

The Influence of Foreigners' Stock Investment on Korean Stock Prices and Its Implications

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Abstract

Foreign investors have quickly come to account for a very high share of Korean stock market capitalization since the partial opening of the Korean stock market in 1992. This stock investment by foreigners has been lauded for its role in fund-raising for Korean firms and improving corporate governance.

On the other hand, foreigners' stock investment in Korea has accentuated the dispersion of Korean stock prices due to preferences for exporting and/or large scale firms, which presumably arises from information asymmetries, along with foreign investors' increased influence on stock price formation. The heightened degree of stock price dispersion in Korea can be attributed in part to the economic polarization that occurred after the Asian currency crisis; however, foreigners' stock investment is also responsible. Foreigners' biased investment pattern may bring about a situation where stock investment is not based on firms' performance but on foreign investors' preferences, shutting off some firms from the benefits of the openness of the stock market to foreign investors.

It is crucial to reduce the information asymmetries faced by foreign investors by fostering investor relations (IR), improving accounting transparency and the credibility of corporate disclosure. It is also highly desirable for institutional investors to play a bigger role, bringing about a reduction in the tendency of individual investors to follow foreign investors' pattern of stock investment.

JEL Classification Number: F21, F36, G11

Key Words : Foreigners' Stock Investment, Stock Prices Dispersion, Home Equity Bias

I. Introduction

After the Korean stock market was partially opened to foreigners in 1992, the ratio of domestically listed shares held by foreigners has increased at a rapid pace and now stands among the highest compared to the global average. A great deal of research has been conducted on the effect of opening stock market to foreign investors on the economy in several aspects such as economic growth, investment, stock price levels and volatility and stock market stability.¹⁾ Especially in Korea, where foreigner's equity holding ratio has reached a considerably high level and its impact has gradually increased, there have been numerous studies on foreign influence on the pattern of stock investment in the domestic market. Foreign equity investment is believed to bring about positive effects such as facilitation of direct financing for domestic firms, expansion of the demand base in the stock market, improvement of nation-wide credit ratings and establishment of conditions for the advancement of corporate governance. These effects are likely to be concentrated upon a certain group of firms rather than to equally affect all the companies listed in the stock market due to the selective investment behavior of foreigners arising from information asymmetry. In general, several studies point out that investors behave in different ways when they invest in overseas stocks because of information asymmetry.

This paper focuses on the possibility that selective investment behavior arising from the information asymmetry confronted by foreign investors may lead to an increase in the degree of foreign influence on the domestic stock market as well as to stock price dispersion in Korea. It may have resulted from the economic polarization that took place after the currency crisis in Korea. This paper attempts to show that even though stock price polarization is basically brought about by economic polarization, foreigners' selective investment in the domestic stock market may aggravate the stock price polarization.

Stock price polarization arising from economic polarization is inevitable given the existence of the latter phenomenon. However, stock price polarization arising from foreigners' characteristic pattern of selective investment attributable to information asymmetry may isolate blue-chip SMEs from the benefits of stock

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1) Refer to Section II for details.

market openness, irrespective of their performance. This paper discusses policy measures that can be taken to minimize these problems brought about by the inflow of foreign investment funds into certain firms and to spread the benefits of stock market opening evenly among all sectors of the economy.

This paper is organized as follows. Section II reviews literature on the effect of stock market opening. Section III examines the trends and characteristics of foreign equity investment. Section IV explores the current status of stock price polarization arising from foreign equity investment and analyzes its causes. Section V concludes the paper and presents policy implications.

II. Literature Review

There has been both theoretical and empirical research into the positive and negative effects of stock market liberalization on the economy from many aspects. WIDER (1990) argues that stock market liberalization in less-developed or developing countries fosters economic growth by promoting domestic savings, increasing efficiency of resource allocation through the market and strengthening corporate discipline. In contrast, Singh and Weisse (1998) suggest that it is of no help in promoting long-term economic growth because of the higher volatility of stock prices and exchange rates, the short-term and speculative characteristics of equity investment, and operational pressure based on short-term rather than long-term consideration.

Theoretically, stock market liberalization lowers firms' cost of equity capital and thereby promotes investment. However, empirical studies show mixed results with regard to this effect. Henry (2000) shows that the opening of the stock market boosts investment in the private sector while Levine and Zervos (1998) point out that it does not lead to a permanent increase in the growth rate of the capital stock. In addition, Durham (2002) shows that the effect of stock market liberalization in boosting investment is not apparent in low income countries in contrast to high income countries.

It is difficult to evaluate a priori the impact of stock market liberalization on stock price volatility because its impact can be both negative and positive. Unexpected foreign capital inflows and outflows can make domestic stock prices more volatile. If foreign investors base their investment decisions on information, on the other hand, it reduces noise trading in the market, causing stock prices to be less volatile. According to empirical studies conducted by

Holmes and Wong (2001) and Ko and Lee (2003), stock market liberalization does not generally lead to an increase in stock price volatility.

Moreover, there are empirical studies investigating foreign investors' herd behavior or trend-chasing behavior that investigate whether foreign investors increase stock price volatility by disturbing the domestic stock market. Ji and Ok (2003) document evidences about both herd and trend-chasing behaviors among foreign investors. Kim (2001) shows that this tendency is greater among non-resident foreign investors than resident foreigners. Choe, Kho and Stulz (1999) report that there was no such behavior during the currency crisis period, and Park (2004) shows that herd behavior was not found during the period of 2002 to 2003. Moreover, Jeon and Choi (2003) point out that the movement of Korean stock prices is closely related to that of the US stock prices as foreign investors closely watch the US stock market before investing in the Korean market.

In theory, stock market liberalization causes domestic stock prices to rise as domestic stocks are integrated into the world market portfolios and demand for diversification increases. Patro and Wald (2004) show that earnings per share increased during the period in which emerging countries were pursuing market liberalization but decreased in most companies after that.

Other than these empirical studies, the effect of stock market liberalization has been examined in several other aspects. For example, Das and Mohapatra (2003) examine it from the aspect of unequal income distribution. In Korea, Park (2004) studies foreign shareholders' policy of demanding high dividend while Seon et al. (2004) study the effect of information trading by foreign investors on stock prices; and lastly the negative impact of the increasing influence of foreign investors such as hostile M&A is addressed by Jeon et al. (2005).

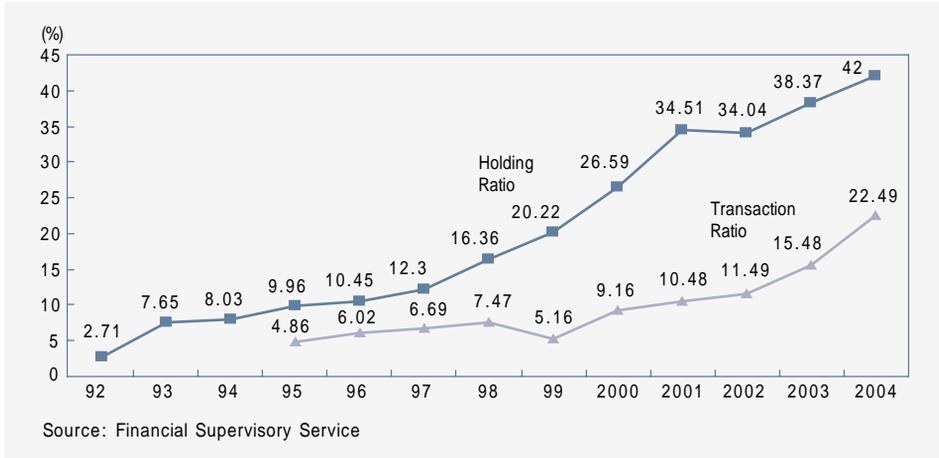
III. Trend and Characteristics of Foreign Equity Investment

1. Trend of Foreign Equity Investment

In 1992, Korea partially opened its stock market, restricting foreigners' acquisition of domestic stocks to no more than 20% and gradually eased the restriction thereafter. In December 1997, the limit was raised to 50% and the stock market was fully liberalized in May 1998. After its full-scale liberalization, the ratio of foreigners' holdings of domestic shares increased substantially. In

Figure 1

Share of equity holdings and trading volumes by foreign investors in the Korean stock market (aggregate value of listed stocks)



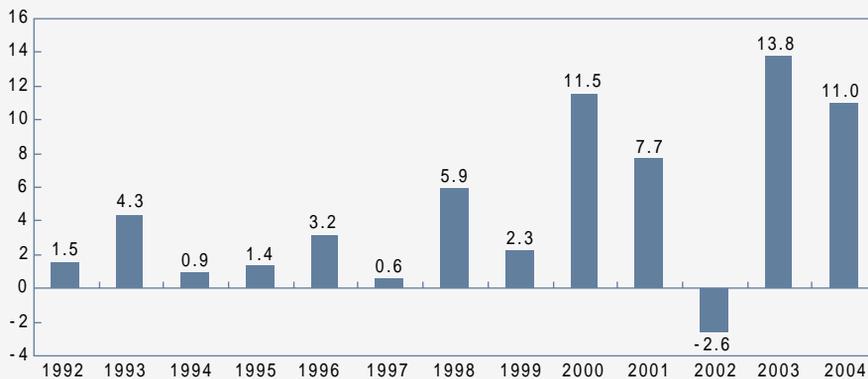
terms of market capitalization of all the listed companies, it increased approximately 14 percentage points from 2.7% to 16.4% between 1992 and 1998 during which period the Korean stock market was partially liberalized. In contrast, it increased approximately 26 percentage points from 16.4% to 42% during the period of full liberalization (1999-2004).

Foreigners' share of the total Korean stock market capitalization currently ranks sixth highest in the world, following Hungary, the Netherlands, Lithuania, Finland and Mexico (Ahn, 2005). On the other hand, foreign investors' ratio of total trading volume is lower than that of their holdings, reflecting the fact that they tend to hold shares longer than domestic investors. However, it has shown an upward trend, reflecting the increase in the share of market capitalization, and it reached 22.5% at the end of 2004.

Foreign investors have been net buyers in the Korean stock market during the period of analysis, except for 2002. Moreover, the scale of their net investment was very substantial in 2000, 2003 and 2004, exceeding 10 trillion won in each of these years.

