appear porous, the risk that policymakers might crackdown in the future appears to be enough to offset sizeable differences in expected returns.

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Table 1
Descriptive Statistics

Mean, standard deviation, minimum and maximum of daily percent change
(July 15, 1993 to January 13, 1998)

	Mean	Min.	Max.	Standard Deviation		
				Full Sample	1993-95	1996-98
Shang. A Index	0.034	-18.4	30.9	3.27	3.76	2.51
Shang. B Index	-0.013	- 1.3	12.2	1.95	1.50	2.40
Shenzh A Index	-2.71	-19.6	29.6	3.26	3.54	2.86
Shenzh B Index	-0.010	-16.7	12.5	2.18	1.08	3.05
H shares	-0.028	-17.7	15.8	2.70	2.30	3.12
Hang Seng (Hong Kong)	0.022	-14.7	17.2	1.83	1.61	2.07
S&P 500	0.066	-7.1	5.0	0.77	0.54	0.97
Topix (Japan)	-0.028	-5.3	6.6	1.11	1.08	1.15

Note: All percentages calculated as 100 times the change in the log of the index.

Table 2
Foreign Relative Prices and Earnings/Price Ratios: The Role of Market Location and Beta

	Dependent Variable					
	Rel. P	**A-Share**	**B-Share**	**Rel. P**	**A-Share**	**B-Share**
Regressor	P_B/P_A	E/P_A	E/P_B	P_B/P_A	E/P_A	E/P_B
Constant	24.5 (9.04)	0.058 (0.13)	0.66 (0.68)	21.6 (3.15)	3.07 (2.74)	1.97 (1.95)
Shenzhen	14.6 (4.76)	1.48 (2.82)	2.65 (2.29)	15.6 (5.09)	1.63 (3.12)	1.94 (1.71)
Hong Kong	28.6 (6.64)	1.61 (2.24)	2.10 (1.36)	25.7 (5.78)	1.91 (2.68)	1.67 (1.08)
HK 94-95	25.5 (3.84)	2.80 (2.59)	-1.98 (-0.85)	26.2 (3.95)	2.51 (2.35)	-2.03 (-0.87)
Shen 94-95	20.6 (4.34)	2.92 (3.76)	-0.30 (-0.18)	22.6 (4.18)	2.73 (3.43)	0.07 (0.04)
$\beta_{\mathbf{A}}$	----	----	----	4.57 (0.69)	-2.90 (-2.68)	----
$\beta_{\mathbf{B, S\&P}}$	----	----	----	0.76 (0.46)	----	1.19 (1.99)
Payout ratio	----	----	----	-3.19 (-1.71)	-0.56 (-1.86)	-1.83 (-2.75)
Adj. R^2	.54	.43	.19	.56	.44	.19

Notes: Results from panel regressions on annual data for 57 companies from 1993-97. All coefficients are multiplied by 100, with t-statistics in parenthesis. All regressions include time effects (with 1997 the omitted time dummy), whose coefficients are not reported. HK 94-95 and Shen 94-95 are the product of the market dummies with a dummy variable equal to 1 in 1994 and 1995 and zero otherwise. P_B refers to the foreign price, whether a B share in Shanghai or Shenzhen, or an H-share in Hong Kong.

Table 3
Regressions Explaining Relative Prices and Earnings/Price Ratios

Regressor	Dependent Variable					
	Rel. P P_B/P_A	**A-Share** E/P_A	**B-Share** E/P_B	**Rel. P** P_B/P_A	**A-Share** E/P_A	**B-Share** E/P_B
Constant	2.74 (0.19)	-2.28 (-1.23)	-1.61 (-0.38)	1.31 (0.08)	-1.51 (2.21)	3.72 (0.63)
Shenzhen	16.2 (5.28)	1.98 (4.25)	2.58 (2.31)	14.4 (4.40)	2.05 (3.88)	2.54 (2.00)
Hong Kong	18.4 (4.16)	1.20 (1.83)	1.62 (0.99)	19.3 (4.02)	1.39 (1.88)	0.76 (0.40)
HK 94-95	27.6 (4.20)	1.54 (1.57)	-3.01 (-1.22)	27.4 (4.40)	1.63 (1.66)	-2.67 (-1.07)
Shen 94-95	26.4 (4.70)	2.63 (3.39)	-0.68 (-0.35)	24.7 (4.59)	2.68 (3.37)	-0.10 (-0.05)
β_A	3.79 (0.57)	-2.45 (-2.53)	----	5.95 (0.92)	-2.49 (-2.48)	----
$\beta_{B, S\&P}$	-0.72 (-0.46)	----	0.98 (1.66)	-0.94 (-0.63)	----	0.94 (1.54)
Payout ratio	-3.41 (-1.93)	-0.55 (-2.08)	-1.60 (-2.42)	-0.97 (-0.41)	-0.27 (-0.78)	-1.31 (-1.37)
Export	-2.89 (-1.25)	-0.72 (-2.19)	-1.07 (-1.23)	-0.71 (-0.28)	-0.68 (-1.75)	-1.12 (-1.09)
% State owned	-16.9 (-3.22)	-3.38 (-4.44)	-6.71 (-3.40)	-11.1 (-2.07)	-3.63 (-4.40)	-7.55 (-3.48)
Log(Sales(-1))	6.86 (6.44)	0.93 (5.90)	0.62 (1.55)	5.47 (4.61)	0.83 (4.46)	0.62 (1.30)
Log(Turnover)$_A$	4.56 (2.12)	-0.12 (-0.38)	-----	4.31 (2.08)	-0.12 (-0.37)	----
Log(Turnover)$_B$	-0.06 (-0.03)	----	-0.38 (-0.66)	-1.25 (-0.67)	----	0.27 (0.37)
Sales Growth	0.02 (0.03)	0.31 (2.28)	0.83 (2.46)	0.23 (0.21)	0.27 (1.61)	0.82 (1.87)
Adj. R^2	.63	.56	.25	.67	.56	.23

Notes: Results from panel regressions on annual data for 57 companies from 1993-97. All coefficients are multiplied by 100, with t-statistics in parenthesis. All regressions include time effects. Export is a dummy variable for whether the firm exports a large share of output. Sales growth is average annual growth rate of sales from 1993-1996. The last three regressions include industry fixed effects for: Chemicals; Food; Services; light Manufacturing; Textiles; Property; Industrial & Steel; Construction; Transportation; and Utilities.

