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Abstract

This paper examines the relationship between changes in the information content of earnings with expected stock returns for the Japanese market during the period of 1991-2001. Results show that a mimicking portfolio return that relates to changes in the information content of earnings, explains a portion of the cross sectional variation in expected returns. Particularly, investors lower (appreciate) firms' stock price whenever firms experience decreases (increases) in the information content of earnings, to enable them to earn higher (lower) expected returns. This relation remains robust to the inclusion of market, size, and book-to-market factors. In addition, this article investigates the extent to which changes in the information content of earnings relate systematically with size and book-to-market factors. Neither the size effect nor the book-to-market effects are found within the changes in the information content of earnings effect. Overall, the findings suggest that changes in the information content of earnings, is a unique effect not captured by the Fama and French (1992) three-factor model.

Keywords: stock returns, profits, losses, Japan.
JEL Classification: G12.

Introduction

A considerable body of academic literature suggests that the nature of earnings, in other words losses or profits, contain different information with respect to both firms' future prospects and information environment (Hayn, 1995; Ertimur, 2004; and Hevas and Siougle, 2011). In that respect, prior studies find that the market responses to earnings and stock returns predictability depends, among others, on the nature of earnings (Conrad, Cornell and Landsman, 2002; Ho and Sequeira, 2007; Barnhart and Giannetti, 2009; Herrmann, Hope, Payne, and Thomas, 2011). In this study, we build on and extent this literature by investigating the role of a *change* in the nature of earnings, rather than the *nature* of earnings used by previous literature, in explaining the cross sectional variation of expected returns.

In particular, we suggest that a decrease in the information content of earnings as proxied by profits in lag year and losses in the current year should increase the discount rate on firm's future cash flows enabling investors to request higher expected returns. Similarly, an increase in the information content of earnings as proxied by losses in lag year and profits in the current year should decrease the discount rate on firm's future cash flows enabling investors to request lower expected returns.

Our analysis focuses on the Japanese market during the period of 1991-2001 for two main reasons. First, the Japanese economy suffered from a prolonged recession. In particular, during that period, the Gross Domestic Product in Japan grew on average about 1% yearly compared to the 4% annual growth in the 1980s. Moreover, a number of economic indicators were negative, and the growth for the first quarter of 2001 was -0.2%. As a result, using this period, we ensure high variation in the information content of firms' earnings. Second, the Japanese stock market merits research because it is highly efficient and it is the second largest stock market in the world after U.S.[1]

The remainder of the study is organized as follows: Section 1 provides a review of the relevant literature and develops the hypotheses. Section 2 discusses the dataset. Section 3 evaluates the relation between size (ME) and book to market (BE/ME) factors with expected returns. Section 4 examines the relation between the change in the information content of earnings and expected returns. Section 5 examines the interaction of the change in the information content of earnings with ME and BE/ME, and the final section provides concluding remarks.

1. Literature review and hypotheses development

A long standing empirical research examines the predictability of stock returns. Starting from Kendal (1953), who used past returns as predictive variable, the literature expanded using other predictive variables such as interest rates, default spreads, dividend yield, book-to-market ratio, earnings-to-price, size, and leverage (Fama and Swertz, 1977; Campbell, 1987; Fama and French, 1988; Stattman, 1980;

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[1] Daniel, Titman and Wei (2001), Chan et al. (1991), among others, uses Japanese data.

Basu, 1983; Banz, 1981; Bhandari, 1988). Fama and French (1992) evaluated the joint role of some of the aforementioned predictive variables and they concluded that apart from the market, ME, and BE/ME play a dominant role in explaining the cross section of expected returns. Drawing on this work, Fama and French (1995) suggest that ME and BE/ME represent risk factors because they both relate to persistent properties of earnings that drives their relationship with stock returns. However, other firm characteristics may also relate to persistent or transitory properties of earnings (see Gaio, 2010; Gaio and Raposo, 2010; Chen, Firth, and Gao, 2011). In particular, Hayn (1995) suggests that investors perceive losses as transitory relative to profits, since shareholders can always liquidate the firm rather than suffer from indefinite losses. In this line, Ertimur (2004) and Hevas and Siougle (2011) suggest that the information asymmetry is higher in loss firms relative to firms reporting profits. Such information asymmetry between profitable and non-profitable firms may be due to the transitory nature of losses that provides less information for firms' future prospects relative to profits.

Fama and French (1992) controlled for the asymmetry in the information content of the nature of earnings in conjunction with the ability of earnings-to-price ratio in explaining expected returns. Even though in univariate analysis the information content of earnings-to-price ratio was significant in explaining expected returns, in the multivariate analysis, ME and BE/ME were the dominant variables in explaining cross-sectional differences in expected returns. Further research, however, building on the different information content of profits and losses, provide evidence that the market response to earnings and stock return predictability depends, among others, on the nature of earnings (Conrad, Cornell and Landsman, 2002; Ho and Sequeira, 2007; Barnhart and Giannetti, 2009).

In this study, we contribute the aforementioned literature by investigating the role of a *change* in the information content of earnings, rather than the *levels* used by previous literature, in explaining the cross-sectional variation of expected returns. Specifically, we investigate whether an increase or a decrease in the information content of earnings explains expected returns. In the spirit of Hayn (1995), an increase in the information content of earnings occurs for those firms with losses at year *t*-1 and profits at year *t*, whereas a decrease in the information content of earnings occurs for those firms with profits at year *t*-1 and losses at year *t*. In particular, we suggest that a change in the sign of firm's earnings relative to the previous year might increase or decrease firms' expected returns. In anticipation of this effect, stock prices are expected to be discounted at a higher or lower rate, to enable investors to earn higher or lower expected returns (depending on whether a decrease or an increase in the information content of earnings is occurred). The aforementioned discussion leads us to the following hypotheses.

