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Stock Market Opening and the Cost of

Capital: the Case of Korea

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Introduction

Research interests in emerging capital markets have been rising rapidly. On one hand, developing economies began opening their capital markets during the past decade, providing data for researchers. On the other hand, with a number of recent crises in emerging markets, the role of foreign capital in developing economies have been attracting renewed attention. While related literature covers diverse topics (see Bekaert and Harvey 2002 for a recent review), one of the key questions that have drawn policy attention as well as academic is the effect of market opening on the cost of capital. The prediction of theory is well known. In a standard international asset pricing model, stock market opening reduces an opening economy's cost of capital by allowing for risk sharing between domestic and foreign agents (Bekaert and Harvey 1995, Eun and Janakiramanan 1986, Errunza and Losq 1989, Errunza, Senbet and Hogan 1998). As actual data of market openings are being generated, economists began testing the theoretical prediction and reporting that cross-country data indeed confirms it (Bekaert and Harvey 2000, Henry 2000, Kim and Singal 2000). It is notable that empirical studies find desirable effects of market openings on the cost of capital, while empirical evidences for impacts on market volatility of market openings are ambiguous (Bekaert and Harvey 2000, Aggarwal et al. 1999).

In this paper, we follow the research line and study changes in the cost of capital after stock market opening while focusing on the Korean experience. By restricting the scope of a data set to a single country, this paper takes the risk of less empirical power than previous works that utilized cross-country data sets. Despite the potential caveat, we seek to complement the existing studies in the following two aspects. First, we take a longer-term perspective in examining the effect of stock market opening on the cost of capital. Stock market opening is a gradual process. Measuring the progress of opening by regulatory liberalization, emerging

economies experiences show that liberalization processes usually take several years to be completed. In case of Korea, the first deregulation that allowed foreign investment in the Korean stock market occurred in 1992. But, final elimination of regulatory restrictions on foreign investment did not take place until 1998. Since the completion of market opening is a relatively recent event, existing studies were not able to consider the total effect of market openings. Instead they concentrate on the initial opening dates in examining the effect on the cost of capital. Also their windows of examination are limited to two or three years around the initial opening. For Korea, Henry (2000)'s sample covers only up to the end of 1994, and Bekaert and Harvey (2000)'s stops at the end of 1995. As a result, existing works are vulnerable to the 'hot money' problem. They may find decrease in the cost of capital because the horizon of their analysis may be confined to when markets are doing well. In this paper, we examine changes in the cost of capital of the Korea stock market for the past fifteen years. We compare the cost of capital during the liberalization era with during the post-liberalization era, where each period includes about six years respectively.

Second, we employ a firm-level investigation approach. In theory, the cost of capital decreases in response to market opening because stocks will be priced differently when foreigners become marginal investors. From this, we may establish a hypothesis that reduction in the cost of capital due to market opening should be more visible in firms with higher foreign ownership. Our strategy is to take advantage of this presumption and directly investigate the relationship between levels of foreign ownership in firms and the cost of capital.

The outline of our paper is as follows. In Section I, we briefly describe the stock market opening process in Korea and examine the trend in the cost of capital. Following Bekaert and Harvey (2000)'s argument, we employ the dividend yield as a measure of the cost of capital. Surprisingly, we find that the dividend yield has become larger in the recent years. In Section II,

we analyze in detail what effects increased foreign presence in the Korea stock market has brought in the dividend yield. Using firm level panel data, we examine what picture emerges when controlling other factors and regressing the dividend yield on degrees of foreign ownership. We obtain an interesting result. The higher the degree of foreign ownership in a firm, the lower the dividend yield is. However, the negative relationship between foreign ownership and the dividend yield is only significant during recent years when the Korea stock market is fully opened. The result is a contrast to the existing studies based on cross-country data sets, which find most of the effects of market opening on the cost of capital tend to realize around the initial liberalization dates. Section III contains some concluding remarks.

I. Descriptive Findings

I.1. Stock Market Opening in Korea

A. Regulatory Changes

Foreign investor's direct access to the Korean stock market[1] was prohibited until January 1992 when foreign participation was allowed with a ceiling regulation. Foreign ownership was limited to 10 percent in so-called ordinary companies and 8 percent in public interest companies (which were deemed of national interests such as defense and communications). The 10 percent ceiling was subsequently raised to 12 percent in December 1994 and to 15 percent in July 1995 (see Table 1). The pace of deregulation was accelerated during 1996 and 1997 while the Korean economy began facing foreign liquidity problems. The foreign investment restriction was relaxed six times over the two years, raising the ceiling to 55 percent for ordinary companies.

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[1] There are two stock exchanges in Korea: the Korea Stock Exchange and the Kosdaq Market. The former is a main board and traditional market while the latter is a Korean version of the Nasdaq. In the paper, we focus on the Korea Stock Exchange.

The ceiling regulation for ordinary companies was finally eliminated in May 1998 as a measure for the currency crisis of 1997.

Another notable deregulation measure taken during the currency crisis period was the raise of the limit on foreign individual ownership. Initially the individual ownership ceiling was set at 3 percent in 1992. Although there were subsequent moderations, it still stood at 7 percent as of November 1997, rendering foreign controlling ownership in Korean firms impossible. In December 1997 when the Korean currency crisis was erupting, the individual ceiling was raised to 50 percent. The individual ceiling regulation was finally abolished in May 1998, together with the company level ceiling regulation.

Though the ceiling regulation for public interest companies still remains, it is fair to say that the Korean stock market has been fully opened since May 1998. The ceiling on public interest companies was raised to 30 percent in May 1998 and to 40 percent in November 2000. As of 2005, the ratio of non-investable stocks for foreigners is 5.3 percent (see Table 2).