It is found that the ratio of foreigners' equity holdings is relatively higher in financial sectors such as banking, insurance and finance and in sectors dominated by exporters and large firms, such as steel, metal and the electric and electronics industries, whereas it is relatively lower in sectors where domestic-based firms and SMEs predominate, such as medical supplies, precision machinery, textile and clothing, and paper and wood.²⁾

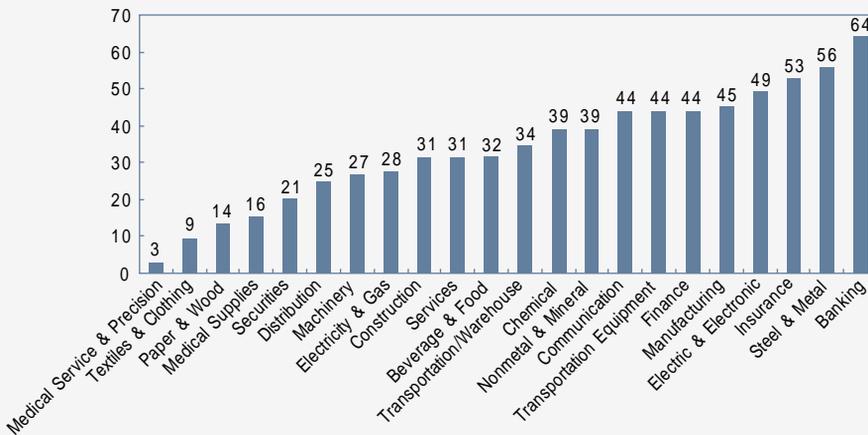
Figure 2 Size of net investment in listed shares by foreign investors (trillion won)



Source: Financial Supervisory Service

Figure 3

Foreigners' equity holding ratio by industry (aggregate value of listed shares at the end of 2004, %)



Source: Fn Guide³⁾

2. Characteristics of Foreign Equity Investment

Characteristics of foreign equity investment are analyzed based on several standards to examine whether the criteria for foreign investors' investment

2) Industrial classification follows the classification standards of the Korea Stock Exchange.

3) Materials of Data Guide provided on-line by Fn Guide are used.

decisions overlap those of economic polarization.⁴⁾ First of all, in terms of size of companies they invest in, it is found that foreigners invest heavily in large firms. At the end of 2004, the number of companies in which foreigners' equity exceeded 5% is 28 out of the top 30 companies and 94 out of the top 100 companies in terms of aggregate market value. It can be seen from Figure 4 that the bigger the size of a company, the greater the proportion of its stocks held by foreign investors.

In particular, the question of whether or not a company is included in the MSCI and FTSE indexes, which are widely used as benchmarks in stock investment, has a large effect on foreign investment in the respective firm's

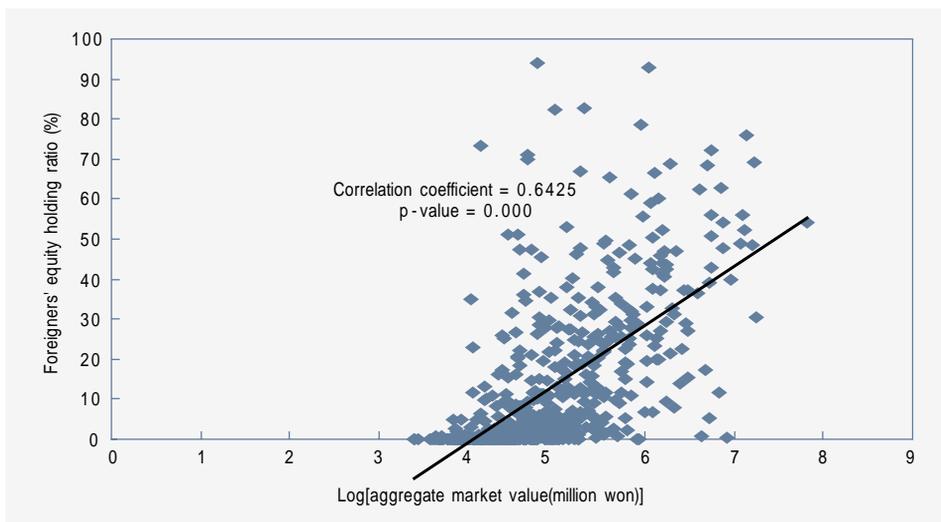
Table 1 Number of companies in which foreigners' shareholdings exceed 5%

	Top 5	Top 10	Top 30	Top 50	Top 100	Top 150	Top 200 Large Firms
Average over 2002-2004	5	10	28	46	90	123	150
End of 2004	5	9	28	48	94	134	165

Source: Fn Guide

Figure 4

Firm size and foreigners' equity holding ratio (aggregate market value at the end of 2004, %)



4) Ji and Ok (2003) analyze the characteristics of issues preferred by foreign investors.

shares. These indexes are generally employed by international institutional investors when they invest in non-U.S. stocks. Morgan Stanley and the Financial Times compute and provide the list of those shares that are included in the indices and their ratios, with several factors such as aggregate market value and the trading volume of listed shares being taken into account. Chakrabarti et al. (2005) present empirical evidence that there is an 'index effect' in that issues newly listed in the MSCI index have experienced a large increase in their stock prices while the stock prices of those that have been excluded have fallen. On February 14, 2005, 84% of total equity investment made by foreigners (based on Korea Stock Exchange, aggregate market value) was concentrated on 66 Korean companies included in the computation of the MSCI index, while 94% was concentrated on 95 companies included in the FTSE index on November 30, 2004. The ratio of issues included in the calculation of the MSCI index and the actual ratio of foreign equity investment in those companies (aggregate value of listed stocks) are presented in Figure 5-1 and Figure 5-2. Since the share of the top company in the MSCI index is much more than those of other companies, it was relatively difficult to distinguish the weights in the index and in total investment among other firms. Thus, the top company is excluded and the relationship between the two ratios is shown separately in Figure 5-2. The more the points are clustered around the 45 degree line on the graph, the closer the proportion of actual investment to the proportion of issues included in the index. There are firms included in the MSCI index in which investment is not made. However, it turns out that the actual investment ratio is in general close to the ratio of issues included in the index for most Korean companies. This may suggest that an 'index' has something to do with foreign investment in Korea.

Figure 5-1

Ratio of issues included in the MSCI index and the actual ratio of foreign equity holdings in their portfolios (February 14, 2005)

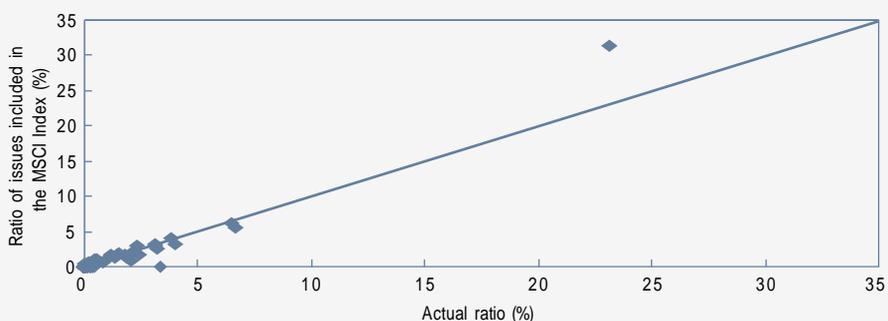


Figure 5-2 Ratio of issues included in the MSCI index and the actual ratio of foreign equity holdings in their portfolios (February 14, 2005, note that the company with the highest share in the MSCI index is excluded)

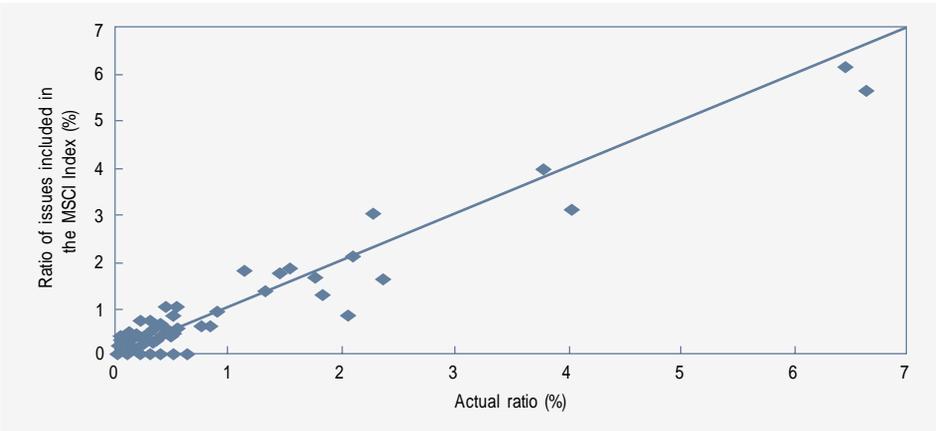
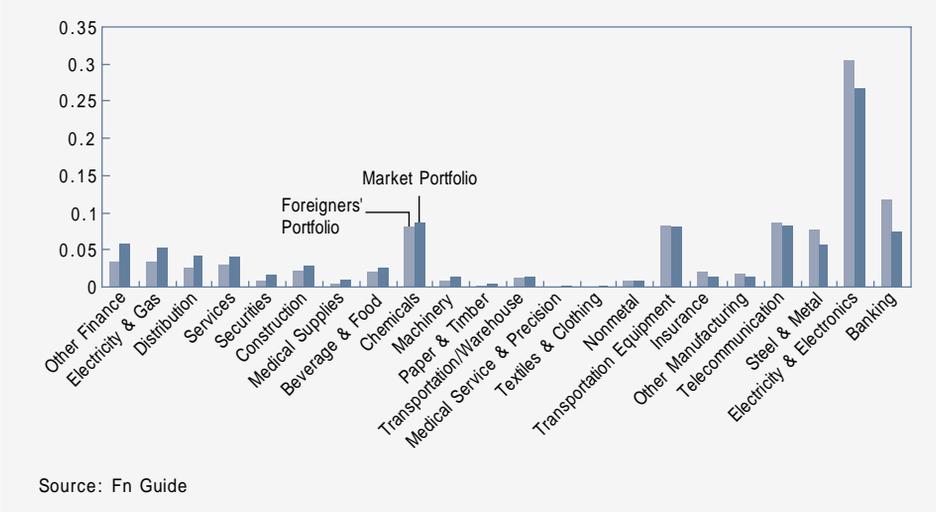


Figure 6 Share in the average market portfolio and share in foreigners' investment portfolio by industry (aggregate value of listed shares at the end of 2004)



Source: Fn Guide

Figure 6 shows, on the basis of the aggregate value of listed shares, the industry-level share in the market portfolio and that in the foreigners' investment portfolio, representing foreign investors' preference in the market. As of 2004, foreign investors invested more heavily than the market average in banking, electric and electronics, steel and metal, telecommunication, and other

Table 2 Shares of companies included in KOSPI IT, KODI and KOGI
(As of the end of 2004)

	KOSPI IT	KODI	KOGI
Market Portfolio	30.0	48.6	46.2
Foreigners' Portfolio	35.0	60.7	56.5

Source : Fn Guide, Korea Stock Exchange.

manufacturing industries but less actively than the market average in other financial industries, electricity and gas, distribution, services, securities, construction, medical supplies and beverages. This seems to imply that the standard by which economic polarization can be explained at the industry level, that is, whether they are export and heavy industries or domestic-based and light industries, applies to the investment pattern in the Korean stock market as well.

