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Relations Between Stock Returns and Fundamental Variables: Evidence from a Segmented Market

MANJEET S. DHATT[1], YONG H. KIM[2⋆] and SANDIP MUKHERJI[3]

[1]*Assistant Professor of Finance, University of Michigan-Dearborn, U.S.A.*
[2]*Professor of Finance, College of Business Administration, University of Cincinnati, Cincinnati, OH 45221, U.S.A.*
[3]*Associate Professor of Finance, Howard University, U.S.A.*

Abstract. This study examines relations between stock returns and potential explanatory factors in Korea, an important and segmented emerging market. Our results show that Korean stock returns in general and returns on stocks listed in Section 1 in particular are significantly positively related to book-to-market, sales-price, and debt-equity ratios, but not significantly related to market value of equity. Returns on stocks listed in Section 2 are, however, negatively related to market value of equity and not significantly related to the other three variables. Among the variables investigated by us, book-to-market ratio has the greatest explanatory power for stock returns and it indicates superior returns for value stocks. Our findings strengthen the international evidence of the role of book-to-market ratio in explaining stock returns by demonstrating its significance even in the segmented Korean market.

Key words: book-to-market, explanatory factors, Korea, stock returns.

1. Introduction

Numerous studies have investigated explanatory factors for U.S. stock returns. Early studies find that stock returns are negatively related to price-earnings ratio (PER) (Basu, 1977) and market value of equity (MVE) (Banz, 1981). Subsequently, Bhandari (1988) reports a positive relation between stock returns and debt-equity ratio (DER). A comprehensive study by Fama and French (1992) shows that book-to-market ratio (BMR) is positively related to stock returns and it has the strongest relation with stock returns among all the variables examined. The authors also find that BMR and MVE absorb the explanatory power of earnings-price ratio, financial leverage and beta for stock returns. In a recent study, Barbee, Mukherji and Raines (1996) find a positive relation between stock returns and sales-price ratio (SPR). They also show that SPR captures the explanatory power of BMR, MVE and DER for U.S. stock returns during 1979–1991.

With increasing integration of global markets in recent years, researchers have started examining stock returns in other countries. Chan, Hamao and Lakonsihok

⋆ Author for correspondence.

(1991) find that Japanese stock returns are positively related to BMR and cash flow yield. A multi-country study by Capaul, Rowley and Sharpe (1993) shows a positive relationship between stock returns and BMR in France, Germany, Japan, Switzerland, U.K. and U.S. Roll (1995) reports that in Indonesia, high-BMR stocks appear to have higher returns than low-BMR stocks, although the difference between the two groups is not statistically significant.

This study evaluates potential explanatory factors for stock returns in Korea. The Korean stock market offers an important and interesting setting for testing relations between fundamental variables and stock returns. It is one of the world's largest stock markets[1] and it is becoming more accessible to foreign investors.[2] Since the Korean stock market was largely closed to foreign investors until recently, our results will show whether the relations between fundamental variables and stock returns observed in integrated, developed markets also hold in a segmented, emerging market.

Cheung and Lee (1993) find that Korean investors were rewarded for bearing only domestic risk during 1982–1989, indicating that the Korean market was segmented during this period. Bessembinder and Chan (1995) show that during 1975–1989, technical trading rules could predict changes in several Asian stock market indices, including the Korean market index, suggesting that these markets were informationally inefficient in that period. The possibility of predicting stock returns with fundamental variables should therefore be even greater in these markets than in developed markets. This potential may not, however, be fully realized as long as the market remains segmented. Bailey and Jagtiani (1994) provide evidence of stock price discounts resulting from restrictions on foreign ownership in Thailand. Opening up to foreign investors could unlock the opportunity to profit from fundamental analysis of stocks in these markets. In this context, identification of explanatory factors for stock returns in emerging markets such as Korea should be of interest to academics and practitioners alike.