H1: Investors lower firms' stock price whenever firms experience decreases in the information content of earnings, to enable them to earn higher expected returns.

H2: Investors appreciate firms' stock price whenever firms experience increases in the information content of earnings, to enable them to earn lower expected returns.

2. Dataset

Our dataset consists of all industrial firms with ordinary common equity included in the Global Vantage database for the period of 1991-2001[1]. Our final sample consists of 2271 firms. Similar to Daniel, Titman and Wei (2001) we use the monthly call money rate of Japanese market as a proxy for risk-free rate.

We start our analysis by examining the robustness of the three-factor model to the extreme economic conditions of the period under examination by forming various portfolios that capture the size and the BE/ME effects.

2.1. The size and BE/ME portfolios. Specifically, at the end of September of each year *t* during the period of 1992-2001, we rank all Japanese stocks in the sample on size, using the market value of equity (ME, price multiplied by number of shares outstanding). We then use the median size to allocate the stocks to two groups, small or big (S or B). We also break the stocks, independently from size groups, into three book-to-market groups based on the breakpoints for the bottom 30% (low), middle 40% (medium), and top 30% (high) of the ranked values of BE/ME of the stocks (BE/ME is the book common equity for the fiscal year ending in year *t*-1, divided by market equity at the end of March of year *t*-1)[2]. The final portfolios are the six intersections of the two ME and the three BE/ME groups (S/L, S/M, S/H, B/L, B/M, and B/H). For example, the B/H contains the stocks in the big-ME group

[1] Consistent with prior studies we exclude from the sample Japanese depositary receipts, real estate investment trusts, and units of beneficial interest (SIC between 4600-4999, 6000-6999 and greater than 9000).

[2] Book common equity (BE) is the Global Vantage book value of stockholder's equity, plus balance sheet deferred taxes and investment tax credit, minus the book value of preferred stock. When calculating the breakpoints for BE/ME or when forming the size and BE/ME portfolios we do not use negative book value firms.

that are also in the high BE/ME. The market portfolio (Mkt) includes all stocks in the six size-BE/ME portfolios, plus negative book-value (BE) stocks excluded from the portfolios. Monthly value-weighted stock returns for the six portfolios are calculated from October of year *t* to September of year *t*+1, and the portfolios are reformed in September of year *t*+1. The number of firms in each portfolio varies by year. Similar to Daniel, Titman and Wei (2001), returns are calculated beginning October of year *t* to ensure that book equity for year *t*-1 is known (i.e., six months after the fiscal year end). To be included in the process of constructing the six portfolios and the return tests, a firm must have (a) information on stock prices and number of shares outstanding at fiscal year end at *t*-1 and at September of year *t*; (b) information on book value of stockholder's equity at year *t*-1 to calculate market value of equity (ME) and book equity (BE). Also, to calculate value-weighted returns, firms must have monthly returns and monthly market value data.

3. The relation between size and BE/ME factors with expected returns

In this section we attempt to provide evidence on the ability of the three-factor model in explaining expected stock returns since it is the benchmark against to which we examine the relation between the changes in information content of earnings effect and expected returns. In section 3.1 we provide descriptive statistics for the monthly value-weighted returns of ME and BE/ME portfolios whereas in section 3.2 we provide evidence on the ability of ME and BE/ME to explain the cross sectional variation of expected returns.

3.1. Descriptive statistics. Panel A of Table 1 presents mean monthly excess returns for the six intersections of the ME and BE/ME portfolios. We observe that the magnitude of the return differs across portfolios most of the times in line with a ME or BE/ME effect, albeit in an insignificant manner. In particular, the average return of the ME effect across the low and medium BE/ME portfolios is 0.0024 and 0.0013, respectively. However, in the high book-to-market portfolio the average return is -0.0012, a result inconsistent with the existence of ME effect within that portfolio. On average, across all portfolios, the ME effect is 0.0008 (see Panel B of Table 1 in Appendix). With respect to the BE/ME effect, the average return for small firms is -0.0015 whereas for big firms it is 0.0021. On average, across all portfolios, the BE/ME is 0.0003 (see Panel B of Table 1). These results are consistent with Xu and Zhang (2003) and the fact that we fail to capture statistically significant ME or BE/ME effects, may be attributed to the extreme economic conditions of the Japanese economy during the tested period. In this line, the market risk premium is only 0.0007 and is statistically insignificant from zero (see Panel B of Table 1).

Table 1. Summary statistics for the dependent and explanatory returns: October 1992 to September 2001, 110 monthly observations

At the end of September of each year *t* (1992 to 2001) Japanese stocks are allocated to two groups (small or big, S or B) based on whether their September market equity (ME, stock price times shares outstanding) is below or above the median ME of the Japanese stocks. Japanese stocks are allocated in an independent sort to three book-to-market-equity (BE/ME) groups (low, medium, or high; L, M, or H) based on the breakpoints for the bottom 30 percent, middle 40 percent and top 30 percent of the values of BE/ME of the Japanese stocks. BE is the Global Vantage book value of stockholders' equity, plus balance sheet deferred taxes and investment tax credit (if available), minus the book value of preferred stock. Book-to-market-equity (BE/ME) is then book common equity for the fiscal year ending in calendar year *t*-1, divided by market equity at the end of March of year *t*-1. The size-BE/ME portfolios (S/L, S/M, S/H, B/L, B/M, B/H) are the intersections of the two ME and the three BE/ME groups.

