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Fundamentals and Stock Returns in Japan

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ABSTRACT

This paper relates cross-sectional differences in returns on Japanese stocks to the underlying behavior of four variables: earnings yield, size, book to market ratio, and cash flow yield. Alternative statistical specifications and various estimation methods are applied to a comprehensive, high-quality data set that extends from 1971 to 1988. The sample includes both manufacturing and nonmanufacturing firms, companies from both sections of the Tokyo Stock Exchange, and also delisted securities. Our findings reveal a significant relationship between these variables and expected returns in the Japanese market. Of the four variables considered, the book to market ratio and cash flow yield have the most significant positive impact on expected returns.

THE JAPANESE AND THE U.S. equity markets are, by far, the two largest in the world. As of March 1990, the two markets together accounted for 67% of the world's stock market capitalization. In recent years, money managers in the U.S., as well as in other countries, have substantially increased their exposure to the Japanese market. However, in spite of the Japanese market's rapid growth and its increasing significance in the international financial arena, only recently have researchers turned their attention to the Tokyo market.

In contrast to the voluminous research in the U.S. relating the cross-sectional behavior of stock returns to such variables as firm size, earnings yield,

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cash flow yield, and book to market ratio, there has been only very limited research relating to the Japanese market. Moreover, the available evidence on Japanese returns suffers from methodological problems and a limited database. For instance, previous studies focused on a subset of stocks traded for a relatively short time period and used only a limited set of financial variables. To the best of our knowledge, information on delisted companies was not available in previous studies; hence, the studies also suffer from a survivorship bias. In contrast to earlier papers, we use a comprehensive, high-quality data set extending over a relatively long period of time.

The purpose of our study is to explore the cross-sectional predictability of equity returns in Japan, using the following variables: earnings yield, cash flow yield, size (market capitalization of equity), and book to market ratio (of equity).[1] Developing a theoretical analysis of this relationship is beyond the scope of this paper. Our choice of predictor variables, instead, is motivated by the existing evidence for the U.S. which, in turn, is influenced by the practice of fundamental security analysts. For the sake of brevity, we refer to these predictor variables collectively as "fundamental" variables.[2]

Studying a market as important as the Japanese stock market is of interest in its own right. In addition, our results, when placed alongside the evidence accumulated from studies of American data, may also be useful in evaluating empirical models of the determinants of stock returns. Wherever possible, therefore, we attempt to draw parallels between our findings and those from similar studies using American data. On the one hand, finding that the same factors are at work in the two countries would strengthen our confidence in the evidence accumulated for the U.S. On the other hand, finding that different factors are at work in the two countries would suggest further research exploring institutional or behavioral differences between the two countries. For example, Japanese regulations do not allow companies to use different reporting methods for tax purposes and for public financial statements. As a result, companies predominantly use accelerated depreciation methods for financial reporting. Firms with large capital investments thus tend to have substantially distorted earnings. Hence, we examine cash flow (earnings plus depreciation) yield in addition to earnings yield as an additional fundamental variable.

In the U.S., the cross-sectional relationship between stock returns and fundamental variables has been extensively studied. In general, a positive

[1] The portfolio formation procedure utilized in this and previous studies can accommodate only a small set of explanatory variables. While the dividend yield has drawn considerable attention in the U.S., dividend yields in Japan have been minuscule in recent years. An additional reason for not examining the effect of the dividend yield in this study is to allow comparisons with similar studies of U.S. data.

[2] Our use of the word "fundamental" should not be confused with its usage in the literature on the time-series predictability of returns (e.g., Summers (1986)). This literature examines whether the predictability in returns is due to irrational investor behavior ("fads") versus rational changes in true intrinsic values ("fundamentals").

relationship has been found between equity returns and earnings yield, cash flow yield and book to market ratio, and a negative relationship has been found between equity returns and size. Especially voluminous are the studies that document the size and the earnings yield effects and studies that try to disentangle the two effects (for example, Basu (1977, 1983), Banz (1981), Reinganum (1981), Cook and Rozeff (1984), Lakonishok and Shapiro (1986), Banz and Breen (1986), Jaffe, Keim, and Westerfield (1989), and Ritter and Chopra (1989)). The shortcomings of accounting earnings have motivated a number of recent papers to explore the relationship between cash flow yields and stock returns (Bernard and Stober (1989) and Wilson (1986)). Rosenberg, Reid, and Lanstein (1984) study the relationship between stock returns and the book to market ratio. The selection of such fundamental variables has been guided more by intuition and by their popularity among practitioners than by any explicit theoretical model. Ball (1978), and more recently, Fama (1991) and Fama and French (1988) suggest reasons why such variables might help to predict returns. In particular, yield surrogates such as the earnings yield and the dividend yield are correlated with returns because they proxy for underlying risks not otherwise accounted for by traditional risk measures such as betas.

Accordingly, as Fama (1991) points out, any correlation observed between fundamental variables and returns could be consistent with market inefficiencies, or with the fundamental variables proxying for omitted risk factors. The joint-hypothesis nature of the problem prevents an unambiguous resolution of whether the predictability of returns, either over time or cross-sectionally, is a result of market inefficiency or not. Nonetheless, documenting such predictability, for whatever reason, may still be useful. For example, it may lead to a better understanding of the behavior of security prices, and in making financial investment decisions. In addition, evidence from the Japanese market helps to shed further light on whether one fundamental variable (e.g., earnings yield) subsumes another (e.g., size), and on whether the results are robust to time period and sample composition.

Academic interest in the Japanese market is a relatively recent phenomenon. Hamao (1991) and Hamao and Ibbotson (1989) characterize the Japanese capital markets by presenting summary statistics. Tests of various asset pricing theories are carried out by Maru and Yonezawa (1984), Hawawini (1991), Elton and Gruber (1988), Hamao (1988), Brown and Otsuki (1990). Gultekin, Gultekin, and Penati (1989), Campbell and Hamao (1991), and Hamao, Masulis, and Ng (1990) investigate the extent of integration between the Japanese and other national markets.

In addition, the information content of the release of accounting reports is examined by Sakakibara, Yamaji, Sakurai, Shiroshita, and Fukuda (1988) and Darrough and Harris (1991). Elton and Gruber (1989) analyze the relationship between expectational data and actual stock performance. The difference between U.S. and Japanese P/E multiples is examined by Bildersee, Cheh, and Lee (1990) and French and Poterba (1990). Finally, daily and intraday patterns in index returns are studied by Jaffe and Westerfield

(1985) and Kato, Ziemba, and Schwartz (1990). Nakamura and Terada (1984) and Kato and Schallheim (1985) document size and seasonal anomalies, while Nakamura and Terada (1984) and Aggarwal, Rao, and Hiraki (1986) document P/E and size effects.

Our findings reveal a significant relationship between fundamental variables and expected returns in the Japanese market. Of the four variables considered, the book to market ratio and cash flow yield have a reliably positive impact on expected returns. The performance of the size variable, although in general consistent with previous findings, turns out to be highly dependent on the specific model and time period. While previous studies document a strong positive earnings yield effect, we find no such evidence after controlling for the other variables. These conclusions are based on a variety of alternative statistical specifications.

The remainder of the paper is structured as follows. In Section I, we describe our data. In Section II, we present the methodology for testing the relationship between stock returns and fundamental variables. Results from univariate analyses are in Section III. In Section IV, we present the results from regression models. Section V examines the robustness of the results. The paper concludes in Section VI with a summary of the findings.

I. Data Description

We use monthly data on stocks listed on the Tokyo Stock Exchange (TSE) from January 1971 to December 1988. The Tokyo Stock Exchange, which accounts for more than 85% of the total market capitalization of Japanese equity, consists of two sections. The distinction between the two sections is similar to that between the NYSE and AMEX. Typically, smaller firms are listed on the second section, and may move to the first section when they satisfy the standards set by the exchange.[3] The number of companies in the sample changes over time, reflecting new listings and delistings.