The empirical evidence summarized above indicates that BMR has a prominent role in predicting stock returns in several countries. Studies of the U.S. market also suggest that MVE, DER and SPR may have significant independent power for explaining stock returns. Consistent with these findings, a preliminary study of Korean stock returns by Mukherji, Dhatt and Kim (1997) shows that median annual returns of portfolios with high BMR, DER and SPR exceed those of portfolios with low values of these variables by 22.53%, 18.88% and 15.06%, respectively. Further, low-MVE portfolios have median annual returns that are 16.28% higher than the returns on high-MVE portfolios. Returns on stock portfolios formed on the basis of EPR and beta values, however, do not display consistent patterns.

This study examines whether monthly stock returns in Korea are significantly related to BMR, DER, SPR and MVE, after controlling for market risk premiums. We also determine the relative powers of these variables for explaining future stock returns. Our results indicate that Korean stock returns in general and returns on stocks listed in Section 1 in particular are significantly positively related to BMR,

SPR, and DER, but not significantly related to MVE. Returns on stocks listed in Section 2 are, however, negatively related to MVE and not significantly related to the other three variables. Among the variables investigated by us, BMR has the greatest power for predicting stock returns. These findings strengthen the international evidence of the role of book-to-market ratio in explaining stock returns by demonstrating its significance even in the segmented Korean market.

The rest of the paper is organized as follows. Section 2 describes the data and methodology. Section 3 provides descriptive statistics and correlations. Section 4 presents the regression results and Section 5 offers conclusions.

2. Data and Methodology

We obtained the data from the PACAP Databases-Korea compiled by the PACAP Research Center at the University of Rhode Island, U.S.A. The database contains monthly stock returns from 1977 for all companies listed on the Korea Stock Exchange (KSE). Income statement and balance sheet data are, however, available only from 1981 and only for nonfinancial companies. Accordingly, we investigate explanatory factors for monthly stock returns during 1982–1992 for nonfinancial companies listed on the KSE.

Listed companies are required to file their annual reports with the KSE and the Securities and Exchange Commission within 90 days of the end of the fiscal year. Accounting data for December are therefore publicly available by next March. To ensure uniformity of the data, firms whose fiscal year does not end in December are excluded.[3] We use accounting data for December and market data from the most recent month to construct financial variables and examine their relations with monthly stock returns from next April through March of the following year.

A total of 129 cross-sectional regressions are conducted with monthly stock returns from April 1982 through December 1992 as the dependent variable, using the Fama and Macbeth (1973) procedure and a two-factor model. For each monthly regression, two betas are first estimated for each stock from the previous 36 months of returns,[4] using the following model:

$$R_{it} - R_{ft} = a_{0i} + \beta_{1i}(VW_t - R_{ft}) + \beta_{2i}(EW_t - R_{ft}) + e_{it}\,, \tag{1}$$

where R_{it} is the return on stock i in estimation month t, R_{ft} is the risk-free rate in estimation month t,[5] VW_t is the return on the value-weighted market index in estimation month t, EW_t is the return on the equally-weighted market index in estimation month t, and e_{it} is the error term for estimation month t.

The 129 monthly regressions in the test period are then conducted for several models, comprising the two estimated betas (β_{1i} and β_{2i}) and one or more fundamental variables ($V_{1i} \ldots V_{ni}$). The general model is

$$R_{id} - R_{fd} = a_{0d} + b_{1d}\beta_{1id} + b_{2d}\beta_{2id} + a_{1d}V_{1id} \ldots + a_{nd}V_{nid} + e_{id}\,, \tag{2}$$

where R_{id} is the return on stock i in test month d, R_{fd} is the risk-free rate in test month d, β_{1id} and β_{2id} are the coefficients of the value- and equally-weighted market indices, respectively, estimated from the 36 monthly returns preceding test month d using Equation (1), $V_{1id} \ldots V_{nid}$ are the relevant values, for test month d, of the fundamental variables used in the model, and e_{id} is the error term for test month d.