Table 4
Regressions over the 1994-95 and 1996-97 Sub-Periods

Regressor	1994-95			1996-97		
	Rel.P P_B/P_A	**A-Share** E/P_A	**B-Share** E/P_B	**Rel.P** P_B/P_A	**A-Share** E/P_A	**B-Share** E/P_B
Constant	-38.7 (-1.00)	-4.62 (-1.51)	8.98 (1.43)	20.5 (1.55)	0.98 (0.37)	2.08 (0.34)
Shenzhen	39.6 (5.54)	4.30 (6.25)	2.62 (1.91)	15.6 (5.83)	2.12 (3.74)	3.01 (2.15)
Hong Kong	48.4 (5.48)	2.37 (2.85)	-1.20 (-0.65)	17.5 (5.11)	1.56 (2.19)	2.15 (1.10)
β_A	20.8 (1.43)	-1.57 (-1.06)	----	-3.00 (-0.46)	-2.90 (-2.12)	----
$\beta_{B, S\&P}$	-3.26 (-0.74)	----	0.43 (0.46)	2.71 (1.55)	----	2.01 (2.00)
Payout ratio	-5.48 (-1.56)	-0.66 (-1.69)	-0.95 (-1.28)	-1.24 (-0.67)	-0.42 (-1.10)	-2.54 (-2.35)
Export	-4.51 (-0.86)	-0.70 (-1.34)	0.16 (0.15)	-0.63 (-0.27)	-0.79 (-1.68)	-1.83 (-1.37)
% State owned	-23.4 (-1.97)	-3.21 (-2.67)	-1.89 (-0.75)	-12.3 (-2.46)	-3.87 (-3.65)	-9.64 (-3.28)
Log(Sales(-1))	8.83 (3.63)	1.38 (5.44)	0.67 (1.32)	6.09 (5.63)	0.58 (2.59)	-0.15 (-0.24)
Log(Turnover)$_A$	1.98 (0.43)	-0.44 (-0.91)	-----	5.29 (2.21)	0.03 (0.06)	----
Log(Turnover)$_B$	-1.89 (-0.41)	----	0.66 (0.74)	1.05 (0.68)	----	-0.90 (-1.09)
Sales Growth	0.81 (0.40)	0.35 (1.56)	0.12 (0.29)	-0.09 (-0.09)	0.40 (2.01)	1.52 (2.85)
Adj. R^2	.59	.55	.00	.59	.35	.25

Note: Results from panel regressions on annual data for 57 companies from 1994-95 and 1996-97, respectively. All coefficients are multiplied by 100, with t-statistics in parenthesis. All regressions include time effects.

Table A-1

Major Stock Markets for Chinese Companies

	China's Official Domestic Exchanges		Hong Kong (H Shares)
	Shanghai (A and B Shares)	Shenzhen (A and B Shares)	
Date of First Chinese Listing	19 December 1990	3 July 1991	July 1993
Date Chinese Stocks Available for Foreigners	28 February 1992	19 December 1991	July 1993
A Shares Listed (Dec. 1997) (Available only to PRC Nationals)	366	257	--
B or H Shares Listed (Dec. 1997) (Available only to non-PRC Nationals)	50	49	39
A-Share PE Ratios (Dec. 1997)	46	45	--
B- or H-Share PE Ratios (Dec. 1997)	13	10.5	13.7
A-Share Capitalization (US $Billions, Dec. 1997)	$104	$93	--
B- or H-Share Capitalization (US $billions, Dec. 1997)	$2.2	$2.3	$6.5

Source: Bloomberg.

Table A-2
Summary Statistics– Regression Variables

Variable	Full	Shanghai	Shenzhen	Hong Kong
Relative price (P_B/P_A)	0.47	0.33	0.56	0.71
EP_A	0.034	0.019	0.047	0.047
EP_B	0.063	0.052	0.077	0.063
β_A	1.01	1.00	1.01	1.05
β_B	-0.18	-0.22	-0.36	0.37
Payout rate(dividends/earnings)	0.43	0.45	0.38	0.50
Export Dummy Variable	0.40	0.36	0.45	0.43
Percent State Owned	0.45	0.43	0.50	0.40
log(Sales)	6.44	6.31	6.28	7.39
Daily Turnover_A	0.024	0.027	0.019	0.028
Daily Turnover_B	0.003	0.004	0.002	0.006
Chemicals	0.14	0.10	0.10	0.34
Food	0.09	0.04	0.15	0.09
Services	0.09	0.14	0.05	0.00
Light Manufacturing.	0.26	0.29	0.34	0.00
Textiles	0.11	0.18	0.05	0.00
Property	0.09	0.07	0.15	0.00
Industrial & Steel	0.14	0.22	0.00	0.23
Construction	0.05	0.04	0.05	0.11
Transportation	0.07	0.00	0.15	0.11
Utilities	0.02	0.00	0.00	0.11

Notes: table gives the mean value of the listed variable for the full sample of 57 companies and for those listing in Shanghai, Shenzhen, and Hong Kong. "*B*" in the table refers to either a foreign B share or a foreign H share. The final set of variables are the "average" values of industry dummy variables, and hence indicate the percentage the companies in each market in each category. Data are annual for the period 1993-97.

