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The forward E/P ratio and earnings growth

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ABSTRACT

Valuation theories predict a negative relation between the earnings-to-price (E/P) ratio and future earnings growth, but prior studies have produced conflicting results. Using a growth measure that incorporates loss firms, this paper shows that the negative relation exists in the long term, but not in the short term. The results also show a U-shaped relation between the forward E/P ratio and earnings risk. Compared with high forward E/P firms which are inherently financially distressed, low forward E/P firms exhibit even higher incidence of loss and larger growth volatility in subsequent years. The wide distribution of earnings growth in the lowest forward E/P portfolio indicates that this portfolio includes not only star firms that generate the strongest earnings growth, but also firms that report the most negative earnings growth. This paper shows that the forward E/P ratio is a stronger predictor of future growth than the conventionally used trailing E/P ratio.

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1. Introduction

This paper examines the association between the forward earnings-to-price ratio (hereafter, E/P ratio) and subsequent earnings growth and earnings risk.[1] The importance of the forward E/P ratio is evidenced in both theoretical models and practice. Both the Abnormal Earnings Growth (AEG) model and the OJ model (Ohlson & Juettner-Nauroth, 2005) suggest that the forward E/P ratio is a function of earnings growth and risk. In practices, the forward E/P ratio is used by money managers to form investment strategies and is cited by sell-side analysts to justify their stock recommendations (Bradshaw, 2002). Most important, the investment community interprets this ratio as impounding the market's expectations of future growth (Chan, Karceski, & Lakonishok, 2003). According to Henry (2006), for example, 'BW50 company stocks tend to be unusually volatile and richly priced…. [T]he price–earnings ratio of the BW50 is 18.6, two points more than the index. …Their potential growth attracts a lot of attention. Stock analysts surveyed by Thomson First Call expect earnings per share of the median BW50 company to grow annually the next five years by 15%, vs. 11% for the S&P 500.[2]

An empirical research on the relations between forward E/P ratio and earnings growth/risk is warranted for several reasons. First, while valuation theories predict a negative relation between the E/P ratio and future earnings growth, empirical research studies have yielded mixed findings. On one hand, Ou and Penman (1989), Fairfield (1994), and Penman (1996) demonstrate that the trailing E/P ratio distinguishes high-growth firms from low-growth firms. On the other hand, Chan et al. (2003) suggest that valuation ratios (E/P, B/M, and S/P) are poor indicators of future realized growth, and Fama and French (2002) find that the trailing E/P ratio predicts one-year-ahead earnings growth but not growth in longer horizons. Different from these studies, this paper focuses on the forward E/P ratio, which is more forward-looking and value relevant, and less affected by transitory earnings than the trailing E/P ratio.[3] Besides, the growth measure in this paper considers loss firms. Given the substantial frequency of loss firms (more than 40% in the year 2000, as reported in Joos and Plesko, (2005)), excluding loss firms from analyses could result in misleading conclusions. Second, this paper investigates earnings risk in each E/P portfolio, which is of interest to both academic researchers and practitioners. The analysis of earnings risk not only reveals a firm's risk

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[1] In this paper, forward earnings are proxied by analysts' earnings forecasts for the coming year. The reciprocal of the forward E/P ratio—i.e., the forward P/E ratio—shows the amount of money that investors are willing to pay for each dollar of forward earnings and is more commonly used by market participants than the forward E/P ratio. This paper focuses on the forward E/P ratio instead of the forward P/E ratio because the former provides some statistical advantages over the latter. To maintain consistency and avoid confusion, the forward E/P ratio is used throughout this paper, except in the quote from *Business Week*.

[2] The BW 50 is composed of fifty top performers picked each year by *Business Week* based on historical firm-level performance, market-wise performance, and other factors.

[3] The trailing ratio and the forward E/P ratio differ in their measurement of earnings. The forward E/P ratio uses the consensus of analysts' one-year-out forecasts, whereas the trailing E/P uses reported earnings. Prior literature indicates that forward-looking earnings are more value-relevant than historical earnings (Dechow, Hutton, & Sloan, 1999; Kim & Ritter, 1999; Liu et al., 2002; Schreiner & Spremann, 2007; Thomas & Zhang, 2006; Yee, 2004). Liu et al. (2002, p.138) conclude that 'they [the forward earnings] should be used as long as earnings forecasts are available.' Also, Penman (2006, p.409) indicates that analysts' emphasis in recent years has shifted gradually from trailing E/P to forward E/P ratio. This shift of focus captures the core principle that stock valuations are based on future sustainable earnings. Nonetheless, the broadly documented bias in analysts' forecasts may work against the forward E/P ratio, an issue that can be explored in future research.

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level, but also infers the extent to which earnings growth persists in the future, which impacts the predictability of earnings and valuation (Dichev & Tang, 2009; Penman & Zhang, 2002). Prior research has shown evidence of the value/glamor anomaly based on the E/P ratio (e.g., Basu, 1977, 1983; Jaffe, Keim, & Westerfield, 1989). However, no research has examined the propensity of loss, the volatility of earnings growth, or other risk perspectives in each E/P portfolio. This paper fills these gaps by analyzing the source and distribution of growth, volatility of earnings growth, along with the frequency of loss reporting in each forward E/P portfolio. A better understanding of the links between the forward E/P ratio and future outcomes in earning growth and risk provide insights for researchers into equity valuation as well as for practitioners to refine the E/P ratio as a better investment instrument.

This paper derives and tests two predictions from the valuation models: (1) *Ceteris paribus*, if investors have rational expectations for earnings growth, a negative correlation should exist between the forward E/P ratio and subsequently realized earnings growth; (2) *Ceteris paribus*, lower risk is associated with a lower forward E/P ratio. In order to test these predictions, firms are first sorted into quintiles based on the forward E/P ratio. The growth, earnings risk, and other firm-specific risks in the following ten years are tested and compared across the portfolios. To calculate earnings growth, this paper proposes a measure that incorporates loss firms; earnings risk is proxied by the volatility of earnings growth and the frequency of loss reporting.

The findings of this paper are summarized as follows. First, while theories predict a negative relation between the forward E/P ratio and earnings growth, the result shows that a negative relation exists only for long-term earnings growth, but not for short-term earnings growth. The conflicting conclusions in prior studies can be driven by the use of growth measure: an analysis not incorporating loss firms or firms with disappointing earnings growth tends to find a stronger relation between the E/P ratio and earnings growth. The result also indicates that compared to the conventional trailing E/P ratio, the forward E/P ratio is a better predictor for future sales growth and earnings growth, especially for the long-term growth prediction.

Second, there exists a U-shaped relation between the forward E/P ratio and earnings risk. Specifically, the lowest and highest forward E/P firms are more likely to report losses and have higher growth volatility than firms with medium forward E/P ratios. Compared to firms in the highest forward E/P portfolio, which are inherently financially distressed, firms in the lowest forward E/P portfolio are even more likely to report losses and have more volatile earnings growth. A U-shaped relation also exists between the forward E/P ratio and other risk measures such as beta, volatility of returns, and leverage. The results are robust after controlling for growth.

Supplemental analyses show that firms in the lowest forward E/P portfolio have a wider distribution of earnings growth than firms in other portfolios. In the lowest forward E/P portfolio, there exist not only star firms that generate the strongest earnings growth, but also firms that report the most negative earnings growth, suggesting that investing in this portfolio is risky and could bring about unpleasant outcomes. Although the market expects high growth from this portfolio, its realized earnings growth could be extremely high or extremely low in subsequent years. Besides, these firms have a high tendency to report losses and their growth is volatile and not sustainable. A return test confirms that firms in the lowest forward E/P portfolio earn the lowest returns in the following two years, and a long–short investment strategy based on the forward E/P ratio generates significantly positive abnormal returns.

This paper contributes to the growth prediction and glamor/value mispricing literature in several ways. First, this paper finds that the conflicting results in prior studies about the relation between the E/P ratio and future growth can be caused by the choice of growth measures. Incorporating loss firms in analyses weakens the relation between the E/P ratio and earnings growth. Second, this paper contributes to the line of research in risk of earnings (Konstantinidi & Pope, 2012; Penman & Reggiani, 2012) by providing a comprehensive and direct analysis on the association between valuation ratios and risk in future earnings growth.[4] The finding that the lowest forward E/P portfolio has the highest risk level also addresses the debate on hedge returns: whether they are a compensation for risk or a manifestation of mispricing. If risk was the main driver of stock returns, the lowest forward E/P portfolio should have the strongest stock returns, given that its risk is the greatest among all firms. The finding in this paper supports the mispricing explanation. Last, this paper shows that the forward E/P ratio is a stronger predictor of future growth than the trailing E/P ratio, a conventional ratio used in prior studies. This paper's findings, along with Liu, Nissim, and Thomas'(2002) results showed that the forward E/P ratio explains stock price better than the trailing E/P ratio, both suggest that the former ratio is more informative than the latter.

The rest of this paper is organized as follows. Section 2 reviews relevant prior literature and develops the hypotheses. Section 3 discusses the sample and the cross-sectional variation in firm characteristics. Section 4 reports the results. Concluding remarks are provided in Section 5.

2. Literature review and hypotheses development

Extant research on the E/P ratio focuses on its links with valuation. For example, the forward E/P ratio is used to estimate the cost of equity capital (Gode & Mohanram, 2003), and it explains stock prices better than other historically based multiples in the U.S. market (Liu et al., 2002), European market (Schreiner & Spremann, 2007), and IPO settings (Kim & Ritter, 1999).

Regarding the E/P ratio's relation to fundamentals such as growth, prior studies take either an *ex ante* or *ex post* perspective. The *ex ante* line of research focuses on the determinants of the E/P ratio. According to the Gordon Growth model and the OJ model, the E/P ratio is a function of expected earnings growth and risk. Evidence shows that forecasted growth better explains the E/P ratio than realized growth (Beaver & Morse, 1978; Thomas & Zhang, 2006; Zarowin, 1990). In contrast, the *ex post* line of research investigates whether the E/P ratio predicts future realized growth. According to Ou and Penman (1989), Fairfield (1994), and Penman (1996), the trailing E/P ratio distinguishes high-growth firms from low-growth firms. However, Chan et al. (2003) claim that valuation ratios (E/P, B/M, and S/P) are poor indicators of future realized growth. Fama and French (2002) find that the trailing E/P ratio simply predicts one-year-ahead earnings growth but not growth in longer horizons. This paper also takes an *ex post* perspective. Specifically, it focuses on the relation between the forward E/P ratio and the realization of earnings growth, with implications for whether the initial valuation can be justified.

The OJ model and the Abnormal Earnings Growth (AEG) model provide a theoretical basis for this paper. Assuming that price equals the present value of expected dividends (PVED),

$$p_0 = \sum_{t=1}^{\infty} R^{-t} d_t \qquad \text{(a)}$$

where p_0 is the present stock price, d_t is expected dividends paid at time t, and R is the discount factor, which equals $1 + r$ (r = the cost of equity capital).

[4] Different from Konstantinidi and Pope (2012) which uses earnings components to predict earnings risk, this paper examines the relation between the E/P ratio and the risk in future earnings growth. While Penman and Reggiani (2012) examines how E/P and B/P ratios explain future stock returns, this paper focuses on the relation between the E/P ratio and earnings growth/risk of growth and demonstrates evidence in the propensity of loss and volatility of earnings growth.

Consider the following algebraic zero-sum equality:

$$0 = y_0 + R^{-1}(y_1 - Ry_0) + R^{-2}(y_2 - Ry_1) + \ldots$$
$$= y_0 + \sum_{t=1}^{\infty} R^{-t}(y_t - Ry_{t-1}). \quad (b)$$

Adding the zero-sum series (b) to PVED (a) yields

$$p_0 = y_0 + \sum_{t=1}^{\infty} R^{-t} z_t' \quad (c)$$

where $z_t' = y_t + d_t - Ry_{t-1}$.

Investment practice suggests that capitalized forward earnings should be the starting point.

That is, $y0 = x1/r$. Similarly, $yt = xt + 1/r$, for $t = 1, 2, \ldots$.

It follows that $z_t' = y_t + d_t - Ry_{t-1} = \frac{1}{r}(\triangle x_{t+1} - r(x_t - d_t)), t = 1, 2, \ldots$.