The fundamental variables, which are used in various combinations in the regression models, are[6,7]

LBMR = log of [(book value of equity in year $y-1$[8]/market value of equity in month $d-1$)/median ratio of book value of equity in year $y-1$ to market value of equity in month $d-1$],

LDER = log of [(book value of debt in year $y-1$/market value of equity in month $d-1$)/median ratio of book value of debt in year $y-1$ to market value of equity in month $d-1$],

LMVE = log of [market value of equity in month $d-1$/median market value of equity in month $d-1$], and

LSPR = log of [(sales per share in year $y-1$/stock price in month $d-1$)/median ratio of sales per share in year $y-1$ to stock price in month $d-1$].

Our general approach is similar to that of Chan, Hamao and Lakonishok (1991). However, we follow slightly different procedures to enhance the reliability and power of the tests. The major differences between their methodology and ours are summarized below:

1. They employ several different methods, most of which use stock portfolios, but indicate that the results that are least susceptible to biases are those involving individual stocks (see Lo and MacKinlay (1990)) and the Fama-Macbeth (1973) approach. We adopt this approach and use individual stock returns for our tests.
2. Their sample comprises all companies, including those whose fiscal year, unlike that of most Japanese companies, does not end in March. To improve the predictive power of the fundamental variables, our sample includes only those firms whose fiscal year, like that of most Korean firms, ends in December.
3. While they estimate the beta coefficients of the two-factor model once a year, we update these beta estimates each month to obtain more current proxies for market factors.
4. We standardize each fundamental variable by its median, rather than its mean, which may be distorted by extreme values.

In addition to analyzing the results for the full sample over the entire test period, we also report separate results for two subperiods and for stocks listed in Sections 1 and 2. The number of listed stocks increased from 285 at the end of 1977 to 688 at the end of 1992. The sharpest increases occurred after 1987; the number of listed companies rose from 389 in 1987 to 502 in 1988 and 626 in 1989. In view of the

substantial increase in sample size after 1987, we conduct separate analyses for two subperiods, ending in 1987 and beginning in 1988, respectively. Further, companies are initially listed in Section 2 and must satisfy several conditions regarding capitalization, trading volume, profits, dividends, debt ratio, current ratio, etc., to be listed in Section 1. Since stocks listed in the two sections are fundamentally different, we examine the results separately for stocks listed in Sections 1 and 2.[9]

3. Descriptive Statistics and Correlations between Explanatory Factors

Table I provides descriptive statistics. There are large differences between mean and median values, indicating some extreme values. Our discussion is therefore based on the medians, which are more representative of the sample. Panel A shows that the monthly risk-free rate (RFR) was 0.57% during the test period, but it was lower during April 1982 through December 1987 (period 1) than in January 1988 through December 1992 (period 2). Further, both the equally-weighted return (EWR) and the value-weighted return (VWR) on the market index were substantially higher in period 1, compared to period 2. The EWR was higher than the VWR in both periods. For the whole test period, the 1.23% risk premium on the equally-weighted market index (EWRP) was considerably greater than the 0.23% risk premium on the value-weighted index (VWRP). Both the indices had large positive risk premiums in the first period, but negative risk premiums in the second period. Therefore, although we form the subperiods based on a large increase in the number of listed companies after 1987, periods 1 and 2 also represent up and down markets, respectively.

Panel A also shows that the market value of equity (MVE) increased from 9.33 billion wons in period 1 to 31.59 billion wons in period 2. Between the two periods, the debt-equity ratio (DER) fell from 5.05 to 1.86, the book-to-market ratio (BMR) declined from 1.67 to 0.87, and the sales-price ratio (SPR) also dropped from 7.75 to 2.69. Panel B indicates that Section 1 stocks had higher MVE and lower DER, BMR and SPR than Section 2 stocks.

These data suggest that the two subperiods were substantially different. The second period had a higher risk-free rate and lower market returns, resulting in substantially lower and negative risk premiums. Further, in the second period, firms were larger and had less financial leverage and greater market values relative to book values and sales. Stocks listed in Sections 1 and 2 are also fundamentally different. Section 1 stocks belong to firms which are larger and have less financial leverage as well as higher market values relative to book values and sales.