Appendix A: Data and Market Description

Market Description

Table A-1 provides an overview of China's two official exchanges, in Shanghai and Shenzhen. These markets opened in 1990 and 1991, respectively. Two classes of shares trade in Shanghai and Shenzhen. A shares are available only to domestic Chinese residents, and trade in Chinese currency, known as renminbi or yuan. B shares are legally available only to foreigners, and trade in foreign currency—U.S. dollars in Shanghai, and Hong Kong dollars in Shenzhen. A and B shares have the same voting rights and earn the same dividends. Shares cannot be cross-listed—for example, Shanghai shares cannot be listed in Shenzhen, and no firm has multiple classes of foreign shares (firms do have ADRs, as described below).

As of December 1997, more than 600 companies had listed A shares in either Shanghai or Shenzhen; about 100 companies had listed B shares. About three-quarters of the companies (76 of the 100) with B shares also had an A share trading on the same exchange. Total capitalization in Shanghai and Shenzhen was about $200 billion, with foreign-only shares accounting for $4.5 billion of this.

Between 1993 and 1997, 39 Chinese companies issued foreign-only "H shares" in Hong Kong. H shares are priced and traded in Hong Kong dollars, and like B shares, are legally available only to non-Chinese residents. As of December 1997, 13 of the 39 H-share companies had issued A shares in Shanghai, and 3 more had issued A shares in Shenzhen. No companies have more than one foreign listing—e.g., no company has both Shanghai B and Hong Kong H shares. H shares differ from B shares in at least three ways. First, H shares trade in the much larger, more liquid, and better understood Hong Kong market. Second, H-share companies must meet Hong Kong securities rules and regulations as well as the looser Chinese ones, and hence probably provide better information to investors. Third, H-share companies tend to be much larger than companies with B shares in Shanghai or Shenzhen.

Foreigners could also buy Chinese companies in other markets, particularly in the form of American Depository Receipts (ADRs) in New York. For at least two of these ADRs, the underlying security is a distinct class of shares, known as N shares, that do not trade elsewhere. Other Chinese companies also have ADRs or Global Depository Receipts (GDRs), where the underlying security is either a B or an H share. In most cases, no additional revenue was raised from issuing the ADR or GDR. In addition, three Chinese joint-venture companies established Bermuda subsidiaries to issued U.S. shares (see Bailey (1994) and World Bank (1995)), and a number of so-called "Red Chips"— Hong Kong-incorporated enterprises that are primarily owned by mainland companies—have issued shares in Hong Kong.

Data Sources and Construction

Our main sources of data on Chinese companies, share prices, and stock indices are Reuters and Bloomberg. We obtained daily price and volume data from Reuters for 57 companies that had a foreign and domestic share listing as of June 30, 1994; this arbitrary cutoff date provides a reasonable compromise between the desire to have as many companies as possible in our cross section, and the desire to have as many years of data as possible on each of the companies in our sample. Our sample includes 28 Shanghai A-B pairs, 20 Shenzhen A-B pairs, and 9 Shanghai A-Hong Kong H pairs. (Until recently, all Hong Kong H-share companies had their domestic listing in Shanghai.) We obtained data from the date these shares were first listed, so the starting date of companies in our sample differ. We have data through the end of 1997 for these stock pairs.

Data on company characteristics came primarily from the company "description" pages on Bloomberg, which includes data on sales, earnings-per-share, dividends, and, usually, a couple of sentences describing the companies's products and sometimes its major markets. (Bloomberg's coverage of the Chinese market has improved considerably in recent years; when we began this project, neither Bloomberg nor Reuters had much information on company characteristics.) We labeled firms as exporters if the short description in Bloomberg suggested they exported a substantial share of their production. For about a third of our sample, Barings (1992) contains data on "Exports as a percentage of total sales," which confirmed that the Bloomberg descriptions were usually reliable.

We augmented these data from a variety of sources. For number of shares outstanding by class, we relied on company reports filed with the Shanghai Stock Exchange, which we obtained from Internet Securities (www.securities.com). (Despite the name, these reports unfortunately have relatively little qualitative or quantitative company data). The number and type of shares outstanding generally correspond to end-1995. Although Bloomberg rarely provides a complete breakdown on the types of shares outstanding for each company, it does include data on the total number of shares, which we used as a check on our series. (Chinese companies fairly frequently undergo stock splits or have rights issues, which change the number of shares outstanding. The income statements on Bloomberg account for these accounting changes in calculating earnings per share, so the data should be internally consistent. The prices on Reuters and Bloomberg are also adjusted to ensure that changes in the number of shares does not cause a spurious jump in the price series.)

For most companies, Bloomberg does not contain data for 1992 and 1993, and often not for 1994. Where possible, we fill in data on H and B share companies from Internet Securities or Baring Securities (1992, 1994, 1995), which contain data on a number of companies going back to about 1990.

For the market-average price-earnings ratios cited in Section II, we used several sources, all of which are consistent with our claim that in early 1998, foreign PE ratios were around 10 and domestic PE ratios were around 40. First, we calculated the median PE ratio from our set of companies for end 1997 and early 1998, using earnings from 1996. Second, from Bloomberg, we obtained daily indices for PE ratios for Shanghai and Shenzhen A- and B-shares and Hong Kong H shares. These indices appear to cover a broader sample of companies, and probably incorporate more recent earnings figures, but details of construction are unclear. Third, until April 1998, Bloomberg had a daily story showing a cross-section of foreign relative prices and foreign PE ratios. Company coverage is similar, though not identical, to our sample. The median foreign PE ratio was 9.5; the median domestic PE ratio was 41.3.

To construct Figure 1, we first calculated the relative price paid by foreigners (P_B/P_A) for each company by converting the foreign price into renminbi using the daily New York exchange rate. Second, we weight the company relative-prices using daily capitalization weights to create a market average.