Defining $z_t = r \cdot z_t' = \triangle x_{t+1} - r(x_t - d_t)$, (c) can be expressed as

$$p_0 = \frac{1}{r} \cdot x_1 + \frac{1}{r}\sum_{t=1}^{\infty} R^{-t} z_t$$
$$= \frac{1}{r}\left[x_1 + \frac{x_2 - x_1 - r(x_1 - d_1)}{(1+r)} + \frac{x_3 - x_2 - r(x_2 - d_2)}{(1+r)^2} + \cdots\right]. \quad (1)$$

A transformation of Eq. (1) expresses the forward P/E ratio as a function of abnormal earnings growth and cost of equity capital:

$$\frac{p_0}{x_1} = \frac{1}{r}\left[1 + \frac{x_2 - x_1 - r(x_1 - d_1)}{x_1(1+r)} + \frac{x_3 - x_2 - r(x_2 - d_2)}{x_1(1+r)^2} + \cdots\right]. \quad (2)$$

Two predictions can be derived from Eq. (2). (i) *Holding r constant*, a negative relation exists between the forward E/P ratio (x_1/p_0) and abnormal earnings growth scaled by expected earnings for the next period (i.e., $\frac{x_{t+1} - x_t - r(x_t - d_t)}{x_1}$). (ii) *Holding growth constant*, a positive relation exists between the forward E/P ratio and the cost of equity capital (r).

According to prediction (i), the forward E/P ratio is a decreasing function of expected growth, holding risk constant. If investors have appropriate expectations for earnings growth and correctly value future earnings, low forward E/P stocks should have persistently higher growth of realized earnings than high forward E/P stocks in subsequent years.

H1. Holding risk constant, the forward E/P ratio is negatively correlated with subsequently realized earnings growth.

According to prediction (ii), the forward E/P ratio is positively correlated with cost of equity capital (r), which, in turn, implies a positive relation between the forward E/P ratio and risk.[5] In addition to firm-specific risk (beta, volatility of stock returns, and leverage), this paper also examines earnings risk, measured by the incidence of losses and the volatility of earnings growth. These two types of risk (earnings risk and firm-specific risk) reveal a firm's risk level from different but related perspectives. According to Dichev and Tang (2009), earnings volatility reflects both economic and accounting factors. Firms that operate in an environment subject to large economic shocks are likely to have more volatile earnings performance. Thus, firms with higher beta or more volatile stock returns are likely to exhibit higher volatility in earnings performance.

H2. Holding growth constant, the forward E/P ratio has a positive relation with earnings risk and firm-specific risk.

3. Sample

The sample is drawn from three sources: accounting numbers from Compustat annual data files, stock returns from CRSP, and analysts' forecasts and stock prices from the IBES summary file. All Compustat per share data (i.e., dividends and EPS) are adjusted for stock splits and stock dividends using the adjustment factors in Compustat. Analysts' consensus EPS forecasts are converted to a diluted basis using the I/B/E/S dilution factors.

This paper requires the sample to meet the following criteria: (1) no missing data for price or analysts' EPS forecasts; (2) no missing data for realized earnings growth over the next two years; (3) stock prices not less than $2; (4) a forward E/P ratio bounded between 0 and 1; and (5) industrial companies (excluding SIC 6000–6999, 4900–4999).[6] To reduce the impact of outliers, each variable is winsorized at the top and bottom 1% in each year. These requirements yield a sample of 56,610 firm-year observations.

In mid-April of each year, firms are sorted into quintiles based on the forward E/P ratio.[7] The forward E/P ratio is calculated as the consensus (median) earnings forecast for the coming fiscal year divided by the stock price.[8] This paper uses the forward E/P ratio, instead of the forward P/E ratio, to avoid the problems caused by zero or a negative denominator. The level of growth, earnings risk, and firm-specific risk in the following ten years are compared across the quintiles. In order to identify the source of growth, this paper analyzes the growth of various income statement items—e.g., sales, operating income, and net earnings. Operating income is defined as operating income per share before depreciation, and net earnings is defined as I/B/E/S actual earnings per share.[9] Compared to earnings growth, sales growth and operating income growth are better-behaved measures of operating performance (Chan et al., 2003) because they are less affected by negative or low positive values in the base year. Evidence also indicates that income statement items differ in their level of persistence (Chan et al., 2003) and are valued differently by investors (Fairfield, Sweeney, & Yohn, 1996;

[5] Although r in Eq. (2) stands for the cost of equity capital, this paper follows Beaver and Morse (1978) and Thomas and Zhang (2006) to examine risk in order to avoid a mechanical-relation problem caused by the common factor shared between the forward E/P ratio and the cost of capital: stock price. A test of risk is reasonable because the theories and prior literature both suggest a positive relation between the cost of equity capital and risk. For example, the Capital Asset Pricing Model (CAPM) suggests that beta is positively correlated with the cost of equity capital. The cost of equity capital also has a positive relation with leverage (Modigliani & Miller, 1958). Furthermore, prior literature has largely used the correlations between risk proxies and the cost of equity capital estimated from valuation theories to evaluate the quality of estimated cost of equity capital (e.g., Gebhardt, Lee, & Swaminathan, 2001; Gode & Mohanram, 2003).

[6] Results are qualitatively similar when I require firms to have a December fiscal year end, which makes the time period between portfolio formation (April) and growth performance measurement (fiscal year end) equal across all firms.

[7] The timing is chosen to ensure that most analysts and investors have received and processed the previous fiscal year's financial reports. The choice of timing is consistent with Liu et al. (2002). Using April forecasts can alleviate the concern of stale forecasts. However, per Richardson, Teoh, and Wysocki (2004), the use of April forecasts may pick up the most optimistically biased earnings forecasts for firms with a December fiscal year end. If the magnitude of optimism is the same across portfolios, the use of April forecasts should have limited impacts on conclusions. However, it is likely that April forecasts are more optimistic for the low forward E/P firms than for the high forward E/P firms. To address this concern, two additional analyses are conducted. First, I calculate earnings growth based on Penman's (1996) measure, which does not rely on analysts' forecasts. Second, analysts' forecasts issued in another month (June) are used to calculate earnings growth. The findings from these two analyses are consistent with my main findings: the low forward E/P firms report disappointing and volatile earnings growth in subsequent years.

[8] Results are qualitatively similar when two-year-out EPS forecasts are used to calculate the forward E/P ratio.

[9] This paper uses I/B/E/S actual earnings, instead of Compustat EPS, to calculate growth because the benchmark is analysts' one-year-ahead earnings forecasts from I/B/E/S. Actual earnings reported by I/B/E/S exclude transitory items; therefore, growth based on actual earnings of IB/E/S (I/B/E/S growth) is typically higher than growth based on Compustat EPS before extraordinary items (Compustat growth). The conclusions remain when Compustat EPS is adopted to calculate growth. When Compustat EPS is used in place of I/B/E/S actual earnings, the earnings growth of the lowest forward E/P portfolio drops more significantly than it does for other portfolios, implying that firms in the lowest forward E/P portfolio reported many transitory items in subsequent years.

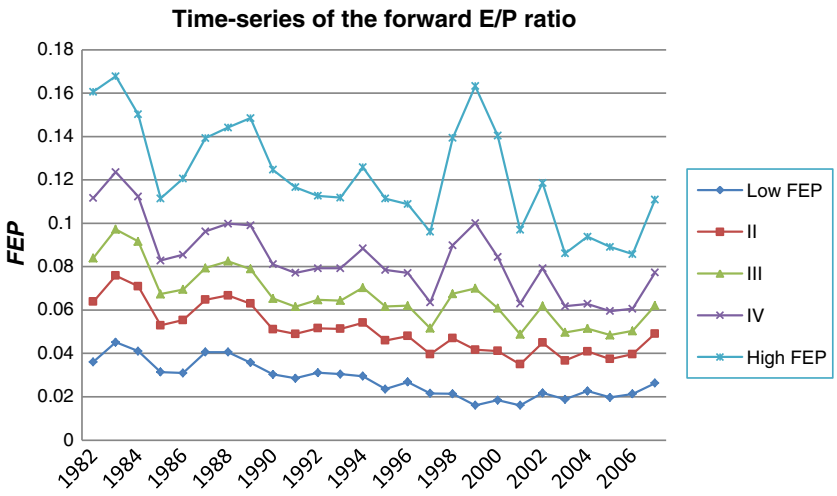

Fig. 1. Time-series of the forward E/P ratio. This graph shows the time-series of the forward E/P ratio from 1982 to 2007. The forward E/P ratio equals analysts' consensus (median) one-year out EPS forecast divided by share price from IBES, measured in April of each year.

Ghosh, Gu, & Jain, 2005; McVay, 2006). Appendix A shows the definitions of all the variables in this study.

Different from the geometric growth measure in some prior studies (Chan et al., 2003; Li, 2003), this paper calculates earnings growth as $\frac{x_{t+k}}{E_t[x_{t+1}]}$ where x_{t+k} is I/B/E/S actual earnings per share in year $t+k$ adjusted for forgone earnings from dividends, and $E_t[x_{t+1}]$ is analysts' one-year-out earnings forecasts in year t. This new earnings growth measure has three attractive features. First, by excluding the root calculation, this measure retains observations with negative earnings and thus allows conclusions to be generalized to a larger sample. This feature is critical because the geometric mean growth measure excludes a substantial amount of loss firms (based on Joos and Plesko, (2005), more than 40% of firms reported losses in the year 2000) and can result in misleading conclusions. Second, motivated by the valuation theories, this growth measure uses earnings forecast instead of reported earnings as the denominator (or benchmark). In this way, the sample is expanded further because earnings forecasts are less likely to be negative than reported earnings. Third, unlike the growth measure used in Ou and Penman (1989), Fairfield (1994), and Penman (1996), the new growth measure can be used to evaluate growth over multiple periods rather than only between two periods.[10] A similar method is used to calculate sales growth and operating income growth: sales (operating income) per share in year $t+k$ divided by sales (operating income) per share in year $t+1$.[11]

Fig. 1 shows the time-series trend of the forward E/P ratio from 1982 to 2007. The decreasing trend in the forward E/P ratio is consistent with Thomas and Zhang (2006) and reflects the decrease in interest rates over the time period. The fluctuations in the forward E/P ratio also reveal the market-wise performance. For example, the increase in the forward E/P ratio for each portfolio from 2001 to 2002 reflects the economic recession in that period.

The descriptive statistics of the sample are summarized in Table 1. Panel A demonstrates the industry distribution of each forward E/P portfolio. The lowest forward E/P portfolio has a high percentage of firms in the Business Equipment industry (30.9%) and more firms in the Health & Medical industry (10.6%) than other portfolios. In contrast, the highest forward E/P portfolio has more firms in the Manufacturing industry (15.4%) and Wholesale & Retail industries (11.9%). This distribution reflects the natures of different industries: firms in the Business Equipment and the Health & Medical industries have high R&D and growth potentials, which causes investors to expect high growth and drives the forward E/P ratio to be low. On the contrary, firms in the Manufacturing and Wholesale & Retail industries tend to have above-average forward E/P ratios because these firms are more mature and stable. Panel B provides an overview of the main variables in this study. Consistent with Liu et al. (2002), the trailing E/P ratio is lower and more volatile than the forward E/P ratio. As expected, the growth of net income (*GR_E*) has the highest volatility, followed by operating income growth and sales growth, suggesting the potential noisiness of the earnings growth measure.

Panel C presents the firm characteristics in the portfolio formation year (i.e. the base year). Consistent with Zarowin (1990) and Thomas and Zhang (2006), portfolios with smaller forward E/P ratios have higher expected earnings growth. Analysts' forecasts of long-term earnings growth (*LTG*) is the highest (0.232) in the lowest forward E/P portfolio, which decreases to 0.128 in the highest forward E/P portfolio. The large magnitude of *R&D* and capital expenditures (*CEXP*) of the lowest forward E/P portfolio may have caused the market to expect high growth and drive the stock valuation higher. Results also indicate that firms in the highest and lowest forward E/P portfolios have smaller payout ratios (*PAYOUT*) and market capitalization (*SIZE*). Different from the other portfolios, the highest forward E/P portfolio's market capitalization is much lower than its total assets, suggesting that such firms tend to be more financially distressed.

