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The Impact of Controlling for Risk on the Value Relevance of Earnings: Evidence from the U.S.

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Abstract

Prior research documents the relatively low explanatory power of the earnings-return association in traditional models that regress returns on levels and changes in earnings. However, these studies fail to consider the impact of variation in discount rates, or risk, as a possible cause of the low explanatory power. In this study, I investigate the impact of controlling for risk on the explanatory power of the earnings-return relation. I begin by estimating two related regression models of annual returns on earnings and changes in earnings drawn from prior research. Then, to examine whether controlling for risk affects the explanatory power of the regressions, I sort observations into portfolios formed on various risk proxies, including market beta, firm size, earnings/price ratio, two implied cost of equity capital proxies, and the combination of beta and firm size. I document higher average adjusted R^2s that suggest a 30% increase in explanatory power, and larger average coefficient estimates of earnings, when I estimate the return-earnings regressions within risk portfolios than those of the Easton and Harris and Easton and Pae models. These findings suggest that controlling for cross-sectional variation in risk, a denominator effect, improves the explanatory power of the model.

Keywords: earnings, explanatory power, returns, risk, value relevance of earnings

1. Introduction

Lev (1989) expresses concern about the low explanatory power of earnings in the earnings/return association. Several studies investigate possible causes for the low explanatory power, including the omission of earnings levels (Easton & Harris,1991), lack of control for earnings conservatism (Easton & Pae, 2004), noise and lack of timeliness in earnings (Collins, Kothari, Shanken, & Sloan, 1994), lack of information content of losses (Hayn, 1994), and measurement error (Easton, Harris, & Ohlson, 1992). Common to these studies is a focus on controlling for cross-sectional variation in factors that affect the "numerator" (future cash flows) of the pricing equation, with little discussion of the potential impact of differences in risk across firms and years. I add to this literature by investigating the effect of controlling for cross-sectional variation in priced risk on the explanatory power of the model. I document a significant increase in the overall explanatory power of the returns-earnings regression estimated within portfolios formed on various risk characteristics relative to regressions estimated without controlling for risk. Accordingly, I conclude that it is important to consider cross-sectional variation in both the numerator and denominator of the pricing equation (i.e. forecasts of future cash flows and risk) when regressing returns on earnings.

I compare the average R^2 from estimating the earnings-return regression models within risk-based portfolios to the R^2s using two models drawn from prior research. The 'basic' model is based on Easton and Harris (1991) (EH) and includes controls for both earnings levels and changes. The 'full' model, based on Easton and Pae (2004) (EP), expands the set of explanatory variables by including proxies for accounting conservatism. The models employed in these earlier studies control for cross-sectional variation in expected future cash flows, but do not consider controls for cross-firm variation in risk. I use various risk proxies, including market beta, firm size (natural log of market value of equity), earnings/price ratio (E/P), and implied cost of equity capital r_{DIV} and r_{PEG}, to sort firms into risk-based portfolios. Using lagged values of our various risk proxies, I sort firms into risk deciles and estimate the earnings-return regression models for each decile. In addition to considering risk factors individually, I form portfolios using the combination of risk factors. Specifically, I form portfolios based on both market beta and firm size.

I expect the explanatory power of both models to improve after controlling for cross-sectional variation in risk, and the findings are consistent with my proposition. I document a 30% increase in the overall explanatory power of earnings and earnings changes on realized returns when I sort firms into risk portfolios over when risk factors are not present.

The remainder of the paper is organized as follows. Section II provides a review of the relevant literature and my hypothesis development. I describe the research design in Section III and the sample selection procedures and the nature of the sample in Section IV. I present the results of the empirical analysis in Section V, and offer concluding comments in Section VI.

2. Literature Review and Hypothesis Development

The association between earnings and returns is a well-studied issue in the accounting academic literature that dates back to the seminal work of Ball and Brown (1968). Ohlson (1995) links abnormal earnings to returns through the clean surplus relation, but much of the research in this area is based on a conceptual link between earnings and returns. Beaver (1998) suggests that to draw a connection between current period earnings and returns we must accept three critical links. First, we must accept that there is a link between future dividends (i.e. cash flows) and price. This link is established via the traditional dividend discount model, shown in equation (1) below.

$$P_{jt} = \sum_{\tau=1}^{\infty} \frac{E(d_{t+\tau})}{(1+r)^{\tau}} \tag{1}$$

The second necessary link is between future earnings and future dividends. This link is established by assuming a constant dividend payout ratio, or on a conceptual level, by assuming that earnings are informative of the underlying economic dividend-paying ability of the firm. The latter contention is consistent with the often-stated observation that "dividends are paid out of earnings."

The final necessary link is between current and future earnings. This link is reasonable provided earnings incorporate a permanent component. Evidence that variation in earnings persistence explains variation in the earnings response coefficient (ERC) (Kormendi & Lipe, 1987; Easton & Zmijewski, 1989; Collins & Kothari, 1989) provides support for this link.

The above discussion suggests that accounting earnings and stock market returns can reasonably be expected to be associated. However, the magnitude of the association documented in prior research has been relatively weak. Lev (1989) laments the low R^2s of the regression models in studies that examine the association between returns and earnings, as well as the inter-temporal instability of the ERC. Lev points to inter-temporal variation in the discount rate as a possible cause of time-series variation in the ERC. In response, Collins and Kothari (1989) investigate cross-sectional and inter-temporal determinants that affect the earnings response coefficient (ERC). They find that ERCs are positively correlated with earnings persistence and growth and negatively correlated with risk (beta) and the risk free interest rate. Easton and Zmijewski (1989) also examine the sources of cross-sectional variation in the ERC and find that ERCs are positively correlated with earnings innovations (earnings surprises) and negatively correlated with systematic risk as measured by beta.

Although these studies provide evidence of a role for the discount rate to play in the cross-sectional and inter-temporal variation of ERCs, other studies that investigate the relation between earnings and returns ignore the impact of risk in the coefficient estimate and the explanatory power of the model. Discount rates are assumed to be constant across time and firm. I add to this literature by exploring the impact of controlling for cross-sectional variation in risk in the explanatory power of the earnings-return regression models.

As I have discussed, one stream of research focuses on the factors that explain variation in the extent of the impact of $1 of earnings innovation on stock price. Another stream of research that addresses concerns about the relatively weak link between returns and earnings focuses on identifying factors that might improve the overall explanatory power (R^2) of the earnings-return regression model. For example, Easton and Harris (1991) investigate whether the level of earnings scaled by beginning of period stock price is relevant for evaluating the association between stock returns and earnings. The authors find that both current earnings levels and changes explain returns, and posit the following model of the earnings-return relation.

$$R_{jt} = \gamma_{0t} + \gamma_{1t}\left[\frac{A_{jt}}{P_{jt-1}}\right] + \gamma_{2t}\left[\frac{\Delta A_{jt}}{P_{jt-1}}\right] + \epsilon_{jt} \tag{2}$$

Where P_{jt-1} is stock price per share of firm j for period t-1, A_{jt} is accounting earnings per share of firm j for period t, and ΔA_{jt} is change in accounting earnings per share of firm j for period t.

Easton and Pae (EP 2004) extend the Easton and Harris model by incorporating accounting conservatism as an additional factor in the relation. EP argue that two forms of accounting conservatism exist that potentially affect the relation. One form is related to accounting rules, choices, and procedures that may lead to an understatement of book values and accounting earnings (e.g. an aggressive depreciation policy). The second form arises because the future benefits of current year cash investments in positive net present value projects are not reflected in book values and accounting earnings until the associated sales occur in a future period. To control for the effects of both forms of accounting conservatism, EP add changes in cash investments and changes in lagged operating assets to the EH model. They find that both variables play a significant role in the earnings-return regression model and that the explanatory power of the model improves.

Both EH and EP achieve an improvement in the explanatory power of the earnings-return regression model by controlling for cross-sectional variation in factors related to expected future cash flows (i.e. the numerator of the pricing equation (1)). However, neither of these studies considers the impact of cross-sectional variation in risk (i.e. the denominator of the pricing equation (1)). I propose that when the model is estimated in the cross-section, controlling for cross-sectional variation in risk will further enhance the explanatory power of the earnings-return regression model. Accordingly, my hypothesis is:

H_1: The explanatory power of the earnings-return regression equation increases after controlling for cross-sectional variation in risk.