Monthly returns (including dividends) and market capitalization are from the database compiled by Hamao in collaboration with Daiwa Securities Co., Ltd., Tokyo. This database is comparable to the CRSP (Center for Research in Security Prices at the University of Chicago) monthly database and is described in Hamao and Ibbotson (1989). Two market indexes, an equally weighted and a value-weighted portfolio of all the stocks of the first and second sections of the TSE, are also derived from these data.[4] Since there is no Japanese equivalent to U.S. Treasury bills, we use a combined series of the call money rate (January 1971–November 1977) and the 30-day Gensaki

[3] The requirements include 20 million shares issued, average monthly trading volume of 200,000 shares, and continuous dividend payment of more than 5 yen per year over the last three years. See Tokyo Stock Exchange (1988) for details.

[4] While TOPIX (Tokyo Stock Price Index) is available from the Tokyo Stock Exchange, this value-weighted index is based on section one stocks and excludes dividends.

(repo) rate (December 1977–December 1988) as a risk-free interest rate. This interest rate series is taken from Hamao and Ibbotson (1989). The data on the remaining three fundamental variables, earnings yield, cash flow yield (earnings plus depreciation), and book to market ratio, are based on Nihon Keizai Shimbun Sha (1971 through 1988) as recorded by Daiwa Securities.[5]

All the studies mentioned earlier which explore the cross-sectional determinants of stock returns in Japan exclude second section stocks. Moreover, many of the studies are based on a subset of stocks from the first section. Aside from their limited database, previous studies of the Japanese market are subject to the following two problems. First, it is typical for commercial databases to disregard delisted companies. This problem is not unique to Japan. Therefore, studies using such databases suffer from survivorship bias which, as Banz and Breen (1986) find, might lead to distorted results. Second, it has been customary in Japan to limit the sample to manufacturing companies since accounting data on nonmanufacturing (especially financial) companies are difficult to obtain. However, the nonmanufacturing sector is very large in Japan; for example, in December 1988, the financial sector alone constituted 30% of total market capitalization.

In contrast, our data set includes delisted stocks and nonmanufacturing companies. There are 123 companies that were delisted from either section of the Tokyo Stock Exchange from 1971 to 1988. While this includes firms that merged for strategic reasons, the majority experienced financial difficulties. In order to warn investors, stocks that fail to satisfy the listing requirements are moved to the "warning post" by the Tokyo Stock Exchange for three months prior to delisting. Our data on these companies are up to the last month of being on the warning post. As of December 1988 the entire sample includes 1570 companies, 1130 of which are in the first section.

The majority of Japanese firms (68% as of the end of 1988) have March as the end of their fiscal year. Some firms publish semiannual statements; we do not use these because of their tentative nature. The data available to us are from the parent-only financial statements. Consolidated financial statements, which became mandatory only after 1978, are usually released after a substantial delay, one to two months after the release of the parent-only statements. Also, Darrough and Harris (1991) found, in a forecasting context, that the parent-only accounting information is most relevant and Ishizuka (1987) found that the parent-only statements have more influence on stock prices than consolidated statements.

While a firm's stock price changes every month, its accounting numbers are updated only once a year, in the month of announcement of the annual statements. All the fundamental variables change every month because of the fluctuation in stock prices.

[5] Nihon Keizai Shimbun Sha (1971 through 1988), the equivalent of Moody's Handbooks in the U.S., provides financial information on first and second section stocks listed on the Tokyo Stock Exchange.

II. Methodology

The analysis of the relationship between stock returns and fundamental variables is conducted at the portfolio level. As stated, most companies in Japan have a fiscal year that ends on March 31, and practically all companies publish their financial statements within three months after the end of the fiscal year. Accordingly, the portfolios we use are formed on the basis of the fundamental variables known to investors as of the end of June for firms with March 31 and non-March 31 fiscal year ends. This ensures that our tests are predictive in nature.

To form portfolios, a three-way grouping procedure is employed. Forming portfolios on the basis of all the four fundamental variables would yield too few stocks per portfolio. In the first step, firms are ranked by earnings yield as of the end of June in each year and placed into one of five groups. Group 0 contains stocks with negative earnings, and groups one to four each contain an equal number of firms with positive earnings, ranked by increasing value of earnings yields. Each earnings yield group is then divided into four subgroups by increasing size values. Each of these groups is in turn divided into five groups based on book to market ratio. Stocks with negative book value are placed in subgroup 0; the remaining firms are sorted into four groups in increasing order of book to market ratio. Each stock receives the same weight within its portfolio. In line with previous studies, we focus in the regression analysis on firms with positive earnings and book values at the grouping stage, thus a total of 64 portfolios ($4 \times 4 \times 4$). This portfolio formation procedure is updated in June of each subsequent year.

We employ the Seemingly Unrelated Regression (SUR) model to adjust simultaneously for portfolio risk and test for the significance of the fundamental variables. Our basic model is:

$$R_{Pt} - R_{ft} = \alpha_0 + \beta_{P1}(RW_t - R_{ft}) + \beta_{P2}(RE_t - R_{ft}) + \alpha_1(\mathrm{E/P})_{Pt} + \alpha_2(LS)_{Pt} + \alpha_3(\mathrm{B/M})_{Pt} + \alpha_4(\mathrm{C/P})_{Pt} + e_{Pt}, \quad (1)$$

where $P = 1, \cdots 64$; $t = 1, \cdots 210$. The dependent variable is the return on portfolio P in month t, R_{Pt}, less the risk-free rate in month t, R_{ft}. RW_t and RE_t are the returns on the value-weighted and equally weighted indexes in month t. The indexes contain all stocks from both the first and the second sections. The fundamental variables analyzed in each month t include $(\mathrm{E/P})_{Pt}$, the average earnings yield for portfolio P; $(\mathrm{LS})_{Pt}$, the average of the natural logarithm of market capitalization for firms in portfolio P; $(\mathrm{B/M})_{Pt}$, the average book to market value for portfolio P and $(\mathrm{C/P})_{Pt}$, the average cash flow yield for portfolio P.[6] All the fundamental variables are known at the beginning of month t.

Preliminary analysis showed that returns for typical companies track an equally weighted index substantially better than a value-weighted index. For

[6] Cash flow is defined to be the sum of earnings and depreciation; the data were provided by Daiwa Securities.

example, in regressions of portfolio returns on index returns, the R^2 averaged across the 64 portfolios is 74% for an equally weighted index and 27% for a value-weighted index. For larger companies, however, the R^2 is substantially higher if a value-weighted index is used. Therefore, in the spirit of Huberman and Kandel (1985), we use two factors, the equally and value-weighted indexes, to account for market-wide risk.

Equation (1) provides a compact summary of the relation between stock returns and fundamental variables. We also examine models based on subsets of the fundamental variables, and examine the sensitivity of the results to the procedures used for portfolio formation (order of grouping) and sample selection (by including or excluding second section stocks).