Through 1993, China had a dual exchange rate, with an official rate and a parallel floating rate. All B-share transactions, including the payment of dividends, took place at the parallel floating rate in the Shanghai Foreign Exchange Adjustment Center. When we convert share prices into a common currency, we therefore use the floating rate until the end of 1993, and the single unified rate since then. This is the standard practice in, say, Barings (1992, 1994, 1995), Bailey (1994), and World Bank (1995). Bloomberg also provides a relative price series, created by Credit-Lyonnais. This series is available only from August 1996, but it corresponds fairly closely with our own series.

We constructed the Shanghai and Shenzhen A-share subindices, shown in Figure 2, using the 57 companies in our sample. We constructed the subindices as Tornquist indices, weighting the growth rates of company prices (measured as the change in the log price) by shares in total capitalization. In a standard Tornquist index, the weights on price-growth between t and t-1 would be the average capitalization weight in periods t and t-1. To accommodate new companies, we use the weights in t-1. Hence, as desired, a new company does not affect the index when it first enters the market, since its weight is zero. It enters the index the day after it enters the market, when its weight becomes non-zero.

Appendix B: Implications of the Consumption Capital-Asset-Pricing Model

This appendix discusses the implications of the consumption-based capital asset pricing model for the pricing of domestic and foreign shares. As is well known, the consumption CAPM does not appear to work particularly well in explaining asset prices in the United States and other developed economies.[17] Nevertheless, the model highlight forces that should affect asset prices, and hence, provides insights into the factors affecting the required returns (denoted by r in Section III) for Chinese and foreign investors.

Suppose that China and the rest of the world each have a representative consumer, who receives utility from consumption each period of $U(C_{t+1})$, has rate of time preference δ, and seeks to maximize the following utility functional:

$$V_t = \sum_{i=t}^{\infty} \delta^i U(C_{t+i}) . \tag{11}$$

At each period in time, the consumer chooses how much of her endowment to consume, C_{t+i}, and how much to save in each type of asset available to her. As is well known (see, for example, Blanchard and Fischer 1989), the Euler equation for consumer optimization implies that for any asset j with gross return between t and $t+1$ of $(1+r_t^j)$,

$$E_t\left[(1+r_t^j)\,\delta\frac{U^{/}(C_{t+1})}{U^{/}(C_t)}\right] = 1 . \tag{12}$$

It will be useful to decompose the expected return on an asset into a risk-free return, and a risk premium. The relationship in (12) must hold for any asset, so it must hold for a risk-free asset:

$$1+r_t^F = \frac{1}{\delta}\left[\frac{U^{/}(C_t)}{E_t\,U^{/}(C_{t+1})}\right] . \tag{13}$$

Thus, the gross return on a risk-free asset, $1+r^F$, equals the expected marginal rate of substitution in consumption between periods t and t+1. Note that a risk-free asset need not exist for us to price it.

From equation (3), the risk-free rate depends on three factors. First, the risk-free rate will tend to be low if the consumer is relatively patient, so that the rate of time preference δ is relatively high. Second, the risk free rate depends on the expected growth rate of consumption, i.e., expected C_{t+1} relative to C_t. The risk-free rate will be relatively low if the marginal utility of consumption is expected to be relatively high in period t+1 relative to period t. Assuming the consumer is risk averse, this high risk-free rate corresponds to a relatively low growth in consumption. Conversely, the risk-free rate will be relatively high if consumption is expected to grow relatively quickly. Third, the risk-free rate depends on the degree of uncertainty about future consumption, which determines incentives for precautionary saving. That is, the risk-free rate will be relatively low if the consumer wishes to save for precautionary reasons, and is willing to accept a lower return to do so. In particular, suppose the third-derivative of the utility function U is positive, so that marginal utility U' is convex. Given Jensen's inequality, for a given level of expected future consumption, higher uncertainty raises expected marginal utility $E(U'(C_{t+1}))$ in the denominator of (13).

Now consider the equity premium. We can rewrite equations (12) and (13) as:

$$E(r_t^j) - r_t^F = -\frac{Cov(r_t^j, U^{/}(C_{t+1}))}{E\ U^{/}(C_{t+1})} \tag{14}$$

In other words, the equity premium depends on the covariance of returns with the marginal utility of

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[17] See, for example, Mehra and Prescott (1985), who document the shortfalls of the consumption CAPM in explaining the magnitude of the equity premium, and Mankiw and Shapiro (1986), who document that the standard CAPM explains asset returns better than the consumption CAPM.

consumption. An asset with a low (or negative) equity premium is one that provides a high return in states of the world where those returns are particularly valuable—that is, when consumption is low, so the marginal utility of consumption is high. Assets requiring large equity premiums are those that pay high returns when consumption is already high, and the marginal utility of consumption is low.

Now consider the pricing of a share. The return on holding a share whose price is P_t equals $(P_{t+1}+D_{t+1})/P_t$, where D_{t+1} is the dividend paid on the share. Substituting recursively into the Euler equation (12) and assuming the usual transversality condition, we can write the price of a share as

$$P_t = E_t\left[\sum_{k=1}^{\infty} \delta^k \frac{U'(C_{t+k})}{U'(C_t)} D_{t+k}\right]. \tag{15}$$

According to equation (15), the price of a share is the expected present discounted value of dividends, discounted using the marginal rate of substitution between consumption in period $t+k$ and consumption in period t. Using the risk-free rate defined by equation , we can rewrite this as

$$P_t = \sum_{k=1}^{\infty} \left(\frac{1}{1+r^F}\right)^k E_t D_{t+k} + \sum_{k=1}^{\infty} \delta^k \frac{Cov\left[U'(C_{t+k}), D_{t+k}\right]}{U'(C_t)}. \tag{16}$$

The first term represents the present discounted value of expected future dividends, discounted at the risk-free rate. (For simplicity, we assume that this risk-free rate is constant over time, though it need not be and likely is not in the data). The second term reflects the equity's risk premium, where the covariance of consumption with the asset's "return" from equation (14) has now been replaced by the covariance with dividends. This second term will ordinarily be less than or equal to zero.