We do not use negative BE firms, when calculating the breakpoints for BE/ME or when forming the size-BE/ME portfolios. Also, only firms with ordinary common equity (as classified by Global Vantage) are included in the tests. This means that Japanese depository receipts, real estate investment trusts, and units of beneficial interest are excluded. The market portfolio (Mkt) includes all stocks in the six size-BE/ME portfolios, plus negative BE stocks excluded from the portfolios.

The portfolios are formed in September of each year *t* and value-weighted monthly returns are calculated from October to the following September. The dependent variables are the returns on the size-BE/ME portfolios minus the Call Money Rate of Japanese market (*Rf*) adjusted monthly. SMB is the difference, each month, between the average of the returns on the three small-stock portfolios (S/L, S/M, and S/H) and the average of the returns on the three big-stock portfolios (B/L, B/M, and B/H). HML is the difference between the average of the returns on the two high-BE/ME portfolios (S/H and B/H) and the average of the returns on the two low-BE/ME portfolios (S/L and B/L).

Panel A: Monthly mean returns of size and book to market portfolios					
		Low	BE/ME medium	High	HML
	Small	0.0014	-0.0009	-0.0001	-0.0015
	Std	0.0973	0.0841	0.0817	0.0296
	T-statistic	0.1521	-0.1095	-0.0150	-0.5414

Table 1 (cont.). Summary statistics for the dependent and explanatory returns: October 1992 to September 2001, 110 monthly observations

Size					
		Low	BE/ME medium	High	HML
	Big	-0.0010	-0.0022	0.0011	0.0021
	Std	0.0658	0.0623	0.0675	0.0477
	T-statistic	-0.1645	-0.3660	0 1682	0.4647
	SMB	0 0024	0.0013	-0.0012	
	Std	0.0618	0.0476	0.0431	
	T-statistic	0.4147	0.2860	-0.2920	

Panel B: Descriptive statistics			
	Mean	Std	T-statistic
SMB	0.0008	0.0446	0.2000
HML	0.0003	0.0295	0.1040
RM_Rf	0.0007	0.0655	0.1129

3.2. The relation between ME and BE/ME factors with expected returns. In this section, similar to Fama and French (1992, 1993, and 1995), we employ the following multivariate regression analysis framework to investigate the relationship between ME and BE/ME with expected returns:

$$R_t - R_{ft} = a + b(R_{mt} - R_{ft}) + sSMB_t + hHML_t + \varepsilon_t, \quad (1)$$

where the dependent variable is the average excess return on the six size-BE/ME portfolios. The explanatory variables are the excess returns of the market portfolio for month *t*, and the returns *SMB* (small minus big) and *HML* (high minus low) of the portfolios for month *t*.

SMB is the difference, each month, between the simple average of the returns on the three small-stock portfolios (S/L,S/M and S/H) and the average of the returns on the three big-stock portfolios (B/L, B/M and B/H). Thus, *SMB* is the difference between the returns on small and big stock portfolios with about the same averaged BE/ME. *SMB* should be largely clean of BE/ME effects, focusing instead on the different return behavior of small and big stocks.

HML is the difference between the simple average of the returns on the two high-BE/ME portfolios (S/H and B/H) and the average of the returns on the two low-BE/ME portfolios (S/L and B/L). The two components of HML are returns on high and low-BE/ME portfolios with about the same average size. Thus, HML should be largely clean of the ME factor in returns, focusing instead on the different return behavior of high- and low-BE/ME stocks. As testimony to the success of both SMB and HML factors, the correlation between the monthly SMB and HML returns, for the period from October 1992 to December 2001 is only -0.155 (the result is not tabulated).

In Panel A of Table 2 we examine the interaction between ME and BE/ME factors on monthly value weighted stock returns in the presence of the market factor. In order to test the relative ability of SMB and HML in explaining the variation of stock returns, we estimate the regression model (1) for the six portfolios first by imposing $h = 0$ and then by imposing $s = 0$. Results indicate differences in the explanatory power of ME and BE/ME factors in small and big stock portfolios. In particular, the adjusted R^2 increases more with the addition of the HML factor relative to the SMB factor, when the testing portfolios consist of big stocks. On the other hand, the adjusted R^2 increases more with the addition of the SMB factor relative to the BE/ME factor when the testing portfolios consist of small stocks. Overall, these results are consistent with the evidence presented in the univariate analysis and they indicate the existence of a relation between ME and BE/ME factors with expected returns.

We next run model (1) without any restrictions. Results in Panel B of Table 2, confirms that *SMB* and *HML*, the mimicking returns related to ME and BE/ME factors, capture common variation in stock returns missed by the market return. In particular, results show that for all portfolios, almost all coefficients of the explanatory variables are highly significant. Consistent with results presented in Panel A, the t-statistics for the SMB coefficients of the small firms are higher, relative to the t-statistics of the BE/ME coefficients. The pattern is reversed for big stocks. The explanatory power of the regressions, as measured by R^2_{adj}, ranges from 85.4% to 96%.

Similar to prior studies (i.e. Fama and French, 1992), the intercepts in the three-factor return regressions are close to zero indicating that the market, ME, and BE/ME factors capture most of the spread in the average returns of the six portfolios.