This SUR methodology has two main advantages: (1) betas are estimated simultaneously with the impact of the fundamental variables and (2) the procedure adjusts for the cross-sectional correlation in the residual returns across portfolios.[7] However, there is a strong possibility for bias in the way that the SUR methodology has been applied in prior research. The SUR approach can be viewed as conducting a time-series regression for each of the 64 portfolios, requiring that the coefficients of the fundamental variables be the same across all portfolios, and finally adjusting the estimates for the cross-correlation in the residual returns. However, the underlying economic hypothesis is that, at any point in time, cross-sectional differences in returns across stocks are determined by cross-sectional differences in their fundamental variables. The cross-sectional distribution of fundamental variables may vary over time, nonetheless. For example, suppose that relative size is an important fundamental variable. In this case, a company whose absolute size is the same in 1971 and 1988, but whose size relative to its peer firms has changed, would not be expected to have the same market-adjusted return. Indeed, the level of fundamental variables in Japan has changed substantially over time, due to the unprecedented appreciation in the value of Japanese stocks over the sample period. For example, large companies in 1971 would not be considered large in 1988; a P/E ratio of 15 would be considered very high in some years and low in others. An adjustment for the level of the fundamental variables in any particular year is therefore essential. We perform such an adjustment by dividing each fundamental variable every month by its corresponding cross-sectional average from the previous June, thus preserving cross-sectional differences when pooling data across time.

As an alternative to the SUR methodology, we also apply the Fama-MacBeth (1973) methodology. The SUR methodology assumes that the betas for the portfolios are constant over time, whereas the Fama-MacBeth procedure updates betas periodically. The Fama-Macbeth methodology, unlike the SUR model, also allows the coefficients of the explanatory variables to vary across months. These coefficients are then averaged across time. Such aggregation,

[7] See Brown, Kleidon, and Marsh (1983) and Jaffe, Keim, and Westerfield (1989) for discussions of the SUR methodology in similar contexts.

however, assumes that the coefficients are drawn from an underlying stationary distribution. Since the level of an independent variable affects the magnitude of its coefficient, dramatic growth over time in the levels of the explanatory variables may invalidate the assumption of a stationary distribution. In order to alleviate this potential nonstationarity, we again follow the procedure of dividing the fundamental variables in each month by its corresponding cross-sectional average from the previous June. In addition, estimating the monthly cross-sectional regressions by ordinary least squares is likely to be inefficient, since the residuals across portfolio groups are in general correlated. In order to obtain a more powerful test, we also carry out the Fama-MacBeth methodology using generalized least squares for each monthly cross-section.

In a related context, the findings of Chen and Kan (1989) further emphasize the importance of verifying the robustness of results to econometric procedures. Chen and Kan found that a variable (the bid-ask spread) that is an important predictor for portfolio returns using one approach becomes insignificant using another approach.

We also check whether the results are sensitive to the methods used to form portfolios and to sample selection. Our tests are replicated using portfolios formed by different orderings of the four fundamental variables. In addition to the "within-group" procedure discussed above, we also form portfolios by ranking securities independently, by each of the fundamental variables. Firms are then classified into portfolios according to which E/P, size, and B/M quartile they jointly belong. We estimate our models for all the firms in the sample, separately for the first and second section firms, and for two subperiods.

In an important recent paper, Lo and MacKinlay (1990) point out difficulties with statistical tests based on data grouped by some empirically motivated fundamental attributes (such as size). In particular, the portfolio-grouping approach may bias test statistics and spuriously exaggerate the relationship between portfolio excess returns and the fundamental attributes. The analysis of Lo and MacKinlay (1990), however, also suggests that the bias is less severe if data on individual securities are used, without grouping into portfolios. In order to guard against the possibility that our conclusions are distorted by biased test statistics, we apply the Fama-MacBeth procedure to data on individual securities.

Prior research, especially a recent paper by Jaffe, Keim, and Westerfield (1989), indicates that the relationship between equity returns and fundamental variables is different in the U.S. for January versus non-January months. This issue will be addressed by introducing a dummy variable for January and non-January months into equation (1).

III. Univariate Analysis of Returns and Fundamental Variables

In Table I, we present average monthly returns and other characteristics for portfolios formed by the four fundamental variables (see also Figure 1). In

each panel the stocks are grouped by a different fundamental variable; the grouping procedure is repeated every year based on end of June values. For each of the variables, four portfolios of equal size are formed for positive values and a special group for negative values.

From Table I, high E/P stocks outperform low E/P stocks with a difference of 0.40% per month between the top and the bottom quartiles. Small stocks achieve substantially higher returns than large stocks, registering a difference of 0.97% per month between the two extreme groups. Firms with large, positive book to market ratios earn a premium of 1.10% over firms with low, positive book to market ratios. Last, the difference in returns between the two extreme groups for the cash flow yield variable is 0.79%, which is larger than the spread in returns on the basis of earnings yield. These results are consistent with U.S. findings (e.g., Jaffe, Keim, and Westerfield (1989)) and with practitioners' views about the relationship between stock returns and each of the four fundamental variables.

A relatively high return is achieved by stocks with negative fundamental values—stocks that most likely performed poorly in the period preceding the portfolio formation period. Stocks with negative E/P, B/M, and C/P experience an average monthly return that exceeds 2.5% relative to approximately 1.8% for the other groups. The somewhat higher betas for losers cannot explain this difference in returns. A similar result was obtained by Jaffe, Keim, and Westerfield (1989), who concluded that, "Surprisingly, stocks with negative earnings outperform many of the positive earnings portfolios in the other five columns."

The results in Table I also reveal that the various fundamental variables are correlated. For example, stocks with high book to market ratios tend to have relatively high cash flow yield ratios. Hence, a multivariate analysis is required to disentangle the impact of the various fundamental variables on stock returns.

IV. Regression Results

A. Seemingly Unrelated Regressions (SUR) with Unadjusted Fundamental Variables

All the SUR regressions in Table II use the same 64 portfolios where first we group by earnings yield, then by size, and last by book to market ratio. The first four models include one of the four independent variables at a time. Models 5 to 7 include various combinations of the fundamental variables and Model 8 includes all our fundamental variables. The sample comprises stocks from both sections and the fundamental variables, as in previous studies utilizing this approach, are not adjusted for the change in levels over time.

The results are striking. They differ from the findings obtained from U.S. data and from previous results on the Japanese market.[8] Moreover, the

[8] Note that previous studies of the Japanese market typically use a cross-sectional regression approach, rather than the SUR methodology.

results conflict with the univariate tests presented in Table I. The earnings yield effect is not significant across the different models; it is not even significant if E/P is the only independent variable. If all the fundamental variables are included, the coefficient on E/P has a negative sign, implying that stocks with low earnings yields outperform stocks with high earnings yields.

Table I

Summary Statistics for Portfolios Sorted by Fundamental Variables

Average monthly returns (standard deviations in parentheses), earnings to price (E/P) ratios, size (millions of yen), book to market (B/M) ratios, and cash flow to price (C/P) ratios, for portfolios sorted each June by the four fundamental variables over the period 1971-1988 for both first and second section stocks. Also reported is the estimated beta coefficient from an ordinary least squares regression of portfolio returns on an equally weighted market portfolio of all first and second section stocks. *N* denotes the average number of securities in each portfolio.