Equation (15) demonstrates how to decompose the differences in prices paid by Chinese and foreign investors to differences in risk-free rates, and differences in risk premia. With open capital markets, of course, arbitrage would tend to equate prices as well as risk-free rates across countries. Of course, a three-month U.S. Treasury bill is close to risk-free for a U.S. investor, who consumes primarily U.S goods, but not for a Chinese citizen, who has to worry about exchange-rate risk as well as inflation. But with sufficient forward markets, covered-interest parity would ensure that interest rate differentials reflect information about exchange-rate risk. Hence, if China's capital account were open, there could not be large differences in risk-free rates. In the absence of ownership restrictions, asset prices would also be equated—differences in equity risk premia would be reflected in ownership patterns, not prices. With ownership restrictions, prices could still differ if there are differences in equity risk premia.

Given that China's market is segmented from world markets, risk-free rates as well as asset prices can differ across investor groups. From equation (2) above, the risk-free rate in equilibrium reflects the willingness of investors to substitute consumption tomorrow for consumption today. Consumers in China who are in a position to save may require a relatively low return on their saving, because they actively seek to shift consumption from the present towards the future—either because they are relatively patient (a high δ), expect consumption to grow relatively slowly, or have strong precautionary saving motives. Precautionary saving motives may be particularly important, given the sizeable increases in uncertainty associated with economic reform. (Cite and discuss Gordon and Li's 1998 argument that China in essence "taxes" the financial sector through low interest rates.)

What about the incentives to diversify, captured by the equity premium in (14) as well as the second term of the pricing equation (15)? For a foreign investor, this term should be close to zero, since returns on a Chinese stock are likely to have little, if any, correlation with foreign consumption opportunities. For example, macroeconomic and political shocks to China are unlikely to be closely related to, say, the stock market or wages in the United States. Returns on Chinese stocks are much more likely to be correlated with Chinese consumption opportunities. For example, one might expect that returns on human capital—wages—are likely to be highest in exactly those states of the world where Chinese companies prosper and pay high dividends. Thus, the diversification or covariance effect tends to work in the direction of raising the foreign price relative to the domestic price. This is, of course, consistent with the observation that in most other markets with investment restrictions, foreigners usually pay a premium, not a discount.

Nevertheless, for a Chinese investor, the covariance or diversification effect is likely to be small. The capitalization of China's stock market was roughly \$200 billion at the end of 1997, but only about one-third of the shares on the market are held by individuals (as discussed in Section I, the rest are non-traded shares owned by the government or by other companies). Hence, the individual component of the stock market is about \$70 billion, an amount equal to about 6 percent of M2 and 8 percent of GDP. By comparison, in the United States, stock market capitalization at end-1997 of nearly \$12 trillion was 300 percent of bank deposits and 150 percent of GDP. Hence, relative to investors in developed markets, the consumption opportunities of a Chinese citizen are not much affected by events on the stock market, so the covariance with consumption is likely to be relatively low.

Of course, if returns on the stock market are highly correlated with bank returns or wages, the covariance term could still be sizeable, even if the stock market itself is small. Nevertheless, it seems unlikely that this correlation is higher in China than in developed economies, where the stock market is much broader, and is probably more representative of the entire economy. This is particularly true given that much of the increase in uncertainty about future outcomes in China is idiosyncratic, reflecting the enormous sectoral shifts hitting the economy, the widely varying skills of different workers, and the absence of a comprehensive safety net.

Hence, it seems likely that the diversification effect is relatively small for Chinese investors—the equity premium in China might well be much smaller than in the United States. In the United States, the average equity premium has averaged about 5 percent since the 1920s. Given the observed home bias puzzle (in which investors do not invest abroad as much as would be suggested by the low covariance of returns abroad with domestic consumption), it seems likely that even on stocks abroad (such as those available in China), investors require an equity premium of 5 percent or more. Although this equity premium is difficult to explain in terms of the consumption CAPM presented above, it nevertheless provides ample scope for the domestic Chinese equity premium to be lower than for foreigners.

We conclude this section with some quick simulations, to get some better idea of what would be required to account for a difference of 4 percentage-points in expected returns. Suppose the period utility function takes the power form $U(C) = \left(C^{1-\gamma}-1\right)/(1-\gamma)$. Then we can write the risk-free rate as:

$$1+r_t^F = \frac{1}{\delta}\frac{1}{E_t\left[\left(C_{t+1}/C_t\right)^{-\gamma}\right]} \tag{18}$$

First, consider rates of time preference δ, which real-business-cycle models usually parameterize to be around 0.96. Suppose foreign investors do have a rate of time preference of 0.96, whereas Chinese investors are more patient and have a rate of time preference of 0.98. Other things being equal, that would account for a difference of about 2 percentage points in risk-free rates. Nevertheless, although this could explain some of the difference in required returns, we have no strong reasons for expecting Chinese investors to be intrinsically more patient than foreign investors.

Second, suppose there are differences in expected growth rates of consumption, $E(C_{t+1}/C_t)$. This channel probably tends to go the wrong way, giving Chinese investors a *higher* risk-free rate, since if anything, Chinese investors probably have a higher rate of expected consumption growth. From 1978 to

1995, for example, measured real per capita consumption grew nearly 7 percent per year in China.[18] An increase of 1 percentage point in expected consumption growth tends to raise the risk-free rate by about γ percentage points. (We can see this directly by ignoring uncertainty about consumption, differentiating 33 with respect to consumption growth C_{t+1}/C_t, and evaluating at C_{t+1}/C_t equal to 1. To account for uncertainty—reflected by the expectation sign in the denominator of (18) —we performed some simple simulations, which suggest that the approximation is very close.)[19] Hence, if the coefficient of relative risk aversion is 2, a percentage-point increase in expected consumption growth raises the risk free rate by about 2 percentage points. Although it would appear that this effect tends to raise Chinese risk-free rates relative to foreign rates, it may be that Chinese stock market investors are not representative of China's population, and hence do not have consumption growth that is as rapid as aggregate consumption growth. Hence, this effect may not be very important. Otherwise, it heightens the puzzle of low required returns.