Table 2 reports the correlations of the main variables and presents some interesting patterns. First, the Spearman and Pearson correlations between the forward and trailing E/P ratios are 0.66 and 0.43, respectively, which implies that these two ratios are correlated, but provide different information. Second, the forward E/P ratio has stronger correlations with subsequently realized earnings and sales growth than the trailing E/P ratio. For example, the Spearman correlation between the forward E/P ratio and the five-year earnings growth (GR_E_{t+5}) is −0.15, but the Spearman correlation between the trailing E/P ratio and GR_E_{t+5} is only −0.08. This result suggests that the forward E/P ratio is a better predictor of future growth than the trailing E/P ratio.

[10] Despite the three attractive features, I acknowledge that the reliability of this growth measure still depends on the credibility of analysts' one-year-out EPS forecast. If analysts' forecasts are more optimistic for firms with a lower forward E/P ratio, this growth measure will understate earnings growth of low forward E/P firms. To address this concern, I also measure earnings growth based on Penman (1996), which takes realized earnings as the denominator. When Penman's growth measure is used, the result shows that the lowest forward E/P portfolio cannot generate high growth in both the short term and long term.

[11] Different from the earnings growth measure which uses earnings forecasts as a dominator, sales (operating income) growth does not rely on expected sales (operating income) for two reasons. First, sales forecasts are not available before 1996, and analysts' forecasts of operating income are not available before 2002. Second, sales and operating income are less likely to be negative than net income.

Table 1
Descriptive statistics for the sample.

Panel A Industry distribution

Quintiles sorted on *FEP*	NonDu	Durbl	Manufactur	Energy	Chemicals	Business equip	Tele	Whole & retail	Health & medical	Others
Low *FEP*	4.2%	1.7%	7.3%	5.1%	1.3%	30.9%	4.2%	9.6%	10.6%	25.0%
II	7.7%	2.3%	10.6%	3.4%	3.5%	21.7%	2.7%	12.4%	9.6%	26.2%
III	8.0%	3.4%	14.1%	3.6%	4.3%	15.3%	2.2%	13.5%	7.0%	28.5%
IV	7.4%	4.2%	15.9%	3.0%	3.0%	11.8%	2.1%	13.5%	4.3%	34.7%
High *FEP*	6.4%	4.9%	15.4%	4.7%	2.0%	8.6%	1.9%	11.9%	2.9%	41.3%

Panel B Descriptive statistics of the main variables

Variable	N	Mean	StdDev	Min	Q1	Median	Q3	Max
FEP_t	55,104	0.070	0.034	0.007	0.047	0.066	0.088	0.182
TEP_t	53,542	0.046	0.074	−0.339	0.027	0.052	0.078	0.246
E_{t+1}	55,104	1.270	1.519	0.011	0.461	0.886	1.538	11.053
GR_S_{t+2}	54,090	1.084	0.202	0.533	0.981	1.072	1.171	1.828
GR_O_{t+2}	53,775	1.013	0.893	−3.627	0.858	1.067	1.240	4.817
GR_E_{t+2}	55,104	0.778	1.600	−7.936	0.568	1.013	1.293	5.775
GR_S_{t+5}	40,156	1.303	0.633	0.175	0.998	1.292	1.632	3.967
GR_O_{t+5}	39,836	1.887	1.468	−4.681	0.747	1.218	1.725	8.205
GR_E_{t+5}	35,794	1.303	1.976	−5.800	0.571	1.210	1.851	10.528

Panel C Firm characteristics in each forward E/P portfolio in portfolio formation year

	Quintiles sorted on *FEP*					Comparison		
	Low	II	III	IV	High	III-Low	High-Low	High-III
FEP_t	0.028	0.051	0.066	0.083	0.120	0.038***	0.092***	0.054***
TEP_t	0.002	0.031	0.047	0.064	0.089	0.045***	0.087***	0.042***
LTG_{tt}	0.232	0.179	0.154	0.138	0.128	−0.078 ***	−0.104***	−0.026***
BM_t	0.454	0.447	0.515	0.632	0.831	0.061*	0.377***	0.316***
LEV_t	2.241	2.317	2.689	3.494	4.632	0.448***	2.391***	1.943***
$BETA_t$	1.405	1.195	1.077	1.004	1.036	−0.328***	−0.369***	−0.041
$STDRET_t$	0.150	0.126	0.115	0.110	0.116	−0.036***	−0.034***	0.001
$R\&D_t$	0.090	0.061	0.045	0.038	0.035	−0.045***	−0.055***	−0.010***
$CEXP_t$	0.090	0.082	0.076	0.076	0.081	−0.014***	−0.009**	0.004
$XFIN_t$	0.257	0.149	0.121	0.111	0.128	−0.136***	−0.129***	0.007
$PAYOUT_t$	0.202	0.259	0.272	0.279	0.239	0.069***	0.037	−0.032
$SIZE_t$ ($M)	2687	3320	3363	3549	3161	676	474	−203**
TA_t ($M)	1818	2265	2993	3677	4599	1175***	2781***	1606

Panel A shows the industry distribution in different *FEP* portfolios. Industry classification is based on Fama–French's 12 industry classification scheme. Financial service and utilities industries are excluded. Panels B and C describe firm characteristics of the whole sample and of each *FEP* portfolio. Portfolios are formed in April of each year (1982–2007). *FEP* is the forward E/P ratio; *TEP* is the trailing E/P ratio. GR_S_{t+k} (GR_E_{t+k}) is the growth of sales (net earnings) over the following k-year period. *BM* is the book-to-market ratio; *SIZE* is log of market capitalization calculated as number of common shares outstanding times stock price in the fiscal year end; *LEV* is leverage calculated as total assets divided by equity. *BETA* is the estimated coefficient of market premium in the regression $r = r_f + Beta^* MKTRF$ using monthly returns over the prior 24 months where r_f is the risk-free rate and *MKTRF* is the monthly market premium. *STDRET* is the standard deviation of monthly returns over the previous 24 months. *LTG* is analysts' consensus (median) long-term growth forecasts, measured in April of each year; *R&D* is calculated as research and development expenses divided by average total assets; *CEXP* is calculated as capital expenditures divided by average total assets; *XFIN* is external financing calculated as the change in total assets minus the change in retained earnings; *PAYOUT* is the payout ratio. All statistics are calculated for each fiscal year and the means of the annual statistics are reported. Differences are tested using two-tailed Wilcoxon test. ***, **, * stand for being significant at 1%, 5%, and 10%, respectively. Each variable is winsorized at the 1st and 99th percentiles.

Third, the forward E/P ratio has a lower correlation with future realized growth (GR_E_{t+5}) than with expected growth (*LTG*) (−0.15 vs. −0.42). This result is similar for the trailing E/P ratio (−0.08 vs. −0.37). Furthermore, the forward E/P ratio has stronger correlations with sales growth than with earnings growth. This finding is reasonable since sales growth is more persistent (Chan et al., 2003) and less volatile than earnings growth.

4. Analysis

4.1. The forward E/P ratio and subsequent growth

H1 predicts a negative relation between the forward E/P ratio and subsequent earnings growth. Table 3 presents the realized growth in the following ten years.

Panel A shows that portfolios with lower forward E/P ratios experience higher sales growth in the following ten years. For example, the two- (ten-) year sales growth of the lowest forward E/P portfolio is 1.127 (2.328), which decreases significantly and monotonically to 1.044 (1.549) in the highest forward E/P portfolio. Panels B and C report the growth of operating income and net earnings. Compared to sales growth, operating income growth and earnings growth have weaker relations with the forward E/P ratio. Specifically, the monotonic decreasing pattern of growth from the lowest to the highest forward E/P portfolio is not observed for every horizon. For two-year growth ($k = 2$), the lowest forward E/P portfolio cannot deliver the strongest earnings growth among all the portfolios. The negative relation between the forward E/P ratio and earnings growth only exists for horizons longer than two years. An unreported analysis shows that when growth is based on Compustat earnings, instead of I/B/E/S actual earnings, the negative relation exists only for horizons longer than seven years.

In order to ensure that the inferences from Table 3 hold after controlling for risk and other firm-specific variables, the following multivariate regressions are tested.

$$GR\_M_{i,t+k} = \beta_0 + \beta_1 FEP_{i,t} + \beta_2 TEP_{i,t} + \beta_3 BM_{i,t} + \beta_4 SIZE_{i,t} + \beta_5 LEV_{i,t} + \beta_6 BETA_{i,t} + \beta_7 STDRET_{i,t} + \beta_8 LTG_{i,t} + \beta_9 R\&D_{i,t} + \beta_{10} CEXP_{i,t} + \beta_{11} XFIN_{i,t} + \beta_{12} PAYOUT_{i,t} + \varepsilon_{i,t+k} \ldots. \quad (A)$$

The dependent variable (*GR_M*) is realized growth of sales or earnings over the next two, five, or ten years. H1 predicts *FEP* to carry a

Table 2
Correlations of the major variables.

	FEP_t	TEP_t	GR_E_{t+2}	GR_E_{t+5}	GR_S_{t+2}	GR_S_{t+5}	BM_t	$SIZE_t$	LEV_t	$BETA_t$	$STDRET_t$	LTG_t	$R\&D_t$	$CEXP_t$	$XFIN_t$	$PAYOUT_t$
FEP_t	1	0.43	**−0.01**	−0.14	−0.13	−0.16	0.35	−0.18	0.22	−0.14	−0.21	−0.37	−0.25	**0.00**	−0.10	0.03
TEP_t	0.66	1	0.08	−0.08	0.01	**−0.01**	0.14	0.05	0.06	−0.12	−0.22	−0.21	−0.23	0.05	−0.07	0.02
GR_E_{t+2}	−0.11	−0.04	1	0.31	0.32	0.24	−0.09	0.12	0.03	−0.05	−0.08	−0.09	−0.07	−0.02	−0.08	0.05
GR_E_{t+5}	−0.15	−0.08	0.41	1	0.12	0.36	**0.00**	0.05	**0.01**	**0.01**	0.03	−0.01	−0.03	−0.01	−0.05	0.03
GR_S_{t+2}	−0.15	−0.07	0.42	0.20	1	0.53	−0.13	−0.03	−0.07	**0.01**	0.05	0.17	**0.01**	0.07	0.03	−0.06
GR_S_{t+5}	−0.16	−0.08	0.33	0.48	0.56	1	−0.18	**0.00**	−0.10	0.02	0.08	0.19	**0.00**	0.12	0.03	−0.09
BM_t	0.39	0.32	−0.10	−0.03	−0.20	−0.25	1	−0.24	0.11	−0.06	−0.06	−0.23	−0.15	−0.02	−0.06	0.04
$SIZE_t$	−0.06	0.07	0.12	0.07	0.01	0.03	−0.24	1	−0.05	0.03	−0.25	−0.18	−0.10	−0.04	−0.02	0.14
LEV_t	0.31	0.19	0.04	0.03	−0.16	−0.19	0.17	0.12	1	−0.14	−0.18	−0.21	−0.13	−0.03	***−0.01***	0.08
$BETA_t$	−0.16	−0.15	−0.06	−0.04	0.03	**0.03**	−0.10	0.02	−0.17	1	0.43	0.26	0.21	**−0.01**	0.10	−0.14
$STDRET_t$	−0.22	−0.28	−0.14	−0.09	0.05	0.03	−0.07	−0.41	−0.30	0.43	1	0.47	0.33	−0.04	0.16	−0.29
LTG_t	−0.42	−0.37	−0.04	−0.02	0.21	0.22	−0.37	−0.24	−0.39	0.30	0.54	1	0.37	0.11	0.37	-0.25
$R\&D_t$	−0.28	−0.27	−0.02	−0.05	**0.01**	−0.01	−0.21	−0.06	−0.32	0.20	0.28	0.37	1	−0.07	0.18	−0.14
$CEXP_t$	−0.03	0.05	−0.02	0.00	0.07	0.11	−0.11	0.13	−0.02	0.01	−0.05	0.11	−0.07	1	0.13	−0.03
$XFIN_t$	−0.07	−0.06	−0.05	−0.05	0.06	0.05	−0.13	−0.01	0.04	0.09	0.13	0.37	0.18	0.13	1	−0.09
$PAYOUT_t$	0.16	0.19	0.09	0.05	−0.11	−0.11	0.11	0.39	0.26	−0.26	−0.62	−0.25	−0.14	−0.03	−0.09	1