3. Research Design

I examine the effect of controlling for risk on the explanatory power of the earnings-return relation by estimating the earnings-return regression models within portfolios formed based on risk. I expect the average R^2s of the models estimated within risk-based portfolios will exceed those of the models estimated on a pooled basis without regard for variation in risk.

3.1 Earnings-Return Regression Models

I estimate two forms of the earnings-return regression model. The first earnings-return model I estimate, the basic or EH model, includes the level of earnings, changes in current year earnings and current year dividends to capture cross-sectional variation in future cash flows. The second model, the full or EP model, augments the EH model by controlling for cross-sectional variation in earnings conservatism which could systematically impact the link between current and future earnings (i.e. the final link in the conceptual relation between earnings and prices discussed above).

The EH model reflects the assumption that, for most companies, investors' expectations regarding future earnings and cash flows are likely a function of both its book values and earnings. Consistently, EH and EP document that both the level of earnings and the change in earnings incrementally explain cross-sectional variation in returns. Accordingly, the first model I estimate is based on equation (3) below.

$$R_{jt} = \beta_0 + \beta_1 \frac{x_{jt}}{p_{jt-1}} + \beta_2 \frac{\Delta x_{jt}}{p_{jt-1}} + \beta_3 \frac{d_{jt-1}}{p_{jt-1}} + \varepsilon_{jt} \tag{3}$$

Where R_{jt} is annual stock returns, P_{jt-1} is market value of equity, x_{jt} is comprehensive income, Δx_{jt} is change in comprehensive income and d_{jt-1} is sum of cash dividends.

As discussed above, the EP model expands regression equation (3) with proxies for earnings conservatism. Following Easton and Pae (2004), I include the same two proxies to control for variation in accounting conservatism. These variables are the change in cash investments (Δci), and the change in lagged operating assets (Δoa_{t-1}). Accordingly, the second model I estimate is shown in equation (4) below.

$$R_{jt} = \beta_0 + \beta_1 \frac{x_{jt}}{p_{jt-1}} + \beta_2 \frac{\Delta x_{jt}}{p_{jt-1}} + \beta_3 \frac{d_{jt-1}}{p_{jt-1}} + \beta_4 \frac{\Delta ci_{jt}}{p_{jt-1}} + \beta_5 \frac{\Delta oa_{jt-1}}{p_{jt-1}} + \varepsilon_{jt} \tag{4}$$

All variables are defined previously.

3.2 Risk Based Portfolios

I form my risk-based portfolios using several different firm-specific proxies for risk in prior literature. In each case, I assign firms to portfolios in year t based on their portfolio assignment from the prior year (t-1). I employ the prior year ranking to mitigate the concern that my results are induced by the potential circularity that could exist with a contemporaneous allocation of observations to portfolios. This issue arises when I use risk proxies (e.g. r_{DIV} and r_{PEG}) from implied cost of equity capital formulas that depend on current stock price.

I employ several alternative risk proxies in the research design to reduce concerns regarding the sensitivity of my results to the choice of proxy. The risk proxies I employ are: (1) market beta, (2) firm size, (3) earning/price (E/P) ratio, (4) implied cost of equity capital derived from the dividend discount formula (r_{DIV}), and (5) implied cost of equity capital derived from the price-earnings growth model (r_{PEG}). In addition, I form portfolios on the basis of the combination of two risk factors: market beta and firm size. The following paragraphs discuss each of my approaches to forming risk-based portfolios in turn. Throughout my analysis, I assign the least risky firms to decile 1 and the most risky firms to decile 10.

3.3Market Beta Based Portfolios

The Capital Asset Pricing Model (CAPM) indicates that risk is increasing in market beta (Lintner, 1965; Mossin, 1966; Sharpe, 1964). Accordingly, I employ market beta to proxy for risk and allocate firms to deciles based on each firms' market beta computed as of the year prior to the year I estimate the earnings-return regression model. I place firms with the lowest market beta (i.e. the least risky firms) in decile 1 and those with the highest market beta (i.e. the most risky firms) in decile 10. Following prior literature, I use *CRSP* data to estimate market beta using the market model.

3.4 Size Based Portfolios

Berk (1995) argues that the market value of equity and risk are inherently inversely related. If two firms with different risk profiles have the same expected future cash flows, market value of equity will be lower for the riskier firm because its future cash flows are discounted at a higher cost of equity capital. Accordingly, I employ the market value of equity to proxy for risk and allocate firms to deciles based on the natural log of their market value of equity (P_{jt}) at December 31 of the year prior to the year I estimate the earnings-return regression model. I place the firms with the largest market value of equity (i.e. the least risky firms) in decile 1 and those with the smallest market value of equity (i.e. the most risky firms) in decile10. I obtain these data from *COMPUSTAT*.

3.5 E/P Based Portfolios

Prior research suggests that the earnings/price (E/P) ratio is a reasonable proxy for risk. Basu (1983) finds a positive relation between average returns and E/P ratios. Ball (1978) proposes that E/P is a "catch-all" proxy for all unnamed sources of risks. Fama and French (1992) (FF) also use E/P ratio as a risk proxy in their study. Botosan (1997) indicates that the E/P ratio adjusted for growth and dividend payout ratio can be used to estimate cost of equity capital. Under certain assumptions (i.e. zero growth rate and 100% dividend payout ratio) the E/P ratio is identical to the firm's cost of equity capital. The assumptions required to link E/P to risk are often violated, however, and consequently this variable is also used to proxy for other firm characteristics, most notably, growth opportunities. Moreover, prior research argues that the abnormal profits arising from growth opportunities erode as competition enters the market place, such that abnormal earnings derived from growth opportunities are inherently more risky (Beaver, Kettler, & Scholes, 1970).

My inability to distinguish between risk and growth opportunities as captured by the E/P ratio is problematic in the context of my study. Cross-sectional variation in growth opportunities could impact the numerator of the pricing equation (1), not the denominator, which is the effect I intend to focus on. Nonetheless, given the prior use of this variable to proxy for risk, I include it among my set of alternative proxies for risk. The interpretation of the results, whether the increase in the adjusted R^2 when controlling for cross-sectional variation in E/P is due to the numerator or the denominator effect, may be open to debate. I form portfolios based on the lagged ratio of comprehensive earnings (x_t) per share to stock price at the fiscal year end. I allocate firms with the smallest (the least risky) E/P ratio in decile 1 and those with the largest E/P ratio (the most risky) in decile 10.

3.6 Implied Cost of Equity Capital Based Portfolios

I employ two implied cost of equity capital proxies, r_{DIV} and r_{PEG}, based on the findings in Botosan and Plumlee (2005) (BP). BP find that these proxies are consistently and predictably associated with various proxies for firm-specific risk in the manner suggested by finance theory. The procedures I use to estimate r_{DIV} and r_{PEG} mirror those followed by BP. To estimate r_{DIV} I employ the following model:

$$P_0 = \sum_{t=1}^{5} (1 + r_{DIV})^{-t} (dps_t) + (1 + r_{DIV})^{-5} (P_5) \tag{5}$$

Where P_0 is price at time t=0, r_{DIV} is estimated cost of equity capital, dps_t is dividends per share, and P_5 is price at time t=5. I collect dividend forecasts and target price estimates from *Value Line* during the third quarter of the calendar year. I allocate firms to deciles based on their r_{DIV} estimate from the prior year. Since BP show that r_{DIV} is positively correlated with market beta and negatively correlated with firm size I conclude that higher r_{DIV} implies higher risk. I place those with the smallest (largest) r_{DIV} estimates in decile 1 (10). Thus, consistent with the portfolios formed on the basis of my other risk proxies firms with the least (most) risk are placed in portfolio 1 (10)**.**

To estimate my second implied cost of equity capital risk proxy, r_{PEG}, I rely on the PEG ratio method (Easton, 2004; Ohlson & Juettner-Nauroth, 2003). The equation I use is

$$r_{peg} = \sqrt{\frac{eps_2 - eps_1}{P_0}} \tag{6}$$

Where P_0 is price at time t=0, R_{PEG} is estimated cost of equity capital, and dps_t is forecasted earnings per share.

I allocate firms to deciles based on their r_{PEG} estimate from the prior year. I place firms with the smallest r_{PEG} (the least risky) in decile 1 while those with the largest r_{PEG} (the most risky) in decile 10.