What about uncertainty about future consumption? The table below shows simulations for the difference between the foreign and domestic risk-free rates, for different values of γ and different values for the standard deviation of consumption growth. For example, the table shows that if γ equals 2, and the standard deviation of Chinese consumption is 10 percent (0.10), the foreign risk-free rate would be about 2 percentage points (0.02) higher than the Chinese risk-free rate.

$r^F_{Foreign} - r^F_{China}$			
	Difference in Standard Deviation of Consumption (Std dev of Chinese consumption - std. dev. of foreign consumption)		
γ	0.01	0.10	0.15
1	0.003	0.005	0.015
2	0.004	0.02	0.05
5	0.001	0.14	0.27

Note: For all simulations, mean consumption growth was set equal to 2.5 percent, δ was set equal to 0.96, and the standard deviation of foreign consumption was set equal to 1.8 percent (equaling the U.S. post-war average).

If γ is somewhat larger, equal to 5, it is very easy to generate large differences in risk free rates. Although not shown, if the standard deviation of Chinese consumption were 5 percentage points higher than in the United States, other things being equal, the Chinese risk-free rate would be about 4 percentage points lower than in the United States. (From 1985-1995, the standard deviation of aggregate consumption growth was around 4 percent in China, slightly more than 2 percentage points higher than in the United States. In China, aggregate consumption is probably even less good as a proxy for individual consumption than it is in the United States, given the lack of insurance markets (including social insurance, such as unemployment) to hedge idiosyncratic risk.)

Of course, Chinese investors might also be less risk-averse than foreign investors, so that γ might be smaller for China investors. To some extent this would capture the notion, often heard in informal

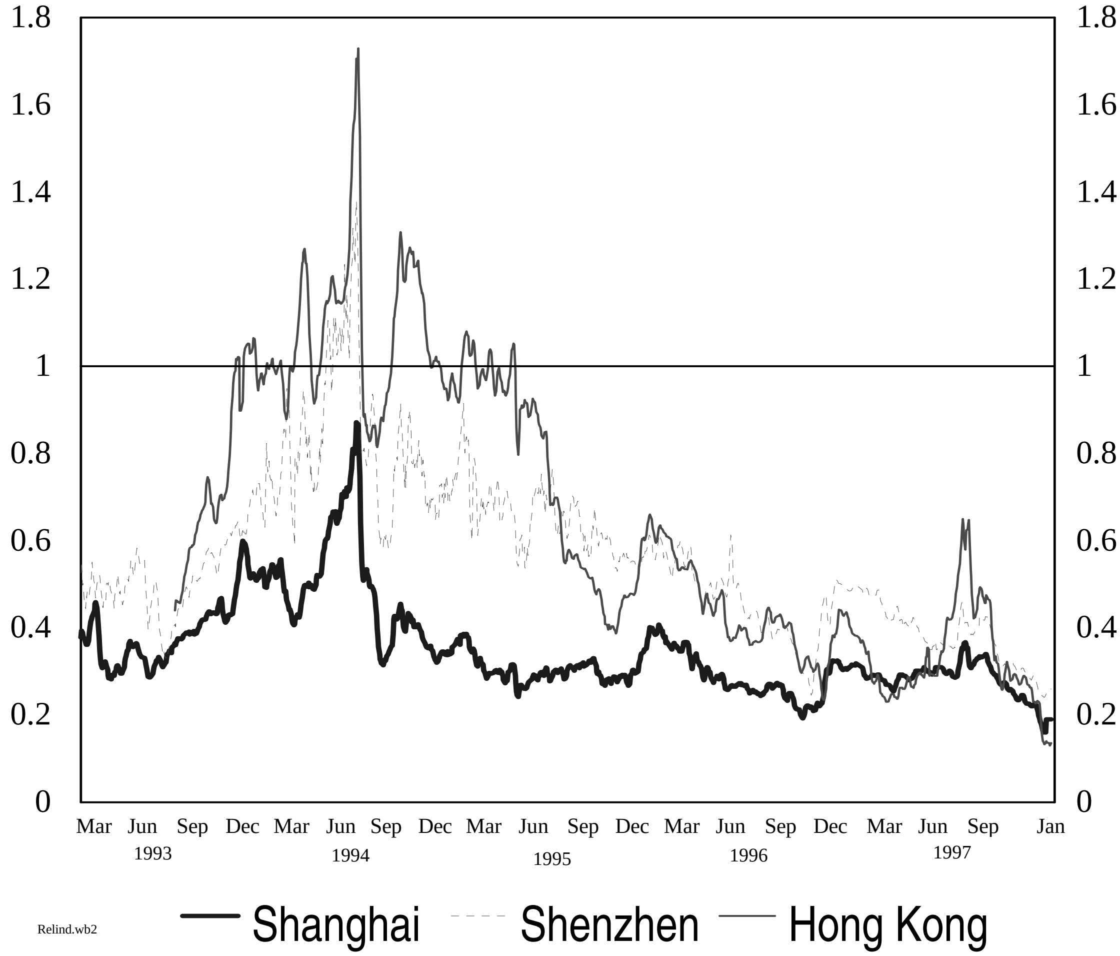
[18] From *China Statistical Yearbook 1996,* p. 280. Consumption data are probably subject to larger than usual biases even for China, given China's historically poor statistical system.

