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# Predictable EPS growth and the performance of value investing

**Richard G. Sloan**[1] · **Annika Yu Wang**[2]

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**Abstract**
Previous research finds that EPS growth rates are difficult to predict and reasons that much of the observed cross-sectional variation in valuation ratios is due to variation in implied future stock returns. Yet the observed cross-sectional relation between valuation ratios and realized future stock returns is weak. We revisit these findings using a refined measure of expected EPS growth rates and document robust evidence of predictability in EPS growth rates. Moreover, we find that this predictable growth extends beyond two years into the future and is strongly reflected in observed valuation ratios. We show that combining valuation ratios with our refined measure of expected EPS growth rates improves forecasts of stock returns, though return predictability remains weak. Thus, we conclude that most of the variation in valuation ratios is driven by predictable EPS growth.

**Keywords** Earnings · Growth · Value · Analyst forecasts

**JEL Classification** M41 · C23 · D21 · G32

✉ Richard G. Sloan
sloanr@marshall.usc.edu

Annika Yu Wang
annikawang@bauer.uh.edu

1 Marshall School of Business, Leventhal School of Accounting, University of Southern California, 3660 Trousdale Pkwy, Los Angeles, CA 90089, USA

2 Bauer College of Business, University of Houston, 4250 Martin Luther King Blvd, Houston, TX 77204, USA

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## 1 Introduction

Valuation theory implies that valuation ratios such as the earnings-to-price ratio increase with implied future returns and decrease with expected future earnings-per-share (EPS) growth rates (e.g., Miller and Modigliani 1961).[1] In practice, we observe significant cross-sectional variation in valuation ratios. Yet most existing research concludes that cross-sectional variation in EPS growth rates is largely unpredictable (e.g., Lakonishok et al. 1994; Chan et al. 2003). This has led many researchers to conclude that stocks with higher earnings-to-price ratios have higher implied future returns (e.g., Lakonishok et al. 1994; Chan et al. 2003; Israel et al. 2021; De la O et al. 2023). An important implication of this conclusion is that value investing strategies that tilt toward stocks with higher valuation ratios should generate higher realized future returns. In recent years, however, evidence of outperformance for such strategies has been mixed (e.g., Fama and French 2021).

One possible explanation for the mixed recent performance of value strategies is that EPS growth rates are more predictable than suggested by the previous research. While the finance and accounting literature continues to cite this previous research, there is some largely overlooked evidence suggesting that EPS growth rates are more predictable (e.g., Gao and Wu 2014; Kryzanowski and Mohsni 2014).[2] Moreover, refined measures of recurring EPS and expected EPS growth rates have become more widely available. To the extent that EPS growth rates are predictable and correctly reflected in stock prices, value strategies will hold stocks with relatively low expected EPS growth rates, and controlling for expected EPS growth rates should lead to improved explanatory power for future stock returns.

We provide robust evidence of predictability in future EPS growth rates by refining and extending previous findings in several respects. Our most significant refinement is to replace the I/B/E/S analyst-forecasted long-term earnings growth measure used by previous research with a much more accurate measure of the expected EPS growth rate that is derived from analysts' multi-year annual EPS forecasts. Using this revised measure of the expected EPS growth rate, we document robust evidence of predictability in future EPS growth rates. We

[1] There is a longstanding unresolved debate concerning whether predictable variation in the cross-section of implied future stock returns is due to rationally priced differences in risk, irrationally biased expectations of future cash flows, or data mining (e.g., Engelberg et al. 2018). We do not claim to resolve the debate in this paper. We use the term "implied returns" rather than "expected returns" to reflect the fact that these returns are implied by current valuation ratios but may not be rationally expected by investors.

[2] We conducted a citation analysis using the *Web of Science* on April 4, 2023. Lakonishok et al. (1994) had 1,600 total citations, 235 from accounting journals and 248 between 2020 and 2022. Chan et al. (2003) had 133 total citations, 34 from accounting journals and 22 between 2020 and 2022. In contrast, Gao and Wu (2014) and Kryzanowski and Mohsni (2014) had only two citations each. The only citation from an accounting journal was to Gao and Wu (2014) from a 2022 *Journal of Financial Reporting* paper. Thus, these papers appear to have been largely overlooked. Moreover, as described in our paper, we introduce a new and improved measure of the expected EPS growth rate and show that the predictability of EPS growth extends significantly beyond the levels documented by Gao and Wu (2014) and Kryzanowski and Mohsni (2014).

also demonstrate that a significant proportion of the cross-sectional variation in observed earnings-to-price ratios is attributable to rationally anticipated variation in future EPS growth rates. Finally, we show that incorporating expectations of EPS growth rates in cross-sectional regressions of future stock returns on earnings-to-price ratios leads to improved explanatory power for future stock returns.