Table 1. Stock Market Opening in Korea: Changes in Foreign Investment Ceilings

	1992	1994	1995	1996		1997				1998	2000
	1	12	7	4	10	5	11	12.11	12.30	5	11
Company Restriction										No Restriction	No Restriction
• Restriction Ordinary Companies	10	12	15	18	20	23	26	50	55		
• Public Interest Companies	8	8	10	12	15	18	21	25	25	30	40
Individual Restriction										No Restriction	No Restriction
• Ordinary Companies	3	3	3	4	5	6	7	50	50		
• Public Interest Companies	1	1	1	1	1	1	1	1	1	3	3

Source: Financial Supervisory Service.

Table 2. Stock Market Opening in Korea: Trend in share of non-investable equities by foreigners

	2000	2001	2002	2003	2004	2005
Number of Companies under Restriction	10	8	7	7	8	8
Stock Value under Restriction [1]	23.5	12.6	10.5	7.2	7.4	5.3

Note: 1) Ratio to Market Capitalization.

B. Foreign Investment Flows into the Korean Stock Market

Since the implementation of the initial opening measure in January 1992, foreign capital kept flowing into the Korean stock market (see Figure 1, 2). When the market was fully opened in May 1998, the pace of capital inflow was accelerated significantly. As a result, foreign participation ratio continued to be on an upward trend since 1992. The slope of the trend stayed mild until 1997 as the ratio rose to 12.9 percent over the six years from 1992 to 1997 (see Figure 3). After the full opening in 1998, the slope of the upward trend became steep. The foreign participation rate jumped to 21.9 percent in 1999, and then continued to increase reaching 30.1 percent in 2000. The rate remained on an upward trend except a slight setback in 2002. As of the end of 2005 foreign investors claim around 40 percent of the Korean stock market capitalization.

Figure 1. Trend in Foreign Investors' Trading in the Korea Stock Exchange: Ratio to the Total
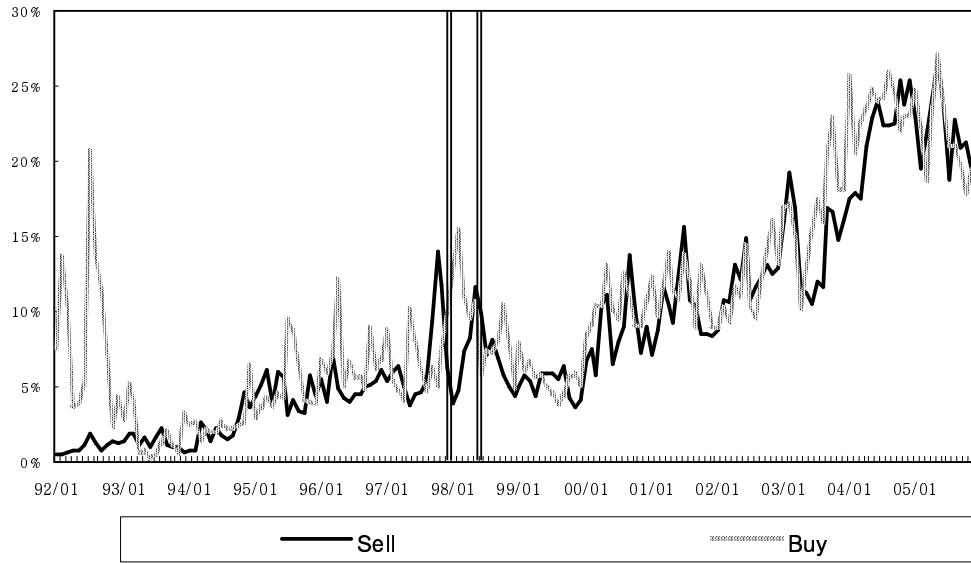