The Korea Stock Exchange compiled KOSPI IT (stock price index for the information and telecommunication industry), KODI (dividend index), and KOGI (corporate governance index) and started to publish them from 2000 and 2003 to reflect the ever-increasing interest on the part of stock investors including foreign investors in recent years.⁵⁾ Table 2 shows that the shares of companies that are included for the calculation of the indexes both in the market portfolio and in the foreign portfolio. As of 2004, foreigners invested more than the market average in IT industries and companies with higher dividend payout ratios and more transparent corporate governance.

IV. Foreign Investment and Stock Price Polarization

1. Phenomenon of Stock Price Polarization due to Foreign Investment

As of January 2005, out of 682 companies listed on the exchange excluding those in financial sectors such as banking, securities, insurance and finance, a total of 627 companies are classified into two groups - foreign-invested firms and other firms - on the basis of foreign investment ratios. Firms the ratio of whose shares held by foreigners exceeds, on average, 5% on a monthly basis

5) The number of firms included in KOSPI IT, KODI and KOGI is 20, 50 and 50, respectively.

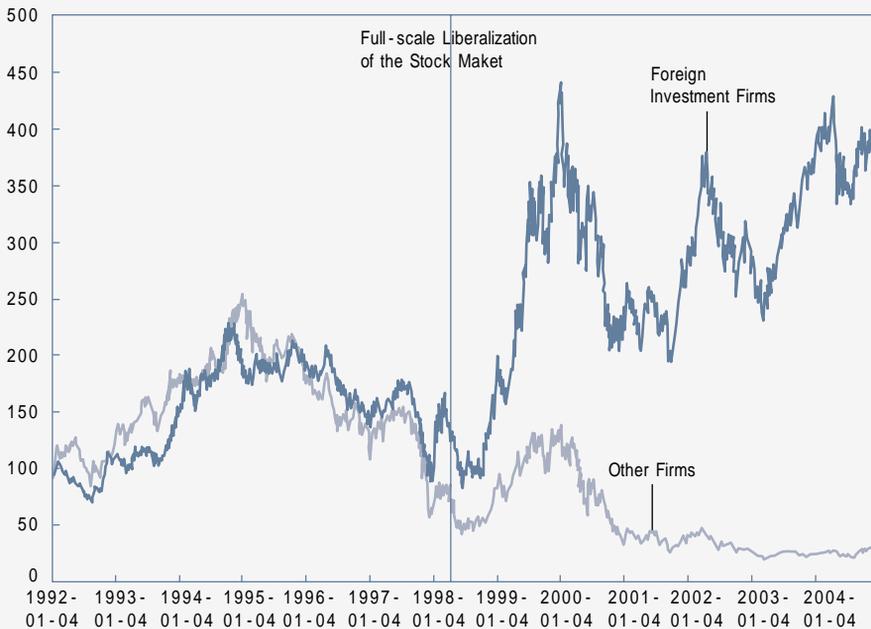
from 2002 to 2004 are classified as foreign-invested firms. As a result, 199 companies are categorized as foreign-invested companies and the remaining 428 companies as others. Using data on the adjusted stock price and aggregate value of listed stocks for each company, stock price indexes for the two groups are computed as follows:

$$I_t = I_{t-1} \sum_{i=1}^n \frac{P_{it} C_{it-1}}{P_{it-1} C_{t-1}} \quad (1)$$

where I_t is a stock price index for a group, P_{it} is a stock price after adjusting factors which make stock prices discontinuous such as paid-in capital increase, gratis issues, stock dividends, reduction of capital, reverse stock splits and stock splits, C_{it} is the aggregate value of listed shares of company i and C_t is the aggregate value of listed shares of the group in which the company is included.

Stock prices of the two groups are set to 100 as of January 4, 1992 and daily indexes from 1992 to 2004, which are calculated as described above, are shown in Figure 7. This shows that the dispersion between the stock prices of the two groups did not emerge before the stock market was fully liberalized but, after its

Figure 7 Trend of stock price indexes of foreign-invested companies and other firms



Source: Fn Guide

full liberalization, not only did the stock prices of the two groups disperse, but the degree of dispersion also widened over time. Especially after 2001, the stock prices of foreign-invested companies have shown an upward trend even though they have been fluctuating. In contrast, stock prices for the other group have been declining. Moreover, a matched two sample one-sided t-test conducted to examine whether there exist differences in daily profits between the stock price indexes of the two groups shows that differences in their stock price indexes are statistically significant as the p-value turns out to be 0.000 over the whole period.⁶⁾

2. Causes of Stock Price Polarization due to Foreign Investment

The occurrence of the disparity between stock prices of foreign-invested firms and other firms after the full-scale liberalization of the stock market was examined in the previous section. It can be inferred that stock price polarization arising from foreign investment is attributable to a combination of the following factors.⁷⁾ First, the composition of foreign equity investment is different from the composition of the market portfolio, and foreign investment tends to concentrate heavily on a certain business groups. Second, the Korean economy has experienced economic polarization over the past few years and, as a result, the phenomenon of the polarization of stock prices has also occurred. Third, investment standards of foreigners in large part overlap with the factors which explain economic polarization. Fourth, due to the increasing size of foreigners' stock investment, the influence of foreigners on stock prices has increased. In this section, existing theories that explain the preferential investment pattern by foreigners as a phenomenon resulting from information asymmetry are examined. In view of the economic polarization, it is examined whether there has been stock price polarization. As a matter of fact, the third and fourth factors

6) Detailed test results are presented in [Table A.1].

7) If different investors, institutional investors in particular, have similar investment behavior to foreign investors, one may argue that stock price polarization arising from classifying firms in terms of foreign investors is not necessarily due to foreign equity investment. It was not possible to conduct an analysis based on the ratios of institutional investors' equity because it was difficult to obtain detailed information about this for each industry, but it can be indirectly inferred by using aggregate data. According to materials obtained from Korea Stock Exchange, (http://sm.krx.co.kr/webkor/tong/tong_index.jsp?url=/webkor/tong/st/ma/tn_st_ma_sn.jsp), it turns out that the proportion of shares owned by foreigners has increased by 30%p while the proportion of shares owned by individuals and institutional investors has declined by 13%p and 15%p, respectively. Using weekly data over the period of January 1995 to May 2003, Yoon (2004) shows that no institutional investor had a positive correlation with foreign investors in terms of net buying. These results, in turn, show that the investment patterns of institutional investors differ from those of foreign investors, and hence it does not imply that the effect of foreign investment on stock prices includes the effect of institutional investors on stock prices.

have been addressed in the preceding section.

3. Foreign Equity Investment and Home Equity Bias Hypothesis

Since foreign investors do not have as much access to information about domestic companies as domestic investors do, it can be inferred that their investment patterns will be different from those of domestic investors. This section briefly examines the existing theoretical and empirical studies of equity investment behaviors which depend upon where the investment is made, i.e., domestic or overseas markets.

An international version of the capital asset pricing model with a perfect asset market assumption suggests that the composition of an asset portfolio by investors is consistent with that of the world market. In reality, however, it turns out that investment in domestic assets has been more dominant than that in overseas asset and this phenomenon is widely known as home equity bias. Many factors have been considered to explain the home equity bias, and the information asymmetry between domestic and foreign companies is regarded as a plausible contender among them.

It is widely accepted that the home equity bias hypothesis can be applied to almost every situation in which information is involved as well as boundaries between countries. In other words, it can happen between regional and non-regional companies even in the same country and there could be a home equity bias even among foreign companies, depending upon their being internationally well known companies or not. Gehrig (1993) explains the home equity bias with information asymmetry using a rational expectations model while Zhou (1998) and Coval (2000) make use of a learning model.

On the other hand, Dahlquist, Pinkowitz, Stulz and Williamson (2003), Aggarwal, Klapper and Wysocki (2003), and Gugler, Mueller and Yurtoglu (2003) emphasize as causes of home equity bias such factors as corporate governance, legal protection measures for investors and transparency of accounting information as well as information asymmetry.

Moreover, there have been several empirical studies explaining the home equity bias. Portes and Rey (1999) prove that information plays a role in investing in overseas securities, and Coval and Moskowitz (1999, 2001) show that mutual fund managers in the US invest more heavily in companies which are clustered in the region in which their offices are based and that they garner higher profits in this way. Ivkovich and Weisbenner (2004) show that household investment in equity tends to concentrate on companies located around their

hometown as well. Lane and Milesi-Ferretti (2002, 2003) show the significance of such factors as trade linkage, language, and the degree of financial market development in explaining the home equity bias, and Chan, Covrig and Ng (2004) report that the slower the development of the financial market in a country, the more common the home equity bias between domestic and foreign investors in the country because of information asymmetry.