Our empirical results update a number of influential findings from previous research. First, Lakonishok et al. (1994) and Chan et al. (2003) find that EPS growth rates mean-revert rapidly. Using refined measures of recurring EPS and a more recent sample period, we provide evidence of slower mean reversion in EPS growth rates. Second, La Porta (1996), Dechow and Sloan (1997), and Chan et al. (2003) find that analysts' forecasts of long-term earnings growth rates provide upwardly biased and inaccurate forecasts of future five-year EPS growth rates. We show that our refined measure of forecasted long-term EPS growth rates that is derived from analysts' multi-year annual EPS forecasts provides more accurate predictions of future five-year EPS growth rates. Third, Lakonishok et al. (1994) and Chan et al. (2003) find that EPS growth rates are difficult to predict, especially beyond two years into the future. Using our refined measures of recurring EPS and forecasted long-term EPS growth rates, we show that EPS growth rates are highly predictable and that this predictability extends beyond two years into the future. For example, the headline result of Chan et al. (2003) is that "only about three percent of the variation in five-year earnings growth rates is captured by the model." Using our refined forecasting variables, the corresponding explanatory power in our forecasting model is about 25%. Finally, Lakonishok et al. (1994) and Chan et al. (2003) find that valuation ratios, such as earnings-to-price ratios, are unrelated to future EPS growth rates but are positively related to future stock returns. Using more recent data, we find that earnings-to-price ratios are strongly negatively related to future EPS growth rates but have no significant relation to future stock returns. However, after following valuation theory by modelling future stock returns as a joint function of earnings-to-price ratios and expected EPS growth rates, we find some evidence of the predicted positive relation between future stock returns and both earnings-to-price ratios and expected EPS growth rates.

Our findings should be useful to investors and academics who forecast earnings and value equities. They should be of particular interest to value investors who select firms with high valuation ratios. Our results show that these value strategies tilt toward stocks with lower future EPS growth rates. This creates undiversified portfolios that are exposed to the unique risks of stocks with low growth opportunities. For example, Dechow et al. (2021) show that value stocks have low cash flow durations, causing them to underperform when discount rates decline and when short-term macroeconomic disruptions strike. We also show that incorporating expected EPS growth rates into value investing strategies leads to improved explanatory power for future stock returns. Finally, we demonstrate the importance of using recurring EPS in constructing earnings-to-price ratios to forecast future stock returns. For example, Ball et al. (2020) advocate the use of the retained earnings-to-market ratio as a measure of earnings yield, due to the presence of transitory items in EPS. Using our sample period and our measure of recurring EPS, we find that the retained earnings-to-market ratio has no incremental predictive ability over the earnings-to-price ratio with respect to future stock returns.

Our findings should also be useful to investors and academics employing measures of expected future EPS growth rates. Previous research has discouraged the use of the I/B/E/S long-term earnings growth rate because it has been shown to provide inaccurate and biased forecasts of future EPS growth rates. Moreover, forecasts derived from analysts' multi-year annual EPS forecasts have historically not been widely available (Lacina et al. 2011). Instead, researchers have encouraged the use of forecasts based on historical financial data (e.g., Li and Mohanram 2014). In contrast, we show that, in more recent years, forecasts derived from analysts' multi-year annual EPS forecasts are broadly available and provide superior forecasts of future EPS growth rates relative to the measures used in previous research.

The remainder of our paper is organized as follows. Section 2 reviews the valuation theory underlying our analyses and the state of previous research. Section 3 describes our data and research design. Section 4 presents our results, and Section 5 concludes.

## 2 Background

### 2.1 Valuation theory

We use standard valuation theory to identify the determinants of valuation ratios. We begin with the standard dividend discounting model:

$$p_0 = \sum_{t=1}^{\infty} \frac{d_t}{(1+r)^t} \tag{1}$$

where

$p_0$ = the price of a share of stock in the firm at time 0,

$d_t$ = dividends paid on the share of stock for period $t$,

$r$ = the implied return from holding the stock (assumed constant).

Note that Eq. (1) is an identity that relates current price to future realizations of dividends per share. It makes no assumption about market efficiency. It simply says that the return received from holding a stock is determined by its current price and future dividend stream.[3]

[3] For example, a price that is irrationally high will simply lead to an implied value for $r$ that is irrationally low. For this reason, we refer to $r$ as the "implied return" and do not attempt to distinguish whether it is determined by a rational or an irrational pricing process.