Panel A: Sorted by Earnings to Price Ratio					
	≤ 0	1 (low)	2	3	4 (high)
Return	0.0277	0.0154	0.0174	0.0176	0.0194
	(0.0665)	(0.0427)	(0.0414)	(0.0413)	(0.0425)
E/P	−0.2461	0.0214	0.0376	0.0530	0.0955
Size	27,668.5	84,470.4	107,703.0	86,685.0	64,496.4
B/M	0.2032	0.4124	0.4665	0.5463	0.6341
C/P	−0.1145	0.0938	0.1062	0.1199	0.1799
Beta	1.1905	0.9678	0.9529	0.9389	0.9423
N	105.2	275.1	279.4	279.0	276.2
Panel B: Sorted by Size					
		1 (low)	2	3	4 (high)
Return		0.0244	0.0189	0.0161	0.0147
		(0.0542)	(0.0457)	(0.0421)	(0.0408)
E/P		−0.0083	0.0305	0.0361	0.0402
Size		4,587.8	13,699.0	36,831.4	262,112.0
B/M		0.5013	0.5086	0.4870	0.4518
C/P		0.0977	0.1080	0.0997	0.1076
Beta		1.0967	1.0297	0.9638	0.8146
N		308.3	310.8	312.2	315.0
Panel C: Sorted by Book to Market Ratio					
	≤ 0	1 (low)	2	3	4 (high)
Return	0.0255	0.0133	0.0166	0.0194	0.0243
	(0.0887)	(0.0431)	(0.0426)	(0.0427)	(0.0464)
E/P	−0.5151	0.0211	0.0370	0.0404	0.0441
Size	10,912.5	126,548.0	79,794.5	65,921.5	49,642.1
B/M	−1.0706	0.2659	0.4292	0.5612	0.8031
C/P	−0.3439	0.0746	0.1035	0.1240	0.1486
Beta	1.1322	0.9399	0.9822	0.9812	0.9840
N	16.3	305.6	307.1	307.0	306.9

Table I—*Continued*

Panel D: Sorted by Cash Yield

	≤ 0	1 (low)	2	3	4 (high)
Return	0.0262	0.0143	0.0168	0.0190	0.0222
	(0.0705)	(0.0412)	(0.0408)	(0.0430)	(0.0464)
E/P	−0.4265	0.0246	0.0423	0.0510	0.0684
Size	17,149.6	121,298.0	75,508.4	62,510.9	72,388.9
B/M	−0.0208	0.3783	0.4920	0.5650	0.6170
C/P	−0.3303	0.0523	0.0860	0.1242	0.2340
Beta	1.1942	0.9247	0.9313	0.9820	1.0135
N	50.1	293.5	295.8	294.4	294.0

Size, in general, is significant but with an unexpected sign in all the models—large companies in Japan tend to outperform small companies. This finding is inconsistent with the uninvariate results in Table I. This discrepancy in results may be due to the fact that the distribution of the fundamental variables changes over time, and pooling the observations on the unadjusted variables fails to account for such changes.

While the C/P and B/M variables are widely used by the financial community as important indicators of value, they have received relatively less attention in the academic literature. We find that the cash flow yield variable and the book to market variable have the expected positive signs. The coefficient on the C/P variable is marginally significant, whereas that on the B/M variable is at least two standard deviations away from zero in all the models.[9]

B. SUR with Adjusted Fundamental Variables.

The dramatic surge in Japanese stock prices has caused a sharp decrease over time in E/P, C/P, and B/M and a sharp increase in size.[10] Therefore, the traditional approach of applying the SUR model without adjusting for time-series variation in the level of fundamental variables is questionable and may account for the unexpected results in Table II. To correct for the model misspecification in Table II, each fundamental variable is deflated each month by its cross-sectional mean value as of the preceding June. The results with the adjusted fundamental variables for all stocks are presented in Table III. These results are in sharp contrast to the results in Table II; the findings are now compatible with the univariate tests presented in Table I, and with previous evidence as well. Specifically, E/P, B/M, and C/P each

[9] The analysis of Table II was replicated using only stocks from the first section. The results are, in general, similar.

[10] For example, in 1973 the mean size is 28.39 billion yen and, by 1988, 300.95 billion yen; the top quartile's boundary is 24.00 billion yen in 1973, which is below the median by 1985, and in the bottom quartile by 1988. With respect to E/P, the 25th percentile in 1973 is 3.96% which is in the top quartile by 1988. Similar changes over time occur with C/P and B/M.

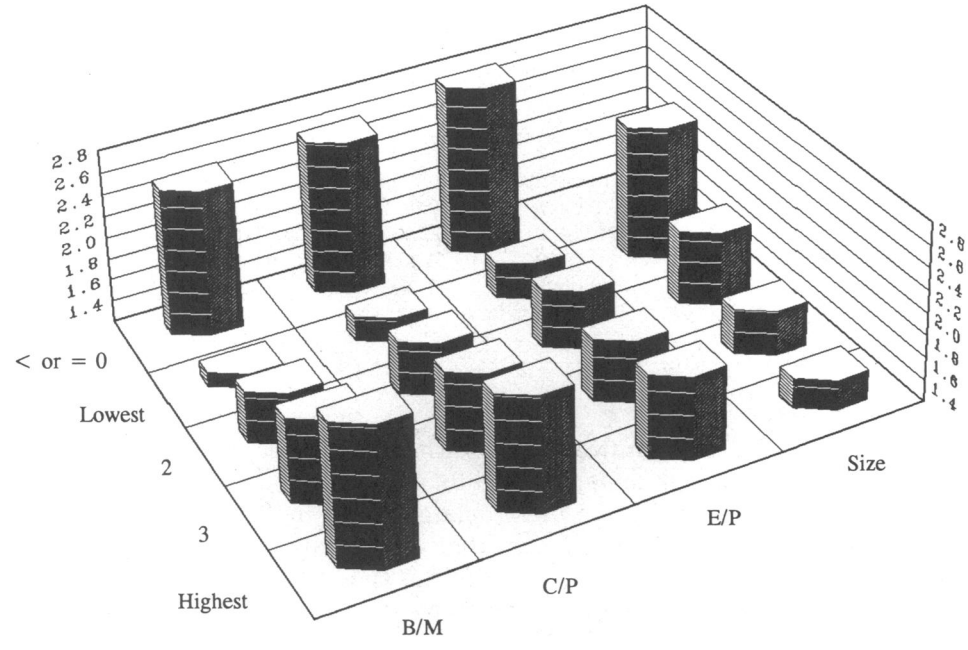

Figure 1. Average monthly returns for portfolios sorted by each of four fundamental variables. The fundamental variables are B/M, the book to market ratio, C/P, the cash flow yield, E/P, the earnings yield, and size. Stocks with negative values of a fundamental variable are placed in a special group; the remaining stocks are then sorted into four equally sized portfolios. This figure shows the average monthly return (in percent) from July 1971 to December 1988 for each portfolio.

individually has a reliably positive influence on subsequent realized returns, while a reliably negative relationship exists between size and future returns. Model 5 attempts to unravel the separate influences of size and earnings yield on returns.[11] While the *t*-statistics suggest that the coefficients are not estimated with a high degree of precision, neither variable dominates the other. Adding the book to market ratio as the third independent variable in Model 6, however, robs both size and earnings yield of any predictive power. It would thus appear that both the size and earnings yield effects are subsumed in our sample by the influence of the book to market ratio. Such a

[11] The correlations between the regressors in the SUR model using adjusted fundamental variables are:

	E/P	LS	B/M	C/P
E/P	1.00			
LS	−0.09	1.00		
B/M	0.25	−0.16	1.00	
C/P	0.76	−0.19	0.58	1.00

With the exception of the correlation between E/P and C/P, the other correlations are quite small.

Table II

Estimated Relationship Between Returns and Unadjusted Fundamental Variables

Results are based on a SUR model using both first and second section stocks. The basic model is,

$$R_{Pt} - R_{ft} = \alpha_0 + \beta_{P1}(RW_t - R_{ft}) + \beta_{P2}(RE_t - R_{ft}) + \alpha_1(\mathrm{E/P})_{Pt} + \alpha_2(\mathrm{LS})_{Pt} + \alpha_3(\mathrm{B/M})_{Pt} + \alpha_4(\mathrm{C/P})_{Pt} + e_{Pt}$$

where $P = 1, \ldots 64$; $t = 1, \ldots 210$; $R_{Pt} - R_{ft}$ is the excess return on portfolio P, $RW_t - R_{ft}$, and $RE_t - R_{ft}$ are the excess returns on the value-weighted and equally weighted indexes, respectively; E/P and C/P are the earnings and cash flow yields, respectively; LS is the natural logarithm of market capitalization; and B/M is the book to market ratio. Results for various subsets of independent variables are presented as well. The numbers in parentheses are t-values. The order of the grouping is earnings yield, size and book to market ratio. The sample period is July 1971 to December 1988.