3.7 Market Beta/Size Based Portfolios

I also form portfolios based on the combination of market beta and market value of equity because if beta and size capture different aspects of risk the combination of the two risk proxies should provide more explanatory power than if using either proxy alone. I use a two-step process to form the portfolios. First I sort observations into quartiles based on lagged market beta. Next, I divide the data within each quartile into quartiles based on lagged natural log of market value of equity (size). This obtains sixteen "beta/size" based portfolios. Firms with the smallest market beta and largest market value of equity (i.e. the least risky firms) reside in the first portfolio and those with the largest market beta and smallest market value of equity (i.e. the most risky firms) populate the last portfolio. The data sources and computational methods I employ in this analysis are the same as the ones I use to form the market-beta portfolios and size portfolios described previously.

4. Sample Selection and Descriptive Statistics

My sample selection begins with all *CRSP* and *COMPUSTAT* firm-year observations from fiscal years 1988 through 2013 for which I have sufficient data to compute the following items: annual returns (R), comprehensive income (x), dividends (d), cash investments (ci), and operating assets (oa). The definition of these variables is the same as described in the research design section.

My sample selection procedures mirror those found within earnings-return literature. I begin by excluding observations with negative values for book value of equity, forecasted book value, or market value of operating assets. I also exclude utilities (SIC 4900-4999) and financial institutions (SIC 6000-6411) from my analysis. To mitigate the effect of outliers, I delete observations in the top and bottom one percent of the distribution for any one of the following variables: annual returns, earnings levels, changes in earnings, lagged dividends, change in cash investments, and change in lagged operating assets. For each risk proxy sample distribution, I first delete observations in the top and bottom one percent of the lagged value of the proxy in order to mitigate the effect of extreme values. I then merge the individual risk proxy sample with the trimmed *COMPUSTAT* and *CRSP* data to create the sample set I use for my analysis.

The final sample consists of 93,913 firm-year observations with data to form annual returns, earnings, earnings changes, changes in cash investments, and changes in lagged operating assets. Because of data restrictions in estimating my risk proxies, the sample size I use to run the basic and the full annual regression models within the risk portfolios varies depending on the risk proxy used to form the portfolios. For example, I have 70,896 firm-year observations with sufficient data to estimate regressions within portfolios formed on market beta, but only 11,403 observations with the data to estimate regressions within portfolios formed on lagged r_{DIV} and r_{PEG}. The sample size for estimating regressions within portfolios formed on size is 79,708. Finally, I have 77,650 observations when I estimate regressions within portfolios based on earnings/price ratios.

Table 1 provides descriptive statistics that are based on data pooled across years. The values are generally similar to those reported in Easton and Pae (2004). The median market value of equity is \$213.229 million while the mean is \$3103.950 million, suggesting that the mean is skewed by extreme observations. The mean and median annual raw stock returns are 12.7% and 3.7%, respectively, which are in line with prior research. Median net comprehensive income and change in net comprehensive income are 4.0% and 0.5%, respectively, of the beginning market value of equity. Median lagged dividends are zero. The mean and median changes in cash investments are 0.4 % and 0.2%, respectively. The change in operating assets is positive, implying that operating assets are generally increasing.

The mean and median beta estimates are 1.083 and 1.005, respectively, indicating that in general my firms are risky. Median r_{DIV} and r_{PEG} are 14.1 % and 10.9 %, which are close to the range of average cost of equity capital of 11.0% to 14.0% reported in previous research. The mean and median earnings/price ratios are zero and 4.0%, indicating that firms, on average, have positive earnings.

Table 1. Descriptive Statistics for key Variables

Variable	N	Mean	Std Dev	Q1	Median	Q3	Min.	Max.
p_t	93913	3103.950	14826.100	43.114	213.229	1088.54	0.000	508329.450
R_t	93905	0.127	0.623	-0.250	0.037	0.353	-0.949	7.154
x_t	93913	-0.001	0.172	-0.029	0.040	0.078	-2.229	0.704
Δx_t	93913	0.010	0.202	-0.034	0.005	0.038	-1.492	5.279
d_{t-1}	93913	-0.013	0.092	-0.010	0.000	0.022	-1.036	0.507
Δci_t	93913	0.004	0.190	-0.031	0.002	0.041	-2.244	1.775
Δoa_{t-1}	93913	0.039	0.297	-0.020	0.028	0.112	-7.144	2.743
β_{t-1}	70896	1.083	0.763	0.571	1.005	1.510	-1.840	4.784
$size_{t-1}$	79708	5.545	2.257	3.876	5.465	7.071	-1.579	13.139
E/P_{t-1}	77650	0.000	0.167	-0.009	0.040	0.07	-3.925	0.419
r_{DIVt-1}	11403	0.150	0.069	0.102	0.141	0.187	0.012	0.555
r_{PEGt-1}	11403	0.115	0.036	0.091	0.109	0.131	0.035	0.420

Table 2 presents Spearman correlation coefficients among key variables. In Panel A, the correlations between annual realized returns and most independent variables are significant at the 0.05 level or greater. In Panel B, I report the correlation coefficients among various risk proxies. The highest correlation between any two risk proxies is between the two implied cost of equity capitals r_{DIV} and r_{PEG} (coefficient of 0.608). Consistent with BP (2005), the r_{DIV} and r_{PEG} are significantly negatively correlated with size, reflecting the established empirical evidence that size is inversely related to risk. However, in contrast to BP (2005) and others, who observe a significant negative correlation between market beta and firm size, I report a significant positive correlation of 0.019 between the two proxies. This result could suggest (1) that market beta and size capture some common underlying risks of the firm, and (2) that the measurement of beta or size is noisy.

Inconsistent with earlier studies, market beta is insignificantly correlated with the implied cost of equity capitals r_{DIV} and r_{PEG}. E/P ratio is negatively correlated to market beta (coefficient of -0.038) and r_{PEG} (coefficient of -0.141). E/P is negatively correlated with r_{DIV} but the correlation is not significant. Moreover, size is significantly positively correlated with E/P (coefficient of 0.172) when I expect to see a negative correlation between the two proxies if E/P is a proxy for risk as suggested in prior literature. These results could suggest that E/P ratio is an inverse measure of risk, i.e., the higher the E/P ratio, the lower the risk, which is contradictive to some previous studies (Basu1983; Ball 1978; Fama and French 1992), but is in line with Penman (1993) who proposes that the E/P ratio is not a good proxy for cost of capital. If E/P is an inverse measure of risk, then P/E, the price to earnings ratio, could be a measure of risk related to growth as suggested in previous studies.

In Panel C of Table 2, I report the Spearman correlation coefficients among realized returns and risk proxies. Contrary to prior research, returns are negatively correlated with market beta (coefficient of -0.020) and are positively correlated with size (coefficient of 0.040). As expected, returns and r_{PEG} are positively correlated while the correlation between returns and r_{DIV} are insignificant. Finally, although returns and E/P are positively correlated as indicated in Basu (1983) and Ball (1978), the positive correlation is unexpected given the negative correlation between E/P and beta and the positive correlation between E/P and size (assuming beta and size are reasonable proxies for risks as suggested in prior literature).

In sum, the results in Table 2 reflect three major contradictions between my results and previous studies. First, market beta and size should not be positively correlated. Second, returns and size should not be positively correlated. My best interpretation for these two findings in my study is that my measurement of the constructs is noisy. Because of the problems with beta and size, I cannot conclude whether the relationship among these two proxies and other risk measurements, i.e., the positive correlation between size and E/P, is consistent with prior studies. As for the negative correlation between returns and beta, the third concern of my findings, I propose that it is because realized returns are not good proxies for expected returns (Elton, 1999). Lakonishok (1993) concludes that it would take 60 years of realized returns for all the firms in the market to have sufficient statistical power to prove that market beta is a priced risk factor.