Following Miller and Modigliani (1961), we further assume a constant dividend payout ratio, $\delta$, and a constant perpetual growth rate in dividends per share, $g$. These assumptions allow Eq. (1) to be written as:[4]

$$p_0 = \frac{e_1 \cdot \delta}{r - g} \tag{2}$$

where

$e_1$ = earnings per share of stock for period 1,

$\delta$ = the dividend payout ratio, $d_t / e_t$,

$g$ = the per-share growth rate in dividends and earnings.

By rearranging Eq. (2), we can identify the determinants of the earnings-to-price ratio:

$$\frac{e_1}{p_0} = \frac{r - g}{\delta} \tag{3}$$

Equation (3) generates our two primary predictions:[5]

1. Ceteris paribus, the earning-to-price ratio is *increasing* in $r$, the implied return from holding the stock.
2. Ceteris paribus, the earnings-to-price ratio is *decreasing* in $g$, the per-share growth rate in future dividends and earnings.

It is important to note that the second prediction relates to the *per-share* growth rate in dividends and earnings. A common mistake is to confuse firm-level growth in earnings with per-share growth in earnings. For example, much of prior research uses the I/B/E/S supplied "long-term earnings growth rate" forecast to proxy for the expectations of $g$. Yet the I/B/E/S manual defines this metric as the "expected annual increase in *operating earnings* over the company's next full business cycle" (Thomson Financial 2008), suggesting that it is estimated at the firm level as opposed to a per-share level.

To understand the relation between valuation ratios and firm-level growth in earnings, we can again refer to the analysis of Miller and Modigliani (1961). Following their Eq. (9), the market value of the firm can be expressed as the discounted value of the excess of periodic earnings over periodic investment:

[4] Equation (2) corresponds to Eq. (24) of Miller and Modigliani (1961).

[5] Equation (3) also indicates that the earnings-to-price ratio is decreasing in dividend payout. Our subsequent tests also control for dividends.

$$P_0 = \sum_{t=1}^{\infty} \frac{E_t - (B_t - B_{t-1})}{(1+r)^t} \tag{4}$$

where

$P_0$ = the market value of the firm at time 0,

$E_t$ = firm-level earnings for period $t$,

$B_t$ = the stock of capital invested in the firm at the end of period $t$.

Note that Eq. (4) expresses the market value of the firm based on the net cash flows accruing to all current and future investors (cash dividends plus stock repurchases less equity issues). To derive a closed-form solution for Eq. (4), we follow Erhard and Sloan (2020) and further assume that the return on investment and the firm-level growth rate are constant:[6]

$ROE$ = return on investment $= \frac{E_t}{B_{t-1}}$,

$G$ = firm-level growth rate $= \frac{(B_t - B_{t-1})}{B_{t-1}}$.

Equation (4) then simplifies to:

$$P_0 = \frac{E_1}{(r-G)} \frac{(ROE-G)}{ROE} \tag{5}$$

and the earnings-to-price ratio is equal to:

$$\frac{E_1}{P_0} = \frac{(r-G) \cdot ROE}{(ROE-G)} \tag{6}$$

An important implication of Eq. (6) is that the relation between the earnings-to-price ratio and firm-level growth ($G$) is ambiguous, because $G$ appears with a negative sign in both the denominator and the numerator. Differentiating $\frac{E_1}{P_0}$ with respect to $G$ yields:

$$\frac{d\frac{E_1}{P_0}}{dG} = -\frac{ROE \cdot (ROE - r)}{(ROE-G)^2}$$

[6] In practice, valuation ratios also depend on future changes in these variables, particularly changes in return on investment. Penman (1996) provides a detailed analysis of how price-to-earnings and market-to-book multiples vary as a function of current levels of and expected future changes in return on investment.

The derivative highlights that the earnings-to-price ratio is only decreasing in the firm-level growth rate, $G$, when $(ROE - r) > 0$ (i.e., when the return on investment exceeds the implied return from holding the stock).

We can solve for the relation between $g$ and $G$ by dividing Eq. (5) by the number of shares outstanding at time 0, equating with Eq. (2), and solving for $g$, which yields:[7]

$$g = r - \frac{\delta \cdot ROE \cdot (r - G)}{(ROE - G)} \tag{7}$$

Equation (7) shows that $g$ differs from $G$ and additionally depends on δ, $ROE$, and $r$. To further understand the relation between $g$ and $G$, it is useful to consider the comparative static of $g$ with respect to $G$:

$$\frac{dg}{dG} = \frac{\delta \cdot ROE \cdot (ROE - r)}{(ROE - G)^2}$$

This comparative static indicates that the sign of the relation between $g$ and $G$ depends on the sign of $(ROE - r)$. If $(ROE - r) > 0$, then higher $G$ creates more value, and $g$ is increasing in $G$. But if $(ROE - r) < 0$, then higher $G$ destroys value, and $g$ is decreasing in $G$. Finally, if $ROE = r$, $g$ is unrelated to $G$. In this latter case, no matter how fast the firm grows, the firm-level earnings growth is exactly offset by the extra shares that must be issued to finance the growth.