Pearson/Spearman correlation coefficients are reported above/below the diagonal. All statistics are calculated for each fiscal year and the means of the annual statistics are reported. *FEP* is the forward E/P ratio; *TEP* is the trailing E/P ratio. GR_S_{t+k} (GR_E_{t+k}) is the growth of sales (net earnings) over the following k-year period. *BM* is the book-to-market ratio; *SIZE* is log of market capitalization calculated as number of common shares outstanding times stock price in the fiscal year end; *LEV* is leverage calculated as total assets divided by equity. *BETA* is the estimated coefficient of market premium in the regression $r = r_f + Beta^* MKTRF$ using monthly returns over the prior 24 months where r_f is the risk-free rate and *MKTRF* is the monthly market premium. *STDRET* is the standard deviation of monthly returns over the previous 24 months. *LTG* is analysts' consensus (median) long-term growth forecasts, measured in April of each year; *R&D* is calculated as research and development expenses divided by average total assets; *CEXP* is calculated as capital expenditures divided by average total assets; *XFIN* is external financing calculated as the change in total assets minus the change in retained earnings; *PAYOUT* is the payout ratio. All of the correlation coefficients are significant at 1% level, except for the italic one which is significant at 10% level and the bolded ones which are insignificant at 10% level. Each variable is winsorized at the 1st and 99th percentiles.

negative coefficient. Eq. (A) also controls for the effects of the following factors on future growth: risk (proxied by *BM*, *SIZE*, *LEV*, *BETA*, *STDRET*), analysts' long-term forecasts (*LTG*), and other growth predictors suggested by prior literature (*R&D*, *CEXP*, *XFIN*, and *PAYOUT*). Proxies of risk are included as control variables because valuation models suggest a negative relation between the forward E/P ratio and growth when risk is held constant. Other variables are included in the regressions to examine whether the forward E/P ratio has incremental predictive

Table 3
Univariate analysis on realized growth in subsequent years.

Variable		Quintiles sorted on *FEP*					Comparison		
		Low	II	III	IV	High	III-Low	High-Low	High-III
FEP_0		0.028	0.051	0.066	0.083	0.120	0.038***	0.092***	0.054***
	N								
Panel A. Growth of sales GR_S_{t+k}									
$k = 2$	54,090	1.127	1.098	1.080	1.068	1.044	−0.046***	−0.083***	−0.037**
$k = 3$	49,106	1.258	1.206	1.173	1.144	1.100	−0.085***	−0.158***	−0.073***
$k = 4$	44,391	1.391	1.321	1.277	1.221	1.161	−0.114***	−0.229***	−0.116***
$k = 5$	40,156	1.530	1.439	1.378	1.301	1.226	−0.152***	−0.304***	−0.152***
$k = 6$	36,351	1.683	1.558	1.480	1.388	1.291	−0.203***	−0.392***	−0.189***
$k = 7$	32,610	1.838	1.677	1.591	1.467	1.345	−0.247***	−0.493***	−0.245***
$k = 8$	29,361	1.992	1.802	1.688	1.539	1.405	−0.304***	−0.587***	−0.283***
$k = 9$	26,421	2.157	1.921	1.797	1.605	1.464	−0.359***	−0.692***	−0.333***
$k = 10$	23,566	2.328	2.069	1.911	1.689	1.549	−0.417***	−0.779***	−0.362***
Panel B. Growth of operating income GR_O_{t+k}									
$k = 2$	53,775	1.012	1.044	1.036	1.019	0.946	0.024	−0.067*	−0.090***
$k = 3$	48,781	1.146	1.136	1.122	1.073	0.984	−0.023	−0.162***	−0.139***
$k = 4$	44,065	1.272	1.263	1.213	1.159	1.053	−0.058	−0.219***	−0.160***
$k = 5$	39,836	1.439	1.370	1.326	1.249	1.097	−0.112	−0.341***	−0.229***
$k = 6$	36,037	1.617	1.493	1.406	1.325	1.161	−0.211 **	−0.456***	−0.245***
$k = 7$	32,303	1.817	1.622	1.523	1.399	1.228	−0.294***	−0.590***	−0.296***
$k = 8$	29,074	1.976	1.758	1.619	1.481	1.278	−0.356***	−0.698***	−0.342***
$k = 9$	26,155	2.120	1.901	1.718	1.537	1.379	−0.402***	−0.741***	−0.339***
$k = 10$	23,321	2.324	2.052	1.854	1.654	1.492	−0.470***	−0.832***	−0.362***
Panel C. Growth of net earnings GR_E_{t+k}									
$k = 2$	55,104	0.606	0.883	0.869	0.832	0.703	0.264**	0.097	−0.167***
$k = 3$	40,481	1.061	1.026	0.991	0.891	0.793	−0.070	−0.268	−0.198***
$k = 4$	35,373	1.490	1.182	1.100	1.023	0.879	−0.389	−0.611***	−0.221***
$k = 5$	31,253	1.809	1.346	1.236	1.118	0.973	−0.573**	−0.837 ***	−0.263 ***
$k = 6$	27,860	2.308	1.518	1.373	1.205	1.038	−0.935**	−1.271***	−0.335***
$k = 7$	24,804	2.398	1.670	1.499	1.301	1.089	−0.899***	−1.309***	−0.410***
$k = 8$	22,175	3.278	1.810	1.578	1.348	1.164	−1.700***	−2.115***	−0.415***
$k = 9$	19,804	3.075	1.986	1.676	1.460	1.209	−1.400***	−1.867***	−0.467***
$k = 10$	17,717	3.181	2.154	1.864	1.554	1.313	−1.317***	−1.868***	−0.551***

This table presents the median realized growth of each forward E/P portfolio in subsequent *k* years ($k = 2$–10). *FEP* is the forward E/P ratio. Growth of sales (operating income), GR_S_{t+k} (GR_O_{t+k}), equals S_{t+k}/S_{t+1} (O_{t+k}/O_{t+1}) where S_t (O_t) is sales (operating income) per share. Growth of net earnings, GR_E_{t+k}, is calculated as I/B/E/S actual EPS in period t + k plus forgone earnings from dividends, divided by base-year's forward earnings. Each variable is winsorized at the 1st and 99th percentiles. All statistics are calculated for each fiscal year and the means of annual statistics are reported. The differences are tested using the two-tailed Wilcoxon test. ***, **, * stand for being significant at 1%, 5%, and 10%, respectively.

power for future growth beyond other growth predictors. This paper is also interested in the differential ability of the forward and trailing E/P ratios to predict future growth.

The results are reported in Table 4 and summarized as follows. First, the forward E/P ratio has higher predictability for sales growth than for earnings growth. Panel A shows that the forward E/P ratio is negatively associated with both short-term and long-term sales growth. In the full regressions, the coefficient estimates of *FEP* for the two-year and ten-year sales growth, −0.657 and −5.699 respectively, are both significant at the 1% level. For every 0.1 unit decrease in the forward E/P ratio (i.e., the forward P/E ratio increases by 10), the two-year sales growth increases by 6.57% and the ten-year sales growth increases by 56.99%. The results of earnings growth (see Panel B), however, shows that the negative relation between *FEP* and earnings growth only exists in the long term ($k = 5$ or 10 years), but not in the short term ($k = 2$ years).

Second, the forward E/P ratio is a better predictor of sales and earnings growth than the trailing E/P ratio. Panel A shows that when both the forward and trailing E/P ratios are included in sales growth regressions, the forward E/P ratio has a predicted negative coefficient, but the trailing E/P ratio carries a positive coefficient which contradicts the predictions of valuation theories. This finding suggests that the trailing E/P ratio is not a good predictor of sales growth. For earnings growth, Panel B shows that the forward E/P ratio's superior predictability exists only for long-term growth, but not short-term growth. In the short term ($k = 2$), neither of the ratios are good predictors for earnings growth: the coefficient of the forward E/P ratio is insignificant, and the positive coefficient estimate of the trailing E/P ratio is opposite from the predictions. These evidences support this paper's choice to focus on the forward E/P, instead of the trailing E/P ratio, as a growth predictor. The finding also complements Liu et al.'s (2002) argument that 'they [the forward earnings] should be used as long as earnings forecasts are available'.

In sum, both the univariate and multivariate analyses demonstrate that the forward E/P ratio better predicts sales growth than earnings growth. In the short term, the forward E/P ratio does not correlate with the growth of income statement items that are below sales (i.e., growth of operating income and net earnings) in a way that is consistent with the valuation theories. Therefore, H1 is supported only for long-term, but not short-term, earnings growth. Since earnings play a crucial role in valuation, the results imply that the initial valuation of the lowest forward E/P portfolio is overstated. A return test (unreported) confirms that the one-year-ahead raw returns and size-adjusted returns both increase with the forward E/P ratio. Besides, an investment strategy that takes a long position on the highest forward E/P portfolio and a short position on the lowest forward E/P portfolio yields size-adjusted returns of 4.3% and 6.1% in one year and two years after the portfolio formation.

4.1.1. Explore explanations for conflicting findings in prior studies

In order to understand the cause of the conflicting results in prior literature, I replicate Penman (1996) using my sample. Penman (1996) calculates earnings growth as $(\Delta EPS_{t+k} + div_{t+k-1}{}^{*}0.1)/|EPS_{t+k-1}|$

Table 4
Multivariate analysis on the relations between forward E/P ratio and growth.

	Panel A					Panel B				
	Dependent variable: Growth of sales (GR_S_{t+k})					Dependent variable: Growth of net earnings (GR_E_{t+k})				
		$k = 2$		$k = 5$	$k = 10$		$k = 2$		$k = 5$	$k = 10$
Intercept	1.142	1.154	1.126	1.626	2.463	0.747	1.198	1.495	2.154	3.211
	(93.191)	(78.284)	(61.131)	(13.605)	(10.065)	(6.042)	(11.328)	(6.790)	(11.080)	(11.084)
FEP_t	−0.847	−0.758	−0.657	−2.379	−5.699	0.521	−0.829	−2.051	−16.486	−26.994
	(−9.994)	(−10.744)	(−8.821)	(−6.720)	(−7.002)	(0.394)	(−0.676)	(−1.480)	(−5.109)	(−8.218)
TEP_t		0.274	0.268	0.905	1.367		2.013	1.966	0.368	−0.276
		(10.982)	(6.862)	(4.809)	(3.660)		(5.612)	(5.025)	(0.785)	(−0.159)
BM_t		−0.054	−0.068	−0.282	−0.573		−0.449	−0.616	0.312	0.898
		(−7.930)	(−4.926)	(−5.618)	(−6.727)		(−4.012)	(−3.740)	(1.693)	(3.324)
$SIZE_t$		−0.003	0.000	0.003	0.021		0.035	0.019	0.072	0.079
		(−1.999)	(−0.007)	(0.421)	(1.952)		(4.339)	(0.680)	(2.641)	(2.270)
LEV_t		−0.003	−0.006	−0.034	−0.102		0.001	−0.006	0.027	−0.005
		(−3.877)	(−2.226)	(−5.641)	(−5.921)		(0.158)	(−0.213)	(1.200)	(−0.105)
$BETA_t$		0.002	−0.002	−0.029	−0.012		−0.014	0.010	−0.020	0.021
		(0.791)	(−0.596)	(−2.443)	(−0.350)		(−0.605)	(0.197)	(−0.452)	(0.312)
$STDRET_t$		0.103	−0.139	−0.656	−2.009		−3.647	−3.932	−1.514	−3.630
		(2.170)	(−1.958)	(−1.995)	(−3.090)		(−7.422)	(−2.328)	(−1.797)	(−2.478)
TG_t			0.290	1.167	3.404			−0.212	−1.603	0.909
			(8.557)	(8.541)	(8.145)			(−0.392)	(−2.559)	(1.030)
$R\&D_t$			−0.141	−0.778	−3.026			0.226	−0.736	0.161
			(−2.133)	(−5.725)	(−6.011)			(0.382)	(−0.929)	(0.163)
$CEXP_t$			0.084	0.151	0.893			−0.319	−0.456	0.212
			(3.524)	(0.854)	(1.960)			(−1.344)	(−0.574)	(0.347)
$XFIN_t$			−0.003	0.008	−0.139			−0.189	−0.305	−0.369
			(−0.347)	(0.311)	(−1.572)			(−1.979)	(−3.786)	(−1.969)
$PAYOUT_t$			−0.019	−0.115	−0.373			0.039	−0.130	−0.292
			(−2.743)	(−6.607)	(−4.282)			(0.610)	(−1.024)	(−1.390)
Adj. R^2	0.023	0.057	0.090	0.141	0.171	0.013	0.070	0.117	0.123	0.121
N	54,090	43,811	19,319	14,363	8269	55,104	44,148	19,436	13,347	7305