Table 2. Spearman Correlation Coefficients among Annualized Returns, Various Explanatory Variables, and Risk Proxies

Panel A: Correlations amount Return and Explanatory Variables

Variables	R_t	x_t	Δx_t	d_{t-1}	Δci_t	Δoa_{t-1}
R_t		0.405	0.341	0.128	0.089	-0.075
x_t			0.492	0.271	0.107	0.063
Δx_t				-0.020	**0.002**	-0.191
d_{t-1}					-0.029	-0.103
Δci_t						-0.201
Δoa_{t-1}						

Panel B: Correlations among Risk Proxies

Variables	β_{t-1}	$size_{t-1}$	E/P_{t-1}	r_{DIVt-1}	r_{PEGt-1}
β_{t-1}		0.019	-0.038	**0.000**	**0.015**
$size_{t-1}$			0.172	-0.249	-0.393
E/P_{t-1}				**-0.002**	-0.141
r_{DIVt-1}					0.608
r_{PEGt-1}					

Panel C: Correlations among Return and Risk Proxies

Variables	R_t	β_{t-1}	$size_{t-1}$	E/P_{t-1}	r_{DIVt-1}	r_{PEGt-1}
R_t		-0.020	0.040	0.109	**-0.007**	0.020
β_{t-1}			0.019	-0.038	**0.000**	**0.015**
$size_{t-1}$				0.172	-0.249	-0.393
E/P_{t-1}					**-0.002**	-0.141
r_{DIVt-1}						0.608
r_{PEGt-1}						

Note. The non-bold-faced values are statistically significant at 0.05 level.

5. Empirical Results

I present the empirical results in Table 3 to Table 8. In Panel A of each table, I present the results of regression (3), the basic model, within deciles or portfolios formed on various risk proxies. The first highlighted row of Panel A of each table (labeled Average) reports the average coefficient values and the Fama-MacBeth adjusted t-statistics of the 10 deciles. For comparison, I estimate annual regressions of the same model without sorting into deciles. Values reported at the bottom of the panel labeled EH are the average coefficient values and the Fama-MacBeth adjusted t-statistics from the annual regressions. For each table from Table 3 to Table 7, I also provide the average coefficient values and the Fama-MacBeth t-statistics from the annual regressions within each decile. For brevity, in Panel A and B of Table 8, I only report the average coefficient values and the Fama-MacBeth t-statistics of the portfolios formed on the combination of beta and size.

In Panel B of each table from Table 3 to Table 8, I report the results of regression (4), my full model, within deciles or portfolios formed on various risk proxies. As in Panel A, the first highlighted row labeled Average presents the average coefficient values and the Fama-MacBeth adjusted t-statistics of the 10 deciles. To compare with prior study, I estimate annual regressions of the same model with the same observations but without sorting data into portfolios. Values presented at the bottom of the panel where it is labeled EP are the average coefficient values and the Fama-MacBeth adjusted t-statistics from the annual regressions of the Easton and Pae model. For Table 3 to Table 7, I also report the average coefficient estimates and the Fama-MacBeth t-statistics from the regressions within each decile.

In general I find improved explanatory power of the basic and the full model when sorting observations into portfolios. In most of the regressions except when portfolios are sorted on E/P ratio, earnings levels are related to returns and the coefficients of earnings for the portfolio regressions are larger than those from the comparison models without sorting data, while changes in earnings are related to returns only in some of the regressions (i.e., when portfolios are formed on beta and size). Dividends are not value relevant in all situations in my study. Different from Easton and Pae, who document positive correlations between realized returns and changes in cash investments, the proxy for accounting conservatism, I document weak correlation between the two variables in regressions within risk portfolios. The result may suggest that changes in cash investments are correlated with risk so once I control for risk the variable loses its explanatory power.

5.1 The Impact of Controlling for Beta

Table 3 Panel A presents the results of regression (3), the basic model, within deciles formed on lagged market beta. Consistent with my expectations, I find increased explanatory power of the basic model (R^2) when I control for beta. The average adjusted R^2 of the regressions sorted by beta risk is 11.6% versus 10.9% when no sorting is done, an increase in explanatory power of almost 7%. I document no evidence of a monotonic relation between the magnitude of the risk proxies and the improved explanatory power: the highest adjusted R^2s are in deciles 2 and 1 and the lowest adjusted R^2s are in deciles 4 and 10.

The average coefficient on earnings (coefficient of 0.741) when the regression is estimated within risk portfolios is greater than when no sorting is done (coefficient of 0.704). Similarly, the average coefficient of earnings changes (coefficient of 0.533) in the risk sorted portfolios is larger than when no sorting is done (coefficient of 0.521) and it is significant. In both the sorted and non-sorted cases dividends do not provide significant explanatory power.

In examining the coefficient estimates on earnings and earnings changes across deciles, I note that the average magnitude of the coefficient on earnings (β_1) and changes in earnings (β_2) is similar between the less risky firms (deciles 1-5) and the more risky firms (deciles 6-10). This finding may suggest that the marker puts equal weight on earnings once controlling for risk in explaining the returns-earnings relation.

Panel B of Table 3 presents the results from regression (4), the full model, for each of the years from 1988 to 2013 within the risk portfolios formed on lagged beta. Similar to those in Panel A, the impact of controlling for risk on the explanatory power of the earnings–return relation is clear. The average adjusted R^2 of the 10 deciles is 12.4% compared with 11.5% for the same model without sorting into beta portfolios, an increase in the explanatory power of about 8.0%. Again, contrary to my expectation, I do not see proof of monotonic increase in adjusted R^2 in the magnitude of the risk proxy.

I observe that coefficients on earnings are significantly different from zero while coefficients on dividends and changes in lagged operating assets are not. It is interesting to note that the coefficients on changes in cash investments are weakly significant in 9 out of 10 deciles and the average coefficient on cash investments across the portfolios is significantly different from zero.

5.2 The Impact of Controlling for Size

Table 4 presents the results of annual regressions of equations (3) and (4) for each of the years from 1988 to 2013 estimated within portfolios formed on size as well as results of the EH and EP models with the same observations but without sorting observations into deciles. The results are very similar to those in Table 3. In Panel A, the average adjusted R^2 for the portfolio regressions is 11.9% versus 10.8% for EH model when no sorting is done. The average coefficients of earnings of 0.948 is larger than the average coefficient of earnings of 0.674 for the EH model. Different than results in Panel A of Table 3, the average coefficients of earnings for lower risk deciles (β_1) are larger than those for the higher risk deciles while the average coefficients of changes in earnings (β_2) do not vary monotonically with the magnitude of the risk proxy of size. It is noted that the average coefficient of changes in earnings of 0.479 is significant, suggesting that changes in earnings are also value relevant when the market evaluates firms by their size.

In Panel B, the mean adjusted R^2 of the regression estimates of equation (4) across the 10 portfolios is 12.7 % versus 11.4 % for the Easton and Pae model which does not incorporate the variation in risk across firms, an increase of about 12% in the explanatory power of the model. Unlike when portfolios are sorted by the beta risk proxy, the coefficients on changes in cash investments are insignificant in 4 out of 10 portfolios but it remains significant on average (t-stat of 2.28).

The similar results in Table 3 and Table 4 echo the positive correlation of 10.3% between market beta and size reported in Table 2, Panel B. Although it is contradictive to prior studies, the two risk proxies seem to capture some common underlying risks of the firms in the paper.

Table 3. Results of Year-by-Year Regressions Estimated within Portfolios Formed on Beta

Panel A: $R_{jt} = \beta_0 + \beta_1 \frac{x_{jt}}{p_{jt-1}} + \beta_2 \frac{\Delta x_{jt}}{p_{jt-1}} + \beta_3 \frac{d_{jt-1}}{p_{jt-1}} + \varepsilon_{jt}$

Decile	Avg. β_{t-1}	n	β_0	t-stat	β_1	t-stat	β_2	t-stat	β_3	t-stat	Adj. R^2
1	-0.057	7079	0.119	(3.94***)	0.781	(7.74***)	0.603	(5.79***)	0.016	-0.12	0.125
2	0.358	7092	0.109	(3.68***)	0.690	(5.79***)	0.671	(6.59***)	0.230	(2.04**)	0.130
3	0.574	7091	0.112	(3.87***)	0.778	(9.51***)	0.502	(5.91***)	0.151	(1.12*)	0.113
4	0.752	7091	0.110	(3.53***)	0.564	(5.76***)	0.599	(6.35***)	0.067	-0.52	0.107
5	0.917	7089	0.113	(3.74***)	0.734	(6.07***)	0.506	(6.36***)	0.060	-0.38	0.125
6	1.086	7097	0.113	(3.62***)	0.735	(6.83***)	0.501	(5.85***)	-0.086	(-0.89)	0.112
7	1.275	7093	0.125	(3.99***)	0.698	(6.43***)	0.580	(6.68***)	-0.104	(-0.77)	0.120
8	1.510	7089	0.117	(3.80***)	0.867	(8.18***)	0.483	(5.94***)	-0.016	(-0.15)	0.117
9	1.854	7094	0.117	(3.40***)	0.816	(12.47***)	0.441	(4.53***)	0.034	-0.23	0.120
10	2.557	7081	0.121	(3.56***)	0.743	(8.77***)	0.440	(6.25***)	0.033	-0.20	0.104
Average	1.083	70896	0.116	(3.71+)	0.741	(7.76+)	0.533	(6.02+)	0.039	-0.28	0.116
EH		70896	0.118	(3.85+)	0.704	(10.15+)	0.521	(8.71+)	0.033	-0.43	0.109