Figure 2. Trend in Net-buy by Foreign Investors in the Korea Stock Exchange: Trend
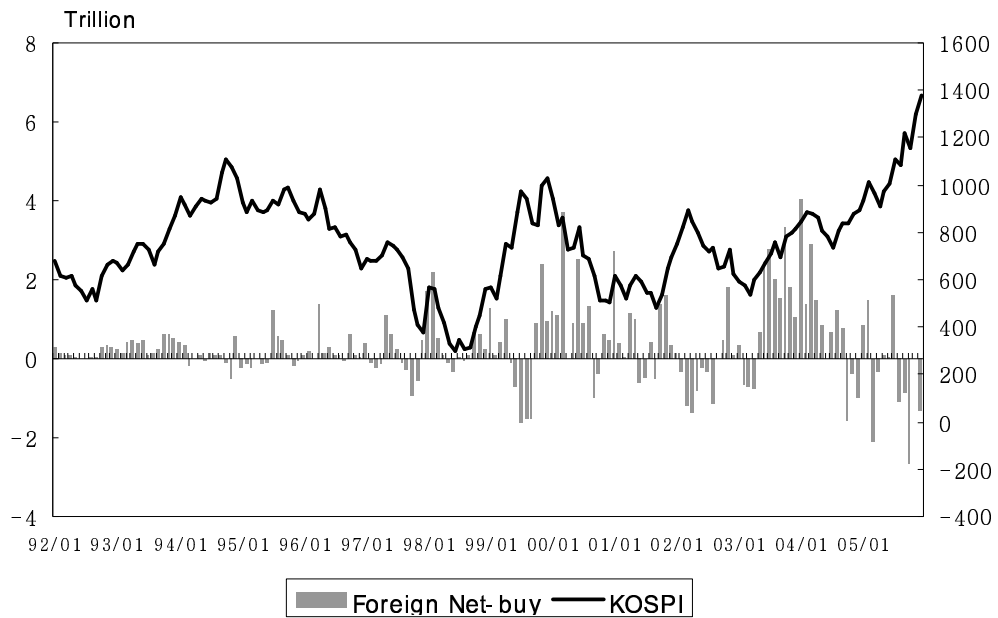
Figure 3. Trend in Foreign Investors' Participation Rate in the Korea Stock Exchange
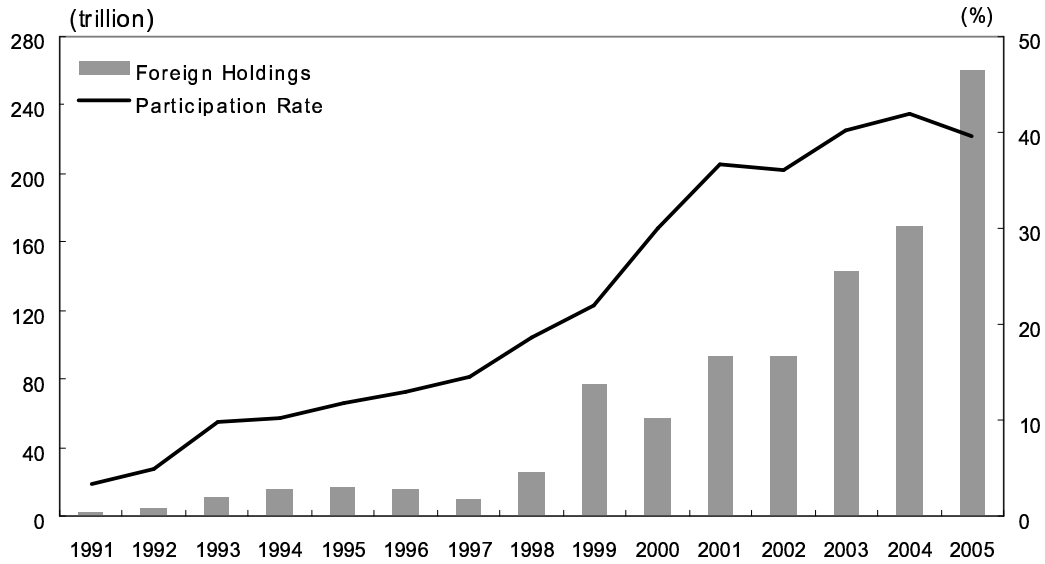

Figure 4. Foreign Investors' Participation Rate in the Korea Stock Exchange: By Industry
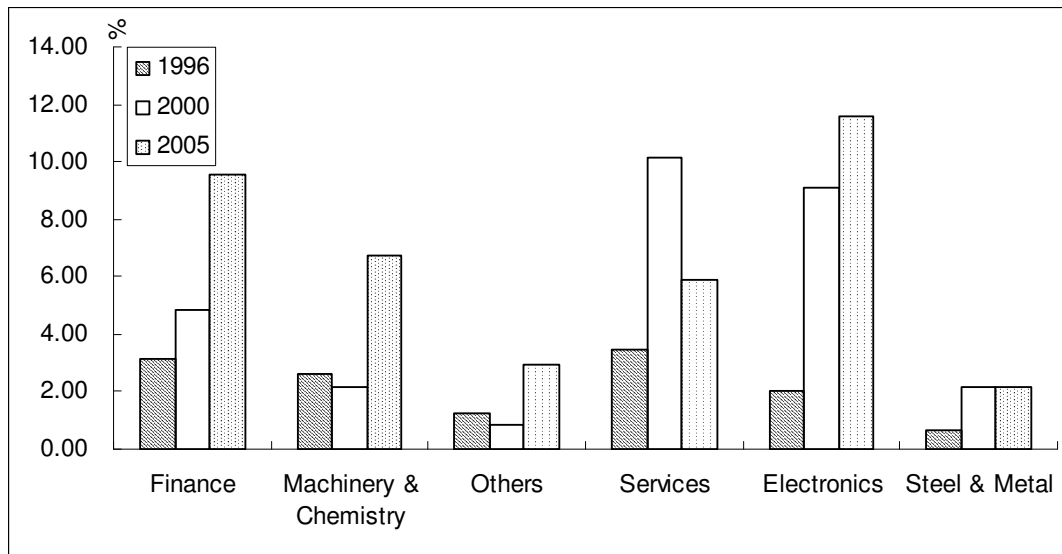
Table 3. Foreign Investors' Participation Rate in the Korea Stock Exchange: Descriptive Statistics

	1996	1998	2000	2002	2004	2005
Number of Companies with Foreign Investor / Number of Listed Companies	650/760	574/748	517/702	509/679	555/668	596/663
Maximum Rate	51.13	96.83	85.93	86.02	94.11	85.47
Mean Rate	6.93	7.43	7.52	9.61	13.56	13.27
Median Rate	3.50	1.71	1.59	1.55	4.28	5.29
STD	8.05	12.21	13.03	15.24	18.60	17.28

I.2. Changes in the Dividend Yield

Bekaert and Harvey (2000) argue that the dividend yield is a better measure of the capital of cost than expected returns. Following their argument, we examine trend in the dividend yield during the stock market opening and the post-opening years.