Table II shows correlation coefficients of the explanatory factors for the sample stocks across the test months. Pearson correlations are reported below the diagonal and Spearman rank correlations are shown above the diagonal. Panel A indicates that in the test period, there was a strong positive relation between LDER and LSPR, moderate positive relations of LBMR with LDER and LSPR, and weaker negative relations of LMVE with the other three variables. Panels B and C show

Table I. Descriptive statistics for stocks listed on the Korea Stock Exchange during 1982–1992

Panel A. Monthly rates of return and fundamental variables for all listed stocks during test period and two subperiods

Variable	04/1982–12/1992		04/1982–12/1987		01/1988–12/1992	
	Mean	Median	Mean	Median	Mean	Median
RFR[a]	0.51	0.57	0.45	0.41	0.58	0.57
EWR[b]	2.37	1.86	3.45	2.70	1.13	0.35
VWR[c]	1.72	0.83	2.53	1.87	0.79	–0.70
EWRP[d]	1.86	1.23	3.00	2.29	0.55	–0.22
VWRP[e]	1.21	0.27	2.08	1.46	0.21	–1.26
MVE[f]	68.43	18.52	23.85	9.33	99.79	31.59
DER[g]	6.65	2.67	10.24	5.05	4.12	1.86
BMR[h]	1.45	1.10	2.04	1.67	1.04	0.87
SPR[i]	8.09	3.84	13.40	7.75	4.35	2.69

Panel B. Fundamental variables for all listed stocks and stocks listed in Sections 1 and 2

Variable	All listed stocks		Section 1 stocks		Section 2 stocks	
	Mean	Median	Mean	Median	Mean	Median
MVE	68.43	18.52	78.36	20.46	32.38	13.69
DER	6.65	2.67	4.00	2.35	16.47	5.38
BMR	1.45	1.10	1.36	1.08	1.86	1.17
SPR	8.09	3.84	6.91	3.64	12.46	4.89

[a]Monthly percentage risk-free rate (geometric average of Bank of Korea's annual discount rate) in month d.
[b]Monthly percentage return on the equally-weighted market index in month d.
[c]Monthly percentage return on the value-weighted market index in month d.
[d]EWR – RFR.
[e]VWR – RFR.
[f]Market value of equity in month $d-1$ in billions of wons.
[g]Book value of debt in year $y-1$/market value of equity in month $d-1$.
[h]Book value of equity in year $y-1$/market value of equity in month $d-1$.
[i]Sales per share in year $y-1$/stock price in month $d-1$.

that the relations between LDER and LSPR, and relations of LBMR with LDER and LSPR were somewhat stronger in the first period compared to the second one. The relations of LMVE with the other three variables were, however, more or less similar in both periods. These findings indicate that firms with greater financial leverage and smaller capitalization have higher market values relative to sales and book values. Further, larger firms tend to have less financial leverage and

Table II. Correlation coefficients of explanatory factors for stocks listed on the Korea Stock Exchange during 1982–1992

Variable	LBMR[a]	LDER[b]	LMVE[c]	LSPR[d]
Panel A. Test period (04/1982–12/1992)				
LBMR	1.00	0.46	–0.33	0.49
LDER	0.45	1.00	–0.16	0.79
LMVE	–0.33	–0.24	1.00	–0.22
LSPR	0.46	0.77	–0.25	1.00
Panel B. Period 1 (04/1982–12/1987)				
LBMR	1.00	0.53	–0.29	0.55
LDER	0.54	1.00	–0.18	0.85
LMVE	–0.33	–0.25	1.00	–0.23
LSPR	0.54	0.83	–0.25	1.00
Panel C. Period 2 (01/1988–12/1992)				
LBMR	1.00	0.40	–0.36	0.45
LDER	0.35	1.00	–0.14	0.75
LMVE	–0.33	–0.23	1.00	–0.22
LSPR	0.38	0.73	–0.25	1.00