Table 2. Excess returns on the six size-BE/ME portfolios regressed on $R_m - R_f$, *SMB* and *HML*. Summary statistics for the dependent and explanatory returns: October 1992 to September 2001, 110 monthly observations

The six size-BE/ME portfolios (S/L, S/M, S/H, B/L, B/M, and B/H) and the market portfolio R_m are described in Table 1. The portfolios are formed in September of each year *t* and value-weighted monthly returns are calculated from October to the following September. The dependent variables are the returns on the size-BE/ME portfolios minus the Call Money Rate (R_f) of Japanese market adjusted monthly. *SMB* is the difference, each month, between the average of the returns on the three small-stock portfolios (S/L, S/M, and S/H) and the average of the returns on the three big-stock portfolios (B/L, B/M, and B/H). *HML* is the difference between the average of the returns on the two high-BE/ME portfolios (S/H and B/H) and the average of the returns on the two low-BE/ME portfolios (S/L and B/L). *t*(.) is a regression coefficient divided by its standard error. Regression R^2 values are adjusted for degrees of freedom.

Panel A: Interaction between size and B/M on average stock returns in the presence of the market factor										
Explanatory variables	Dependent variables	A	B	S	H	*t*(*A*)	*t*(*B*)	*t*(*S*)	*t*(*H*)	R^2_{adj}
Mkt. SMB	S/L-Rf	0.000	0.954[a]	1.262[a]	…………..	-0.138	25.227	22.686	………..	0.933
	S/M-Rf	-0.002	0.809[a]	1.103[a]	…………..	-1.077	23.143	21.464	………..	0.924
	S/H-Rf	-0.002	0.818[a]	1.005[a]	…………..	-0.665	22.286	18.612	………..	0.911
	B/L-Rf	-0.002	0.956[a]	0.042	…………..	-0.969	33.657	1.015	………..	0.918
	B/M-Rf	-0.003	0.811[a]	0.129[c]	…………..	-1.002	17.997	1.948	………..	0.770
	B/H-Rf	0.000	0.815[a]	0.199[b]	…………..	0.095	14.408	2.392	………..	0.690
Explanatory variables	Dependent variables	A	B	S	H	*t*(*A*)	*t*(*B*)	*t*(*S*)	*t*(*H*)	R^2_{adj}
Mkt. HML	S/L-Rf	0.000	1.173[a]	………….	0.000	0.102	12.619	………..	0.003	0.616
	S/M-Rf	-0.002	1.059[a]	………….	0.401[b]	-0.351	13.202	………..	2.251	0.617
	S/H-Rf	-0.001	1.069[a]	………….	0.523[a]	-0225	14.521	………..	3.203	0.658
	B/L-Rf	-0.002	0.903[a]	………….	-0.410[a]	-1.081	39.002	………..	-7.995	0.948
	B/M-Rf	-0.003	0.926[a]	………….	0.629[a]	-1277	24.279	………..	7.439	0.842
	B/H-Rf	0.000	1.007[a]	………….	1.067[a]	0.026	27.042	………..	12.919	0.872
Panel B: Three-factor model in explainingaveragestock returns										
Explanatory variables	Dependent variables	A	B	S	H	*t*(*A*)	*t*(*B*)	*t*(*S*)	*t*(*H*)	R^2_{adj}
Mkt. HML, SMB	S/L-Rf	0.000	0.976[a]	1.270[a]	0.154[c]	-0.168	24.847	22.991	1.801	0.935
	S/M-Rf	-0.003	0.883[a]	1.131[a]	0.537[a]	-1.546	31.533	28.688	8.826	0.956
	S/H-Rf	-0.002	0.908[a]	1.037[a]	0.648[a]	-1.175	35.268	28.650	11.596	0.960
	B/L-Rf	-0.002	0.899[a]	0.022	-0.408[a]	-1.090	37.815	0.651	-7.898	0.948
	B/M-Rf	-0.003	0.901[a]	0.162[a]	0.649[a]	-1.380	23.921	3.056	7.936	0.854
	B/H-Rf	0.000	0.967[a]	0.254[a]	1.098[a]	-0.066	28.358	5.305	14.822	0.898

Note: a, b, c denote statistical significance at 1%, 5%, and 10% levels, respectively.

4. Information content effect and expected returns

In the previous section we provided evidence that the three-factor model explains expected returns well. In this section we investigate (1) the relation between the change in the information content effect with expected returns, and (2) the relation between the change in the information content with ME and BE/ME.

4.1. The relation between changes in the information content effect and expected returns. In this section we examine whether portfolios with changes in the information content of earnings provide different returns. In doing so, each year, we allocate firms to two portfolios as follows: (1) a portfolio that consists of firms with a decrease in the information content of earnings (i.e. positive earnings at year *t*-1 and negative earnings at year *t*); and (2) a portfolio that consists of firms with an increase in the information content of earnings (i.e. negative earnings at year *t*-1 and positive earnings at year *t*). Then, for each portfolio we compute the average returns over the next year[1].

The results are presented in Table 3. The average return difference between the decrease in the information content of earnings and the increase in the information content of earnings portfolios is 0.0789 per annum and it is highly significant. This return differential is mainly due to firms that experience an increase in the information content of earnings rather than a decrease in the information content of earnings (-0.0973 vs -0.0184). Overall, the results seem to support partly our hypotheses.

[1] Unlike prior studies, we select to separate firms in yearly portfolios and to compute yearly average returns because we define the change in the information content using yearly earnings. We use yearly earnings to avoid possible seasonality effect on the firms' profitability.