<Figure 5> shows the trend in the dividend yield for the past 16 years starting from 1990. Each year's dividend yield was computed as a ratio of the total value of dividends paid by the listed companies during the year to the market capitalization measured at the end of the year. The presented figure displays that the dividend yield had been on a downward trend before the first market opening in 1992. After the implementation of the partial opening measure in 1992, the decreasing trend lasted one more year, but was overturned in 1994. For the following years until the eruption of the financial crisis of 1997, the dividend yield kept increasing. During the post crisis period, the dividend yield process became more volatile. But aside from the increased volatility, it can be seen that the dividend yield has been leveled up relative to that of the pre-crisis period.

Descriptive statistics of the dividend yield are reported in <Table 4>. Dividing the 16 years

into the pre-crisis and the post-crisis period, the mean and the standard deviation of the dividend

yield during the recent years are higher than the pre-crisis. A simple test comparing mean-

differences between the pre-crisis and the post-crisis period is conducted. The result shows that

the increase in the dividend yield is statistically significant.

Figure 5. Trend in the Cost of Capital: Dividend Yield (1990~2005)

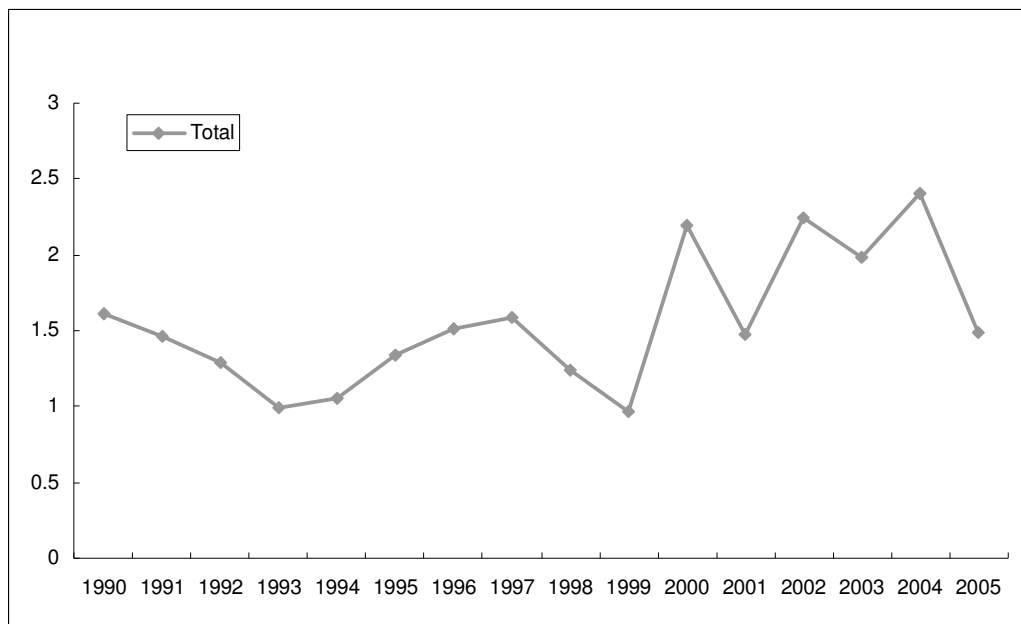Table 4. Difference in the Dividend Yield: During and After the Market Opening

	1992-1998(A)	1999-2005(B)	B-A
Average	1.29	1.82	0.48
St.Deviation	0.22	0.52	(4.07)

*( ) is a t-statistic for the hypothesis 'B-A=0'.

II. Regression Strategy and Data

II. 1. Research Question

The inspection of the trend in the dividend yield gives rise to a natural question: why have dividend yields increased after the economic crisis of 1997 when the Korean stock market is fully opened and foreign investors participation in the market is rising?

II.2. Potential Explanations

In measuring the effect of market opening on the cost of capital through the dividend yield, some factors that may blur the relationships among the three need to be considered. The dividend yield is a function of not only the cost of capital but also future dividend flows. Hence, the negative relationship of market opening with the dividend yield holds under the condition of controlling future dividend flows constant. Any factor that changes future dividend flows may prevent one from observing the negative effect of market opening on the dividend yield. Indeed, Henry (2000) reports that macroeconomic reform measures other than capital market opening also take significant impacts on the cost of capital in emerging economies, presumably by changing their growth prospects.

Even if one can hold future dividend flows constant, still it may not be easy to identify the impact of market opening on the dividend yield process. A standard theory predicts the effect of market opening on the cost of capital and the dividend yield to be negative because market opening changes marginal investor groups from domestic investors to foreign. But, it is not clear at which level of foreign ownership the change in the marginal investor group occurs.

Taking these into account, four possible explanations arise regarding the effect of the market opening and the interpretation of the observed trend in the dividend yield of the Korean

stock market. Based on his cross-country examination, Henry (2000) argues that the impact of market opening on the cost of capital is found only around the first opening years. Though market opening-process is always gradual in emerging economies, later opening measures in economies of his sample do not produce statistically significant effects on the cost of capital. The Korean experience may be interpreted along this line. One may argue that the decreasing effect of the market opening on the cost of capital and the dividend yield has already been realized around 1992, namely the initial period of the market opening. And then one can claim that the movement of the dividend yield during the post-crisis period should not be connected to the market opening. Instead, the increase in the dividend yield may be attributed to other changes such as the lowered growth prospect of the Korean economy after the economic crisis of 1997.