[a]Log of [(book value of equity in year $y-1$/market value of equity in month $d-1$)/median ratio of book value of equity in year $y-1$ to market value of equity in month $d-1$ for all stocks].
[b]Log of [(book value of debt in year $y-1$/market value of equity in month $d-1$)/median ratio of book value of debt in year $y-1$ to market value of equity in month $d-1$ for all stocks].
[c]Log of [market value of equity in month $d-1$/median market value of equity in month $d-1$ for all stocks].
[d]Log of [(sales per share in year $y-1$/stock price in month $d-1$)/ median ratio of sales per share in year $y-1$ to stock price in month $d-1$ for all stocks].
Note: Pearson correlations are reported below the diagonal and Spearman rank correlations are shown above the diagonal. All the coefficients are significant at 1% level.

lower market values relative to book values and sales. Finally, the two measures of relative market value are positively related.

4. Regression Results

The regression findings are presented in Table III. Panel A shows mean coefficient estimates and t-test significance levels for 129 cross-sectional regressions of monthly excess stock returns with each of the four independent variables as well

as various combinations of these variables. Panels B and C provide the regression results for two subperiods, while Panels D and E give the results for stocks listed in Sections 1 and 2, respectively.

Univariate regression models 1 and 2 in Panel A show that stock returns are positively related to LBMR and LSPR at 1% and 5% significance levels, respectively, indicating greater returns for stocks with high book-to-market and sales-price ratios. In regression 3, LDER is positively related to stock returns at 10% significance level, suggesting evidence of a leverage premium that is weaker than the value premium. Regression 4 shows that LMVE has a negative coefficient, but it is not significant, indicating that firm size does not have predictive power for Korean stock returns. This is contrary to the evidence of a significant negative relationship between firm size and stock returns in the U.S.

In multiple regression model 5, LBMR weakens the significance level of LSPR to 10%, but does not fully absorb its explanatory power. Both book-to-market and sales-price ratios therefore have independent predictive power for stock returns. Model 6 shows that LBMR captures the explanatory power of LDER, indicating that the leverage premium is subsumed by the value premium. Model 7 shows that when it is combined with LMVE, LBMR retains its significance level, while LMVE remains insignificant. In the full model (8), which includes all the four variables, LBMR is the only one with significant predictive power. These results demonstrate that book-to-market ratio has significant predictive power for Korean stock returns after controlling for the effects of sales-price and debt-equity ratios as well as firm size.

The results for the first subperiod, in Panel B, show that LBMR is the only variable with significant explanatory power. Its coefficient is significant at 5% level in models 1 (univariate regression), 5 (with LSPR), and 7 (with LMVE). The significance level of LBMR increases to 1% in models 6 (with LDER) and 8 (with all the other variables). In the second subperiod (Panel C), LBMR is significant at 5% level and LSPR is significant at 10% in the univariate regressions. In model 5, where LBMR and LSPR are used together, both variables are significant at 10% level. The significance level of LBMR also falls to 10% when it is combined with LDER (model 6), but it improves to 1% when used with LMVE. In the full model (8), LBMR is significant at 5% level; no other variable is significant.

Regressions involving Section 1 stocks in Panel D indicate that in univariate regressions, LBMR, LSPR, and LDER are all significant at 1% level, while LMVE is not significant. Combining LBMR with LSPR (model 5) and LDER (model 6) reduces the significance levels of LSPR and LDER to 5%, but LBMR remains significant at 1% level. LBMR is also significant at 1% level when used with LMVE (model 7). In model 8, LBMR is again significant at 1% level and LDER is significant at 5% level; the other two variables are not significant.