Panel B: $R_{jt} = \beta_0 + \beta_1 \frac{x_{jt}}{p_{jt-1}} + \beta_2 \frac{\Delta x_{jt}}{p_{jt-1}} + \beta_3 \frac{d_{jt-1}}{p_{jt-1}} + \beta_4 \frac{\Delta ci_{jt}}{p_{jt-1}} + \beta_5 \frac{\Delta oa_{jt-1}}{p_{jt-1}} + \varepsilon_{jt}$

Decile	Avg. β_{t-1}	n	β_0	t-stat	β_1	t-stat	β_2	t-stat	β_3	t-stat	β_4	t-stat	β_5	t-stat	Adj. R^2
1	-0.057	7079	0.119	(4.03***)	0.845	(8.18***)	0.539	(4.93***)	-0.021	(-0.15)	0.178	(3.16***)	-0.145	(-3.65***)	0.134
2	0.358	7092	0.105	(3.62***)	0.675	(5.45***)	0.687	(6.15***)	0.266	(2.31**)	0.158	(3.80***)	0.008	-0.31	0.131
3	0.574	7091	0.115	(4.04***)	0.828	(9.86***)	0.436	(4.43***)	0.094	-0.73	0.139	(2.93***)	-0.112	(-3.32***)	0.118
4	0.752	7091	0.109	(3.46***)	0.561	(5.47***)	0.593	(6.25***)	0.090	-0.68	0.140	(2.60*)	-0.029	(-0.70)	0.107
5	0.917	7089	0.113	(3.72***)	0.675	(5.68***)	0.568	(5.41***)	0.083	-0.56	0.089	(1.42*)	0.045	-0.63	0.137
6	1.086	7097	0.112	(3.67***)	0.764	(7.42***)	0.459	(4.92***)	-0.115	(-1.17)	0.137	(2.61*)	-0.065	(-2.01**)	0.118
7	1.275	7093	0.119	(3.91***)	0.641	(5.66***)	0.646	(6.80***)	-0.089	(-0.69)	0.142	(3.25***)	0.073	(1.33*)	0.126
8	1.510	7089	0.117	(3.76***)	0.850	(7.56***)	0.511	(5.73***)	-0.032	(-0.29)	0.103	(1.65*)	0.002	-0.04	0.123
9	1.854	7094	0.114	(3.36***)	0.766	(10.40***)	0.496	(4.66***)	0.070	-0.47	0.164	(2.49**)	0.032	-0.94	0.128
10	2.557	7081	0.119	(3.59***)	0.768	(8.18***)	0.418	(5.35***)	0.015	-0.09	0.090	-1.28	-0.079	(-1.79*)	0.115
Average	1.083	70896	0.114	(3.72+)	0.737	(7.39+)	0.535	(5.46+)	0.036	-0.25	0.134	(2.52+)	-0.091	-1.33	0.124
EP		70896	0.117	(3.89+)	0.699	(10.21+)	0.521	(7.85+)	0.030	-0.41	0.132	(3.79+)	-0.025	(-1.15)	0.115

Note: *(**)[***] Significant at or below the 0.05 (0.01) [0.001] level. + More than two standard deviations from zero.

Table 4. Results of Year-by-Year Regressions Estimated within Portfolios Formed on Size

Panel A: $R_t = \beta_0 + \beta_1 \frac{x_{jt}}{p_{jt-1}} + \beta_2 \frac{\Delta x_{jt}}{p_{jt-1}} + \beta_3 \frac{d_{jt-1}}{p_{jt-1}} + \varepsilon_{jt}$

Decile	Avg. $Size_{t-1}$	n	β_0	t-stat	β_1	t-stat	β_2	t-stat	β_3	t-stat	Adj. R^2
1	9.486	7961	0.048	(1.71*)	1.070	(6.11***)	0.315	(2.99***)	0.222	-1.36	0.088
2	7.810	7975	0.062	(1.87*)	1.137	(5.53***)	0.369	(2.95***)	0.187	-1.25	0.113
3	6.914	7972	0.065	(2.43**)	1.147	(8.72***)	0.509	(4.22***)	0.073	-0.58	0.111
4	6.267	7976	0.076	(2.46**)	1.139	(8.64***)	0.471	(4.35***)	0.323	(3.68***)	0.130
5	5.702	7977	0.085	(2.82***)	1.133	(10.36***)	0.602	(6.06***)	0.076	-0.81	0.132
6	5.162	7967	0.099	(2.96***)	0.997	(7.33***)	0.576	(4.22***)	0.053	-0.58	0.135
7	4.615	7973	0.122	(3.50***)	0.826	(7.01***)	0.521	(5.22***)	0.110	-0.78	0.126
8	4.020	7974	0.137	(3.77***)	0.764	(9.12***)	0.541	(5.76***)	-0.121	(-1.01)	0.123
9	3.310	7973	0.169	(4.04***)	0.697	(7.17***)	0.513	(7.37***)	-0.066	(-0.40)	0.120
10	2.163	7960	0.210	(4.88***)	0.593	(9.55***)	0.376	(7.07***)	-0.080	(-0.45)	0.111
Average	5.545	79708	0.108	(3.04+)	0.950	(7.95+)	0.479	(5.02+)	0.078	-0.72	0.119
EH		79708	0.118	(3.69+)	0.687	(9.78+)	0.526	(9.37+)	0.041	-0.55	0.108

Panel B: $R_{jt} = \beta_0 + \beta_1$ x_{jt} $+ \beta_2$ Δx_{jt} $+ \beta_3$ d_{jt-1} $+ \beta_4$ Δci_{jt} $+ \beta_5$ Δoa_{jt-1} $+ \varepsilon_{jt}$

		p_{jt-1}		p_{jt-1}		p_{jt-1}		p_{jt-1}		p_{jt-1}					
Decile	Avg. Size$_{t-1}$	n	β_0	t-stat	β_1	t-stat	β_2	t-stat	β_3	t-stat	β_4	t-stat	β_5	t-stat	Adj. R^2
1	9.486	7961	0.047	(1.68*)	1.136	(6.86***)	0.251	(2.30**)	0.172	-1.04	0.008	-0.12	-0.090	(-1.53)	0.097
2	7.810	7975	0.063	(1.97*)	1.118	(5.50***)	0.389	(2.67**)	0.162	-1.10	0.027	-0.56	-0.013	(-0.29)	0.123
3	6.914	7972	0.063	(2.48**)	1.211	(10.20***)	0.497	(4.36***)	0.052	-0.40	-0.005	(-0.06)	-0.069	(-1.47)	0.126
4	6.267	7976	0.074	(2.49**)	1.155	(8.94***)	0.470	(3.71***)	0.325	(3.65***)	0.117	(2.21**)	-0.042	(-1.30)	0.136
5	5.702	7977	0.082	(2.82***)	1.099	(10.64***)	0.646	(5.44***)	0.090	-1.01	0.150	(1.96*)	-0.002	(-0.04)	0.142
6	5.162	7967	0.097	(2.97***)	0.974	(6.93***)	0.599	(4.14***)	0.078	-0.82	0.112	(2.08*)	0.006	-0.20	0.139
7	4.615	7973	0.121	(3.48***)	0.787	(6.88***)	0.559	(5.21***)	0.116	-0.87	0.151	(2.98***)	0.025	-0.52	0.133
8	4.020	7974	0.138	(3.80***)	0.771	(8.59***)	0.534	(4.59***)	-0.131	(-1.09)	0.133	(1.89*)	-0.046	(-0.89)	0.130
9	3.310	7973	0.168	(4.02***)	0.653	(6.75***)	0.569	(6.84***)	-0.038	(-0.24)	0.267	(6.32***)	0.004	-0.10	0.129
10	2.163	7960	0.207	(4.87***)	0.571	(8.39***)	0.397	(6.73***)	-0.065	(-0.35)	0.260	(4.74***)	-0.010	(-0.30)	0.119
Average	5.545	79708	0.106	(3.06+)	0.948	(7.97+)	0.491	(4.60+)	0.076	-0.72	0.122	(2.28+)	-0.024	(-0.50)	0.127
EP		79708	0.117	(3.73+)	0.674	(9.65+)	0.534	(8.50+)	0.044	-0.64	0.151	(4.41+)	-0.018	(-0.81)	0.114