Home equity bias arising from information asymmetry refers to the phenomenon that domestic investors invest more heavily in domestic companies' shares than in overseas shares because of information they hold, but this can be generalized further to include the case that even when domestic investors make investment in overseas shares, they make more investment in companies whose information is more readily accessible. When there is home equity bias due to the more generalized concept of information asymmetry, it can be inferred as follows: (i) If the size of a company is an important indicator to show the accessibility of its information, foreign investors are likely to make more investment in well-known, large-scale companies than small and medium sized companies. (ii) Profits earned by foreign investors will be lower than those gained by domestic investors.

In this paper, I introduce a simple model in which information asymmetry can explain both the stock price polarization between shares preferred by foreign investors and others as well as the home equity bias which occurs among shares invested by foreigners. A more detailed explanation about the model is shown in the Appendix and the results can be summarized as follows.

[Proposition]

Suppose that there are one risk-free asset and two risky assets in an economy, a large firm's stock and a small firm's stock, and that the stock price of the former is B_t and that of the latter is S_t and that demand for the two shares by both domestic and foreign investors is $\phi_t^b, \phi_t^s, \phi_t^{*b}, \phi_t^{*s}$, respectively. Then, under the information set, Ω_t , it is assumed that domestic investors recognize dividends of the two shares as Equation (2) while foreign investors see them as in Equation (3).

$$\begin{aligned} y_{t+1}^b &= y_t^b + \epsilon_{t+1}^b \\ y_{t+1}^s &= y_t^s + \epsilon_{t+1}^s \end{aligned} \quad (2)$$

$$\begin{aligned} y_{t+1}^b &= y_t^b + \epsilon_{t+1}^b \\ y_{t+1}^s &= y_t^s + \epsilon_{t+1}^s + \mu_{t+1} \end{aligned} \quad (3)$$

That is, foreign investors see the dividend of the small company's shares as additional noise (μ) because of information asymmetry. The utility functions of domestic and foreign investors are assumed to take the following forms:

$$U = -e^{-\alpha W}, U^* = -e^{-\alpha^* W} \quad (4)$$

where W denotes wealth. Then, the following conditions (5) and (6) hold:

$$B_t > S_t \quad (5)$$

$$\phi_t^{*b} > \phi_t^{*s} \quad (6)$$

The proposition presented above is highly intuitive. In other words, the degree of uncertainty about the dividends of the large-scale company's shares is the same for both domestic and foreign investors but foreign investors take the dividends of the small company's shares as more uncertain than their domestic counterparts because of information asymmetry.⁸⁾ Therefore, foreign investors who tend to be risk-averse are more likely to reduce demand for shares of small companies and increase demand for those of large corporations when there is asymmetric information than otherwise. This will raise the stock prices of large corporations and lower those of small companies.

The fact that foreign investors tend to invest relatively more in well-known and large-scale companies is backed by several empirical research papers. Kang and Stulz (1997) point out that there is a tendency of foreigners' stock investment to be heavily concentrated in large corporations because information about them is more widely available. Dahlquist and Robertsson (2001) and Ji and Ok (2003) find a similar situation in Sweden and Korea, respectively. Furthermore, Edison and Warnock (2004) show that the US investors' equity holdings in emerging markets are heavily dependent upon several factors such as large scale companies, fewer restrictions on equity ownership by foreigners, and companies which are listed in the US stock market. Ahearne, Grier and Warnock (2004) show that simultaneous listing of a company on both the domestic and the US stock market reduces the information cost for investors.

However, there are mixed results on the second inference that, because of relatively less access to information, the profit margins of foreigners will be

8) The purpose of the Proposition is to present a simple model in order to show that information asymmetry can explain home equity bias as well as the phenomenon of stock price disparity. It should be regarded that the Proposition does not state that the volatility of dividends of small-scale firms is in fact large but it assumes that foreign investors perceive this to be the case due to information asymmetry.

lower than domestic counterparts. First, Choe, Kho, and Stulz (2004) report that foreign investors tend to buy at a high price and to sell at a low price compared to domestic investors in Korea, and Dvorak (2001) shows a similar pattern in Indonesia. Moreover, Shukla and van Inwegen (1995) show that mutual funds based in England recorded lower profits than their US counterparts in the US, and Frankel and Schmukler (1996) point out that when the financial crisis occurred in Mexico in 1994, it was domestic investors who started selling shares earlier than foreigners did. In contrast, Karolyi (2002) and Grinblatt and Keloharju (2000) analyzed the markets in Japan and Finland, respectively, and found that foreigners generated more profits than domestic investors. Seasholes (2004) also pointed out that foreign investors buy stocks at a lower price and sell them at a higher price than domestic counterparts. In the case of Korea, Yoon (2004) shows that the performance of foreign investors, represented by timing of selling and buying and accumulated profit records, has been superior to that of domestic investors. Kim (2001) also finds that individual investors have realized higher yields in low-capital stocks while foreign investors have achieved greater yields in high-capital stocks.

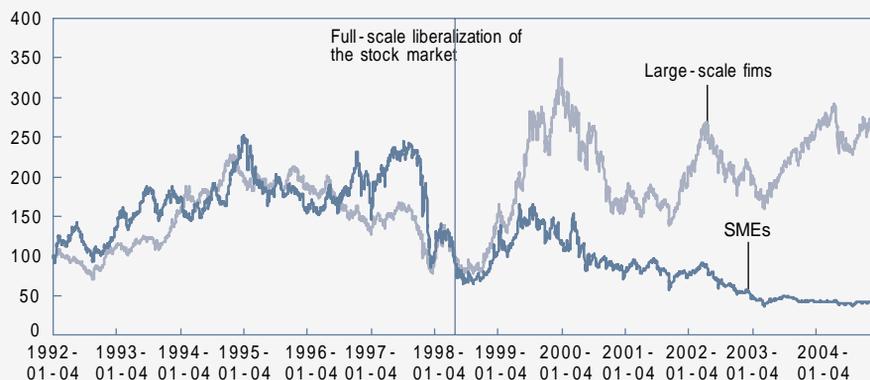
4. Economic Polarization

The Korean economy has experienced economic polarization in several dimensions such as business performance among companies and industries, employment and income since the financial crisis, most remarkably so from 2002 to 2003. In particular, the polarization of economic performance across industries and companies can be seen more readily by comparing the relatively brisk growth in export-oriented, IT-industry, and large corporations with a relative slowdown in those companies that are domestic-oriented, light industry, non-IT and SMEs.⁹⁾ Therefore, it is expected that the difference in business results among companies will be reflected in their stock prices and that this will bring about polarization in stock prices. This section examines whether there is in fact a polarization of corporate stock prices.

To examine whether economic polarization due to company size is attributable to stock price polarization, companies ranking within the top 33% (or 1/3) in terms of average amount of total assets are categorized as large corporations and others as small and medium-sized companies and stock price indexes on the basis of the above categorization are calculated as illustrated in Figure 8. It shows that since the full liberalization of stock market, the stock prices of large

9) Refer to Lee et al. (2004) for details.

Figure 8 Trend of Stock Price Indexes of Large Corporations and SMEs

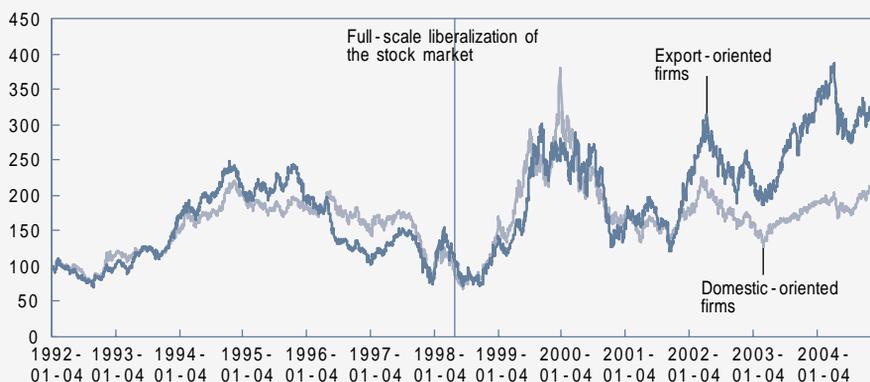


Source: Fn Guide

firms have been on an upward trend despite some fluctuations while those of SMEs have gradually declined since 2000. Therefore, the degree of dispersion between the two indices has been getting wider. Moreover, the t-test shows that the p-value is 0.024 throughout the tested period and that dispersion of the two stock prices is statistically significant.

To examine whether the polarization of business performance between export and domestic firms has affected stock price polarization between the two groups, I classify transport and equipment, electricity and electronics, steel and metal

Figure 9 Stock Price Indexes of Export-Oriented and Domestic-Oriented Companies



Source: Fn Guide

industry as the export-oriented sector but others except for the financial industry as the domestic sector. Figure 9 shows stock price indexes of the two sectors and it can be seen that the stock prices of export sector exceed those of the domestic-based sector since 2002 and the two price indexes start to diverge thereafter. It seems that the economic polarization between the export-oriented and domestic sectors because of brisk exports and the slowdown in domestic consumption has had an influence on the dispersion in the two stock price indexes. However, stock price differences between the two sectors turn out to be relatively small and this seems to be attributable to classification standards. That is, although there will be big differences among companies within the same sector, I categorize companies on the basis of the industry in which they are included. The t-test also suggests that the difference between the two stock price indexes is not statistically significant because the p-value turns out to be 0.188 after 2002.

5. Effect of Foreign Investment on Stock Price Polarization

In this section, I analyze stock price polarization between foreign invested companies and others to see whether shares preferred by foreign investors coincide with those of the sector characterized by economic polarization, whether it just reflects economic polarization, and whether the degree of stock price dispersion is more serious than that of economic polarization. For this purpose, the stock prices of foreign invested and other companies are examined under the control of effect of business results on stock prices as much as possible. I categorize companies into four groups on the basis of quarterly returns on equity (ROE) from 1999 to 2004. Table 3 shows the number of companies in each group in terms of return on equity and, from Figure 10-1 to Figure 10-4, the stock price indexes of foreign invested companies and others on the basis of return on equity are shown.