Model	Intercept	E/P	LS	B/M	C/P
(1)	−0.0028	−0.0001			
	(−8.64)	(−0.01)			
(2)	−0.0074		0.0005		
	(−3.69)		(2.28)		
(3)	−0.0043			0.0028	
	(−5.79)			(2.00)	
(4)	−0.0035				0.0058
	(−7.60)				(1.59)
(5)	−0.0079	0.0040	0.0005		
	(−3.65)	(0.62)	(2.37)		
(6)	−0.0152	−0.0054	0.0009	0.0064	
	(−5.05)	(−0.81)	(3.83)	(3.80)	
(7)	−0.0156		0.0010	0.0055	0.0025
	(−5.14)		(3.91)	(2.90)	(0.51)
(8)	−0.0161	−0.0202	0.0010	0.0046	0.0139
	(−5.31)	(−1.85)	(4.13)	(2.25)	(1.74)

model has not been previously tested in the literature, and these results indicate the sensitivity of inferences to model specification.

In Model 7, earnings yield is replaced by the cash flow measure. For Japanese firms, the cash flow variable may be more informative than earnings yields, since reported earnings are likely to be distorted by the substantial divergence between economic and reported depreciation. This is consistent with the "quality of earnings" explanation discussed by Bernard and Stober (1989), according to which earnings per share is more easily manipulable.[12] In both Models 7 and 8, where cash flow and earnings yield are

[12] Another reason for the differential impact of E/P and C/P on returns is suggested in the accounting literature (Bernard and Stober (1989) and Wilson (1986)). In particular, the information content of E/P versus C/P may depend on the stage of the business cycle. However, the empirical evidence is not very supportive of this hypothesis.

Table III

Estimated Relationship Between Returns and Adjusted Fundamental Variables

Results are based on a SUR model using both first and second section stocks. The basic model is,

$$R_{Pt} - R_{ft} = \alpha_0 + \beta_{P1}(RW_t - R_{ft}) + \beta_{P2}(RE_t - R_{ft}) + \alpha_1(\text{E/P})_{Pt} + \alpha_2(\text{LS})_{Pt} + \alpha_3(\text{B/M})_{Pt} + \alpha_4(\text{C/P})_{Pt} + e_{Pt}$$

where $P = 1, \ldots 64$; $t = 1, \ldots 210$; $R_{Pt} - R_{ft}$ is the excess return on portfolio P, $RW_t - R_{ft}$, and $RE_t - R_{ft}$ are the excess returns on the value-weighted and equally weighted indexes, respectively; E/P and C/P are the earnings and cash flow yields, respectively; LS is the natural logarithm of market capitalization; and B/M is the book to market ratio. Results for various subsets of independent variables are presented as well. The numbers in parentheses are t-values. The order of the grouping is earnings yield, size and book to market ratio. Each of the fundamental variables is deflated by its cross-sectional average from the previous June. The sample period is July 1971 to December 1988.

Model	Intercept	E/P	LS	B/M	C/P
(1)	−0.0034	0.0007			
	(−9.75)	(1.95)			
(2)	−0.0011		−0.0005		
	(−1.23)		(−1.91)		
(3)	−0.0070			0.0043	
	(−6.77)			(4.05)	
(4)	−0.0054				0.0028
	(−8.79)				(4.23)
(5)	−0.0018	0.0007	−0.0005		
	(−1.80)	(1.88)	(−1.85)		
(6)	−0.0060	0.0003	−0.0003	0.0042	
	(−4.22)	(0.91)	(−1.30)	(4.02)	
(7)	−0.0065		−0.0003	0.0036	0.0014
	(−4.49)		(−1.22)	(3.31)	(2.06)
(8)	−0.0066	−0.0005	−0.0003	0.0034	0.0022
	(−4.55)	(−0.92)	(−1.15)	(3.03)	(2.07)

simultaneously included, the cash flow variable has a positive coefficient and a t-statistic slightly above two. These results suggest that C/P may be more important in predicting returns than E/P, although it is important to note that the two variables are quite highly correlated (0.76, from footnote 11).

The book to market ratio consistently has the largest coefficient[13] and the highest t-statistic in every model in Table III. Since the book to market ratio is likely to be less noisy than earnings and cash flow yields, its influence can be detected more reliably. In the full model (Model 8), only the coefficients on B/M and C/P are statistically different from zero. If anything, the results for

[13] The variables are deflated by their mean value and hence the size of the coefficients is indicative of their impact on returns.

these two variables may be understated; in forming portfolios, we group by B/M last and do not group by C/P, thereby dampening the dispersion across portfolios in the values of these variables.

The magnitude of the coefficients suggests that the variables are not only statistically but economically significant as well. For example, in 1988, for the book to market variable, the difference between the boundaries of the upper and lower 10 percentiles is 1.28 (after dividing by the mean). According to Model 8 (Table III), the coefficient of the book to market ratio is 0.0034, which implies a difference in monthly returns of .44%.[14]

The unprecedented appreciation of the Japanese market in recent years has motivated arguments on the applicability of traditional fundamental variables in explaining cross-sectional differences in stock returns. To address this issue, the results from Table III were replicated for the second half of the period, 1980–1988. The results (not presented) in general carry over. As before, the book to market ratio is the most significant variable across the different specifications.

Many previous studies found unusual price behavior in the month of January (Haugen and Lakonishok (1989)). Therefore, in studying the impact of fundamental variables on stock returns, it is of interest to investigate January separately from other months. For example, Jaffe, Keim, and Westerfield (1989) find that the coefficient for size is significant only in January, while that for E/P is significant in both January and the rest of the year. To address this issue for the Japanese market, we expand the SUR model described in Equation (1), by introducing dummy variables for January and non-January months. Our basic model is:

$$\begin{aligned} R_{Pt} - R_{ft} = {} & \alpha_{0j} D_{jt} + \alpha_{0r}(1 - D_{jt}) + \beta_{P1j}(RW_t - R_{ft}) D_{jt} \\ & + \beta_{P1r}(RW_t - R_{ft})(1 - D_{jt}) + \beta_{P2j}(RE_t - R_{ft}) D_{jt} \\ & + \beta_{P2r}(RE_t - R_{ft})(1 - D_{jt}) + \alpha_{1j}(\mathrm{E/P})_{Pt} D_{jt} \\ & + \alpha_{1r}(\mathrm{E/P})_{Pt}(1 - D_{jt}) + \alpha_{2j}(\mathrm{LS})_{Pt} D_{jt} + \alpha_{2r}(\mathrm{LS})_{Pt}(1 - D_{jt}) \\ & + \alpha_{3j}(\mathrm{B/M})_{Pt} D_{jt} + \alpha_{3r}(\mathrm{B/M})_{Pt}(1 - D_{jt}) + \alpha_{4j}(\mathrm{C/P})_{Pt} D_{jt} \\ & + \alpha_{4r}(\mathrm{C/P})_{Pt}(1 - D_{jt}) + e_{Pt}, \end{aligned} \tag{2}$$

where $P = 1, \cdots 64$, $t = 1, \cdots 210$, and D_{jt} is a dummy variable that takes the value of one in the month of January and zero otherwise. The other variables are defined as in Equation (1).

In Table IV results are presented for the comprehensive model (Equation (2)) as well as models based on partial sets of fundamental variables. In the specification using the same fundamental variables as Jaffe, Keim, and Westerfield (1989), Model 5, the coefficient for E/P in January is higher than

[14] To examine whether the results are sensitive to the composition of the sample, we re-estimated the models from Table III, using only stocks from the first section. The results are, in general, similar to those in Table III.