Note: *(**)[***] Significant at or below the 0.05 (0.01) [0.001] level. + More than two standard deviations from zero

5.3 The Impact of Controlling for the Earnings to Price (E/P) Ratio

Table 5 reports the results of annual regressions of equations (3) and (4) for each of the years from 1988 to 2013 within portfolios formed on the ratio of comprehensive earnings (x_t) per share to fiscal year end price (p_t). In Panel A, the results suggest that the portfolio model fits much better than the pooled annual regression model of Easton and Harris. The mean adjusted R^2 increases to 12.5 % for the portfolio regressions from 11.1%, an increase in explanatory power of about 13.0%. In Panel B, I see similar results. The average adjusted R^2 for the portfolio regression is 13.4 % versus 11.7% for the pooled Easton and Pae model, suggesting a 15.0 % increase in explanatory power. Further, the adjusted R^2 in both panels generally increases as the magnitude of the risk proxy increases from decile 1 to decile10, suggesting that the impact of controlling for E/P on the explanatory power of the model is positively correlated with the magnitude of E/P.

Two interesting findings are worthy of mention. First, unlike when portfolios are formed based on beta and size, the average intercepts for the 10 deciles with both the basic and the full model become insignificant. Second, the coefficients of earnings are only significant in 5 out of 10 deciles in Panel A and Panel B. These results suggest that earnings become less value relevant when controlling for cross-sectional variation in E/P.

Table 5. Results of Year-by-Year regressions estimated within portfolios formed on E/P ratio

Panel A: $R_{jt} = \beta_0 + \beta_1 \frac{x_{jt}}{p_{jt-1}} + \beta_2 \frac{\Delta x_{jt}}{p_{jt-1}} + \beta_3 \frac{d_{jt-1}}{p_{jt-1}} + \varepsilon_{jt}$

Decile	Avg. E/P$_{t-1}$	n	β_0	t-stat	β_1	t-stat	β_2	t-stat	β_3	t-stat	Adj. R^2
1	-0.355	7756	0.134	(2.71***)	0.313	(5.70***)	0.402	(5.46***)	-0.016	(-0.16)	0.084
2	-0.082	7767	0.078	(1.99**)	0.456	(1.52*)	0.800	(2.95***)	-0.139	(-1.12)	0.098
3	-0.014	7765	0.095	(2.57***)	0.769	-1.21	0.640	-0.96	0.179	(1.70*)	0.098
4	0.017	7767	0.074	(1.48*)	1.112	-0.86	0.452	-0.37	0.181	(1.63*)	0.110
5	0.034	7761	0.097	(2.02**)	0.198	-0.18	1.796	(1.60*)	0.103	-1.00	0.109
6	0.046	7775	0.074	-0.84	0.860	-0.46	1.090	-0.58	0.323	(3.59***)	0.130
7	0.058	7769	0.157	(1.97**)	-0.784	(-0.58)	2.877	(2.13*)	0.132	-1.33	0.131
8	0.071	7764	-0.026	(-0.20)	2.929	(1.56*)	-0.885	(-0.50)	0.036	-0.33	0.145
9	0.089	7768	0.044	-0.65	1.873	(2.30**)	0.261	-0.33	-0.065	(-0.56)	0.173
10	0.136	7758	0.081	(2.27**)	1.713	(6.96***)	-0.064	(-0.29)	-0.085	(-0.61)	0.168
Average	0.000	77650	0.081	-1.63	0.944	-2.02	0.737	-1.36	0.065	-0.71	0.125
EH		77650	0.116	(3.68+)	0.652	(8.38+)	0.603	(8.74+)	0.055	-0.78	0.111

Panel B: $R_{jt} = \beta_0 + \beta_1 \frac{x_{jt}}{p_{jt-1}} + \beta_2 \frac{\Delta x_{jt}}{p_{jt-1}} + \beta_3 \frac{d_{jt-1}}{p_{jt-1}} + \beta_4 \frac{\Delta ci_{jt}}{p_{jt-1}} + \beta_5 \frac{\Delta oa_{jt-1}}{p_{jt-1}} + \varepsilon_{jt}$

Decile	Avg. E/P$_{t-1}$	n	β_0	t-stat	β_1	t-stat	β_2	t-stat	β_3	t-stat	β_4	t-stat	β_5	t-stat	Adj. R^2
1	-0.355	7756	0.134	(2.70***)	0.270	(4.97***)	0.459	(6.18***)	0.027	-0.28	0.226	(4.52***)	0.044	(1.43*)	0.090
2	-0.082	7767	0.078	(1.94**)	0.462	(1.56*)	0.800	(3.05***)	-0.108	(-0.94)	0.174	(1.87**)	0.009	-0.17	0.109
3	-0.014	7765	0.093	(2.58***)	0.647	-1.02	0.763	-1.14	0.221	(2.25**)	0.197	(3.26***)	-0.001	(-0.02)	0.107

4	0.017	7767	0.075	(1.50*)	1.060	-0.82	0.497	-0.41	0.153	(1.46*)	0.124	(2.14**)	-0.054	(-0.92)	0.118
5	0.034	7761	0.100	(1.98**)	0.152	-0.14	1.845	(1.64*)	0.071	-0.67	0.161	(2.08**)	-0.080	(-1.31)	0.117
6	0.046	7775	0.048	-0.58	1.403	-0.79	0.574	-0.32	0.298	(3.33***)	0.092	(1.93**)	-0.177	(-2.88***)	0.140
7	0.058	7769	0.161	(2.02**)	-0.904	(-0.65)	3.007	(2.16**)	0.148	(1.51*)	0.158	(2.31**)	0.012	-0.22	0.140
8	0.071	7764	-0.035	(-0.30)	3.163	(1.89**)	-1.025	(-0.62)	-0.027	(-0.26)	0.033	-0.44	-0.167	(-3.15***)	0.159
9	0.089	7768	0.045	-0.65	1.880	(2.34**)	0.253	-0.32	-0.055	(-0.47)	0.106	(2.23**)	-0.063	(-1.27)	0.180
10	0.136	7758	0.083	(2.26**)	1.728	(7.23***)	-0.090	(-0.41)	-0.148	(-1.10)	0.053	(1.43*)	-0.072	(-1.78**)	0.179
Average	0.000	77650	0.078	-1.59	0.986	-2.01	0.708	-1.42	0.058	-0.67	0.132	-2.22	-0.055	-0.61	0.134
EP		77650	0.115	(3.72+)	0.637	(8.26+)	0.612	(8.11+)	0.059	-0.90	0.154	(4.66+)	-0.018	(-0.79)	0.117

Note: *(**)[***] Significant at or below the 0.05 (0.01) [0.001] level. + More than two standard deviations from zero

5.4 The Impact of Controlling for Implied Cost of Equity Capital

Table 6 and 7 report the results of annual regressions of equations (3) and (4) for each of the years from 1993 to 2004 within portfolios formed on r_{DIV} and r_{PEG}. The impact of controlling for risk is most evident when regressions are estimated within portfolios formed on r_{DIV}. In Panel A, the average adjusted R^2 of the regressions estimated within portfolios formed on r_{DIV} (r_{PEG}) is 12.3 % (11.8%) versus 9.7% (9.7%) when regressions are estimated without sorting observations into decile. In Panel B of both tables, the adjusted R^2 for the portfolios regressions are also higher than those for the pooled EP regressions. It is noted that in Panel B of Table 6, the adjusted R^2 for the portfolio regressions increases to 13.0% from 10.0% for the EP model, an increase of 30% in the explanatory power.