A question that arises from the aforementioned discussion is to what extent do we really capture a unique information content effect? To the extent that changes in the information content of earnings relate systematically with ME and BE/ME effects we may not capture a unique effect. To shed more light on this issue, we present in Table 3 the average ME and BE/ME for the two portfolios. The average ME is significantly different between the two portfolios. The same is valid for the BE/ME. In particular, average size for the decrease in information content of earnings portfolio is 5.0008 relative to the average size of the increase in information content of earnings portfolio that is 5.1749. The opposite is true for BE/ME i.e. average BE/ME for the decrease in information content of earnings portfolio is 0.9348 relative to the average BE/ME of the increase in information content of earnings portfolio that is 0.8852. These results is an indication that both ME and the BE/ME effects may relate with the information content of earnings effect.

Table 3. Portfolios sorted on the basis of the change in the information content of earnings

Each year from 1991 to 2001, we allocate firms into two portfolios as follows: the first portfolio consists of firms with a decrease in the information content of their earnings (i.e. positive earnings at year *t*-1 and negative earnings at year *t*). The second portfolio consists of firms with an increase in the information content of their earnings (i.e. negative earnings at year *t*-1 and positive earnings at year *t*). We then compute the average returns over the next year. Average size and average BE/ME is computed within information content of earnings portfolios. The t-statistics are calculated from independent t-tests to compare the equality between the means of the two portfolios.

	Information content of earnings			
	Decrease	Increase	Decrease-increase	t-statistic
Average returns	-0.0184	-0.0973	0.0789	3.9067
Average size	5.0008	5.1749	-0.1741	-1.7490
Average BE/ME	0.9348	0.8852	0.0496	3.0752

4.2. The relation between information content effect with size and BE/ME. To examine the extent to which the ME and the BE/ME effects relate to the information content effect, we examine whether either the ME or the BE/ME effects exist within portfolios of different information content. Specifically, for each of the years 1991-2001, we allocate firms into two portfolios as follows: (1) a portfolio that consists of firms with a decrease in the information content of their earnings (i.e. positive earnings at year *t*-1 and negative earnings at year *t*); and (2) a portfolio that consists of firms with an increase in the information content of their earnings (i.e. negative earnings at year *t*-1 and positive earnings at year *t*). Then, within each portfolio, stocks are sorted into five ME portfolios and five BE/ME portfolios based on their prior year's market value and BE/ME, respectively. We then compute the average value-weighted returns over the next year. In this way, we are able to investigate the presence of either ME or BE/ME effects within the information content of earnings effect.

4.2.1. Size effect within information content effect. Results in Panel A of Table 4 suggest that the size effect does not exist within the portfolio of firms with either an increase or a decrease in their information content of earnings. Specifically, for the portfolio with a decrease in the information content of earnings, the difference in the average return of small firms' portfolio with the average return of big firms' portfolio is -0.020 whereas for the portfolio with an increase in the information content of earnings, the difference in the average return of small firms' portfolio with the average return of big firms' portfolio is 0.034. In both cases average returns are statistically insignificant.

In Panel B of Table 4 we address the question whether there is substantial variation in the size of stocks for the two information content portfolios. Results show that there is indeed large variation in the market value of both information content portfolios. Despite large variation in the market value raises the presumption for different expected return profile among these firms, our results suggest that one set of S/B firms, namely firms with changes in the information content of earnings, do not experience the relatively higher/lower expected returns profile, known as size effect.

In Panel C of Table 4 we report the average BE/ME of the information content and size-sorted portfolios. These results are useful in order to understand the extent to which the information content of earnings effect, ME and BE/ME are interrelated. Panel C shows that BE/ME decreases monotonically with information content, a result indicating that the BE/ME may relate with the information content effect.

Table 4. Size effect controlled by the change in the information content of earnings

Each year from 1991 to 2001, we allocate firms into two portfolios as follows: the first portfolio consists of firms with a decrease in the information content of their earnings (i.e. positive earnings at year *t*-1 and negative earnings at year *t*). The second portfolio consists of firms with an increase in the information content of their earnings (i.e. negative earnings at year *t*-1 and positive earnings at year *t*). Within each portfolio, stocks are sorted into five size portfolios based on their prior year's market value. We then compute the average returns over the next year. "Small-Big" is the return difference between the smallest and the biggest size portfolios within each information content portfolio. The t-statistics are calculated from independent t-tests to compare the equality between the means of the two portfolios.

	Small 1	2	3	4	Big 5	Small-Big	t-statistic
Panel A: Average returns							
Decrease in information content of earnings	-0.016	-0.041	-0.046	0.009	0.004	-0.020	-0.517
Increase in information content of earnings	-0.065	-0.080	-0.113	-0.129	-0.099	0.034	0.712
Panel B: Average size							
Decrease in information content of earnings	3.235	4.139	4.815	5.604	7.241		
Increase in information content of earnings	3.355	4.291	4.957	5.797	7.483		
Panel C: Average BE/ME							
Decrease in information content of earnings	1.072	1.031	0.942	0.930	0.702		
Increase in information content of earnings	0.918	1.010	0.942	0.862	0.692		

4.2.2. BE/ME effect within information content effect. Results in Panel A of Table 5 suggest that the BE/ME effect does not exist within the portfolio of firms with either an increase or a decrease in their information content of earnings. Specifically, for the portfolio with a decrease in the information content of earnings, the difference in the average return of high BE/ME firms' portfolio with the average return of low BE/ME firms' portfolio is 0.046 whereas for the portfolio with an increase in the information content of earnings, the difference in the average return of high BE/ME firms' portfolio with the average return of low BE/ME firms' portfolio is 0.0700. None of the differences is statistically significant.