Table IV

Estimated Relationship Between Returns and Fundamental Variables for January and non-January Months

Results are based on a SUR model using both first and second section stocks. The basic model is described in Equation (2) in the text. The model relates portfolio excess returns to the excess returns on the value and equally weighted indexes, E/P and C/P, the earnings and cash flow yields; LS, the natural logarithm of market capitalization; and B/M, the book to market ratio. Results for subsets of independent variables are presented as well. The numbers in parentheses are *t*-values. The order of the grouping is earnings yield, size, and book to market ratio. Each of the fundamental variables is deflated by its cross-sectional average from the previous June. The sample period is July 1971 to December 1988.

Model		Intercept	E/P	LS	B/M	C/P
(1)	January	−0.0052	0.0039			
		(−3.57)	(2.55)			
	February–December	−0.0032	0.0004			
		(−8.98)	(1.03)			
(2)	January	−0.0058		0.0012		
		(−1.79)		(1.33)		
	February–December	−0.0009		−0.0006		
		(−0.94)		(−2.19)		
(3)	January	−0.0161			0.0140	
		(−4.18)			(3.76)	
	February–December	−0.0061			0.0032	
		(−5.70)			(2.98)	
(4)	January	−0.0114				0.0099
		(−5.02)				(4.32)
	February–December	−0.0048				0.0020
		(−7.53)				(2.97)
(5)	January	−0.0090	0.0038	0.0011		
		(−2.63)	(2.52)	(1.27)		
	February–December	−0.0012	0.0004	−0.0005		
		(−1.22)	(0.93)	(−2.14)		
(6)	January	−0.0209	0.0021	0.0013	0.0128	
		(−4.26)	(1.34)	(1.40)	(3.33)	
	February–December	−0.0046	0.0001	−0.0004	0.0033	
		(−3.09)	(0.14)	(−1.66)	(3.01)	
(7)	January	−0.0229		0.0013	0.0101	0.0066
		(−4.62)		(1.46)	(2.53)	(2.74)
	February–December	−0.0048		−0.0004	0.0029	0.0008
		(−3.24)		(−1.66)	(2.58)	(1.07)
(8)	January	−0.0234	−0.0020	0.0014	0.0096	0.0091
		(−4.69)	(0.89)	(1.55)	(2.40)	(2.55)
	February–December	−0.0050	−0.0006	−0.0004	0.0027	0.0016
		(−3.29)	(−1.00)	(−1.60)	(2.29)	(1.47)

in other months of the year, and is statistically significant. However, in the full Model 8, E/P has a coefficient which is negative and lower in January than in the other months of the year. The results for E/P for non-January months are similar to the results across all the months presented in Table III.

Jaffe, Keim, and Westerfield (1989) found that the size coefficient is significant only in January. In Japan, the size coefficient is in general not significant for both January and non-January months, and even has an unexpected sign in January.[15] With respect to the remaining two variables, B/M and C/P, their coefficients in January are substantially larger than their coefficients in the other months of the year and are significant both in January and other months of the year.

The analysis that compares January to the remainder of the year should be interpreted with care, since there are only 17 Januaries in the sample period. Studies in the U.S., such as Jaffe, Keim, and Westerfield (1989), utilized much longer time periods. Moreover, the finding that the coefficient for size in January is not smaller than in other months of the year should not be taken to mean that there is no small firm premium in January. Specifically, during our sample period, the difference in mean returns between the equally and value-weighted indexes is about 2% in January versus 0.5% in the remaining months.

V. Sensitivity Analysis

In this section the sensitivity of the results presented above will be examined with respect to: (1) various model specifications, (2) grouping procedures, and (3) sample composition. The results presented are based on the SUR and Fama-MacBeth methodologies.

A. Sensitivity Analysis for the SUR Model

In order to reduce the burden on the reader, Table V presents results for only three of the models estimated: Models 5, 6, and 8. The first panel of the table investigates the sensitivity of the results to the order of the fundamental variables used to assign stocks to portfolios. In particular, stocks are aggregated into portfolios first on the basis of the book to market ratio, then by cash flow yield, and finally by size. Panel A of Table V yields results that are qualitatively similar to the findings of the previous section. B/M and C/P continue to exert a reliably positive effect on returns in the subsequent period. While size and returns are still negatively related, the *t*-statistics for the size variable are sensitive to the specification of the model. The earnings yield variable has a negative coefficient that, in contrast to the earlier results, is now highly significant. In addition, portfolios were also formed using a variety of alternative orderings of the variables by which securities are ranked; the basic findings of the previous section are essentially unaltered.

[15] When our results from Table IV are replicated for only surviving firms (as in previous studies of the Japanese market), the coefficient of the size variable is statistically significant in the non-January months for all the different specifications. Another difficulty in comparing our results to Jaffe, Keim, and Westerfield (1989) is that they utilize a single market factor (either the equally or value-weighted index), whereas in our study we include both indexes.

Further evidence on the sensitivity of the results to the method of forming portfolios is presented in Panel B of Table V. In this panel, the results are based on an independent, three-way grouping of securities into portfolios, according to E/P, size, and B/M. In contrast to the portfolio-grouping methods employed in the previous tables, this independent grouping method does not favor one explanatory variable over another; however, portfolios formed under this method will differ in the number of securities that they contain.[16] Although Panel B employs a different ranking procedure, the results do little to alter our earlier conclusions.

Panel C of Table V investigates whether the results are sensitive to the generalized least squares correction employed in the SUR procedure to correct for the contemporaneous correlation of the residuals. In the first pass of the SUR procedure, the model is estimated under ordinary least squares, without adjusting for the residual correlations; it is these estimates from the first pass that are reported in Panel C of Table V. While the evidence in Panel C of Table V reveals that the general results are robust, there are substantial changes in the magnitudes of individual coefficients and their associated t-values. For example, under Model 8, the coefficient of B/M and its t-statistic are 0.0057 and 6.02, respectively, in Panel C of Table V; the corresponding values from Table III are 0.0034 and 3.03. These differences are consistent with nonnegligible correlations across portfolio residuals, illustrating the potential advantage of employing the SUR methodology.

The results in Panel D of Table V exclude nonsurviving firms from the sample (a total of 123 companies). Most studies of foreign stock markets suffer from such survivorship bias. To the best of our knowledge, all prior studies of cross-sectional predictability in the Japanese market lack information on delisted companies. In accordance with the results of Banz and Breen (1986) using U.S. data, the survivorship bias appears to affect the outcome of the statistical tests. Model 5, which includes both size and earnings yield, is a specification that has appeared in many studies. Applying this model to surviving firms leads to the conclusion that both E/P and size have the expected signs and are highly significant. When delisted firms are included (as in Table III), however, E/P and size retain their expected signs, but their t-statistics fall below two. In the sample containing only surviving firms, the influence of size tends to be statistically stronger; its t-statistic in Model 8 is -1.94, relative to -1.15 when delisted firms are included.

B. Fama and MacBeth Procedure

As a final check on the robustness of the results, this section presents alternative estimates of Models 5, 6, and 8 using the methodology of Fama and MacBeth (1973). In Table VI, the first four panels are based on portfolios

[16] This portfolio formation method may yield portfolios that contain either no, or only a few, securities in any given month. In our sample, four portfolios contained no securities in some month of the period, while eight other portfolios contained less than three securities at some point in time. The results in Panel B exclude these twelve portfolios. (Existing computer programs for SUR models require a complete time series of observations on the variables.)