The figures show that, even among companies with similar business results, stock price dispersion between foreign invested companies and others is

Table 3

Number of companies in terms of ROE

	ROE < 0%	0% ROE < 5%	5% ROE < 10%	ROE 10%
Foreign Investment Firms	8	50	82	58
Other Firms	115	141	104	50
Total	123	191	186	108

apparent and this stock price polarization is more evident for companies that have recorded favorable returns. The t-test shows that p-values are 0.091, 0.060, 0.156 and 0.001 respectively for the average of quarterly ROE being below 0%, 0-5%, 5-10% and over 10% from 1999 to 2004, and that the case of the average quarterly ROE over 10% is only significant at 5% level. At 10% level, all cases except that of average quarterly ROE ranging from 5% to 10% are statistically significant. In contrast, when the time period after full liberalization of stock market is only considered, it turns out that the p-values for each case are 0.035,

Figure 10-1 Stock price indexes of foreign investment companies and others: ROE < 0%

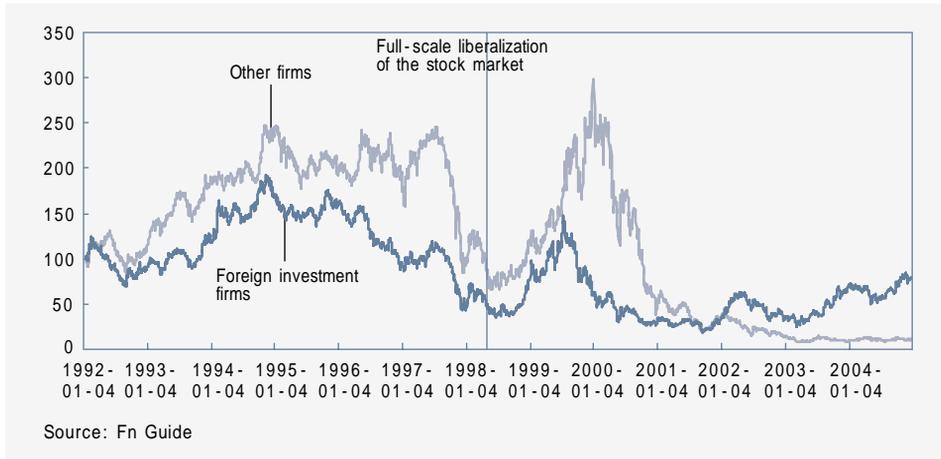


Figure 10-2 Stock price indexes of foreign invested companies and others: 0% < ROE < 5%

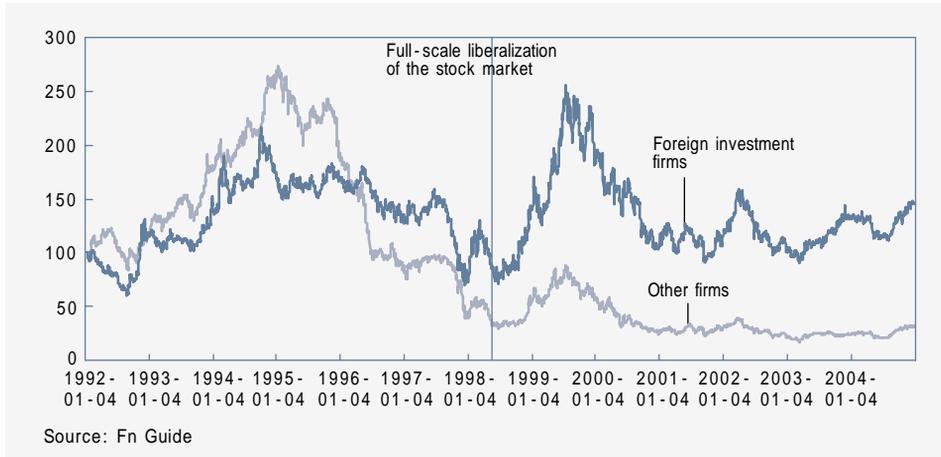
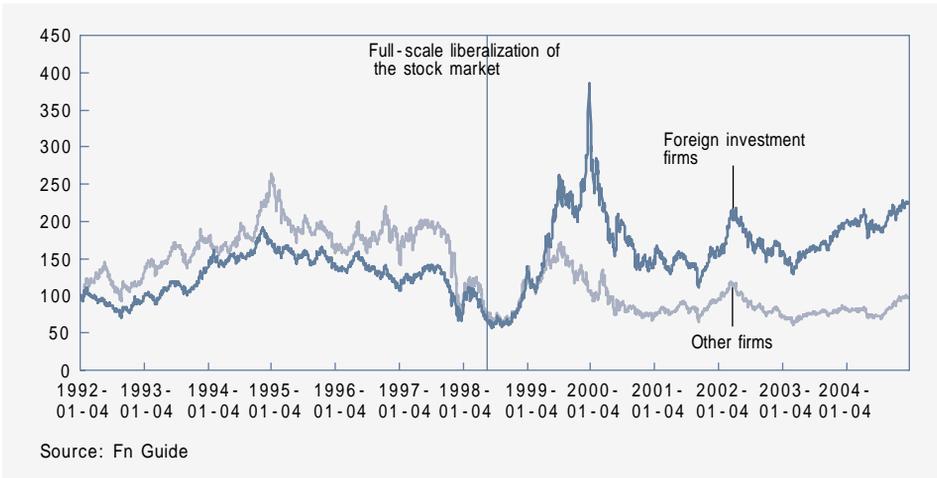
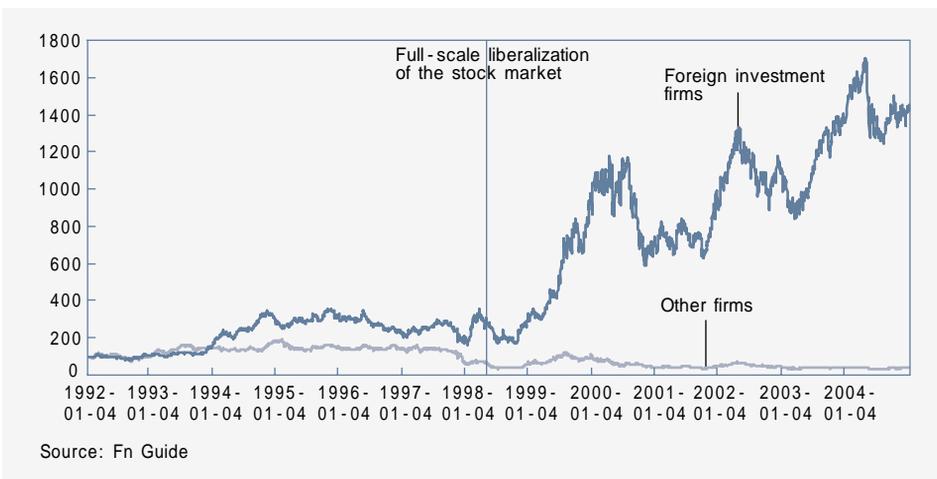


Figure 10-3 Stock price indexes of foreign invested companies and others: $5\% < ROE < 10\%$ Figure 10-4 Stock price indexes of foreign market invested companies and others: $ROE > 10\%$ 

0.203, 0.081 and 0.012, respectively, and that at 10 % level, the case of the average ROE being 5-10% is also statistically significant. This test seems to prove that prices of shares invested in by foreigners increase because of liquidity and a 'signaling' effect, and this implies that stock price dispersion due to foreign investment can be more severe than that due to economic polarization. Thus, it seems that foreigners' stock investment aggravates stock price dispersion even after the impact of economic polarization is taken into account.

Table 4 Number of companies in each group by total assets

	Small	Medium	Large
Foreign Invested Firms	30	59	106
Other Firms	191	157	65
Total	221	216	171

Source : Fn Guide.

To control the effect of company size on stock price, I divide companies into three groups, large, medium and small companies on the basis of average total assets from 1999 to 2004 and examine stock price indexes of foreign invested companies and others in the same group. Table 4 shows the number of companies in each group categorized by total assets, and the stock price indexes of foreign invested companies and others are shown within the same group from Figure 1 to Figure 3 in the Appendix. The p-value of the t-test turns out to be 0.000 throughout the whole period in all three groups and proves that differences in returns on assets between foreign invested companies and others are statistically significant. Even though the effect of company size on stock price is controlled, stock price dispersion between foreign invested companies and others is found in every group.

Using a more objective method, an analysis is conducted to see whether foreign investment aggravates stock price dispersion in Korea more than economic polarization does. For this analysis, we need to examine whether foreign equity investment has a significant effect on listed stock prices in the domestic market. So far, quite a few models on stock returns have been suggested, however models developed to analyze stock price level are rare. Bekaert et al. (2005) assume that all of asset returns are paid out as dividend and set the price-earnings ratio as a function of the discount rate and growth opportunities (GO). This paper eases some of the above assumptions and assumes that dividend policy follows a random walk. Moreover, I set PE ratio at the firm level as a function of risk factors (X_i) which affect growth opportunities and discount rates (See Appendix 2 for more detailed modeling and results). For the risk factors, the three factors of Fama and French (1992, 1993, 1995) are employed, i.e., company size, ratio of book value to market value, and beta coefficient.¹⁰⁾ As in Bekaert et al. (2005), the growth rate of sales revenue is used

10) Since the beta coefficient represents the relative volatility of the stock price of the respective firm in comparison with the market portfolio, the level of the stock price of the individual firm as well as stock price volatility is

as an index for growth potential. The following equations about stock price level, which are derived from PE ratios, are used for the test.

$$PE_{it} = \frac{S_{it}}{EPS_{it}} = f(X_{it}, GO_{it}),$$

$$\frac{S_{it}^*}{S_{i0}^*} = EPS_{it}^{**} \cdot f(X_{it}, GO_{it}) \quad (7)$$

where S_{i0}^* and S_{it}^* are adjusted stock prices of firm i at the reference and the comparison points, respectively, and $EPS_{it}^{**} = (S_{it}^*/S_{i0}^*)/PE_{it}$.