[19] Expectations were calculated via simulations, averaged over 500 random draws of consumption. The rate of time preference δ was set to 0.96, and the standard deviation of consumption growth was set to 1 percent. These simulations, for the effects of changes in mean consumption growth, are relatively insensitive to the rate of time preference or the standard deviation.

discussions of the stock market in China, that the domestic market is essentially a casino, where investors don't mind (or perhaps even like) risk. If foreign investors have γ equal to 2, while domestic investors have γ equal to 1, then for the baseline parameters from the table above, the Chinese risk-free rate would be about 3 percentage points lower than the foreign rate.

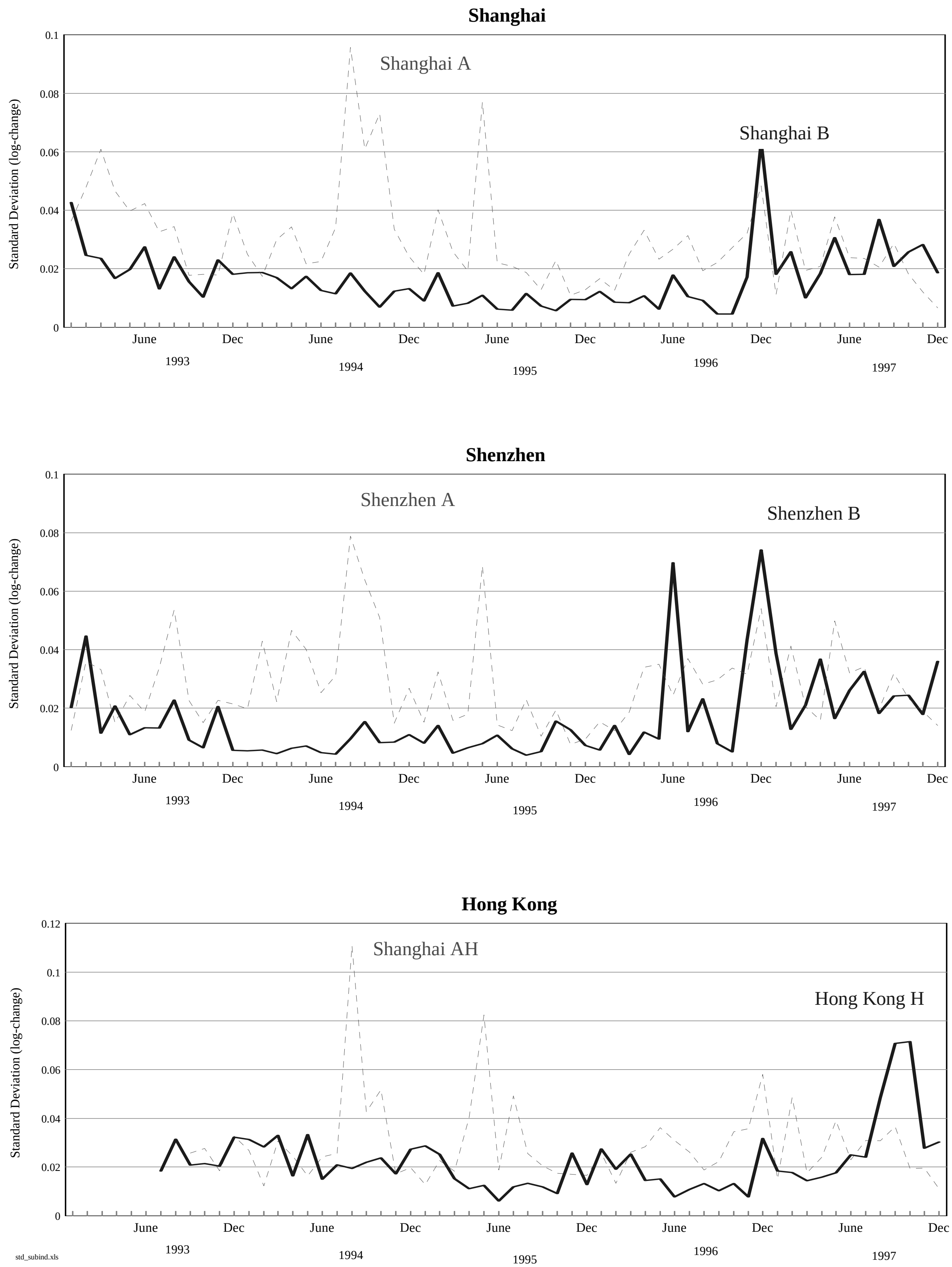
Hence, in the consumption CAPM, to explain the pricing difference through the risk-free rate, we need some combination of patient Chinese investors; lower risk-aversion for Chinese investors; or substantially higher uncertainty about individual Chinese consumption growth than about foreign consumption growth. These forces need to be large enough to offset the probable higher mean consumption growth in China. Finally, it is probably the case that Chinese investors also have a low equity premium, given that the stock market is relatively small, but also provides one of the few ways to hedge the presumably sizeable idiosyncratic risk facing individual investors.

Figure 1
Relative Price Paid by Foreigners



Note: Average prices for foreign-only shares relative to prices for corresponding domestic-only shares, using capitalization (domestic plus foreign shares) weights. In Shanghai and Shenzhen, foreign and domestic shares trade on the same exchange. For Hong Kong H shares, the corresponding domestic share trades in Shanghai. Foreign prices are converted into Chinese renminbi. Before February 1997, series are computed from our sample of companies (28 in Shanghai, 20 in Shenzhen, and 9 in Hong Kong). Since February 1997, series are from Credit Lyonnais.