Both earnings and earnings changes are significant explanatory variables in the earnings-return relation when regressions are estimated within portfolios formed on r_{DIV}, but the coefficient on earnings changes is not significantly different from zero when observations are sorted into deciles based on r_{PEG} (Panel A&B of Table 7). This result is consistent with the results in Table 5, where portfolios are formed on E/P ratio, because r_{PEG} captures risks associated with earnings growth (BP 2005) and E/P ratio could also capture risks related to growth. However, if both r_{PEG} and E/P ratio are reasonable proxies for risks associated with growth, it would be difficult to explain why r_{PEG} and E/P are negatively correlated as reported in Panel B of Table 2.

In Panel A and B of both Table 6 and 7, the average coefficients of earnings (β_1) are larger than those for the EH and EP regressions. In addition, the average coefficients of earnings for firms in the lower risk decile (decile 1 -6) are generally larger than those in the higher risk deciles (deciles 7-10). These results suggest that earnings are more value relevant when controlling for cross-sectional variation in risk, and that the market put more weight on earnings levels for firms with lower risk than firms with higher risk.

Table 6. Results of Year-by-Year regressions estimated within portfolios formed on rDIV

Panel A: $R_{jt} = \beta_0 + \beta_1 \dfrac{x_{jt}}{p_{jt-1}} + \beta_2 \dfrac{\Delta x_{jt}}{p_{jt-1}} + \beta_3 \dfrac{d_{jt-1}}{p_{jt-1}} + \varepsilon_{jt}$

Decile	Avg. r_{DIVt-1}	n	β_0	t-stat	β_1	t-stat	β_2	t-stat	β_3	t-stat	Adj. R^2
1	0.054	1135	0.135	(2.61**)	0.670	-0.61	1.511	(1.49*)	-0.119	(-0.28)	0.090
2	0.084	1140	0.055	(1.80**)	1.637	(4.53***)	0.515	-1.31	0.005	-0.02	0.123
3	0.104	1142	0.056	(1.96**)	1.537	(3.66***)	0.723	(1.76*)	0.030	-0.06	0.157
4	0.120	1143	0.081	(3.46***)	1.372	(8.88***)	0.601	(2.87***)	-0.015	(-0.06)	0.111
5	0.135	1140	0.095	(2.95***)	0.976	(2.74***)	0.976	(3.11***)	0.188	-0.60	0.118
6	0.151	1141	0.045	(1.48*)	2.228	(6.73***)	0.176	-0.65	0.071	-0.23	0.137
7	0.167	1144	0.137	(3.44***)	0.406	-1.22	0.988	(3.05***)	-0.026	(-0.08)	0.105
8	0.187	1139	0.075	(2.09**)	1.273	(2.70***)	0.677	(2.42**)	-0.288	(-1.20)	0.151
9	0.215	1144	0.081	(1.93**)	1.289	(3.93***)	0.327	-1.25	0.311	-0.84	0.143
10	0.280	1135	0.091	(1.85**)	1.014	(4.64***)	0.287	(2.76***)	-0.097	(-0.46)	0.096
Average	0.150	11403	0.085	(2.36+)	1.240	(3.96+)	0.678	2.067	0.006	-0.033	0.123
EH		11403	0.099	(3.54+)	1.065	(6.68+)	0.481	(4.31+)	-0.024	-0.142	0.097

Panel B: $R_{jt} = \beta_0 + \beta_1 \dfrac{x_{jt}}{p_{jt-1}} + \beta_2 \dfrac{\Delta x_{jt}}{p_{jt-1}} + \beta_3 \dfrac{d_{jt-1}}{p_{jt-1}} + \beta_4 \dfrac{\Delta ci_{jt}}{p_{jt-1}} + \beta_5 \dfrac{\Delta oa_{jt-1}}{p_{jt-1}} + \varepsilon_{jt}$

Decile	Avg. r_{DIVt-1}	n	β_0	t-stat	β_1	t-stat	β_2	t-stat	β_3	t-stat	β_4	t-stat	β_5	t-stat	Adj. R^2
1	0.054	1135	0.135	(2.51**)	0.346	-0.24	1.673	(1.44*)	0.177	-0.26	0.351	-1.12	0.146	-0.65	0.104

2	0.084	1140	0.061	(1.97**)	1.766	(4.84***)	0.344	-0.79	-0.197	(-0.75)	0.005	-0.06	-0.227	(-2.14**)	0.127
3	0.104	1142	0.051	-1.61	1.700	(4.17***)	0.722	(2.10**)	-0.073	(-0.15)	0.186	(1.42*)	-0.028	(-0.22)	0.170
4	0.120	1143	0.076	(3.18***)	1.445	(9.64***)	0.593	(2.81***)	-0.037	(-0.12)	0.096	-1.25	0.032	-0.35	0.108
5	0.135	1140	0.094	-2.76	0.929	(2.48**)	0.967	(3.23***)	0.195	-0.52	0.179	(2.30**)	0.013	-0.11	0.130
6	0.151	1141	0.064	(2.44**)	2.158	(5.97***)	0.204	-0.60	0.002	0.00	0.152	(1.80**)	-0.152	(-1.02)	0.145
7	0.167	1144	0.134	(3.46***)	0.516	(1.54*)	0.891	(2.41**)	-0.150	(-0.46)	-0.025	(-0.24)	-0.074	(-0.74)	0.106
8	0.187	1139	0.074	(2.04**)	1.434	(3.06***)	0.578	(1.88**)	-0.293	(-1.29)	-0.087	(-0.68)	-0.118	(-1.30)	0.157
9	0.215	1144	0.083	(1.93**)	1.400	(4.59***)	0.165	-0.63	0.373	-0.98	0.009	-0.08	-0.189	(-2.07**)	0.155
10	0.280	1135	0.084	(1.75*)	0.903	(4.65***)	0.382	(3.62***)	-0.040	(-0.18)	0.201	(1.80**)	0.136	(1.99**)	0.104
Average	0.150	11403	0.086	(2.37+)	1.299	(4.12+)	0.682	-1.950	0.000	(-0.12)	0.096	-0.89	-0.066	-0.40	0.130
EP		11403	0.102	(3.66+)	1.066	(6.91+)	0.462	(3.87+)	-0.054	(-0.32)	0.098	(2.61+)	-0.045	(-1.63)	0.100

Note: *(**)[***] Significant at or below the 0.05 (0.01) [0.001] level. + More than two standard deviations from zero

Table 7. Results of Year-by-Year Regressions Estimated within Portfolios Formed on rPEG

Panel A: $R_{jt} = \beta_0 + \beta_1 \frac{x_{jt}}{p_{jt-1}} + \beta_2 \frac{\Delta x_{jt}}{p_{jt-1}} + \beta_3 \frac{d_{jt-1}}{p_{jt-1}} + \varepsilon_{jt}$

Decile	Avg. r_{PEGt-1}	n	β_0	t-stat	β_1	t-stat	β_2	t-stat	β_3	t-stat	Adj. R^2
1	0.069	1136	-0.001	(-0.02)	2.871	(3.64***)	-0.023	(-0.04)	-0.896	(-1.77*)	0.162
2	0.084	1145	0.022	-0.54	2.086	(4.29***)	0.202	-0.56	0.102	-0.33	0.121
3	0.092	1136	0.080	(3.71***)	1.687	(5.43***)	0.467	(1.51*)	-0.289	(-0.78)	0.085
4	0.099	1145	0.084	(1.84**)	1.249	(1.92**)	0.159	-0.29	0.142	-0.42	0.081
5	0.106	1133	0.014	-0.49	2.602	(6.32***)	-0.480	(-1.12)	0.094	-0.26	0.127
6	0.113	1145	0.084	(2.40**)	1.498	(2.42**)	1.162	(1.82**)	-0.521	(-1.50*)	0.146
7	0.121	1142	0.066	(2.31**)	1.704	(6.19***)	0.367	-1.60	0.028	-0.08	0.126
8	0.131	1142	0.102	(3.34***)	1.049	(3.77***)	0.814	(2.58**)	0.390	(1.47*)	0.108
9	0.147	1149	0.114	(3.32***)	0.854	(3.87***)	0.48	(2.99***)	0.058	-0.21	0.097
10	0.188	1130	0.150	(2.68***)	0.617	(4.29***)	0.462	(3.46***)	0.198	-0.66	0.130
Average	0.115	11403	0.071	-2.06	1.622	(4.21+)	0.361	-1.36	-0.069	-0.59	0.118
EH		11403	0.099	(3.54+)	1.065	(6.68+)	0.481	(4.31+)	-0.024	(-0.14)	0.097