A regression analysis is not an appropriate method because not only is the function $f(\cdot)$ non-linear, but also the number of observations for growth potential indexes is not sufficient for the test. Instead of using regression analysis, I employ a method which analyzes the effect of foreign equity investment by searching for a matching firm, which is a method commonly used in finance. It finds the matching firm that has the most similar characteristics for each reference firm by controlling relevant effects with cells or measures. In this paper, the three risk factors (X_i) that affect discount rates are controlled by separating them in different cells and then, in each cell, foreign investment and other companies are also matched together based upon the measures of other factors, EPS_i and GO_i . Specifically, values of the respective three risk factors are estimated to be one of the three kinds, i.e, high, medium, low, and a total of 27 cells are made. Then, all the companies are allotted to one of the cells so that the discount rate for the companies in the same cell may be considered as similar. This way, the effect of the discount rate on stock prices is controlled. Next, I combine EPS_i^{**} and GO_i into one measure as follows:

$$measure(F_i, N_j) = \frac{(EPS_{Fi}^{**} - EPS_{Ni}^{**})^2 + (1 - \lambda)(GO_{Fi} - GO_{Ni})^2}{Var(GO) + Var(EPS^{**})} \quad (8)$$

where F and N represent foreign invested firms and other firms, respectively. Based on EPS_i^{**} and GO_i , the above measurement can be regarded as an index that quantitatively measures how far two firms lie apart from each other in a combination of a foreign invested firm and one of other firms. The measure defined above is computed for each foreign invested firm, and then the firm that

reflected through the beta coefficient in a statistical analysis of stock price differential between foreign invested firms and other firms.

is closest to it among other firms is selected as the matching firm based on the measure. One identical firm in other firms can be chosen as the matching firm for multiple foreign invested firms. The discount rate and growth potential that can affect the level of stock price are reasonably controlled. By making a comparison of the ratio of adjusted stock price (=adjusted stock price at the comparison point/adjusted stock price at the reference point) between the foreign invested and the matching firms, it is now possible to examine whether foreign equity investment has a significant effect on the level of stock price with other relevant factors being held constant.

The period of analysis runs from 2000, when the proportion of foreigners' stock holdings increased, to 2004 and the reference year is set to 1998.¹¹⁾ The adjusted stock price at three months after the end of fiscal year is used as the stock price to avoid the earnings effect. Firms are classified into foreign invested firms and other firms with the proportion of foreigners' stock holding of 10% as well as 5%. To examine whether firms are assigned reasonably to those 27 cells that are formed to control the discount rate, the number of foreign invested firms and other firms based on 5% included in each cell of 2000 and 2004 is presented in Table A.2. If the number of other firms is considerably smaller than that of foreign investment firms in a particular cell, it may not be able to appropriately control the relevant variable as many foreign invested firms choose an identical firm as their matching firm. As shown in the table, however, it is found that there is no cell in which there is such problem.

Table 5 presents the result of one-sided t-test for the null hypothesis that there is no difference between the ratio of adjusted stock prices of foreign invested firms and those of their matching firms in the comparison year relative to the reference year. In the case of classifying foreign-invested firms based on 5%, the p-value marks 0.06 in 2002 alone and is below 0.05 in all the remaining years. In

		2000	2001	2002	2003	2004
5%	t - value	2.04	2.22	1.49	3.81	2.97
	p - value	0.02	0.01	0.06	0.00	0.00
10%	t - value	1.09	2.29	2.19	3.31	4.40
	p - value	0.13	0.01	0.01	0.00	0.00

11) Similar results are obtained if the reference year is set to 1999, and the report of the results is omitted.

Table 6 Hypothetical Test for the Stock Price Differential between Matching Firms of Foreign Invested Firms and Other Firms: Wilcoxon signed-rank test

		2000	2001	2002	2003	2004
5%	z - value	2.29	2.71	0.36	2.55	2.01
	p - value	0.01	0.00	0.35	0.00	0.02
10%	z - value	1.28	2.01	1.38	4.69	6.70
	p - value	0.09	0.02	0.08	0.00	0.00

the case of 10%, it is 0.13 in 2000 and below 0.05 in the remaining years. This can be interpreted as indicating a significant difference in the level of stock prices even after considering the discount rate between foreign invested firms and other firms and the growth opportunities of firms.

To test for the robustness of the test result, the Wilcoxon signed-rank test is conducted in addition to the t-test for the above hypothesis. The test results are presented in Table 6. The results obtained from the two testing methods coincide for the most part but fail to reject the null hypothesis for 2002 as the p-value turns out to be 0.35 in the case of classifying foreign invested firms based on 5% and the p-value is down to 0.08 if they are classified based on 10%. On the other hand, the p-value slightly decreased to 9% in 2000 if foreign invested in firms are classified on the basis of 10% in 2000.

To examine whether different growth indices lead to different test results, an analysis is conducted based on the method of matching firms using the growth rate of assets, instead of the growth rate of sales for the growth index.¹²⁾ The results of the t-test and the Wilcoxon signed-rank test are presented in Table 7. The stock price differential between foreign invested firms and other companies becomes more apparent when using the growth rate of assets as an alternative index for growth opportunities. In the case of the t-test, in particular, the difference between the two groups of firms turns out to be insignificant when the growth rate of sales is used, however, it is significant when the growth rate of asset is used. Moreover, the difference between foreign invested firms and other firms is not significant in 2002 when using the growth rate of sales in the Wilcoxon signed-rank test, but the significance increases to a great extent when using the growth rate of assets.

12) Fama and French (2002) use the growth rate of assets, price-book value ratio and the ratio of R&D costs to assets as a proxy variable.

Table 7 Hypothetical test for the stock price differential between matching firms of foreign invested firms and other firms: using the growth rate of asset as growth index

		One-sided t-test				
		2000	2001	2002	2003	2004
5%	t - value	2.59	2.62	1.90	6.27	5.43
	p - value	0.01	0.01	0.03	0.00	0.00
10%	t - value	2.35	2.61	2.27	4.30	5.09
	p - value	0.01	0.01	0.01	0.00	0.00
		Wilcoxon signed-rank test				
		2000	2001	2002	2003	2004
5%	z - value	2.43	2.30	1.65	6.06	5.13
	p - value	0.01	0.01	0.05	0.00	0.00
10%	z - value	2.10	2.23	1.58	3.86	5.00
	p - value	0.01	0.01	0.06	0.00	0.00

VI. Concluding Remarks and Policy Implications

This paper computes the stock price indices of foreign-invested firms which are mostly owned by foreigners and other firms separately and shows that the disparity between the stock price indices of the two groups arises after the stock market was completely liberalized. It is found that the phenomenon also occurs within firms whose business results are similar. In addition, a comparison of the adjusted stock prices of foreign-invested firms and others with a firm's discount rate and growth opportunity controlled by using the method of matching firms shows that the stock price of the former is significantly higher than that of the latter. Based on the result, it can be inferred that foreign holdings of domestically listed stocks serves as a key factor in the disparity of stock prices.

On the other hand, it is found that foreigners have been tended to invest in large-scale industries, export-oriented industries and IT industries and in firms that have a high propensity to pay dividends and that have good corporate governance. It appears that foreigners' selective investment behavior coincides closely with industrial and business classifications of the polarization that has been underway since the currency crisis at the longest and around 2002 or 2003 at the shortest. Thus, it appears that stock price polarization, progressed along with the deepening of economic polarization, has been deepened due to the

expansion of foreign equity investment and selective investment. If domestic investors follow the foreign investors' trading behavior, being aware of their influences in the stock market, then the degree to which foreign equity investment affects stock price polarization will expand further. Seon et al. (2004) argue that domestic investors, and individual investors in particular, believe that foreign investors tend to purchase the respective stocks prior to the public announcement of good news about individual stocks and sell before the advent of bad news based on superior information power and analytical ability. They also assert that domestic investors pursue imitative trading strategies by chasing the trend of foreign investors' transactions.

It is difficult to judge clearly as to whether foreigners' selective investment behavior is mainly explained by information asymmetry or whether foreign investors are informed traders. This is because foreign investors have achieved better investment performance than domestic investors in terms of the investment results. Since domestic IT firms, export-oriented firms and large corporations are recognized well internationally, foreign investors are not seen to be in a disadvantageous position in terms of information in these firms than are domestic investors. Some people even argue that foreign investors, in fact, have an informational advantage in some industries. However, it appears that foreign investors are at an informational disadvantage in non-IT industries, domestic industries and SMEs.

The stock market acts as a supply window for direct financing along with the corporate bond market. As Korea began to attach more importance to corporate profitability and financial soundness after the currency crisis, the significance of the stock market as a means of corporate financing has greatly increased. In order for a firm to finance smoothly through the stock market its stock price should be reasonably formed, and it should also be possible to expect the likelihood of a future increase of its stock price. In this respect, it can be inferred that foreign-invested firms experienced an increase in their stock prices due to foreign equity investment and it was relatively easy for them to finance through the stock market. On the other hand, it might have been difficult for other firms to finance through the stock market because they have been relatively isolated and the demand for their shares has been sluggish as the interest of investors has been on foreign invested companies whose stock prices have increased on the relatively greater scale.

To alleviate the polarization of domestic stock prices caused by foreign investment, the proportion of individual investors needs to fall and indirect equity investment through institutional investors should increase, thereby

bringing about a decline in individual investors' imitation of foreign investment patterns and in foreign investors' influence on domestic stock prices. Yoon (2004) regards the absence of a corporate pension system, premature equity investment culture, and investors' lack of skills in business analysis and risk management as causes of the small proportion of institutional investors in Korea. In addition, he points out that the maturity of equity investment culture, the inducement of institutional investors to expand their long-term equity investment, and the increase of institutional investors' capabilities are indispensable if institutional investors are to expand their role.

As was seen in the relationship between business results and stock price index, the stock price index for foreign-invested firms with good performance shows an upward trend reflecting corporate performance reasonably well. On the other hand, the stock price index for other firms, even those with good performance, continues to show a downward trend. In order for the stock market to function as a sound investment market and a reliable supply market for corporate financing, the price to earnings ratio should reflect corporate performance well in the long run, and foreign investment needs to be expanded in those domestic firms and SMEs that not had access to it so far. For this, it is essential that the information asymmetry between domestic and foreign investors should be eased and the range of stocks preferred by foreigners should be enlarged by making it easier for them to access information about domestic corporations. To increase the interest of foreign investors and induce investment, aggressive activities to encourage investment such as investor relations and corporate communications are essential. It is also important to win credibility for accounting and public announcements in order to increase corporate transparency. Institutions such as Korea Stock Exchange or Korea Investor Relations Association currently support firms' IR activities, but the support for the IR activities of the domestic firms is not sufficient. On the other hand, Korean regulatory authorities have put much effort into improving the system of accounting and public announcements, but greater efforts need to be made in order to establish customs and practices in conformity with the purpose of this system.