Panel E shows that LMVE is the only variable with significant explanatory power for Section 2 stocks. It is negatively related to stock returns and significant at

Table III. Mean estimated coefficients from cross-sectional regressions of monthly excess stock returns in Korea with a two-factor model and fundamental variables

Model	Intercept	LBMR[a]	LSPR[b]	LDER[c]	LMVE[d]
Panel A. Full sample, April 1982 through December 1992 (129 months)					
1	.0150	.0097			
	(.0153)	(.0021)			
2	.0167		.0052		
	(.0065)		(.0239)		
3	.0192			.0048	
	(.0017)			(.0523)	
4	.0177				–.0029
	(.0048)				(.1445)
5	.0148	.0077	.0030		
	(.0150)	(.0025)	(.0876)		
6	.0164	.0079		.0031	
	(.0066)	(.0005)		(.1728)	
7	.0145	.0085			–.0013
	(.0200)	(.0005)			(.5079)
8	.0157	.0070	.0012	.0019	–.0015
	(.0099)	(.0003)	(.5276)	(.4909)	(.4498)
Panel B. Full sample, April 1982 through December 1987 (69 months)					
1	.0256	.0105			
	(.0006)	(.0272)			
2	.0270		.0059		
	(.0005)		(.1269)		
3	.0292			.0057	
	(.0185)			(.1498)	
4	.0295				–.0038
	(.0004)				(.1917)
5	.0252	.0087	.0024		
	(.0006)	(.0108)	(.3909)		
6	.0261	.0091		.0023	
	(.0005)	(.0006)		(.5105)	
7	.0252	.0086			–.0029
	(.0007)	(.0282)			(.2870)
8	.0259	.0075	.0003	.0015	–.0032
	(.0007)	(.0020)	(.8978)	(.7135)	(.1935)

Table III. Continued

Model	Intercept	LBMR[a]	LSPR[b]	LDER[c]	LMVE[d]
Panel C. Full sample, January 1988 through December 1992 (60 months)					
1	.0027	.0087			
	(.7885)	(.0317)			
2	.0049		.0045		
	(.6209)		(.0548)		
3	.0078			.0038	
	(.4168)			(.1787)	
4	.0042				–.0018
	(.6557)				(.4887)
5	.0029	.0066	.0038		
	(.7726)	(.0901)	(.0687)		
6	.0052	.0066		.0040	
	(.5895)	(.0896)		(.1496)	
7	.0021	.0084			.0004
	(.8360)	(.0031)			(.8948)
8	.0039	.0064	.0022	.0023	–.0005
	(.6871)	(.0366)	(.4139)	(.5087)	(.8750)
Panel D. Section 1 stocks, April 1982 through December 1992 (129 months)					
1	.0166	.0128			
	(.0089)	(.0002)			
2	.0164		.0062		
	(.0097)		(.0009)		
3	.0182			.0078	
	(.0041)			(.0002)	
4	.0177				–.0029
	(.0060)				(.1094)
5	.0156	.0105	.0034		
	(.0127)	(.0013)	(.0400)		
6	.0170	.0094		.0048	
	(.0066)	(.0037)		(.0140)	
7	.0156	.0119			–.0012
	(.0149)	(.0001)			(.5289)
8	.0157	.0086	.0002	.0045	–.0013
	(.0124)	(.0012)	(.9219)	(.0382)	(.5104)

Table III. Continued

Model	Intercept	LBMR[a]	LSPR[b]	LDER[c]	LMVE[d]
Panel E. Section 2 stocks, April 1982 through December 1992 (129 months)					
1	.0064	.0053			
	(.4572)	(.1207)			
2	.0127		.0035		
	(.1374)		(.3366)		
3	.0135			.0037	
	(.1015)			(.2607)	
4	.0118				–.0053
	(.1523)				(.0676)
5	.0054	.0019			–.0054
	(.5498)	(.4911)			(.0712)
6	.0130		.0010		–.0041
	(.1315)		(.5583)		(.0746)
7	.0129			.0013	–.0042
	(.1152)			(.6923)	(.0726)
8	.0065	.0027	.0006	.0003	–.0051
	(.4636)	(.3501)	(.8723)	(.9484)	(.0553)

[a]Log of [(book value of equity in year $y-1$/market value of equity in month $d-1$)/median ratio of book value of equity in year $y-1$ to market value of equity in month $d-1$ for all stocks].
[b]Log of [(book value of debt in year $y-1$/market value of equity in month $d-1$)/median ratio of book value of debt in year $y-1$ to market value of equity in month $d-1$ for all stocks].
[c]Log of [market value of equity in month $d-1$/median market value of equity in month $d-1$ for all stocks].
[d]Log of [(sales per share in year $y-1$/stock price in month $d-1$)/median ratio of sales per share in year $y-1$ to stock price in month $d-1$ for all stocks].
Note: *P*-values for two-tailed *t*-tests are shown in parentheses below the mean coefficient estimates.