Panel B: $R_{jt} = \beta_0 + \beta_1 \frac{x_{jt}}{p_{jt-1}} + \beta_2 \frac{\Delta x_{jt}}{p_{jt-1}} + \beta_3 \frac{d_{jt-1}}{p_{jt-1}} + \beta_4 \frac{\Delta ci_{jt}}{p_{jt-1}} + \beta_5 \frac{\Delta oa_{jt-1}}{p_{jt-1}} + \varepsilon_{jt}$

Decile	Avg. r_{PEGt1}	n	β_0	t-stat	β_1	t-stat	β_2	t-stat	β_3	t-stat	β_4	t-stat	β_5	t-stat	Adj. R^2
1	0.069	1136	0.011	-0.30	2.366	(4.66***)	0.324	-0.75	-0.697	(-1.57*)	0.289	(1.37*)	0.099	-0.89	0.173
2	0.084	1145	0.018	-0.43	2.404	(5.45***)	0.017	-0.05	-0.068	(-0.23)	-0.051	(-0.37)	-0.099	(-0.89)	0.118
3	0.092	1136	0.087	(3.70***)	2.095	(5.15***)	0.104	-0.31	-0.696	(-1.66*)	-0.133	(-0.88)	-0.400	(-3.36**)	0.101
4	0.099	1145	0.089	(1.94**)	1.054	(1.64*)	0.354	-0.62	0.066	-0.17	0.218	(2.04**)	0.041	-0.5	0.086
5	0.106	1133	0.018	-0.62	2.664	(6.11***)	-0.544	(-1.18)	-0.008	(-0.02)	-0.004	(-0.04)	-0.129	(-0.99)	0.128
6	0.113	1145	0.080	(2.01**)	1.509	(2.26**)	1.232	(1.86**)	-0.587	(-1.59*)	0.084	-0.78	0.006	-0.04	0.159
7	0.121	1142	0.064	(2.28**)	1.647	(7.03***)	0.369	(1.73*)	0.109	-0.29	0.116	(1.55*)	0.025	-0.33	0.120
8	0.131	1142	0.107	(3.44***)	1.109	(4.19***)	0.680	(1.94**)	0.331	-1.24	-0.053	(-0.66)	-0.142	(-1.71**)	0.111
9	0.147	1149	0.114	(3.27***)	0.824	(4.18***)	0.509	(2.40**)	0.032	-0.12	0.198	(1.89**)	-0.011	(-0.14)	0.107
10	0.188	1130	0.159	(2.69***)	0.641	(4.63***)	0.372	(2.20**)	0.162	-0.49	0.131	-1.34	-0.100	(-1.24)	0.142
Average	0.115	11403	0.075	-2.07	1.631	(4.53+)	0.342	-1.07	-0.136	-0.69	0.079	-0.70	-0.071	-0.36	0.124
EP		11403	0.102	(3.66+)	1.066	(6.91+)	0.462	(3.87+)	-0.054	(-0.32)	0.098	(2.61+)	-0.045	(-1.63)	0.100

Note: *(**)[***] Significant at or below the 0.05 (0.01) [0.001] level. + More than two standard deviations from zero

5.5 The Impact of Controlling for Beta and Size

Table 8 summaries the results of estimates of annual regressions for each of the years from 1988 to 2013 within the sixteen portfolios sorted on the combination of beta and size. For the sake of brevity I only report the average of the coefficient estimates across the portfolios as well as the average results of the EH and EP pooled models. As predicted, the explanatory power of the model increases when controlling for cross-sectional variation in risk. In Panel A, the average adjusted R^2 (12.3%) of the annual regression estimates across the sixteen portfolios is greater than the average adjusted R^2 (10.9%) of the annual regression estimates of equation (3) with the same observations but without sorting. Consistent with my expectation, the mean adjusted R^2 of 12.3 % is slightly larger than the mean adjusted R^2 of 11.6% and 11.9% for regressions estimated within portfolios formed on beta and size (reported in Panel A of Table 3 and 4) alone.

In Panel B of Table 8, I see very similar patterns of results to those in Panel A. The average adjusted R^2 (13.1%) of the annual regression estimates within portfolios formed on beta and size is greater than that of the same model with the same observations but without sorting the data into portfolios (Adjusted R^2 of 11.5%). Similarly, the average adjusted R^2 of 13.1% is larger than that for regressions estimated based on portfolios formed on beta (mean adjusted R^2 of 12.4% as reported in Panel B of Table 3) and that for regressions estimated based on portfolios formed on size (mean adjusted R^2 of 12.7% as reported in Panel B of Table 4). These results suggest that combining beta and size may provide incremental explanatory power of the earnings/returns model over beta or size alone. The last thing in

Table 8 that needs to be discussed is that consistent with those results in previous tables, the average coefficient on earnings for regressions estimated within risk portfolios are larger than that for the same model estimated without sorting data.

Table 8. Results of Year-by-Year Regressions Estimated within Portfolios Formed on Beta and Size

Panel A: $$R_{jt} = \beta_0 + \beta_1 \frac{x_{jt}}{p_{jt-1}} + \beta_2 \frac{\Delta x_{jt}}{p_{jt-1}} + \beta_3 \frac{d_{jt-1}}{p_{jt-1}} + \varepsilon_{jt}$$

	n	β_0	t-stat	β_1	t-stat	β_2	t-stat	β_3	t-stat	Adj. R^2
Average	73352	0.107	(3.17+)	0.931	(6.84+)	0.460	(3.75+)	0.092	-0.63	0.123
EH	73352	0.114	(3.85+)	0.707	(10.58+)	0.511	(8.73+)	0.044	-0.60	0.109

Panel B: $$R_{jt} = \beta_0 + \beta_1 \frac{x_{jt}}{p_{jt-1}} + \beta_2 \frac{\Delta x_{jt}}{p_{jt-1}} + \beta_3 \frac{d_{jt-1}}{p_{jt-1}} + \beta_4 \frac{\Delta ci_{jt}}{p_{jt-1}} + \beta_5 \frac{\Delta oa_{jt-1}}{p_{jt-1}} + \varepsilon_{jt}$$

	n	β_0	t-stat	β_1	t-stat	β_2	t-stat	β_3	t-stat	β_4	t-stat	β_5	t-stat	Adj. R^2
Average	73352	0.104	(3.13+)	0.945	(6.67+)	0.455	(3.37+)	0.091	-0.65	0.144	-1.64	-0.057	(-0.66)	0.131
EP	73352	0.113	(3.89+)	0.704	(10.66+)	0.507	(7.77+)	0.038	-0.55	0.135	(4.00+)	-0.028	(-1.32)	0.115

+ More than two standard deviations from zero.

It is interesting to note that the explanatory power of the model (the average adjusted R^2) increases as the magnitude of beta increases and the magnitude of size decreases (results are not tabulated here). This result suggests that as the magnitude of risk increases, the explanatory power of the model increases, which is in line with my prediction.

6. Conclusion

Lev (1989) expresses concern with the low explanatory power of the earnings-return association and points out that the instability of discount rate may be one of the reasons. However, previous studies of the earnings-return relation fail to consider the impact of cross-sectional variation of risk on the coefficient estimates of earnings and the explanatory power of the model. I investigate the denominator effect, the impact of risk, on the value relevance of earnings in the earnings-return association. I estimate the Easton and Harris model and the Easton and Pae model from previous studies within portfolios formed on various risk proxies, including market beta, size, earnings/price ratio, implied cost of equity capital r_{DIV} and r_{PEG}, and the combination of market beta and size. In general, I find pervasive evidence that controlling for cross-sectional variation of risk increases the explanatory power of the earnings-return regression model. I document an average adjusted R^2 of 30.0 % higher when I estimate the models within portfolios sorted on risk than when I do not sort the observations. I observe a larger average coefficient of earnings when I estimate regressions within portfolios formed on various risk proxies. I conclude that it is important to control for both variations in cash flows (the numerator effect) and variations in risk (the denominator effect) when regressing returns on earnings.

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