In Panel B of Table 5 we address the question whether there is substantial variation in the BE/ME of stocks for the two information content portfolios. Results show that there is indeed large variation in the BE/ME of both information content portfolios. However, given that this variation in BE/ME does not produce variation in returns, we suggest that one set of high/low BE/ME firms, namely firms with changes in the information content of earnings, do not experience the relatively higher/lower expected returns profile, known as BE/ME effect.

Finally, in Panel C of Table 5 we report the average ME of the information content and BE/ME-sorted portfolios. Similar with the results of panel C in Table 4, ME decreases monotonically with information content.

Table 5. BE/ME effect controlled by the change in the information content of earnings

Each year from 1991 to 2001, we allocate firms into two portfolios as follows: the first portfolio consists of firms with a decrease in the information content of their earnings (i.e. positive earnings at year *t*-1 and negative earnings at year *t*). The second portfolio consists of firms with an increase in the information content of their earnings (i.e., negative earnings at year *t*-1 and positive earnings at year *t*). Within each portfolio, stocks are sorted into five BE/ME portfolios based on their prior year's BE/ME. We then compute the average returns over the next year. "High-Low" is the return difference between the smallest and the biggest BE/ME portfolios within each information content portfolios. The t-statistics are calculated from independent t-tests to compare the equality between the means of the two portfolios.

	High 1	2	3	4	Low 5	High-Low	t-statistic
Panel A: Average returns							
Decrease in information content of earnings	-0.002	-0.010	-0.010	-0.020	-0.049	0.046	1.082
Increase in information content of earnings	-0.069	-0.112	-0.117	-0.051	-0.138	0.070	1.493
Panel B: Average size							
Decrease in information content of earnings	4.437	4.903	5.137	5.360	5.157		
Increase in information content of earnings	4.722	5.083	5.354	5.534	5.173		

Table 5 (cont.). BE/ME effect controlled by the change in the information content of earnings

	High 1	2	3	4	Low 5	High-Low	t-statistic
Panel C: Average BE/ME							
Decrease in information content of earnings	1.686	1.149	0.873	0.873	0.337		
Increase in information content of earnings	1.801	1.133	0.824	0.571	0.102		

5. The interaction of the change in the information content of earnings with size and BE/ME using regression analysis

In the previous section, we provided evidence that neither ME nor BE/ME effects exist within the change in the information content of earnings effect. It would thus appear that the relation between changes in the information content of earnings and expected returns established in section 4.1 might represent a unique effect. In this section, we further explore the degree of interaction between the change in the information content of earnings with ME and BE/ME using regression analysis. We employ two different methodologies. The first one is a portfolio-based time-series regression approach used in order to examine the power of the information content of earnings effect in explaining expected returns in the presence of ME and BE/ME effects. The second approach uses individual stock returns to examine whether the information content of earnings effect is priced by the market. That is, we examine the power of information content effect in explaining the cross section of current returns in the presence of ME and BE/ME effects.

5.1. The portfolio-based time-series regression approach. In this subsection we examine whether the information content effect systematically affects the expected returns beyond the already known Mkt, ME and BE/ME effects. We first provide some details for the framework, and subsequently we present the empirical results.

To obtain maximum dispersion against ME, BE/ME and the information content effect, we perform a three-way independent sort. That is, for every year *t* we split the already existing 6 portfolios to 12 portfolios, in such a way that every portfolio has only firms with positive or negative earnings at year *t*[1]. In this way we construct 12 portfolios (S/L/P, S/M/P, S/H/P, B/L/P, B/M/P, B/H/P, S/L/N, S/M/N, S/H/N, B/L/N, B/M/N, B/H/N). For example, the B/H/P portfolio contains the stocks in the big-ME group that are also in the high BE/ME group and have positive earnings whereas the B/H/N contains the stocks in the big-ME group that are also in the high BE/ME group and have negative earnings. For the construction of the 12 portfolios, we included all firms with earnings data available at year *t*.

The monthly value weighted excess returns of the 12 portfolios are then used as dependent variables in the following model:

$$R_t - R_{ft} = a + b(R_{mt} - R_{ft}) + sSMB_t + \\ + hHML_t + pNMP_t + \varepsilon_t. \quad (2)$$

The explanatory variables are the excess returns of the market portfolio for month *t*, the returns SMB (small minus big), the HML (high minus low) and the NMP (negative minus positive) of the portfolios for month *t* (henceforth four-factor model).

SMB is the difference, each month, between the simple average of the returns on the six small-stock portfolios (S/L/P, S/M/P, S/H/P, S/L/N, S/M/N, S/H/N) and the average of the returns on the six big-stock portfolios (B/L/P, B/M/P, B/H/P, B/L/N, B/M/N, B/H/N). Thus, *SMB* is the difference between the returns on small and big stock portfolios with about the same average BE/ME and information content effect. SMB should be largely clean of BE/ME and information content effects, focusing instead on the different return behavior of small and big stocks.

HML is the difference between the simple average of the returns on the four high-BE/ME portfolios (S/H/P, B/H/P, S/H/N, B/H/N) and the average of the returns on the four low-BE/ME portfolios (S/L/P, B/L/P, S/L/N, B/L/N). The two components of *HML* are returns on high and low-BE/ME portfolios with about the same average size and information content effect. Thus, HML should be largely clean of the size and information content effects in returns, focusing instead on the different return behavior of high and low-BE/ME stocks.