This table shows the coefficient estimates of the following regressions.
$GR\_M_{i,t+k} = \beta_0 + \beta_1 FEP_{i,t} + \beta_2\, TEP_{i,t} + \beta_3\, BM_{i,t} + \beta_4\, SIZE_{i,t} + \beta_5\, LEV_{i,t} + \beta_6\, BETA_{i,t} + \beta_7\, STDRET_{i,t} + \beta_8\, LTG_i t + \beta_9\, R\&D_{i,t} + \beta_{10}\, CEXP_{i,t} + \beta_{11}\, XFIN_{i,t} + \beta_{12}\, PAYOUT_{i,t} + \varepsilon_{i,t+k}$.
Dependent variable is growth of sales or net income over next 2 (5, 10) years. Growth of sales, GR_S_{t+k}, equals S_{t+k}/S_{t+1} where S_t is sales per share. Growth of net income, GR_E_{t+k}, is calculated as I/B/E/S actual EPS in period $t + k$ plus forgone earnings from dividends, divided by base-year's forward earnings. *FEP* is the forward E/P ratio; *TEP* is the trailing E/P ratio. *BM* is the book-to-market ratio; *SIZE* is log of market capitalization calculated as number of common shares outstanding times stock price in the fiscal year end; *LEV* is leverage calculated as total assets divided by equity. *BETA* is the estimated coefficient of market premium in the regression $r = r_f + Beta^{*}\, MKTRF$ using monthly returns over the prior 24 months where r_f is the risk-free rate and *MKTRF* is the monthly market premium. *STDRET* is the standard deviation of monthly returns over the previous 24 months. *LTG* is analysts' consensus (median) long-term growth forecasts, measured in April of each year; *R&D* is calculated as research and development expenses divided by average total assets; *CEXP* is calculated as capital expenditures divided by average total assets; *XFIN* is external financing calculated as the change in total assets minus the change in retained earnings; *PAYOUT* is the payout ratio. Each variable is winsorized at the 1st and 99th percentiles. Following Fama and MacBeth (1973), the regression is estimated annually and the times-series means of estimated coefficients and associated *t*-statistics (in parentheses) are reported.

where EPS_t (div_t) is earnings (dividends) in year t, and his Table 1 reports the portfolio's *median* earnings growth. Panel A of Table 5 shows similar results to Penman (1996): the lowest trailing E/P portfolio demonstrates the strongest *median* earnings growth, and the highest trailing E/P portfolio reports the lowest *median* earnings growth.

However, when the performance of each portfolio is measured by the *mean* earnings growth, Panel B shows that the inferences change substantially: firms in the lowest trailing E/P portfolio demonstrate the lowest, instead of the highest, earnings growth. The discrepancy between the median and mean earnings growth results suggests that the distribution of earnings growth has a fat left tail in the lowest forward E/P portfolio. In other words, some firms in this portfolio report very negative earnings growth. This conjecture is confirmed in the next section's analysis of earnings risk.

A key implication from this analysis is that conclusions based on median earnings growth should be interpreted with caution because the effects of firms in the left tail can be easily ignored. That is, the results of median earnings growth may not fully reflect the disappointing performance of loss firms. To alleviate concerns that the mean and median earnings growth can lead to different conclusions, this paper uses both univariate and regression analyses and adopts a growth measure that incorporates loss firms. I find a weaker relation between the E/P ratio and earnings growth than that suggested by Penman (1996). In particular, this paper shows that the negative relation between the E/P ratio and earnings growth exists only in the long term, but not in the short term.

4.2. The forward E/P ratio and earnings risk

H2 predicts a positive relation between the forward E/P ratio and risk, holding growth constant. To test this hypothesis, two types of risk are examined: (1) earnings risk, measured by the frequency of loss firms and the volatility of earnings/sales growth and (2) conventional risk measures: beta, leverage, and standard deviation of stock returns.

Table 5
Explanations of conflicting results in prior studies.

	Quintiles sorted on TEP_0				
	Low	II	III	IV	High
TEP_0	−0.008	0.034	0.052	0.072	0.106
	Panel A: Median of growth				
$k = 2$	0.164	0.146	0.113	0.092	0.027
$k = 3$	0.136	0.128	0.123	0.106	0.066
$k = 4$	0.185	0.125	0.137	0.114	0.094
$k = 5$	0.169	0.148	0.130	0.120	0.105
$k = 6$	0.137	0.140	0.128	0.120	0.119
$k = 7$	0.132	0.132	0.127	0.119	0.106
$k = 8$	0.144	0.134	0.116	0.121	0.092
$k = 9$	0.116	0.129	0.117	0.116	0.110
$k = 10$	0.130	0.146	0.127	0.123	0.116
	Panel B: Mean of growth				
$k = 2$	−0.335	−0.064	−0.031	−0.006	−0.192
$k = 3$	−0.334	−0.038	0.033	0.046	−0.110
$k = 4$	−0.128	−0.087	0.114	0.015	−0.081
$k = 5$	−0.221	−0.001	0.032	0.099	−0.072
$k = 6$	−0.204	−0.007	0.082	0.099	0.007
$k = 7$	−0.162	0.024	0.143	0.088	−0.038
$k = 8$	−0.064	0.057	0.118	0.103	−0.098
$k = 9$	−0.067	0.090	0.084	0.059	−0.124
$k = 10$	−0.102	0.160	0.070	0.179	0.031

This table shows the realized earnings growth of each trailing E/P (*TEP*) portfolio in the subsequent k years ($k = 2$–10). The trailing E/P ratio is calculated as earnings per share before extraordinary items and discontinued operations divided by stock price. The earnings growth measure is based on Penman (1996) and is defined as $(\Delta EPS_{t+k} + div_{t+k-1} * 0.1)/|EPS_{t+k-1}|$ where *EPS* is Compustat earnings per share before extraordinary items and discontinued operations and *div* is dividend per share. Each variable is winsorized at the 1st and 99th percentiles. All statistics (median or mean) are calculated for each fiscal year and the means of annual statistics are reported.

Table 6 presents the frequency of loss firms in each portfolio. Panel A is based on GAAP net income, and Panel B is based on I/B/E/S actual earnings. In each of the following ten years, the lowest forward E/P portfolio reports the highest frequency of losses, and this frequency is even higher than it is for the financially distressed firms in the highest forward E/P portfolio. For example, in year two, 29.50% (18.00%) of the firms in the lowest (highest) forward E/P portfolio reported negative GAAP earnings, but the other portfolios have a frequency of loss reporting of less than 16%.[12] Similar inferences apply to longer horizons.

When I/B/E/S actual earnings are used, Panel B shows a lower frequency of loss than Panel A. For example, in the lowest forward E/P portfolio, 29.50% of firms reported negative GAAP net earnings, but only 24.03% of them reported negative I/B/E/S earnings. This result is due to the fact that actual I/B/E/S earnings exclude nonrecurring items, which are mostly negative, and therefore are less likely to be negative than GAAP net income. Based on actual I/B/E/S earnings, the lowest forward E/P portfolio still shows a higher frequency of loss than other portfolios. This analysis suggests that although investors expect the low forward E/P firms to have strong earnings growth, these firms are more likely to report losses in subsequent years than other firms.

Table 7 reports the relation between the forward E/P ratio and risk measures (proxied by the volatility of growth and the conventional risk measures). Panel A details the volatility of growth in each portfolio, where volatility is measured time-serially for different income statement items—e.g., sales, operating income, and net earnings.[13]

As Table 7 shows, for all of the growth measures, the lowest forward E/P portfolio demonstrates the highest growth volatility, followed by the highest forward E/P portfolio and the other three portfolios. This result implies a U-shaped relation between the forward E/P ratio and the volatility of growth. In addition, among the different measures of growth, the growth of net earnings is more volatile than the growth of operating income, and sales growth is the least volatile. This finding suggests that associated risk increases as we move from sales to the bottom line in the income statement, which is consistent with the findings in Chan et al. (2003) that sales are more persistent than earnings.

Since Table 7 suggests a U-shaped relation between the forward E/P ratio and the volatility of growth, I further test their relation using the following quadratic regression:

$$VolGR_{t+k} = \alpha + \beta_1 FEP_t + \beta_2 (FEP_t)^2 + \beta_3 LTG_t + \beta_4 GR\_M_{t+k} + \varepsilon_{t+k} \cdots (B1)$$

where $VolGR_{t+k}$ is the time-series volatility of growth in sales or net earnings, *FEP* is the forward E/P ratio, LTG_t is analysts' long-term growth forecasts, and GR_M_{t+k} is the growth of sales or net earnings. Growth measures are included in this regression as control variables. H2 predicts a positive $\hat{\beta}_1$ and a zero $\hat{\beta}_2$. A positive $\hat{\beta}_2$ will indicate a U-shaped relation between $VolGR_{t+k}$ and FEP_t. Contrary to the prediction of H2, Panel B of Table 7 shows a negative sign for $\hat{\beta}_1$ and a positive sign for $\hat{\beta}_2$. Therefore, the empirical evidence does not support H2. The results suggest that a U-shaped instead of a positive relation exists between the volatility of growth and the forward E/P ratio.

For the volatility of earnings growth (*GR_E*), the turning point of the estimated U shape is located at $FEP_0^* = -\hat{\beta}/2\hat{\beta}_2 \approx 0.1$, which falls within the range of the sample data [0.007, 0.182]. Note that the turning point is a nonlinear function of the estimated coefficients. To ensure that the

[12] The high frequency of loss firms in the lowest forward E/P portfolio supports my choice of not using the geometric mean method to calculate growth. Loss firms would be disproportionately excluded from each forward E/P portfolio if the geometric mean method was used. For example, for the two-year growth of net income, only 70.50% (=1–29.50%) of the firms in the lowest forward E/P portfolio would be considered under the geometric mean method, but 86.81% of firms in portfolio III would be included. An unreported table shows that under the geometric mean method, the forward E/P ratio negatively correlates with subsequently realized earnings growth for *each* of the following ten years. However, Tables 3 and 4 of this paper show that when loss firms are considered, the negative relation does not exist for the short term.

[13] The inferences are similar when the volatility of growth is measured cross-sectionally.

Table 6
Frequency of loss firms.