Table V

Sensitivity Analysis for the SUR Model

Estimated relationship between returns and fundamental variables for both first and second section stocks using a SUR model. The basic model is,

$$R_{Pt} - R_{ft} = \alpha_0 + \beta_{P1}(RW_t - R_{ft}) + \beta_{P2}(RE_t - R_{ft}) + \alpha_1(E/P)_{Pt} + \alpha_2(LS)_{Pt} + \alpha_3(B/M)_{Pt} + \alpha_4(C/P)_{Pt} + e_{Pt},$$

where $P = 1, \ldots 64$; $t = 1, \ldots 210$; $R_{Pt} - R_{ft}$ is the excess return on portfolio P, $RW_t - R_{ft}$, and $RE_t - R_{ft}$ are the excess returns on the value-weighted and equally weighted indexes, respectively; E/P and C/P are the earnings and cash flow yields, respectively; LS is the natural logarithm of market capitalization; and B/M is the book to market ratio. Results for various subsets of independent variables are presented as well. The numbers in parentheses are t-values. Each of the fundamental variables is deflated by its cross sectional average from the previous June. The sample period is July 1971 to December 1988. In Panel A the order of the grouping is B/M, C/P, and size. The results in Panel B are based on ranking securities into portfolios by E/P, size, and B/M independently. Panels C and D employ the "within-group" portfolio formation procedure where the order of grouping is E/P, size, and B/M. Panel C reports the results for the first pass regression under SUR, without adjustment for the cross-correlation of residuals. In Panel D delisted companies are excluded from the sample.

Model	Intercept	E/P	LS	B/M	C/P
Panel A: Portfolios Formed Using Alternative Grouping Order					
(5)	0.0006	−0.0011	−0.0006		
	(0.56)	(−2.68)	(−2.31)		
(6)	−0.0054	−0.0017	−0.0005	0.0062	
	(−3.53)	(−3.97)	(−1.83)	(5.19)	
(8)	−0.0063	−0.0030	−0.0004	0.0054	0.0026
	(−4.03)	(−5.46)	(−1.47)	(4.51)	(3.54)
Panel B: Portfolios Formed Using Independent Grouping Method					
(5)	−0.0020	−0.0004	−0.0001		
	(−1.65)	(−0.84)	(−0.22)		
(6)	−0.0079	−0.0009	−0.0001	0.0065	
	(−4.62)	(−1.87)	(−0.21)	(5.00)	
(8)	−0.0089	−0.0025	−0.0000	0.0052	0.0038
	(−5.15)	(−3.41)	(−0.04)	(3.72)	(2.94)
Panel C: Without Adjustment for Residual Cross-correlation					
(5)	−0.0006	0.0006	−0.0007		
	(−0.52)	(1.37)	(−2.37)		
(6)	−0.0079	−0.0004	−0.0003	0.0069	
	(−5.43)	(−0.82)	(−1.13)	(8.84)	
(8)	−0.0089	−0.0015	−0.0002	0.0057	0.0031
	(−5.87)	(−2.25)	(−0.83)	(6.02)	(2.28)
Panel D: Delisted Companies Excluded					
(5)	−0.0012	0.0014	−0.0008		
	(−1.00)	(2.74)	(−2.62)		
(6)	−0.0059	0.0005	−0.0006	0.0053	
	(−3.77)	(0.89)	(−2.09)	(4.48)	
(8)	−0.0068	−0.0007	−0.0006	0.0044	0.0028
	(−4.21)	(−1.01)	(−1.94)	(3.58)	(2.57)

Table VI

Estimated Relationship Between Returns and Fundamental Variables for Both First and Second Section Stocks Using the Fama-MacBeth Approach

The basic model for month t is,

$$R_{Pt} - R_{ft} = a_{0t} + b_{1t}\beta_{P1} + b_{2t}\beta_{P2} + a_{1t}(\mathrm{E/P})_{Pt} + a_{2t}(\mathrm{LS})_{Pt} + a_{3t}(\mathrm{B/M})_{Pt} + a_{4t}(\mathrm{C/P})_{Pt} + e_{Pt}$$

where, $R_{Pt} - R_{ft}$ is the excess return on portfolio (security) P, β_{P1} and β_{P2} are betas for a two-factor model with the factors being excess returns on value and equally weighted indexes, respectively; E/P and C/P are the earnings yield and cash flow yields, respectively; LS is the natural logarithm of market capitalization, and B/M is the book to market ratio. The numbers in parentheses are t-values. The order of the grouping is earnings yield, size, and book to market ratio. Results for various subsets of independent variables are presented as well. The sample period is July 1971 to December 1988. The results in Panel A are for a simple average of the cross-sectional coefficients; in Panel B the weight of each monthly coefficient is inversely proportional to the variance of the estimate; in Panel C the monthly coefficients are estimated using GLS; in Panel D the fundamental variables are divided by cross-sectional averages; and in Panel E the results are at the level of individual securities.

Model	Intercept	E/P	LS	B/M	C/P
		Panel A: Simple Average of Cross-sectional Coefficients			
(5)	0.0353	0.0088	−0.0025		
	(3.35)	(0.50)	(−2.67)		
(6)	0.0205	−0.0266	−0.0014	0.0198	
	(1.74)	(−1.46)	(−1.45)	(4.56)	
(8)	0.0221	−0.0740	−0.0016	0.0132	0.0522
	(1.87)	(−2.67)	(−1.60)	(3.37)	(2.86)
		Panel B: Weighted Average of Cross-sectional Coefficients			
(5)	0.0226	0.0068	−0.0016		
	(5.63)	(0.98)	(−4.78)		
(6)	0.0119	−0.0056	−0.0011	0.0147	
	(2.55)	(−0.78)	(−3.20)	(9.83)	
(8)	0.0118	−0.0404	−0.0011	0.0099	0.0342
	(2.49)	(−3.45)	(−3.14)	(5.66)	(3.45)
		Panel C: Estimates using GLS			
(5)	0.0136	0.0226	−0.0005		
	(0.64)	(1.44)	(−1.98)		
(6)	0.0182	−0.0112	−0.0002	0.0212	
	(0.87)	(−0.69)	(−0.55)	(5.12)	
(8)	0.0158	−0.0350	−0.0001	0.0180	0.0239
	(0.72)	(−1.56)	(−0.48)	(4.34)	(1.97)
		Panel D: Results with Adjusted Fundamental Variables			
(5)	0.0353	−0.0000	−0.0081		
	(3.35)	(−0.01)	(−2.80)		
(6)	0.0205	−0.0015	−0.0055	0.0103	
	(1.74)	(−1.89)	(−1.80)	(4.44)	
(8)	0.0221	−0.0040	−0.0059	0.0063	0.0071
	(1.87)	(−2.87)	(−1.92)	(3.18)	(2.81)

Table VI—*Continued*

Model	Intercept	E/P	LS	B/M	C/P
			Panel E: Results for Individual Securities		
(5)	0.0370	0.0201	−0.0026		
	(4.19)	(2.04)	(−3.27)		
(6)	0.0172	−0.0071	−0.0015	0.0224	
	(1.83)	(−0.80)	(−1.93)	(6.56)	
(8)	0.0173	−0.0299	−0.0016	0.0195	0.0240
	(1.84)	(−2.31)	(−1.99)	(6.09)	(3.10)

formed from securities ranked first by earnings yield, then by size, and finally by book to market ratio. The results in the last panel are for individual securities. In June of each year, the beta coefficients for each security (with respect to both the equally and value-weighted market indexes) are estimated from the most recent thirty-six months of data. Cross-sectional regressions relating returns to betas and fundamental variables from the prior period are then conducted in each of the next twelve months.[17]

As suggested by Litzenberger and Ramaswamy (1979), two possible ways of averaging the time series of coefficients from the monthly cross-sectional regressions are presented: a simple average (Panel A of Table VI) and a weighted average, where the weights are inversely proportional to the variance of each monthly estimate (Panel B). In line with the results from the SUR model, portfolio returns are reliably and positively related to B/M and C/P. While the market capitalization variable has a negative coefficient, its *t*-statistic is somewhat sensitive to the specification of the model. The sign of the coefficient for earnings yield, however, is contrary to intuition. Even after allowing the relationship between returns and fundamentals to vary each month, the results parallel those from the SUR approach.