The second and an opposite explanation would be that the decreasing effect of market opening has actually been materializing during the post-crisis years, but disguised by other developments. And the decrease in the dividend yield during the pre-crisis period is an effect of other factors instead of the initial market opening measures. This hypothesis may be justified on the ground that foreign participation in the Korean stock market has not reached a critical level before the crisis, which is necessary for the change in the marginal investor group. Only after the crisis when foreign ownership in Korean companies further rose, foreign investors replaced domestic investors as the marginal investor group and so began affecting the cost of capital.

The third hypothesis is that the cost of capital has been declining all along the liberalization process since the first opening in 1992. The reason why its effect on the cost of capital is not shown clearly in the movement of the dividend yield in recent years can be attributed to other factors that affect dividend flows.

The final possibility would be an outright rejection of the prediction that market opening

should lower the cost of capital. For example, in contrast to what the theory tells, foreign investors may be myopic so that they may seek to maximize short-term returns from their investment in Korean companies. If foreign investors' myopic behavior leads them to demand exploiting dividends from Korean companies that cannot be sustained, one may observe temporary increase in the dividend yield as occurred during the post-crisis period.

II.3. Regression Strategy

A. Strategy

To identify the impact of market opening on the cost of capital, existing studies such as Bekaert and Harvey (2000), Henry (2000) employ cross-country regressions. Their strategy is to control effects of other factors on the cost of capital by differences among emerging economies. As long as macroeconomic profiles and histories of economic reforms are different among emerging economies, it may be argued that cross-country regressions are to correctly identify impacts of stock market openings.[2]

Our approach is different. We employ a one-country, firm-level panel regression approach instead of cross-country panel regression. While the dependent variable in the existing studies is dividend yields of emerging economies, the dependent variable in our regression is firm-level dividend yields of the Korean stock market. In our regression, macroeconomic events including economic reforms that may affect the dividend yield will be controlled by time-effects. We seek to identify the effect of market opening on the cost of capital and the dividend yield through foreign participation rate in each company. Our identifying assumption is that if market opening decreases the cost of capital as foreign investors become marginal investors, the impact of

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[2] Henry (2000) includes some dummy variables for macroeconomic reforms in his regression as an additional attempt to control their effects on measures of the cost of capital. But, identifying economic reforms that may have taken effects on measures of the cost of capital is hard. So, it seems that his main strategy to control other variables' effects on measures of the cost of capital is to exploit cross-country differences.

market opening would be more visible in firms with higher foreign participation rates. The following is the basic form of the regression equation we run.

$$DY_{it} = \alpha + \beta' X_{it} + \gamma FS_{it-1} + \delta T_t + \mu_i + \varepsilon_{it} \tag{1}$$

In the equation X_{it} stands for firm-level characteristics that may affect each firm's dividend yield. Changes in economic environment such as reforms and global market conditions will be controlled by a time-dummy variable T_t. μ_i is to allow individual fixed effect. The parameter of key interest is γ the coefficient to the foreign participation rate variable, FS_{it}.

B. Control Variables

It has been suggested by many works in the field of corporate finance that irrelevance of dividend policy à la Modigliani-Miller does not hold, and so firm's dividend policy is influenced by variety of variables. Following the literature, we include five variables to control possible variation in dividend yields due to corporate financial policy: change in investment, return on asset, change in fixed debt, cash flow, and size of the firm[3].

Change in investment (investment) is defined as the ratio of the change in investment in fixed assets to the total asset. Inclusion of the variable as an explanatory variable is primarily based on the theory that regards dividend as a signaling device for firm's future profitability. One may presume that if the prospect of future profitability improves, managers would increase investment and at the same time may also increase dividend payout as an attempt to signal their private information to the outside investors.

On the contrary, one can deduce the opposite implication from the signaling motivation on the relationship between investment activities and dividend policy. Since it is possible for

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[3] For a standard reference, see Frankfurter, Wood and Wansley (2003)

investors to observe investment activities of a firm, increase in investment itself may contain rich enough information on firm's future growth prospect for the outside investors. In that case, it is unnecessary for managers to employ dividend policy as an additional signaling device. This is so since dividend is a relatively costly signal device due to tax treatment on dividend income. Hence, any sign of the coefficient to the change in investment would be consistent with the signaling theory of dividend.

Return on asset (ROA) is the ratio of earnings net of dividend distribution to preferred stocks to total asset. Earning is the most frequently used variable in empirical study to explain dividend decision ever since Lintner's seminal work (1956). Earnings net of dividend distributed to preferred stocks constitute the source of fund for either retained earning or dividend to common stocks. Therefore, the presumption is that better earning performance in general leads to higher dividend if liquidity constraint is present for some reason.

Both change in fixed debt (fixed debt) and cash flow are variables included to take into account cash flow hypothesis (Ecko and Verma 1994). Change in fixed debt is normalized by total asset to neutralize scale effect and cash flow is defined as operating profit less corporate income tax and total dividend, which also normalized by total asset. Cash flow hypothesis argues that investors use dividend as discipline device for managers by minimizing free cash flow that can be arbitrarily disposed by managers. Less dependence on internal source of funding, in general, bring in lower monitoring cost through wider exposure to capital market.