NMP is the difference between the simple average of the returns on the six negative-earnings portfolios (S/L/N, S/M/N, S/H/N, B/L/N, B/M/N, B/H/N) and the average of the returns on the six positive-earnings

[1] By separating the sample in those firms with negative earnings and those firms with positive earnings we are able to use the whole sample of firms in our estimations. Negative earnings firms consist of those firms with a decrease in their information content of earnings, as well as those firms with consecutive years of losses (two or more years). Positive earnings firms consist of those firms with an increase in their information content of earnings, as well as those firms with consecutive years of profits (two or more years). Assuming that the information content effect is constant for firms with consecutive years of losses and for firms with consecutive years of profits (since no change in the information content of earnings is occurred), this type of sorting is expected to capture the effect of the change in the information content of earnings.

portfolios (S/L/P, S/M/P, S/H/P, B/L/P, B/M/P, B/H/P). The two components of NMP are returns on positive and negative portfolios with about the same average size and BE/ME. Thus, NMP should be largely clean of the size and BE/ME effects in returns, focusing instead on the different return behavior of stocks with positive and negative earnings.

If the expected returns are related to the change in the information content of earnings, the coefficient of the NMP should be reflected in the expected returns of the portfolios. On the other hand, if the market, the size and the BE/ME adequately explain expected returns, then the expected returns will be fully explained by these factors and the estimates of p_s should be insignificantly different from zero.

The results of equation (2) are reported in Table 6 see Appendix. Results confirm that NMP, the mimicking return related to the information content effect, captures common variation in stock returns missed by the Mkt, the ME and the BE/ME factors. Consistent with our hypothesis, the t-statistics for the NMP are all greater than 2.5. Whether we control for size (independent of BE/ME) or for BE/ME (independent of size) the slopes of NMP increase from the positive earnings firms to the negative earnings firms. More importantly, the same pattern is also observed after controlling for both size and BE/ME factors. Consequently, consistent with our hypothesis, the information content of earnings effect seems to affect expected returns. In addition to that, we employ F-tests to examine whether the incremental explanatory power of the four-factor model is significantly different from the explanatory power of the Fama and French (1992) three-factor model. In all cases we reject the null hypothesis that the three-factor model is superior (the results are not tabulated).

In practical terms, similar to Fama and French (1992), the intercepts in the twelve-regression models are close to zero (all but two). Thus, the regression slopes and the average premiums for the explanatory variables capture most of the spread in the average returns on the twelve size-BE/ME information content portfolios.

Table 6. Excess returns on the twelve size-BE/ME information content portfolios regressed on R_m-R_f, *SMB* and *HML* and *NMP*. Period: October 1992 to September 2001, 110 monthly observations

In September of each year *t* we split the already existing 6 portfolios described in Table 1, into 12 portfolios such that every portfolio has only firms with positive or negative earnings at year *t* (S/L/P, S/L/N, S/M/P, S/M/N, S/H/P, S/H/N, B/L/P, B/L/N, B/M/P, B/M/N, B/H/P and B/H/N). The portfolios are formed in September of each year *t* and value-weighted monthly returns are calculated from October to the following September. The dependent variables are the returns on the size-BE/ME information content portfolios minus the Call Money Rate (R_f) of Japanese market adjusted monthly. SMB is the difference, each month, between the average of the returns on the six small-stock portfolios (S/L/P, S/L/N, S/M/P, S/M/N, S/H/P and S/H/N) and the average of the returns on the six big-stock portfolios (B/L/P, B/L/N, B/M/P, B/M/N, B/H/P and B/H/N). HML is the difference between the average of the returns on the four high-BE/ME portfolios (S/H/P, S/H/N, B/H/N and B/H/N) and the average of the returns on the four low-BE/ME portfolios (S/L/P, S/L/N, B/L/P and B/L/N). *NMP* is the difference between the simple average of the returns on the six negative-earnings portfolios (S/L/N, S/M/N, S/H/N, B/L/N, B/M/N, B/H/N) and the average of the returns on the six positive-earnings portfolios (S/L/P, S/M/P, S/H/P, B/L/P, B/M/P, B/H/P). t(.) is a regression coefficient divided by its standard error. Regression R^2 values are adjusted for degrees of freedom.

Explanatory variables	Dependent variables	A	B	S	H	P	t(A)	t(B)	t(S)	t(H)	t(P)	R^2_{adj}
Mkt, HML, SMB, PMN	S/L/P	-0.003	0.880[a]	0.969[a]	0.181	0.566[a]	-1.087	17.620	10.316	1.540	4.891	0.888
	SUP	-0.005[b]	0.870[a]	0.978[a]	0.554[a]	0.312[a]	-2099	19.192	11.487	5209	2.972	0.889
	SH.P	-0.001	0.841[a]	0.708[a]	0.631[a]	0.256[a]	-0.610	19.105	8.552	6.107	2.517	0.867
	SLN	-0.001	0.957[a]	1.094[a]	-0.151	1.426[a]	-0.381	16.427	9.987	-1.106	10.574	0.915
	S/MN	-0.004	0.778[a]	1.047[a]	0.540[a]	1.092[a]	-1.402	14.998	10.734	4.436	9.095	0.897
	S'HN	-0.003	0.937[a]	0.985[a]	0.873[a]	1.079[a]	-1.368	24.977	13.969	9.921	12432	0.949
	B.LP	-0.002	0.908[a]	0.085	-0.337[a]	-0.201[a]	-1.352	30277	1.512	-4.784	-2.901	0.920
	BMP	-0.002	0.850[a]	-0.117	0.559[a]	0.358[a]	-0.633	20.679	-1.511	5.790	3.762	0.836.
	BH.P	-0.005	0.914[a]	0.157	1.040[a]	0.440[a]	-1.423	16.333	1.491	7.915	3.397	0.783
	BUN	-0.002	0.852[a]	-0.299[a]	-0.188	1.345[a]	-0.630	14280	-2.669	-1.343	9.740	0.828
	B/MN	-0.008[b]	0.833[a]	-0.046	0.592[a]	1.429[a]	-2690	15228	-0.447	4.609	11.283	0.850
	BfttN	0.000	0.906[a]	0.000	0.961[a]	1.360[a]	0.058	16.825	-0.001	7.611	10.920	0.860