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[Appendix 1] Information Asymmetry, Home Equity Bias and Stock Price Bias: A Simple Model

This section presents a simple model in which information asymmetry in foreign equity investment can explain the phenomenon of home equity bias as well as that of stock price disparity. The model is a modified version of the simple model designed by Frankel and Schmukler (2000) to explain the discount phenomenon of country fund.

In this section, it is assumed that there are two types of risky assets that differ in risk and access to information and that domestic and foreign investors make their investment decisions during the first period in an economy comprised of two periods. The price of the risk-free assets is normalized to 1 and the rate of return is denoted by r . The two risky assets represent shares of a large and a small firm, and it is assumed that the former is well known to foreigners whereas the latter is not.

If the stock prices of the large and small firms are denoted by B_t and S_t , respectively, and the demand for large and small companies by domestic and foreign investors is denoted by ϕ_t^b , ϕ_t^s , ϕ_t^{*b} and ϕ_t^{*s} , respectively, the wealth of domestic and foreign investors in the second period can be expressed as follows:

$$W_{t+1} = W_t(1+r) + \phi_t^b(B_{t+1} + y_{t+1}^b - B_t(1+r)) + \phi_t^s(S_{t+1} + y_{t+1}^s - S_t(1+r)) \quad (\text{A.1})$$

$$W_{t+1} = W_t(1+r) + \phi_t^{*b}(B_{t+1} + y_{t+1}^b - B_t(1+r)) + \phi_t^{*s}(S_{t+1} + y_{t+1}^s - S_t(1+r)) \quad (\text{A.2})$$

where y_t denotes dividend, and the domestic investors' perception of dividend in the information set, Ω_t , at time t is as follows:

$$\begin{aligned} y_{t+1}^b &= y_t^b + \epsilon_{t+1}^b \\ y_{t+1}^s &= y_t^s + \epsilon_{t+1}^s \end{aligned} \quad (\text{A.3})$$

It is assumed that noise arising from information asymmetry is included in foreign investors' perception, that is,

$$\begin{aligned} y_{t+1}^b &= y_t^b + \epsilon_{t+1}^b + \mu_{t+1}^b \\ y_{t+1}^s &= y_t^s + \epsilon_{t+1}^s + \mu_{t+1}^s \end{aligned} \quad (\text{A.4})$$

A shock to the dividend is assumed to follow the following distribution:

$$\begin{pmatrix} \epsilon_{t+1}^b \\ \epsilon_{t+1}^s \\ \mu_{t+1}^b \\ \mu_{t+1}^s \end{pmatrix} \sim N \left(\begin{pmatrix} 0 \\ 0 \\ 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \frac{2}{\epsilon_b} & 0 & 0 & 0 \\ 0 & \frac{2}{\epsilon_s} & 0 & 0 \\ 0 & 0 & \frac{2}{\mu_b} & 0 \\ 0 & 0 & 0 & \frac{2}{\mu_s} \end{pmatrix} \right) \quad (\text{A.5})$$

Under these assumptions, the variance of dividend expectation by foreign investors is greater than that by domestic investors. That is,

$$\begin{aligned} \text{Var}^*(y_{t+1}^b | I_t^m) &= \frac{2}{\epsilon_b} + \frac{2}{\mu_b} > \text{Var}(y_{t+1}^b | I_t^m) = \frac{2}{\epsilon_b} \\ \text{Var}^*(y_{t+1}^s | I_t^m) &= \frac{2}{\epsilon_s} + \frac{2}{\mu_s} > \text{Var}(y_{t+1}^s | I_t^m) = \frac{2}{\epsilon_s} \end{aligned} \quad (\text{A.6})$$

If the utility functions of domestic and foreign investors are defined respectively as follows:

$$U = - e^{-2W}, U^* = - e^{-2W^*} \quad (\text{A.7})$$

then the investors act to maximize their conditional expected utilities expressed in what follows:

$$\begin{aligned} E(U_{t+1} | I_t) &= E(W_{t+1} | I_t) - \text{Var}(W_{t+1} | I_t) \\ E(U_{t+1}^* | I_t^*) &= E(W_{t+1}^* | I_t^*) - \text{Var}(W_{t+1}^* | I_t^*) \end{aligned} \quad (\text{A.8})$$

The following equations can be derived from the above equation:

$$\begin{aligned} E(U_{t+1} | I_t) &= W_t(1+r) + \phi_t^b [E(B_{t+1} + y_{t+1}^b) - B_t(1+r)] \\ &\quad + \phi_t^s [E(S_{t+1} + y_{t+1}^s) - S_t(1+r)] \\ &\quad - \phi_t^{b2} \text{Var}(B_{t+1} + y_{t+1}^b | I_t) \\ &\quad - \phi_t^{s2} \text{Var}(S_{t+1} + y_{t+1}^s | I_t) \end{aligned} \quad (\text{A.9})$$

$$\begin{aligned} E(U_{t+1}^* | I_t^*) &= W_t^*(1+r) + \phi_t^{*b} [E^*(B_{t+1} + y_{t+1}^b) - B_t(1+r)] \\ &\quad + \phi_t^{*s} [E^*(S_{t+1} + y_{t+1}^s) - S_t(1+r)] \\ &\quad - \phi_t^{*b2} \text{Var}(B_{t+1} + y_{t+1}^b | I_t^*) \\ &\quad - \phi_t^{*s2} \text{Var}(S_{t+1} + y_{t+1}^s | I_t^*) \end{aligned} \quad (\text{A.10})$$

From the investors' optimization problems, the following demand functions for equity can be obtained:

$$\begin{aligned}
\phi_t^b &= \frac{E(B_{t+1} + y_{t+1}^b) - B_t(1+r)}{2 \text{Var}(B_{t+1} + y_{t+1}^b | I_t)} \\
\phi_t^s &= \frac{E(S_{t+1} + y_{t+1}^s) - S_t(1+r)}{2 \text{Var}(S_{t+1} + y_{t+1}^s | I_t)} \\
\phi_t^{*b} &= \frac{E^*(B_{t+1} + y_{t+1}^b) - B_t(1+r)}{2 \text{Var}(B_{t+1} + y_{t+1}^b | I_t^*)} \\
\phi_t^{*s} &= \frac{E^*(S_{t+1} + y_{t+1}^s) - S_t(1+r)}{2 \text{Var}(S_{t+1} + y_{t+1}^s | I_t^*)}
\end{aligned} \tag{A.11}$$

On the other hand, if the number of shares of the large and the small firm is denoted by b and s , respectively, the economy equilibrates where demand and supply of equity coincide.

$$\phi_t^b + \phi_t^{*b} = b, \phi_t^s + \phi_t^{*s} = s \tag{A.12}$$

If it is assumed that unconditional distributions of the stock prices, B_{t+1} and S_{t+1} , are equal to the distributions of B_t and S_t , then closed form solutions for stock prices can be derived as follows:

$$\begin{aligned}
B_t &= -2b \left(\frac{\sigma_{cb}^2}{\sigma_{cb}^2 + (\frac{\sigma_{cb}^2}{\sigma_{cb}^2} + \frac{\sigma_{\mu}^2}{\sigma_{\mu}^2})^{-1}} \right)^{-1} r^{-1} (r^{-1} + 1)^2 + r^{-1} y_t^b \\
S_t &= -2s \left(\frac{\sigma_{cs}^2}{\sigma_{cs}^2 + (\frac{\sigma_{cs}^2}{\sigma_{cs}^2} + \frac{\sigma_{\mu}^2}{\sigma_{\mu}^2})^{-1}} \right)^{-1} r^{-1} (r^{-1} + 1)^2 + r^{-1} y_t^s
\end{aligned} \tag{A.13}$$

If it is assumed that, *ceteris paribus*, there is no information asymmetry for the large domestic firm but there is for the small firm, the stock price of the large company is greater than that of the small firm. That is, if

$$y_t^b = y_t^s, \frac{\sigma_{cb}^2}{\sigma_{cb}^2} = \frac{\sigma_{cs}^2}{\sigma_{cs}^2}, b = s, \frac{\sigma_{\mu}^2}{\sigma_{\mu}^2} = 0, \frac{\sigma_{\mu}^2}{\sigma_{\mu}^2} > 0 \tag{A.14}$$

then the following condition holds.

$$B_t > S_t \tag{A.15}$$

Moreover, foreign investors' demand for the shares of a large firm is greater than that for those of the small firm. That is, the following condition holds.

$$\phi_t^{*b} > \phi_t^{*s} \tag{A.16}$$

[Appendix 2] PE Ratio, Growth Opportunity and Dividend

This section expresses the PE ratio as growth opportunities and dividends using a present value model. It is defined that the log growth rate is affected by the firm's growth opportunity (GO_{*i*}) after the dividend of firm *i* is paid out.

$$\ln(EA_{i,t}) = {}_iGO_{i,t-1} + \epsilon_{i,t} \quad (\text{A.17})$$

where $\epsilon_{i,t} \sim N(0, \sigma_{\epsilon_i}^2)$. Growth opportunity is assumed to follow an AR(1) process as follows.

$$GO_{i,t} = \mu + {}_iGO_{i,t-1} + \eta_{i,t} \quad (\text{A.18})$$

where $\eta_{i,t} \sim N(0, \phi_i^2)$. The value of a firm is defined as the present value of future earnings discounted by the firm's discount rate, $r_{i,t}$.

$$V_{i,t} = E_t \left[\sum_{k=1}^{k-1} \exp(-\sum_{t=0}^{k-1} r_{i,t+i}) \cdot EA_{i,t+k}(1 + \delta_{i,t+k}) \right] \quad (\text{A.19})$$