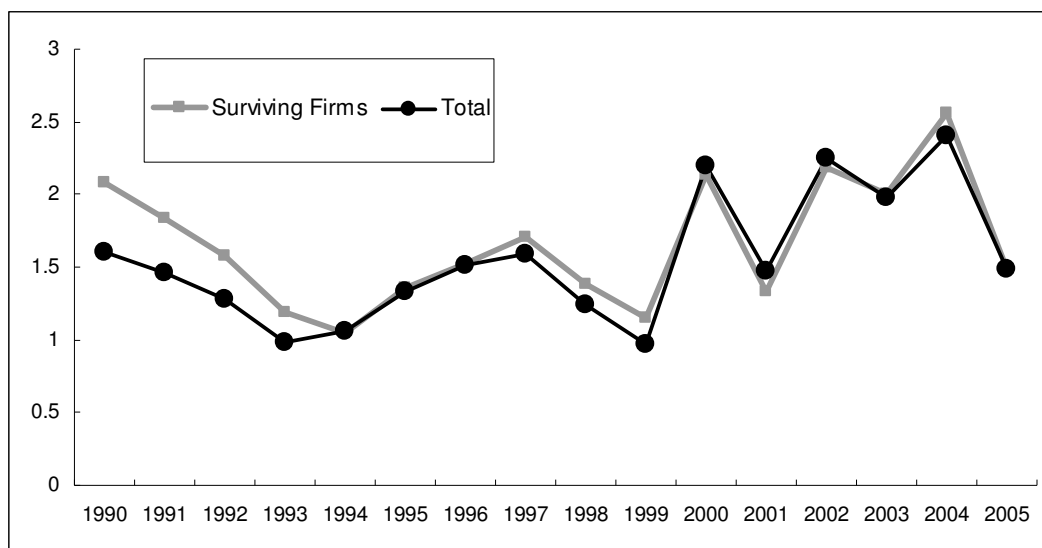Finally, size is measured as the log of total asset and included to capture the empirical regularity that larger firms tend to pay out more dividend. It is also possible to justify the inclusion of size as an explanatory variable in terms of agency cost. Larger firms are more likely to subject to negative effects of asymmetric information and have stronger incentive to use dividend as signaling device for future profitability.

II.4. Data

A. Sample Selection

In principle, we want to construct a sample consisting of all non-financial firms that have been continuously listed at the Korea Stock Market during the period 1992-2004. One potential problem with this sampling approach is 'survival bias'. The dividend yield process of the sample composed of surviving firms may be different from that of the total sample. To see whether there exists any tangible difference in the dividend yield, we present two dividend yield processes in Fig. 6. As it shows two processes move closely together since 1994. But, there appears a visible gap between the two in 1992 and 1993. We take two remedies. First, we restrict our sample period to 1994-2004 when the sample of surviving firms closely represent the total sample as far as movement in the dividend yield is concerned. Second, we repeat the same regression analysis with the total sample including de-listed firms.

Figure 6. Trends in the Dividend Yield

We exclude a small number of firms for which crucial information such as foreign participation rate and/or dividend is unavailable. When excluding those firms, for the surviving firm sample we end up with 411 non-financial firms. Table 5. describes basic features of the panel sample.

Table 5. Industry Composition and Relative Size of the Panel Sample to the Market

	Machinery & Chemistry	Services	Electronics	Steel & metal	Others	Total
Sample	140	62	49	29	131	411
1996	204	76	85	43	241	649(760)
1997	213	79	90	43	238	663(776)
1998	211	74	91	43	230	649(748)
1999	211	73	89	43	213	629(725)
2000	209	74	88	42	207	620(704)
2001	208	76	88	41	201	614(689)
2002	212	76	81	39	197	605(683)
2003	212	76	79	41	190	598(684)
2004	214	84	73	40	175	586(683)

Note: ( ) denotes the number of all listed companies including finance industry each year.

B. Data Source

Information for share of foreign investors for each listed firm and stock prices are extracted from database maintained by Korea Security Computing Corporation (Koscom) and information on all other variables are obtained from financial statements for listed firms provided by Korea Information Service (KIS)

III. Result

III.1. Basic Model

Main results of the regression are contained in Table 6 and 7. For simplicity, we do not report the coefficients of individual fixed effects and time effects. Table 6 reports the result when the dividend yield is regressed on foreign participation rate or share of foreign investors' holding in a firm. The regression is implemented three times changing sample periods, first for the whole sample period, second for the pre-crisis sample period and finally for the post-crisis period. This is to see whether the trend in the dividend yield observed in Fig. 5. can be confirmed by the regression analysis.

For the whole sample period of 1994-2004, the estimate of the coefficient to the foreign participation rate is negative and significant, which is encouraging since it implies that stock market opening and increase in foreign participation in domestic stock market indeed reduces the cost of capital.

When the whole sample is divided into the two sub-periods, an interesting finding emerges. The estimate of the coefficient to the foreign participation rate remains negative and significant for the post-crisis sample. However, for the pre-crisis sample it is estimated to be positive and insignificant. The result is a contrast to Henry (2000) and Bekaert and Harvey (2000), as they report that the decreasing effect of market opening on the cost of capital realizes in the early stage of market opening.

Table 6. Dividend yields and Shares of Foreign Investors: Regression (1)

Variable	Basic Model		
	1994 - 2004	1994 - 1998	1999 - 2004
FS(t-1)	-0.0114** (0.0052)	0.0020 (0.0086)	-0.0187** (0.0082)
Investment	0.0030 (0.0032)	0.0023 (0.0030)	0.0040 (0.0073)
ROA	0.0027** (0.0013)	0.0087*** (0.0034)	0.0022 (0.0015)
Fixed debt	0.0028** (0.0014)	-0.0043 (0.0027)	0.0024 (0.0016)
Cash flow	0.0008 (0.0045)	-0.0025 (0.0098)	-0.0044 (0.0056)
Size	0.5533*** (0.0956)	0.1387 (0.1795)	0.4911** (0.1943)
# of obs.	4,521	2,055	2,466
R^2	0.0437	0.0505	0.0274
Wald test	352.48***(16)	111.4***(10)	69.63***(11)