Figure 2
Monthly Standard Deviations of Daily Percentage Change in Price

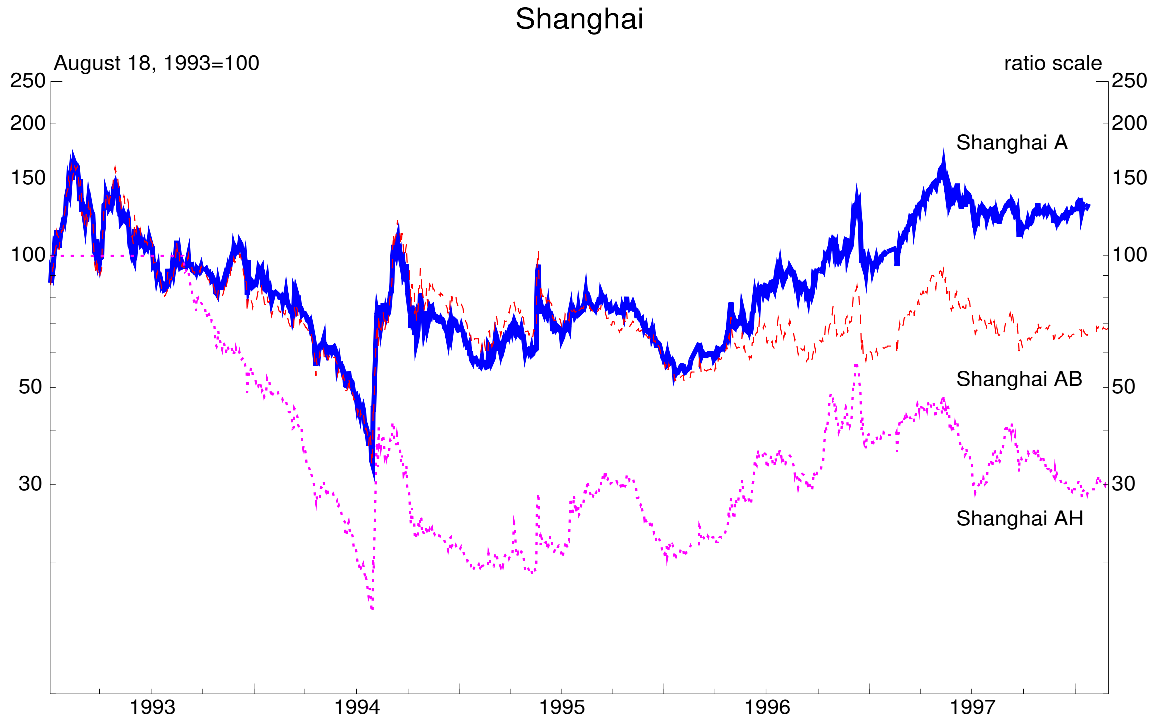


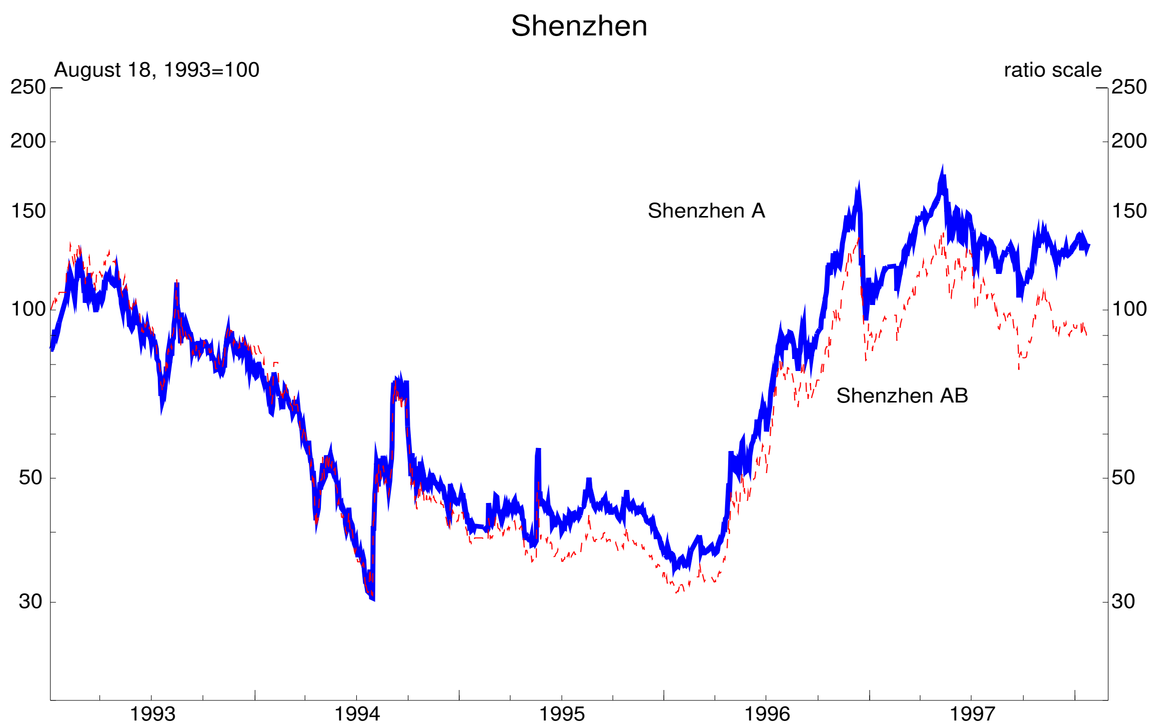
Note: Figures show standard deviations, by month, of the daily change in the log of the market indices. Domestic indices are the subindices for companies with foreign shares, as described in Appendix A.

Figure 3
China Stock Indices Available to Foreign Investors

Sources: Bloomberg and Reuters.

Figure 4
Domestic Shanghai and Shenzhen Subindices





Notes: Shanghai and Shenzhen A indices are from Reuters. Shanghai and Shenzhen AB indices are A-share prices for companies with foreign B shares; AH indices are Shanghai A-share prices for companies with Hong Kong H shares. AB and AH indices are capitalization weighted, constructed as described in Appendix A.