The results obtained earlier from the SUR model suggest that residual correlations across portfolios may be substantively important (Table V, Panel C). In Panel C of Table VI, the results for each monthly cross-sectional regression are obtained using generalized least squares. The estimated residual covariance matrix used to form the cross-sectional estimates is the same matrix obtained from the SUR model. The results in Panel C are similar to those in the previous panel; the main effect of the generalized least squares adjustment is to lower the *t*-statistics for the size variable.

The Fama and MacBeth approach assumes that the coefficients estimated every period are drawn from a stationary distribution. Changes over time in the levels of the explanatory variables will invalidate this assumption. To alleviate this problem, we divide the fundamental variables each month by the corresponding cross-sectional average from the previous June (as in the

[17] Note that, since portfolios are not formed by ranking securities on the basis of estimated betas, an extra period for estimating portfolio betas is not necessary.

SUR procedure). Panel D of Table VI reports the simple time-series average of the monthly coefficients estimated using ordinary least squares. No substantive changes arise as a result of adjusting the fundamental variables for changes in levels over time.

In Panel E we present results at the level of individual securities. Lo and MacKinlay (1990) point out biases in statistical inferences when portfolios are formed by some empirically motivated fundamental attributes. They suggest that the bias is less severe when data on individual securities are used. Another advantage of conducting the analysis at the level of individual securities is that arbitrary decisions on the order of grouping securities into portfolios do not have to be made. As a result, the explanatory variables are all assigned equal importance beforehand. In comparing the relative importance of size and earnings yield (Model 5), each variable has the expected sign with *t*-statistics above two. When additional explanatory variables are introduced, however, the coefficient of E/P switches sign and becomes negative. On the other hand, the coefficient for size is only slightly less than two standard errors below zero. In both Models 6 and 8, the coefficients for B/M and C/P are positive and highly significant. Overall, Panel E suggests that our findings cannot be entirely attributed to biased test procedures, nor to the methods used to group securities into portfolios.

VI. Summary and Conclusions

The cross-sectional relationship between financial variables and stock returns has attracted a considerable amount of research attention in the U.S. In contrast, there is limited evidence for the Japanese market. In order to fill this void, this paper relates cross-sectional differences in returns on Japanese stocks to the underlying behavior of four fundamental variables: earnings yield, size, book to market ratio, and cash yield. Because it is difficult to pre-specify theoretically the correct relationship between observable fundamental variables and stock returns, it is important to verify that any relationships that are uncovered are not merely statistical artifacts. Accordingly, this paper takes great care to apply alternative statistical specifications, and various estimation methods, to a comprehensive, high-quality data set that extends from 1971 to 1988. In contrast to previous studies, our sample includes both manufacturing and nonmanufacturing firms, companies from both sections of the Tokyo Stock Exchange and also delisted securities. The results are based on returns on individual securities, as well as returns on portfolios, where portfolios are constructed under several different grouping schemes. Our analysis varies the sample period and allows the relationship to differ in January from the rest of the year.

Our findings reveal a significant cross-sectional relationship between the fundamental variables we consider and expected returns in the Japanese market. The performance of the book to market ratio is especially noteworthy; this variable is statistically and economically the most important of the four variables investigated. The importance of this variable persists if the

tests are applied to stocks from the first section only, and if only the latter half of the sample period is considered. In addition, the predictive role of the book to market ratio is not a phenomenon specific to the month of January. Another variable, cash flow yield, also has a positive and in general highly significant impact on expected returns.

The remaining two fundamental variables, earnings yield and size, have been the sole focus of the few available cross-sectional studies on the Japanese market and have been extensively analyzed in studies on the U.S. market. Our findings confirm the existence of a "size effect"; small firms in our sample tend to outperform larger firms, after adjusting for market risk and the other fundamental variables. However, the statistical significance of the market capitalization variable is sensitive to the specification of the model; indeed, in some cases it is not significant.

Of the four variables considered, it is hardest to disentangle the effect of the earnings yield variable. In Table I, for example, a strategy of holding stocks with high E/P ratios would out-perform a strategy of holding low E/P stocks. In Table III, if earnings yield is considered in isolation or included with size, it indeed has a positive and significant impact on returns. If the book to market ratio is added to the model, however, the coefficient on earnings yield becomes insignificantly different from zero. In the context of the full model, earnings yield even has a negative impact on stock returns, and is in some cases reliably negative.

Overall, of the four variables, the book to market ratio and cash flow yield have the most significant impact on expected returns. This is intriguing, since these two variables, although popular in the financial community, have received little attention in the academic literature, in comparison to size and earnings yield. It is perhaps understandable that the cash flow yield variable has higher predictive power than does earnings yield, in light of the distortions in the earnings of Japanese firms induced by accelerated depreciation allowances. The noise in reported earnings, related to Japanese accounting standards, may also help to explain why the book to market ratio has such a strong influence. Of course, there is no guarantee that relationships uncovered from historical data will prevail in the future.

Our findings raise the possibility that earlier studies linking stock returns in Japan or the U.S. to fundamental variables should be interpreted with caution; potentially important explanatory variables may have been omitted. In our context, if we were to restrict attention to the model including only size and earnings yield, in Table III, we would be led to conclude, as earlier studies have, that E/P has a positive and nearly significant impact on stock returns. Yet this inference would be reversed when a larger set of fundamental variables is considered. Our results suggest that, in general, such statistical inferences should be made with caution since the correct specification is unknown. We do not claim, of course, that the list of fundamental variables employed in this paper is exhaustive. While our sample period is long relative to studies of foreign stock markets, it is nonetheless short and covers fewer different market cycles, in comparison with studies of American data.

Previous applications of the SUR methodology have failed to adjust for changes over time in market-wide levels of the fundemental variables. Since the economic hypothesis predicts that relative returns in a cross-section of portfolios are determined by the relative values of their fundamental variables, the failure to perform this adjustment results in a misspecified model. In light of the unprecedented rise in Japanese stock prices, this adjustment is substantively important for our study. For example, the results using unadjusted fundamental variables indicate that large companies in Japan significantly outperform small companies. This is at odds with previous evidence and results based on adjusted fundamental variables. Therefore, previous studies that failed to adjust for the level of fundamental variables may have to be re-evaluated.

Alternatively, the Fama and MacBeth (1973) methodology is less subject to the above shortcoming because separate cross-sectional regressions are run every month. Indeed, our results with the Fama-MacBeth procedure are compatible with the results from the SUR model using adjusted variables. As an additional safeguard against the biases noted by Lo and MacKinlay (1990), we apply the Fama-MacBeth procedure to individual securities. There are no essential differences between the results using individual securities and those using portfolios.

In studying the empirical determinants of stock returns, our selection of financial variables is motivated by their popularity among practitioners and the many studies on U.S. data. In common with prior studies in this area, our results do not enable us to determine unambiguously whether the predictability in returns is a result of market inefficiency or deficiencies in the asset-pricing model. As Fama and French (1989) state, "What one takes as comforting evidence for market rationality is, however, somewhat a matter of predilection. As always, the ultimate judgment must be left to the reader." Further research on theoretical asset-pricing models might help us to distinguish more confidently between the two competing explanations.

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