Note: 1) dependent variable = dividend yield
2) standard errors are in parentheses.
3) Wald is the test statistic for the null hypothesis that all coefficients except for constant term are jointly zero and degrees of freedom are in the parentheses.
4) **: statistically significant at 5%, ***: statistically significant at 1%

III.2. Alternative Model

We repeat the regression now with allowing for serial correlation in the dividend yield. There exist studies on dividend policy that emphasize the presence of inertia in the dividend process (Lintner 1956, Waud 1966). These studies suggest various empirical specifications based on partial adjustment model for dividend change. Allowing for the possibility of inertia in dividend adjustment, we estimate the following dynamic panel model.

$$DY_{it} = \alpha + \beta' x_{it} + \gamma FS_{it-1} + \delta DY_{it-1} + \mu_i + \varepsilon_{it} \qquad (2)$$

It is well-known that a typical estimation strategy for static panel like (1) leads to inconsistent estimator. Therefore, we resort to Arellano and Bond (1988) style GMM estimation

procedure in estimating the dynamic panel model.

The result is presented in Table 7. The coefficient to the lagged dividend yield is estimated to be positive and significant, indicating the existence of persistence in the dividend yield process. But, focusing on the coefficient to the foreign participation rate, we report that the result is qualitatively unchanged from the basic model regression.

Table 7. Dividend yields and Shares of Foreign Investors: Regression (2)

Variable	Dynamic Model		
	1995 - 2004	1995 – 1998	1999 – 2004
FS(t-1)	-0.0246*** (0.0090)	-0.0141 (0.0224)	-0.0381** (0.0130)
Investment	0.0015 (0.0032)	0.0055 (0.0053)	-0.0041 (0.0083)
ROA	0.0015 (0.0014)	0.0026 (0.0071)	0.0025 (0.0019)
Fixed debt	0.0012 (0.0014)	-0.0155*** (0.0059)	0.0026 (0.0021)
Cash flow	-0.0083 (0.0055)	-0.0299 (0.0210)	-0.0102 (0.0075)
Size	0.3004* (0.1798)	-0.0080 (0.4435)	0.2273 (0.3339)
DY(t-1)	0.1383*** (0.0260)	0.6823*** (0.2429)	0.2706*** (0.0486)
# of obs.	3,699	1,233	1,644
Sargan test	256.76***(44)	9.66**(5)	96.33***(9)

Note: 1) dependent variable = dividend yield
     2) standard errors are in parentheses.
     3) Sargan is the test statistic for overidentifying restrictions and degrees of freedom are in the parentheses.
     4) *: statistically significant at 10%, **: statistically significant at 5%, ***: statistically significant at 1%

Before ending this section, we redo the regression analyses with the unbalanced panel sample including de-listed companies sometime during the sample period. Results are contained in Table 8 and 9. Significance of the coefficient to the foreign participation rate becomes marginal in the basic model regression. The result for the dynamic model remains qualitatively same.

<Table 8> Dividend yields and shares of foreign investors: Regression (3)

Variable	Basic Model: Total Listed Companies		
	1992 - 2004	1992 – 1998	1999 - 2004
FS(t-1)	-0.0015 (0.0057)	0.0021 (0.0106)	-0.0093 (0.0064) **(p-value 14.5%)**
Investment	0.0002 (0.0011)	-0.0004 (0.0023)	-0.0002 (0.0011)
ROA	0.0009 (0.0009)	0.0152*** (0.0049)	0.0003 (0.0006)
fixed debt	0.0018 (0.0236)	-0.0012 (0.0321)	-0.0028 (0.0417)
cash flow	0.0035 (0.0043)	-0.0183* (0.0107)	0.0001 (0.0040)
Size	0.5141*** (0.1093)	-0.2668 (0.2504)	0.5382*** (0.1488)
# of obs.	7,873	4,156	3,717
R^2	0.0143	0.0037	0.0171
Wald test	173.12***(16)	34.56***(9)	92.5***(10)

Note: 1) dependent variable = dividend yield

2) standard errors are in parentheses.

3) Wald is the test statistic for the null hypothesis that all coefficients except for constant term are jointly zero and degrees of freedom are in the parentheses.

4) *: statistically significant at 10%,   **: statistically significant at 5%, ***: statistically significant at 1%

5) The sample includes all firms both listed and de-listed for each period.

<Table 9> Dividend yields and shares of foreign investors: Regression (4)

Variable	Dynamic Model		
	1994 – 2004	1994 – 1998	1999 – 2004
FS(t-1)	-0.0044	0.0049	-0.0331***
	(0.0083)	(0.0135)	(0.0105)
investment	-0.0015	-0.0006	-0.0043
	(0.0040)	(0.0053)	(0.0067)
ROA	0.0006	0.0163	0.0005
	(0.0010)	(0.0058)	(0.0011)
fixed debt	0.0004	0.0005	0.0005
	(0.0011)	(0.0034)	(0.0013)
cash flow	-0.0117***	-0.0331***	-0.0006
	(0.0048)	(0.0120)	(0.0051)
size	0.1889	-0.7420**	0.0740
	(0.1781)	(0.3448)	(0.2438)
DY(t-1)	0.5262***	-0.0081	0.2838***
	(0.0130)	(0.0323)	(0.0410)
# of obs.	6,387	2,832	2,339
Sargan test	4227.5***(65)	2467.06***(14)	111.89***(9)

Note: 1) dependent variable = dividend yield
2) standard errors are in parentheses.
3) Sargan is the test statistic for overidentifying restrictions and degrees of freedom are in the parentheses.
4) *: statistically significant at 10%, **: statistically significant at 5%, ***: statistically significant at 1%
5) The sample includes all firms both listed and de-listed for each period.