	Horizons (years)								
	+2	+3	+4	+5	+6	+7	+8	+9	+10
Quintiles sorted on *FEP*	Panel A. % of firms with negative GAAP net income								
Low	**29.50%**	**30.33%**	**30.72%**	**29.85%**	**29.62%**	**29.44%**	**28.23%**	**27.41%**	**27.19%**
	3186	2975	2722	2381	2141	1900	1631	1422	1256
	10,798	9808	8860	7978	7227	6455	5780	5188	4621
II	**15.58%**	**17.97%**	**18.33%**	**19.13%**	**19.33%**	**18.43%**	**19.30%**	**19.45%**	**19.04%**
	1693	1785	1657	1574	1454	1251	1186	1080	950
	10,866	9932	9037	8229	7518	6789	6143	5554	4990
III	**13.19%**	**14.85%**	**15.80%**	**16.47%**	**17.57%**	**17.92%**	**18.39%**	**18.77%**	**18.16%**
	1429	1469	1424	1352	1316	1210	1127	1040	901
	10,833	9896	9014	8208	7492	6751	6128	5540	4960
IV	**13.53%**	**16.35%**	**16.68%**	**17.13%**	**18.25%**	**18.97%**	**19.27%**	**19.87%**	**19.54%**
	1461	1602	1482	1386	1330	1246	1139	1056	925
	10,799	9802	8882	8090	7290	6569	5912	5316	4733
High	**18.00%**	**20.40%**	**21.59%**	**22.41%**	**22.67%**	**23.12%**	**23.09%**	**23.33%**	**22.30%**
	1905	1951	1863	1737	1569	1415	1261	1136	963
	10,581	9564	8627	7754	6920	6120	5461	4868	4317
Quintiles sorted on *FEP*	Panel B. % of firms with negative I/B/E/S actual earnings								
Low	**24.03%**	**22.28%**	**21.46%**	**19.80%**	**18.71%**	**18.14%**	**15.73%**	**15.45%**	**14.28%**
	2646	2068	1729	1390	1168	1001	766	671	547
	11,011	9282	8058	7019	6244	5515	4870	4342	3830
II	**10.68%**	**11.65%**	**11.05%**	**11.06%**	**10.41%**	**9.55%**	**10.21%**	**9.64%**	**8.97%**
	1178	1118	940	843	712	584	559	475	395
	11,022	9589	8505	7620	6836	6112	5478	4930	4404
III	**8.95%**	**9.45%**	**9.52%**	**9.58%**	**9.11%**	**9.02%**	**9.53%**	**9.50%**	**8.07%**
	987	906	808	724	618	545	517	462	349
	11,027	9584	8483	7554	6782	6036	5420	4859	4329
IV	**9.12%**	**10.01%**	**9.91%**	**9.29%**	**10.08%**	**10.29%**	**10.75%**	**10.01%**	**9.98%**
	1006	940	809	670	646	585	545	448	395
	11,030	9394	8165	7208	6409	5688	5068	4476	3958
High	**13.03%**	**13.40%**	**13.10%**	**13.48%**	**13.26%**	**13.59%**	**12.69%**	**14.31%**	**12.61%**
	1435	1188	981	862	738	662	545	541	424
	11,014	8867	7490	6393	5571	4870	4294	3781	3364

This table shows the percentage of observations with negative net income (Panel A) or negative I/B/E/S actual earnings (Panel B) in each forward E/P portfolio. For each portfolio, the first row shows the percentage of loss firms, the second row shows the number of loss firms, and the third row show the total number of firms (loss firms and profit firms) in each portfolio. The percentage of loss firms is calculated for each fiscal year and the means of the annual statistics are reported.

turning point is statistically within the range of the observed sample data, this paper follows the method of David, Hwang, Pei, and Reneau (2002) and uses a linear Taylor series approximation to estimate the turning point and its corresponding Wald statistics. The result rejects the null hypothesis that the turning point is outside the sample data's range at the confidence level of 1%. Therefore, the turning point is statistically within the sample range, so the U-shaped relation between the forward E/P ratio and the volatility of growth is confirmed.

Panel C of Table 7 reports the analysis on conventional risk measures using the following regressions.

$$Risk_{t+k} = \alpha + \beta_1 FEP_t + \beta_2 (FEP_t)^2 + \beta_3 LTG_t + \beta_4 GR\_E_{t+k} + \varepsilon_{t+k} \cdots \quad (B2)$$

where $Risk_{t+k}$ is measured by $BETA_{t+k}$, $STDRET_{t+k}$, or LEV_{t+k}, and GR_E_{t+k} is the growth of net earnings. Similar to the volatility of growth, Panel C shows that these risk measures have a U-shaped relation with the forward E/P ratio as well.

Overall, while H2 predicts a positive relation between the forward E/P ratio and risk, the results of earnings risk (the frequency of loss firms, the volatility of earnings and sales growth) and conventional risk measures both suggest that their relations are in U shape. Especially, firms in the lowest forward E/P portfolio bear higher level of risk than other firms. Despite the high growth expectation from the market, the actual performance of low forward E/P firms is subject to higher risk and likely to disappoint investors.

4.3. Supplementary analyses

4.3.1. The forward E/P ratio and the distribution of earnings growth

The high frequency of loss and large growth volatility in the lowest forward E/P portfolio implies a wide distribution of earnings growth in this portfolio. Fig. 2 illustrates the distribution of two-year earnings growth for each forward E/P portfolio.

Among the five portfolios, the lowest forward E/P portfolio (i.e. Portfolio I in Fig. 2) shows the most widespread distribution of earnings growth. Its right tail is longer than those of the other portfolios, suggesting that it includes star firms which deliver the strongest earnings growth among all firms. Its left tail is also longer than those of the other portfolios, indicating that this portfolio has firms that report the most negative earnings growth in the overall sample. This finding is coherent with the results of Section 4.2, in which the lowest forward E/P portfolio has the highest frequency of loss and the largest volatility of earnings growth. It also implies that an investment in this portfolio is risky because earnings growth in subsequent years could be extremely high or extremely low.

As a supplementary analysis, I compare each portfolio's probability of delivering earnings that are more than 1, 3, or 5 times the base year's forward earnings. The probability is calculated as the proportion of firms that satisfy the specified conditions. If investors have rational expectations of earnings growth, the forward E/P ratio will have a negative relation to the probability of surpassing each benchmark. In other words, the lowest forward E/P portfolio should demonstrate the highest probability of reaching the specified benchmarks.

Contrary to this prediction, Panel A of Table 8 shows that the lowest forward E/P portfolio does not have a greater probability of beating the

Table 7
Forward E/P ratio, volatility of growth, and conventional risk measures.

Panel A Univariate analysis on the volatility of growth

Variable		Quintiles sorted on *FEP*					Comparison		
		Low	II	III	IV	High	III-Low	High-Low	High-IV
FEP_0		0.028	0.051	0.066	0.083	0.120	0.038***	0.092***	0.037***
	N								
Volatility of sales growth GR_S_{t+k}									
$k = 2–6$	49,177	0.318	0.254	0.228	0.208	0.211	−0.090***	−0.107***	0.003
$k = 3–7$	44,459	0.337	0.270	0.242	0.218	0.221	−0.094***	−0.115***	0.003
$k = 4–8$	40,217	0.355	0.284	0.255	0.229	0.231	−0.100***	−0.123***	0.003
$k = 5–9$	36,411	0.373	0.299	0.265	0.240	0.240	−0.107***	−0.133***	0.000
$k = 6–10$	32,674	0.392	0.315	0.276	0.249	0.251	−0.117***	−0.141***	0.002
Volatility of operating income growth GR_O_{t+k}									
$k = 2–6$	48,878	0.830	0.506	0.425	0.399	0.435	−0.405***	−0.395***	0.036
$k = 3–7$	44,167	0.839	0.522	0.441	0.413	0.454	−0.398***	−0.385***	0.042*
$k = 4–8$	39,927	0.856	0.539	0.450	0.431	0.474	−0.406***	−0.382***	0.043 *
$k = 5–9$	36,130	0.882	0.557	0.464	0.449	0.495	−0.418***	−0.387***	0.046
$k = 6–10$	32,397	0.914	0.569	0.484	0.474	0.515	−0.430***	−0.399***	0.041
Volatility of earnings growth GR_E_{t+k}									
$k = 2–6$	47,968	1.559	0.698	0.554	0.511	0.549	−1.005***	−1.009***	0.038
$k = 3–7$	41,931	1.538	0.714	0.581	0.537	0.570	−0.957***	−0.968***	0.033
$k = 4–8$	37,036	1.598	0.735	0.604	0.551	0.602	−0.994***	−0.997***	0.051
$k = 5–9$	32,946	1.680	0.763	0.644	0.582	0.643	−1.037***	−1.038***	0.060
$k = 6–10$	29,219	1.725	0.794	0.658	0.620	0.670	−1.066***	−1.054***	0.050

This table shows the relation between the forward E/P ratio and risk. Panel A presents the volatility of growth in each forward E/P portfolio. *FEP* is the forward E/P ratio. For each firm, volatility of growth is calculated as the standard deviation of growth over five years (year $t + k$–year $t + k + 4$). Growth of sales (operating income), GR_S_{t+k} (GR_O_{t+k}), equals S_{t+k}/S_{t+1} (O_{t+k}/O_{t+1}) where S_t (O_t) is sales (operating income) per share. Growth of net income, GR_E_{t+k}, is calculated as I/B/E/S actual EPS in period $t + k$ plus forgone earnings from dividends, divided by base-year's forward earnings. Each variable is winsorized at the 1st and 99th percentiles. All statistics are calculated for each fiscal year and the means of annual statistics are reported. The differences are tested using the two-tailed Wilcoxon test. ***, **, * stand for being significant at 1%, 5%, and 10%, respectively.

Panel B Relation between forward E/P ratio and volatility of growth (*t*-statistics in parenthesis)

	Dependent variable: volatility of sales growth (GR_S_{t+k})					Dependent variable: volatility of earnings growth (GR_E_{t+k})				
	$k = 2–6$	$k = 3–7$	$k = 4–8$	$k = 5–9$	$k = 6–10$	$k = 2–6$	$k = 3–7$	$k = 4–8$	$k = 5–9$	$k = 6–10$
Intercept	−0.175	−0.112	−0.077	−0.050	-0.019	2.519	2.287	2.280	2.234	2.129
	(−7.612)	(−6.592)	(−5.399)	(−3.011)	(−1.245)	(17.207)	(20.724)	(14.463)	(9.513)	(8.227)
FEP_t	−1.667	−1.526	−1.624	−1.813	−2.119	−42.849	−40.421	−42.228	−44.107	−41.860
	(−11.387)	(−10.051)	(−10.827)	(−8.519)	(−7.715)	(−10.818)	(−11.442)	(−9.212)	(−5.598)	(−5.309)
$(FEP_t)^2$	10.283	9.286	9.900	10.820	12.285	226.208	217.390	235.066	260.570	249.172
	(7.568)	(7.891)	(8.360)	(8.008)	(7.318)	(8.109)	(7.897)	(6.208)	(3.820)	(3.566)
LTG_t	0.526	0.472	0.419	0.368	0.318	−0.457	−0.134	−0.068	0.010	0.020
	(10.638)	(10.660)	(8.972)	(6.705)	(5.006)	(−2.845)	(−0.821)	(−0.282)	(0.035)	(0.056)
GR_M_{t+2}	0.357					−0.104				
	(14.694)					(−3.594)				
GR_M_{t+3}		0.293					−0.007			
		(16.173)					(−0.244)			
GR_M_{t+4}			0.264					0.050		
			(18.241)					(1.713)		
GR_M_{t+5}				0.246					0.113	
				(19.069)					(3.723)	
GR_M_{t+6}					0.232					0.125
					(20.518)					(3.974)
Adj. R^2	0.182	0.227	0.266	0.301	0.328	0.177	0.260	0.225	0.230	0.255
N	41,240	37,363	33,912	30,792	27,704	40,565	35,215	31,090	27,640	24,560

Panel B shows the results of the following regression: $VolGR\_M_{t+k} = \alpha + \beta_1 FEP_t + \beta_2 (FEP_t)^2 + \beta_3 LTG_t + \beta_4 GR\_M_{t+k} + \varepsilon_{t+k}$ where $VolGR\_M_{t+k}$ is the volatility of growth M (M = Sales or Net Income) over five years (year $t + k$–year $t + k + 4$), sales growth GR_S_{t+k} equals S_{t+k}/S_{t+1}, and earnings growth GR_E_{t+k} is calculated as I/B/E/S actual EPS in period $t + k$ plus forgone earnings from dividends, divided by base-year's forward earnings, *FEP* is the forward E/P ratio, and *LTG* is analysts' consensus (median) long-term growth forecasts, measured in April of each year t. Following Fama and MacBeth (1973), the regression is estimated annually and the times-series means of estimated coefficients and associated *t*-statistics (in parentheses) are reported.