The discount rate of individual firms is assumed to be affected by risk factors,

$$r_{i,t} = B_i X_t + \nu_{i,t}, \quad (\text{A.20})$$

where X_t is a risk vector and $\nu_{i,t} \sim N(0, \sigma_{\nu_i}^2)$. And

$$X_t = X_{t-1} + E_t, \quad (\text{A.21})$$

where $E_t \sim MVN(0, \Omega)$ and Ω is a diagonal matrix whose *j*th element is σ_j . The propensity to pay dividend is assumed to follow a random walk.

$$\delta_{i,t} = \delta_{i,t-1} + \zeta_{i,t} \quad (\text{A.22})$$

where $\zeta_{i,t} \sim N(0, s_{\zeta_i}^2)$. Under this assumption, the PE ratio can be expressed as follows.

$$PE_{i,t} = \frac{V_{i,t}}{EA_{i,t}(1 + \delta_{i,t})} = \frac{E_t \left[\sum_{k=1}^{k-1} \exp(-\sum_{t=0}^{k-1} r_{i,t+1} + \sum_{l=0}^{k-1} \delta_{i,t+1+l}) \ln(EA_{i,t+1+l}) \right]}{\sum_{k=1}^{k-1} Q_{i,k,t}} \quad (\text{A.23})$$

If $k = 1$, then

$$\begin{aligned} Q_{i,1,t} &= E_t[\exp(-r_{i,t} + \delta_{i,t+1} + \ln(EA_{i,t+1}))] \\ &= \exp(-B_i X_t - \frac{1}{2} \sigma_i^2 + \frac{1}{2} s_i^2 + \mu_i GO_{i,t} + \frac{1}{2} \phi_i^2) \end{aligned} \quad (A.24)$$

Suppose that the root for an arbitrary k takes the following form:

$$Q_{i,k,t} = \exp(a_{i,k} + C_{i,k} X_t + d_{i,k} GO_{i,t}) \quad (A.25)$$

Now, the coefficient can be computed using the recursive relation. For this, if undetermined coefficient of each variable is

$$\begin{aligned} Q_{i,k+1,t} &= E_t[\exp(\sum_{i=0}^k -r_{i,t+i} + \delta_{i,t+1+i} + \ln(EA_{i,t+1+i}))] \\ &= E_t[\exp(-r_{i,t} + \delta_{i,t+1} + \ln(EA_{i,t+1})) \\ &\quad \cdot \exp(\sum_{i=0}^{k-1} -r_{i,t+1+i} + \delta_{i,t+2+i} + \ln(EA_{i,t+2+i}))] \\ &= Q_{i,1,t} \cdot E_t[\exp(a_{i,k} + C_{i,k} X_{t+1} + d_{i,k} GO_{i,t+1})] \\ &= \exp(-B_i X_t - \frac{1}{2} \sigma_i^2 + \frac{1}{2} s_i^2 + \mu_i GO_{i,t} + \frac{1}{2} \phi_i^2 + a_{i,k} \\ &\quad + C_{i,k} (X_t + \frac{1}{2} \Omega 1_n) + d_{i,k} (\mu + \mu_i GO_{i,t} + \frac{1}{2} \phi_i^2)) \end{aligned} \quad (A.26)$$

then the following recursive relations can be obtained:

$$\begin{aligned} a_{i,k+1} &= a_{i,k} - \frac{1}{2} \sigma_i^2 + \frac{1}{2} s_i^2 + \frac{1}{2} \mu_i^2 + \frac{1}{2} C_{i,k} \Omega 1_n + d_{i,k} (\mu + \frac{1}{2} \phi_i^2), \\ c_{i,k+1} &= C_{i,k} - B_i, \\ d_{i,k+1} &= d_{i,k} + \mu_i \end{aligned} \quad (A.27)$$

By combining the above results, the PE ratio can be expressed as follows:

$$PE_{i,t} = \sum_{k=1} \exp(a_{i,t} + C_{i,k} X_t + d_{i,k} GO_{i,t}) \quad (A.28)$$

Table A.1 Results of t - test for the difference of daily equity returns(p - value)

Hypothesis	Firms	Total Period	Pre - crisis Period	Post - crisis Period	Pre - 2002	Post - 2002
H0 : $\mu_{F-N} = 0$ H1 : $\mu_{F-N} > 0$	Total	0.000	0.025	0.003	0.002	0.024
H0 : $\mu_{F-N} = 0$ H1 : $\mu_{F-N} > 0$	ROE < 0%	0.091	0.750	0.035	0.523	0.008
H0 : $\mu_{F-N} = 0$ H1 : $\mu_{F-N} > 0$	0% ROE < 5%	0.060	0.077	0.203	0.073	0.294
H0 : $\mu_{F-N} = 0$ H1 : $\mu_{F-N} > 0$	5% ROE < 10%	0.156	0.615	0.081	0.240	0.151
H0 : $\mu_{F-N} = 0$ H1 : $\mu_{F-N} > 0$	ROE > 10%	0.001	0.010	0.012	0.003	0.037
H0 : $\mu_{F-N} = 0$ H1 : $\mu_{F-N} > 0$	Small	0.002	0.051	0.007	0.011	0.023
H0 : $\mu_{F-N} = 0$ H1 : $\mu_{F-N} > 0$	Medium	0.000	0.000	0.001	0.000	0.006
H0 : $\mu_{F-N} = 0$ H1 : $\mu_{F-N} > 0$	Large	0.002	0.018	0.015	0.005	0.084
H0 : $\mu_{L-MS} = 0$ H1 : $\mu_{L-MS} > 0$	Total	0.024	0.490	0.006	0.148	0.001
H0 : $\mu_{E-M} = 0$ H1 : $\mu_{E-M} > 0$	Total	0.206	0.330	0.245	0.316	0.188

Note : μ_{F-N} , μ_{L-MS} , μ_{E-M} represent the differences of daily equity returns between foreign invested and other firms, between large firms and SMEs and between export and domestic firms, respectively.

Table A.2 Distribution of foreign invested firms and others by risk factor cells

(size - beta - pbr)	2000			2004		
	Total	F	N	Total	F	N
H-H-H	26	19	7	35	23	12
H-H-M	13	9	4	18	8	10
H-H-L	12	6	6	4	2	2
H-M-H	19	11	8	26	19	7
H-M-M	13	9	4	17	9	8
H-M-L	11	5	6	4	2	2
H-L-H	13	8	5	18	13	5
H-L-M	13	8	5	10	4	6
H-L-L	10	1	9	3	1	2
M-H-H	12	0	12	17	2	15
M-H-M	16	1	15	17	2	15
M-H-L	10	1	9	13	1	12
M-M-H	17	4	13	12	3	9
M-M-M	18	3	15	18	3	15
M-M-L	12	1	11	19	1	18
M-L-H	15	5	10	10	4	6
M-L-M	16	3	13	20	2	18
M-L-L	14	6	8	13	0	13
L-H-H	11	0	11	6	0	6
L-H-M	9	0	9	13	0	13
L-H-L	21	0	21	13	2	11
L-M-H	7	2	5	8	0	8
L-M-M	13	1	12	10	1	9
L-M-L	20	1	19	27	1	26
L-L-H	10	1	9	4	1	3
L-L-M	19	2	17	13	1	12
L-L-L	22	0	22	45	1	44
Total	392	107	285	413	106	307

Note : Size, beta and pbr denote firm size, beta coefficient and the ratio of book to market price, respectively. 'H', 'M' and 'L' means that the respective index is high, medium or low, respectively. F and N represent foreign invested firms and the number of other firms, respectively.

Figure A.1. Trend of stock price indices of foreign invested firms and others: small firms

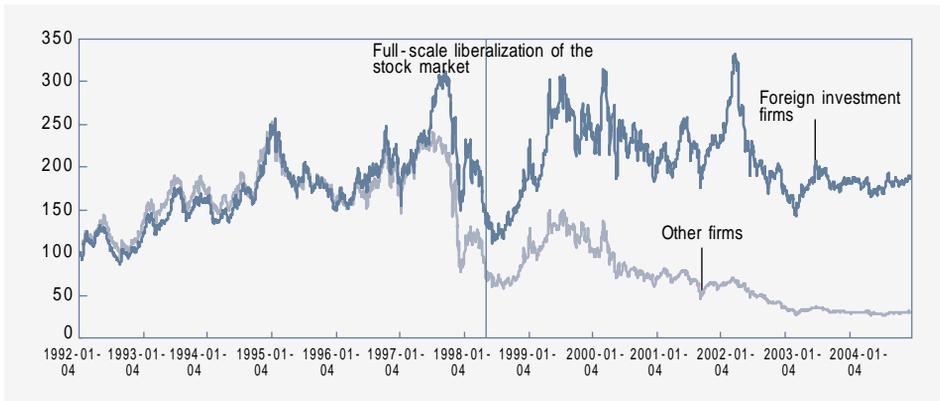


Figure A.2. Trend of stock price indices of foreign invested firms and others: medium firms

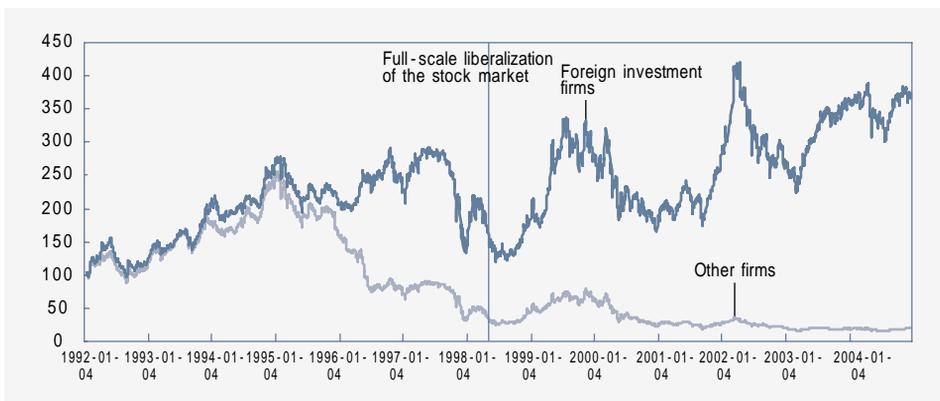


Figure A.3. Trend of stock price indices of foreign invested firms and others: large firms