10% level in the univariate regression as well as in multiple regressions involving the other three variables separately and in combination.

Our findings for the Korean market are consistent with the international evidence that book-to-market ratio is a generally reliable predictor of stock returns. Not only is this variable significant well beyond the 1% level in the full model involving all stocks for the whole test period, but its coefficient is also by far the largest. For Korean stocks in general, LBMR is the only variable tested by us that has significant predictive power in the whole test period as well as both subperiods, indicating the robustness of this variable to changing samples and market conditions (up and down markets). For Section 1 stocks, LBMR has the greatest explanatory power,

followed by LDER. For Section 2 stocks, however, LMVE is the only variable with significant predictive power.

5. Conclusions

This paper investigates potential explanatory factors for monthly stock returns in Korea during 1982–1992. We find that during the test period, Korean investors generally earned higher returns on value stocks, represented by high book-to-market ratios. The relationships between stock returns and fundamental variables were, however, markedly different for stocks listed in Sections 1 and 2. While Section 1 stocks offered premiums for value and financial leverage, Section 2 stocks provided only a firm size premium.

Among the explanatory factors examined by us, book-to-market ratio generally has the greatest predictive power for stock returns. We leave it to future researchers to unravel the factors behind the differing results for stocks listed in different Sections. The overall results are, however, consistent with the findings of recent international studies that book-to-market ratio has significant explanatory power for stock returns. This result in a segmented, emerging market reinforces the similar findings from more integrated, developed markets.

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Notes

1. Caires and Fletter (1990) report that the Korea Stock Exchange was the tenth-largest stock market in the world at the end of 1989.
2. The Korean stock market was opened to foreign direct investment in January, 1992. However, foreign investors were required to register with the Securities Supervisory Board. In addition, there was a 3% ceiling on each foreign investor's ownership, and a 10% ceiling on aggregate foreign ownership, of each stock (Korea Stock Exchange, *Fact Book* (1992, page 3)). Since December 1995, the government has taken further measures to open the Korean market to foreign investors, in phases, by 1998.
3. The Korea Stock Exchange, *Fact Book* (1992, page 37) indicates that the fiscal year ends in December for about 77% of listed firms.
4. For reliability of the regression parameters, stocks that do not have at least 24 months of returns available in the 36-month estimation period are excluded.
5. Since Korea does not have any financial instrument similar to a U.S. treasury bill, we use the geometric average of the annual discount rate of the Bank of Korea as the monthly risk-free rate.

This is the closest proxy available for the risk-free rate in Korea. The Bank of Korea grants loans to commercial banks at the discount rate. Since Korean commercial banks are controlled by the government as a major shareholder, the discount rate is essentially risk-free.

6. Since regression coefficients are affected by growth in the level of the independent variables, each of these variables is standardized by its median value.
7. Following Fama and French (1992), we use the log form of each independent variable, thereby excluding negative values. Of the ratios used in this study, only book-to-market ratio may be negative. Our data indicate that this ratio was negative for less than 3% of the sample.
8. As indicated earlier, we consider accounting data for December to be available by next March and relate it to stock returns from next April through March of the following year. Year $y - 1$ therefore refers to the December before the 12-month period from April through March. In constructing the ratios, accounting data are updated only in March each year, but market data are revised every month.
9. Most of the listed stocks are in Section 1. Our data show that Section 1 contained 222 of the 285 stocks listed at the end of 1977 and 483 of the 688 stocks listed at the end of 1992.

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