Panel C Relation between forward E/P ratio and conventional risk measures

	Dependent Variables								
	$BETA_{t+k}$			$STDRET_{t+k}$			LEV_{t+k}		
	$k = 2$	$k = 5$	$k = 10$	$k = 2$	$k = 5$	$k = 10$	$k = 2$	$k = 5$	$k = 10$
Intercept	1.036	0.960	0.898	0.095	0.092	0.090	3.518	3.720	3.898
	(14.592)	(14.239)	(10.450)	(17.128)	(26.930)	(16.214)	(17.598)	(12.871)	(11.171)
FEP_t	−8.194	−5.929	−3.381	−0.677	−0.631	−0.487	−1.324	−5.025	−10.628
	(−4.955)	(−5.569)	(−2.728)	(−5.532)	(−10.251)	(−5.310)	(−0.236)	(−0.766)	(−1.426)
$(FEP_t)^2$	49.152	38.239	23.991	4.558	4.148	3.171	126.847	161.938	184.621
	(4.497)	(5.249)	(3.433)	(5.762)	(8.263)	(5.193)	(2.784)	(3.314)	(3.045)
LTG_t	2.473	2.192	2.014	0.293	0.279	0.258	−5.798	−6.147	−6.245
	(14.852)	(9.820)	(8.623)	(18.092)	(15.418)	(17.168)	(−9.561)	(−8.331)	(−7.851)

(continued on next page)

Table 7 *(continued)*

Panel C Relation between forward E/P ratio and conventional risk measures

	Dependent Variables								
	$BETA_{t+k}$			$STDRET_{t+k}$			LEV_{t+k}		
	$k=2$	$k=5$	$k=10$	$k=2$	$k=5$	$k=10$	$k=2$	$k=5$	$k=10$
GR_E_{t+2}	−0.020			−0.004			−0.136		
	(−1.775)			(−9.322)			(−4.160)		
GR_E_{t+5}		−0.017			−0.004			−0.065	
		(−1.081)			(−6.554)			(−2.116)	
GR_E_{t+10}			−0.016			−0.004			−0.034
			(−1.598)			(−7.338)			(−1.743)
Adj. R^2	0.142	0.113	0.072	0.347	0.339	0.260	0.097	0.082	0.061
N	43,896	30,133	16,933	43,896	30,133	16,933	45,397	30,865	17,474

Panel C shows the results of the following regression: $Risk_{t+k} = \alpha + \beta_1 FEP_t + \beta_2 (FEP_t)^2 + \beta_3 LTG_t + \beta_4 GR\_E_{t+k} + \varepsilon_{t+k}$ where *Risk* is proxied by *BETA*, *STDRET*, and *LEV*. *BETA* is the estimated coefficient of market premium in the regression $r = r_f + Beta^* MKTRF$ using monthly returns over the prior 24 months where r_f is the risk-free rate and *MKTRF* is the monthly market premium. *STDRET* is the standard deviation of monthly returns over the previous 24 months. *LEV* is leverage calculated as total assets divided by equity. *FEP* is the forward E/P ratio. *LTG* is analysts' consensus (median) long-term growth forecasts, measured in April of each year. GR_E_{t+k} is earnings growth, calculated as I/B/E/S actual EPS in period $t+k$ plus forgone earnings from dividends, divided by base-year's forward earnings. Following Fama and MacBeth (1973), the regression is estimated annually and the times-series means of estimated coefficients and associated *t*-statistics (in parentheses) are reported.

base year's earnings than portfolio II. In year 2 ($k=2$), only 48.28% of firms in the lowest forward E/P portfolio surpassed the base year's earnings, compared to 51.20% of firms in portfolio II. Similar inferences can be made for years 3 through 10 ($k=3$–10). These results suggest that the growth of the lowest forward E/P portfolio is not as high as expected.

However, when the benchmark is set higher, at 3 or 5 times the base year's forward earnings, the lowest forward E/P portfolio demonstrates the highest probability of exceeding related benchmarks. Panel B of Table 8 shows that for year 2 ($k=2$), the lowest forward E/P portfolio has a 10.07% probability of generating earnings that are 3 times of the base year's forward earnings. This probability is much higher than that of the highest forward E/P portfolio, 0.80%. When the horizon is lengthened (i.e., $k=3$–10), these two portfolios' discrepancy in the probabilities of exceeding benchmarks also increases. Panel C indicates that when the benchmark is 5 times of the base year's forward earnings, the lowest forward E/P portfolio again demonstrates the strongest ability to reach this benchmark.

Overall, the evidence in Fig. 2 and Table 8 is consistent with the results in Sections 4.1 and 4.2. While valuation theories predict that the lowest forward E/P portfolio will deliver the strongest earnings growth in subsequent years, the results show that this portfolio has a wide distribution of earnings growth. Among all portfolios, the lowest forward E/P portfolio is the most capable of delivering strong earnings growth, but it also contains firms that generate disappointing performances which drive down this portfolio's average performance.

4.3.2. Relation between forward E/P ratio and growth: profit vs. loss firms

Despite the theoretical predictions of a negative relation between E/P ratio and future growth, the results show that a negative relation does not exist for short-term earnings growth. This finding likely occurs because of a high incidence of losses in the lowest forward E/P portfolio. As a supplementary analysis, I decompose the sample into profit firms and loss firms and compare the results.

Table 9 shows that dividing the sample into profit and loss firms substantially increases the fit of regressions, especially for the two-year earning growth (adjusted R-squares increase from 0.070 in Table 4 to 0.238 and 0.142 for profit and loss firms, respectively, in Table 9). For profit firms, the forward E/P ratio is negatively related to future earnings growth, as predicted by valuation theories. However, loss firms present an inverse relationship: the positive coefficient of *FEP* suggests that among loss firms, firms with lower forward E/P ratios generate more disappointing earnings growth than other firms. This analysis suggests that the relation between the forward E/P ratio and realized growth is very distinctive between profit and loss firms, so studies which exclude loss firms may produce misleading conclusions.

4.4. Robustness tests

4.4.1. Industry effects

Panel A of Table 1 indicates industry clustering in some portfolios. For example, the lowest forward E/P portfolio is composed mainly of firms in the Business Equipment industry. To ensure that the results of the relation between the forward E/P ratio and earnings growth/risk do not just manifest industry effects, I compose the portfolios *within* each industry for each year based on the Fama–French 12-industry classification scheme. The results are qualitatively similar.

4.4.2. Alternative growth measures

The growth measure in the previous sections utilizes only the information at the beginning and end of a horizon. When the horizon is long and performance is volatile, the calculated growth may not be representative of the whole period's growth. To address this issue and fully incorporate the information within the period, two alternative growth measures are calculated: least-squares-based growth and aggregate growth. Following Dechow and Sloan (1997), the least-squares-based growth is obtained from the following regression: $logX_{t+s} = g_{T*}s$ where $s=0,\ldots,T$ and $T \geq 4$. For each firm, aggregate earnings growth is calculated as the sum of earnings over *T* years divided by one-year-out earnings forecasts available in the base years. Both measures show findings (untabulated) consistent with the negative relation between long-term growth and the forward E/P ratio documented in the main analyses.

4.4.3. Different time periods

To ensure that the results are robust for different periods, the analyses are implemented for three sub-periods: 1982–1992, 1993–2000, and 2001–2007. The cutoff of time is selected because I/B/E/S significantly expanded its coverage in 1992, and many accounting rules were enacted after 2000. Untabulated results suggest similar conclusions.

4.4.4. Mechanical relation between the forward E/P ratio and earnings growth

Previous studies on the relation between the trailing E/P ratio and earnings growth are subject to a mechanical relation problem caused by the common factor shared between the trailing E/P ratio and earnings growth; that is, earnings in base years. Similar problems exist in studies of the relation between book-to-market ratio and return on equity where book value is the common factor. This paper faces a similar issue because the forward E/P ratio and the growth measure have a common factor—analysts' one-year-out earnings forecasts. To alleviate concerns, two methods are utilized to ensure the robustness of the results.

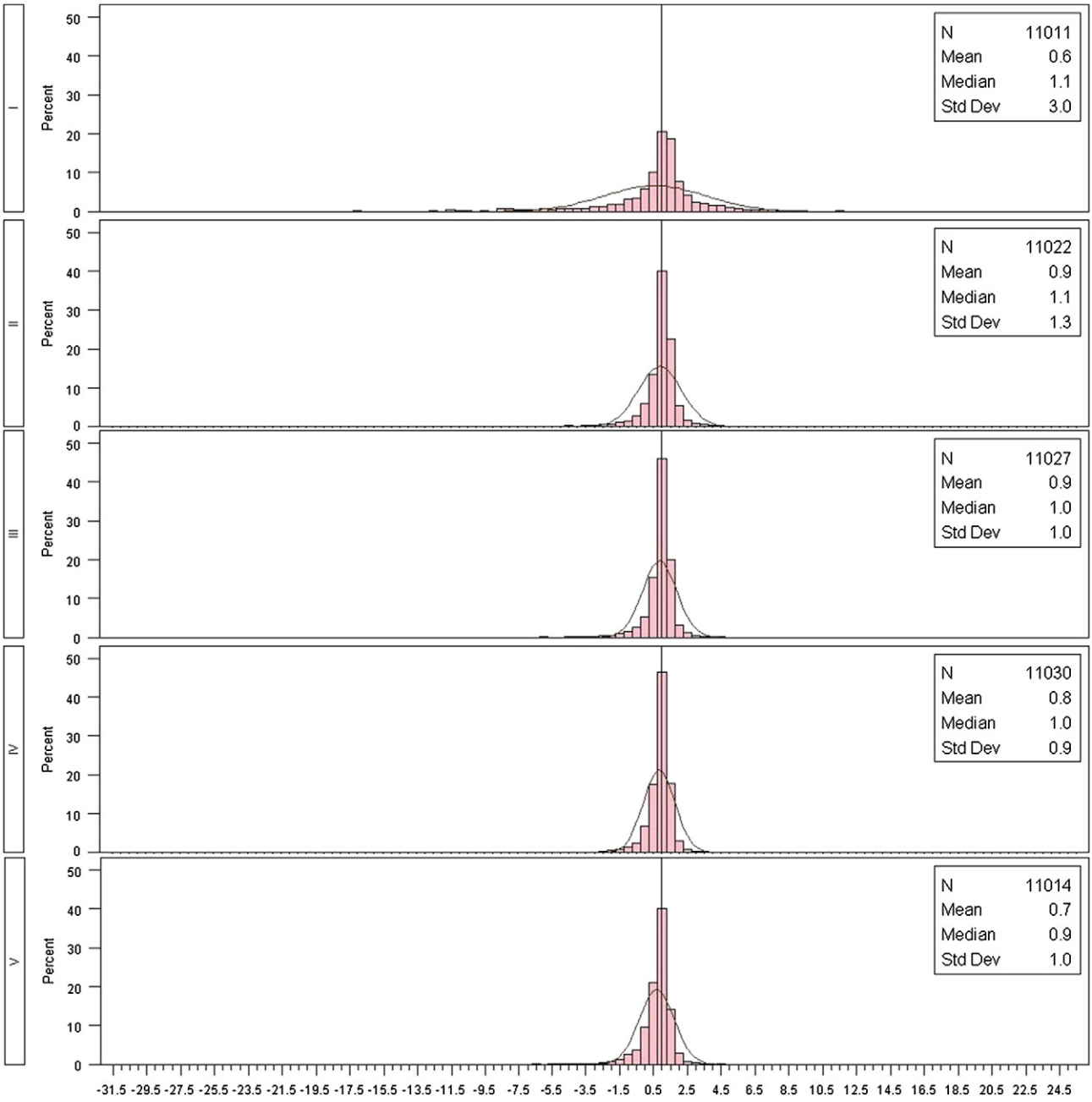

Fig. 2. Distribution of Two-Year Earnings Growth in Each Forward E/P Portfolio. This graph shows the distribution of two-year earnings growth of each forward E/P portfolio. In April of each year, firms are sorted into quintiles based on the forward E/P ratio. Growth of net income, GR_E_{t+2}, is calculated as I/B/E/S actual EPS in period $t+2$ plus forgone earnings from dividends, divided by base-year's forward earnings.

The first method replaces analysts' one-year-out earnings forecasts with the analysts' two-year-out earnings forecasts to calculate the forward E/P ratio. Earnings in year t are still scaled by one-year-out analysts' forecasts to obtain the earnings growth measure. In this approach, no common factor exists between the dependent and independent variables.[14] Under the new measure, the results are quantitatively and qualitatively similar.