III.2. Causality Check

In this section, we conduct a supplementary analysis on the effect of foreign investors on dividend yield. Unlike the previous section, we do not assume direction of causality between share of foreign investors and dividend yield. There is no compelling theoretical argument to prevent us from forwarding the claim that foreign investors prefer stocks with higher dividend yield.

We test the existence of causal relationship in Granger sense between share of foreign investors and dividend yield by taking advantage of the panel vector autoregression (VAR) technique suggested by Holtz-Eakin, Newey, and Rosen (1988). Grinstein and Michaely (2005) successfully applied panel VAR to finance research in investigating the interaction between institutional holdings and payout policy.

Suppose the following bi-variate panel VAR allowing for time varying coefficients and individual fixed effect such that;

$$
\begin{aligned}
DY_{it} &= \alpha_{0t} + \sum_{l=1}^{m} \alpha_{lt} DY_{it-l} + \sum_{l=1}^{m} \beta_{lt} FS_{it-l} + \varphi_t f_i + \varepsilon_{it} \\
FS_{it} &= \gamma_{0t} + \sum_{l=1}^{m} \gamma_{lt} DY_{it-l} + \sum_{l=1}^{m} \delta_{lt} FS_{it-l} + \omega_t g_i + \eta_{it}
\end{aligned}
\tag{3}
$$

where $i = 1, 2, \cdots, N$ is the number of firms and $t = 1, 2, \cdots, T$ is the number of years in the sample. l is the number of time lags included for estimation and f_i and g_i are individual fixed effects allowed for dividend yield and share of foreign investors, respectively. $(\alpha, \beta, \varphi, \gamma, \delta, \omega)$ is the vector of parameters to be estimated and $(\varepsilon_{it}, \eta_{it})$ is a sequence of serially independent stochastic error terms with a well-defined joint distribution.

Following Holtz-Eakin, Newey, and Rosen (1988), one can transform (3) into a set of two estimating functions without individual fixed effect;

$$DY_{it} = a_{0t} + \sum_{l=1}^{m+1} a_{lt} DY_{it-l} + \sum_{l=1}^{m+1} b_{lt} FS_{it-l} + u_{it}$$

$$FS_{it} = c_{0t} + \sum_{l=1}^{m+1} c_{lt} DY_{it-l} + \sum_{l=1}^{m+1} d_{lt} FS_{it-l} + v_{it}$$

(4)

GMM with the following orthogonality conditions bring us a consistent estimator;

$$E[DY_{is}u_{it}] = E[FS_{is}u_{it}] = 0 \quad \text{for} \ s < (t-1)$$

$$E[DY_{is}v_{it}] = E[FS_{is}v_{it}] = 0 \quad \text{for} \ s < (t-1)$$

The null hypotheses of the traditional Granger causality test are given as;

$$H_0 : \beta_{1t} = \beta_{2t} = \cdots = \beta_{mt} = 0 \ \forall t$$

$$H_0 : \gamma_{1t} = \gamma_{2t} = \cdots = \gamma_{mt} = 0 \ \forall t$$

(5)

Holtz-Eakin, Newey, and Rosen (1988) show that testing (5) in (3) is equivalent to testing

the following null hypotheses in (4);

$$H_0 : b_{1t} = b_{2t} = \cdots = b_{mt} = b_{(m+1),t} = 0 \ \forall t$$

$$H_0 : c_{1t} = c_{2t} = \cdots = c_{mt} = c_{(m+1),t} = 0 \ \forall t$$

(6)

Holtz-Eakin, Newey, and Rosen (1988) also suggest a Wald type test statistic based on the

difference between the residuals of restricted model and unrestricted model.

The test statistics are reported in Table 10. Our interpretations are as follows. We reject the

null hypothesis that share of foreign investors does not Granger cause dividend yield for the

period from 1994 to 2004. However, we cannot reject the null hypothesis that dividend yield

does not Granger cause share of foreign investors for the same period. Second, for the pre-crisis

period, we do not obtain a consistent conclusion on the interaction between share of foreign

investors and dividend yield. Third, for the post-crisis period, share of foreign investors help

explain dividend yield, but not vice versa.

In sum, Granger causality tests in this section confirm that the effect of foreign investors on

the cost of capital (dividend yield) unfolded its potential in full scale after 1999 when capital

market liberalization was completed and foreign participation rate rose.

Table 10. Granger causality test

# of lags	FS → DY			DY → FS		
	χ^2-statistics	d. f.	p-value	χ^2-statistics	d. f.	p-value
1994 – 2004						
1	43.2231	16	0.0003	22.1696	16	0.1378
2	47.3938	21	0.0008	28.5234	21	0.1259
1994 – 1998						
1	8.0402	4	0.0901	15.5057	4	0.0038
2	3.5896	3	0.3093	5.1844	3	0.1578
1999 - 2004						
1	15.3385	6	0.0178	9.6124	6	0.1646
2	20.4021	6	0.0023	10.085	6	0.1211

IV. Conclusion

We have examined the effect of market opening on the dividend yield based on the Korean data. We employed firm-level panel regression approaches, focusing on the relationship between foreign participation rates and the dividend yield. We found that the larger the foreign participation rate is, the lower the dividend yield is. But, the relationships is only significant in the post-crisis period when the Korean stock market is fully opened and foreign participation rate is relatively higher. The results are different from the existing studies based on cross-country data that find the effect of market opening realizes in the early stage of opening.

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