Note: a, b, c denote statistical significance at 1%, 5%, and 10% levels, respectively.

5.2. Results on individual stock returns. Daniel and Titman (1997) and Daniel, Titman and Wei (2001) suggest that firm characteristics may yield better risk measures compared to the portfolio-based approach. Consequently, to examine whether the information content effect plays a role in the cross section of returns we run yearly cross-sectional regressions of stock returns on size (LnME), BE/ME, beta, and on two dummy variables that capture the change in the information content of earnings. The first dummy variable ($D1$) equals 1 for decreases in the information content of earnings and zero otherwise. The second dummy variable (D2) equals 1 for increases in the information content of earnings and zero otherwise. Beta is the average of monthly estimated betas for the corresponding year. Monthly betas were estimated using the market model for the most recent 24 months of return data for each month. Specifically the following model is run:

$$R_{it} = a + b\mathrm{Ln}Size_{it} + cBE/ME_{it} + dBeta_{it} + \\ + eD_{1it} + fD_{2it} + \varepsilon_{it} \quad (3)$$

Regressions are run each year. The time-series average of the yearly estimates is then taken as the estimate of the parameters. The t-statistics of the parameter estimate is calculated from the time-series standard errors of the yearly estimates. The reported R^2 is the time-series average of the adjusted R^2 in yearly cross-sectional regressions.

With this regression we examine whether the information content effect is priced by the market. Results are reported in Table 7. In specifications (1) and (2) we use as explanatory variables size, BE/ME and beta. As expected, and similar with prior studies, the size is positively related with current returns, the BE/ME is negatively related with current returns and the beta has no explanatory power. In specifications (3) and (4) we examine whether the information content dummy variables explain stock returns beyond the explanatory power of size and BE/ME. Consistent with our hypothesis, both dummy variables are highly significant. D_1 is negatively related with current returns while D_2 is positively related with current returns. The results imply that investors require higher expected returns when firms face a decrease in their information content of earnings while they require lower expected returns when firms face an increase in the information content of earnings. Consistent with the results of the previous subsection, the information content effect seems to be priced by the market.

Table 7. Cross-sectional regression of returns on size, BE/ME, beta and two dummy variables that control for the change in the information content of earnings

The table reports the coefficients estimates of the cross-sectional regression of returns on the firm-specific variables. The model used is the following: $R_{it} = a + b\mathrm{Ln}Size_{it} + cBE/ME_{it} + dBeta_{it} + eD_{1it} + fD_{2it} + \varepsilon_{it}$. The variable D_1 equals 1 for a decrease in the information content of earnings and zero otherwise. The variable D_2 equals 1 for an increase in the information content of earnings and zero otherwise. Beta is the average of monthly estimated betas for the corresponding year. Monthly betas were estimated using the market model for the most recent 24 months of return data for each month. Ln*Size* is the logarithm of the market equity and the *BE*/*ME* is the book-to-market ratio. The regression is run every year. The time-series average of the yearly estimates is then taken as the estimate of the parameters. The t-statistics of the parameter estimate is calculated from the time-series standard errors of the yearly estimates (in italics). The reported R^2 is the time-series average of the adjusted R^2 in yearly cross-sectional regressions.

	1	2	3	4
Constant	0.033 *0.823*	-0.011 *-0.251*	0.033 *0.825*	-0.004 *-0.102*
Ln*Size*	0.012 *2.001*	0.014 *2.572*	0.012 *2.045*	0.014 *2.541*
BE/*ME*	-0.163 *-8.936*	-0.150 *-10.634*	-0.158 *-8.719*	-0.148 *-10.532*
Beta		-0.002 *-0.109*		-0.002 *-0.145*
D_1			-0.103 *-3.802*	-0.107 *-4.151*
D_2			0.089 *2.731*	0.074 *2.805*
R^2	0.094	0.110	0.117	0.129

Conclusion

This paper investigates the importance of a change in the information content of earnings, as proxied by a change in the nature of earnings (i.e. from losses to profits and vice versa), and its relation with expected returns, size and book-to-market factors.

Using a sample of Japanese firms during the period of 1991-2001 we provide evidence that a mimicking return that relates with the information content of earnings effect affects expected returns. This relation remains robust to the inclusion of market, size and BE/ME factors suggesting that the information content of earnings effect is not captured by the Fama and French (1992) three-factor model and is priced by the market. Furthermore, we investigate whether the information content effect contains any size or BE/ME effects. Results show neither size nor BE/ME effects within the information content effect. As a result, the relation between expected returns and information content effect is unique.

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