The second method uses the following regression to capture the relation between the forward E/P ratio and earnings growth:

$$x_{t=k} = \beta_1 E_t[x_{t+1}] + \beta_2 p_t + \varepsilon_{t+k} \quad \text{(C)}$$

where x_{t+k} is earnings per share k years subsequent to the base year t, $E_t[x_{t+1}]$ is analysts' one-year-out earnings forecasts in the base year t, and p_t is stock price. An examination of Eq. (C) is identical to the analysis of the relation between earnings growth and the forward P/E ratio, which is apparent when both sides of Eq. (C) are divided by $E_t[x_{t+1}]$. The results (not reported) support the findings in the main analysis.

5. Conclusion

This paper examines the relation between the forward E/P ratio and subsequent earnings growth, with a focus on the earnings risk in each forward E/P portfolio. Despite theoretical predictions of a negative relation between the forward E/P ratio and earnings growth, the results indicate that the negative relation exists only for long-term earnings

[14] It is acknowledged that one-year-out earnings forecasts are highly correlated with two-year-out earnings forecasts. Thus, the mechanical relation problems may not be completely resolved by this approach.

Table 8
Nonparametric analysis on growth of net income.

Quintiles sorted on *FEP*	*k*								
	2	3	4	5	6	7	8	9	10
Panel A Prob ($GR\_E_{t+k} > 1$)									
Low	48.28%	49.35%	49.90%	51.10%	52.96%	53.15%	54.44%	55.64%	56.21%
II	51.20%	52.70%	54.33%	55.40%	56.51%	57.20%	58.35%	57.88%	59.51%
III	49.21%	51.13%	52.94%	54.06%	54.87%	55.86%	55.92%	56.07%	57.97%
IV	45.78%	46.92%	49.01%	49.68%	50.49%	50.74%	50.73%	50.73%	52.19%
High	39.04%	41.05%	42.02%	42.79%	43.95%	44.47%	45.38%	45.96%	48.44%
Diff (low–high)	9.25%	8.30%	7.87%	8.31%	9.00%	8.69%	9.06%	9.68%	7.77%
Panel B Prob ($GR\_E_{t+k} > 3$)									
Low	10.07%	13.45%	16.31%	19.85%	22.21%	24.49%	26.30%	28.89%	31.45%
II	2.47%	3.93%	5.85%	8.31%	10.68%	12.70%	14.97%	17.19%	19.74%
III	1.20%	2.49%	4.04%	5.55%	7.16%	8.98%	10.76%	12.80%	15.11%
IV	1.07%	1.76%	3.05%	4.11%	5.41%	6.27%	7.80%	9.26%	11.30%
High	0.80%	1.58%	2.81%	3.79%	4.53%	5.14%	6.40%	7.87%	9.65%
Diff (low–high)	9.27%	11.87%	13.50%	16.07%	17.68%	19.35%	19.90%	21.03%	21.80%
Panel C Prob ($GR\_E_{t+k} > 5$)									
Low	5.44%	7.45%	8.84%	10.31%	11.75%	12.71%	14.57%	16.34%	17.90%
II	0.74%	1.16%	1.74%	2.62%	3.39%	3.95%	4.82%	6.24%	7.25%
III	0.33%	0.59%	1.05%	1.51%	1.96%	2.48%	2.57%	2.94%	4.19%
IV	0.32%	0.43%	0.66%	0.85%	1.38%	1.57%	1.94%	2.45%	3.01%
High	0.28%	0.44%	0.71%	0.93%	1.30%	1.55%	1.70%	2.38%	2.66%
Diff (low–high)	5.16%	7.01%	8.13%	9.37%	10.45%	11.16%	12.87%	13.95%	15.24%

This table presents each forward E/P portfolio's probability of delivering earnings that are greater than 1, 3, or 5 times of based year's forward earnings. Probability is calculated as the proportion of firms that beat the benchmark. *FEP* is the forward E/P ratio. Growth of net income, GR_E_{t+k}, is calculated as actual I/B/E/S EPS in period $t + k$ plus forgone earnings from dividends, divided by base-year's forward earnings.

growth but not for short-term earnings growth. On average, firms in the lowest forward E/P portfolio reported the lowest, instead of the highest, earnings growth in the two years following the portfolio's formation.

Using a growth measure that incorporates loss firms and firms with disappointing performance, this paper proposes a possible reason for the conflicting results in prior literature regarding the relation between the E/P ratio and future growth. When accounting for the performance of loss firms, the relation between the E/P ratio and earnings growth becomes much weaker than when loss firms are excluded, and the results for short-term earnings growth can contradict the predictions of valuation theories.

The analyses on earnings risk (the incidence of losses, the volatility of earnings growth) and the conventional risk measures (beta, the volatility of stock returns, and leverage) show that firms in the lowest forward E/P portfolio bear the highest level of risk among the whole sample. Its risk level is even higher than that of the highest forward E/P portfolio, which is inherently financially distressed. Supplementary analyses on the distribution of earnings growth show that the lowest

Table 9
Relation between forward E/P ratio and earnings growth (profit vs. loss firms).

	Dependent variable: earnings growth GR_E_{t+k}					
	$k = 2$		$k = 5$		$k = 10$	
	Loss firms	Profit firms	Loss firms	Profit firms	Loss firms	Profit firms
Intercept	−3.164***	1.682***	−2.837***	2.673***	−2.771***	4.373***
	(−8.034)	(23.468)	(−13.876)	(20.655)	(−5.404)	(13.811)
FEP_t	23.402***	−9.082***	15.728***	−21.039***	19.432***	−33.749***
	(9.236)	(−13.643)	(7.611)	(−7.867)	(2.797)	(−8.802)
TEP_t	2.595***	−1.096***	2.165***	−2.149***	−8.050	−2.127**
	(5.769)	(−5.650)	(3.172)	(−5.845)	(−0.938)	(−2.289)
BM_t	−0.835***	0.325***	−0.482***	0.916***	−0.573***	1.289***
	(−5.977)	(8.763)	(−3.271)	(5.982)	(−3.886)	(4.831)
$SIZE_t$	0.183***	−0.016**	0.155***	−0.039***	0.221***	−0.097***
	(6.919)	(−2.336)	(8.647)	(−3.355)	(5.562)	(−3.707)
LEV_t	−0.084**	0.018***	−0.033***	0.036***	−0.034*	0.058***
	(−2.390)	(6.759)	(−3.004)	(7.059)	(−1.965)	(5.048)
$BETA_t$	−0.082	−0.008	0.040	0.019	−0.101	0.006
	(−1.516)	(−0.687)	(1.060)	(0.788)	(−1.550)	(0.091)
$STDRET_t$	−2.504***	0.279	−2.037***	0.933*	−0.362	2.954*
	(−2.706)	(1.020)	(−2.650)	(1.949)	(−0.231)	(1.963)
Adj. R^2	0.238	0.142	0.170	0.165	0.161	0.164
N	5302	38,846	3411	26,013	1660	14,748

This table shows the coefficient estimates of the regression of earnings growth on forward E/P ratio and other control variables conditional on the sign of net income (profit vs. loss) where net income is defined as actual earnings from I/B/E/S. Growth of net income, GR_E_{t+k}, is calculated as actual I/B/E/S EPS in period t + k plus forgone earnings from dividends, divided by base-year's forward earnings. *FEP* is the forward E/P ratio; *TEP* is the trailing E/P ratio. *BM* is the book-to-market ratio; *SIZE* is log of market capitalization calculated as number of common shares outstanding times stock price in the fiscal year end; *LEV* is leverage calculated as total assets divided by equity. *BETA* is the estimated coefficient of market premium in the regression $r = r_f + Beta^* MKTRF$ using monthly returns over the prior 24 months where r_f is the risk-free rate and *MKTRF* is the monthly market premium. *STDRET* is the standard deviation of monthly returns over the previous 24 months. Each variable is winsorized at the 1st and 99th percentiles. Following Fama and MacBeth (1973), the regression is estimated annually and the times-series means of estimated coefficients and associated *t*-statistics (in parentheses) are reported. Estimated coefficients are tested in two-sided *t*-tests. ***, **, * stand for being significant at 1%, 5% and 10%, respectively.

forward E/P portfolio includes star firms that generate the strongest earnings growth within the sample. However, this portfolio also contains firms reporting the most negative earnings growth, which significantly decrease the performance of this portfolio.

Overall, the findings of earnings risk and earnings growth are coherent: the high incidence of losses and the high volatility of earnings growth in the lowest forward E/P portfolio explain why a negative relation between the forward E/P ratio and short-term earnings growth cannot be observed. This paper's comprehensive analysis of earnings growth and earnings risk provides insights for both growth prediction and market inefficiency literature. For growth prediction, the incorporation of loss firms is important because it may change the conclusions considerably. In addition, the forward E/P ratio is a better growth predictor than the trailing E/P ratio, especially for the prediction of long-term growth. For market inefficiency literature, this paper suggests that the mispricing of low forward E/P stocks is due to the irrationality of investors' expectations of future growth. The initially high valuation for the lowest forward E/P portfolio cannot be justified by the realized earnings growth in subsequent periods since low forward E/P firms report losses more frequently and have more volatile earnings growth than other firms. The high risk level of the lowest forward E/P portfolio also suggests that risk is not an explanation of the returns from the long-short investment strategy based on the forward E/P ratio.

This paper bears certain caveats. For long-term earnings growth, the analysis is restricted to firms which survive long-term and operate successfully. In addition, because the paper requires analysts' forecasts to calculate the forward E/P ratio and growth measures, the results may not generalize to firms for which analyst coverage is not available. Future research can explore the effects of analysts' forecast biases on the forward E/P ratio's predictive power of future growth.

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Appendix A. Variable definition

Variables		Calculation*
FEP_t	:	Forward earnings-to-price ratio = analysts' consensus (median) one-year out EPS forecast, E_{t+1}, divided by share price from IBES, measured in April of each year
TEP_t	:	Trailing earnings-to-price ratio = earnings per share before extraordinary items and discontinued operations divided by share price from IBES, measured in April of each year
GR_M_{t+k}	:	Growth rate of M measures over the next k years, where M is sales, operating income, or net earnings, and $k = 2 \sim 10$. GR_S_{t+k} (GR_O_{t+k}), growth of sales (operating income), equals S_{t+k}/S_{t+1} (O_{t+k}/O_{t+1}) where S_t (O_t) is sales (operating income) per share. GR_E_{t+k}, growth of net income = actual EPS from I/B/E/S in period t plus forgone earnings from dividends, divided by base-year's forward earnings (i.e., $(x_{t+k} + r \cdot d_{t+k-1})/E_{t+1}$) where x_t (d_t) is actual EPS from I/B/E/S (dividend per share) in year t. r is assumed to be 0.07.
BM_t	:	Book-to-market ratio = common equity (adjusted for deferred tax liabilities) at the end of fiscal year $t-1$, divided by market capitalization in April of each year t
$SIZE_t$	:	Market capitalization = log (number of common shares outstanding times stock price in fiscal year end)
LEV_t	:	Leverage = total assets divided by total common equity
$BETA_t$	:	Beta calculated from CAPM model = the estimated coefficient of market premium in the regression $r = r_f + Beta^* MKTRF$ using monthly returns over the prior 24 months where r_f is the risk-free rate and $MKTRF$ is the monthly market premium
$STDRET_t$	:	The standard deviation of monthly returns over the prior 24 months
LTG_t	:	Analysts' consensus (median) long-term growth forecasts, measured in April of each year
$R\&D_t$	:	Research and development intensity = research and development expense deflated by average total assets
$CEXP_t$	:	Capital expenditure = capital expenditure divided by average total assets
$XFIN$	:	External financing = change in total assets minus change in retained earnings
$PAYOUT_t$	:	Payout ratio. If earnings >0 then $PAYOUT$ = common dividend divided by earnings. If earnings ≤0 then $PAYOUT$ = dividend divided by (0.08*common equity). Earnings are defined as income before extraordinary items available for common equity.
TA_t	:	Total assets

*Per share data from COMPUSTAT are adjusted for stock splits and stock dividends.

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