By way of illustrative example, assume that $r = 10\%$, $G = 4\%$, δ = 60%, and $ROE = 10\%$. Applying Eq. (7) indicates that $g = 4\%$. For each dollar of earnings, \$0.60 is paid as a dividend, and \$0.40 (=0.04 / 0.10) is reinvested. In this case, undistributed earnings will just cover reinvestment, and no shares will be issued or repurchased. In contrast, consider the same initial assumptions but with $ROE = 40\%$. Applying Eq. (7) now indicates that $g = 6\%$. In this case, undistributed earnings are more than sufficient to cover reinvestment, and the excess is used to repurchase shares. For each dollar of earnings, \$0.60 is paid as a dividend, \$0.10 (=0.04 / 0.40) is reinvested, and \$0.30 is left over to repurchase shares. From Eq. (6), the earnings-to-price ratio for this company is 0.067. Hence, the shares repurchased amount to 2% (=0.067 × 0.30) of shares outstanding each year. Combined with the 4% firm-level growth, this sums to the $g$ of 6%.

Figure 1 provides two real-world examples from the period 2016–2020 to illustrate how a relatively high ROE allows for share repurchases that boost the EPS growth rate relative to the firm-level growth rate. The first example is Alphabet, which grew its firm-level net income by about 16% with negligible net share issuance or repurchase. Alphabet's ROE hovered around 16% over this period, and Alphabet reinvested essentially all of its earnings to generate net income and EPS growth of around 16%. Apple, on the other hand, grew its firm-level net income by only 14%. But its ROE during this period was around 40%. Thus, Apple only had to reinvest about a third of its earnings (0.14 / 0.40 = 0.35) to achieve this firm-level

[7] This analysis corresponds to the analysis relating to Eq. (25) of Miller and Modigliani (1961).

growth rate and was able to simultaneously repurchase about 4% of its shares each year. These repurchases increased Apple's EPS growth rate to 20%, which was significantly greater than both its firm-level net income growth rate and Alphabet's firm-level net income and EPS growth rates.

The important takeaway from the above analyses is that the firm-level growth rate is a different construct from the per-share growth rate and has an ambiguous relation with both the per-share growth rate and the earnings-to-price ratio. The per-share growth rate is the relevant growth rate for determining the appropriate earnings-to-price ratio.

We can also use Eq. (2) to derive expressions for other popular valuation ratios, such as book-to-market ratio (*B/P*) and sales-to-price ratio (*S/P*):

$$B/P = \frac{(r-g)}{\delta \cdot ROE}$$

$$S/P = \frac{(r-g)}{\delta \cdot NM}$$

where

*NM* net margin (assumed constant), defined as earnings divided by sales.

These expressions indicate that, ceteris paribus, both ratios are increasing in the implied return, $r$, and decreasing in the future per-share growth rate, $g$. In addition, *B/P* is decreasing in *ROE*, and *S/P* is decreasing in *NM*. We test for evidence of these predicted relations in our subsequent empirical analyses.

### 2.2 Prior research

Early research on the predictability of EPS growth and the characteristics of stocks with extreme valuation ratios reports several findings. First, past growth rates in EPS strongly mean-revert (e.g., Lakonishok et al. 1994; Nissim and Penman 2001; Chan et al. 2003). This implies that recent past EPS growth rates have low predictive ability with respect to future EPS growth rates. Instead, growth rates rapidly revert to their long-run mean. Second, analysts' explicit forecasts of long-term earnings growth rates provide upwardly biased and inaccurate forecasts of the future growth rate in Compustat "EPS before extraordinary items" over the next one to five years (e.g., Dechow and Sloan 1997; Chan et al. 2003).[8] It is important to note that this prior evidence is based on the explicit long-term earnings growth rates provided by analysts and collected by I/B/E/S. I/B/E/S indicates that these growth rates represent the expected annualized growth rate in operating earnings over the next three to five

[8] Dechow and Sloan (1997) evaluate the ability of the I/B/E/S median long-term earnings growth rate to forecast the future growth rate in Compustat EPS before extraordinary items over the next five years. Their sample covers the period from 1981 to 1993. Chan et al. (2003) evaluate the ability of the I/B/E/S median long-term earnings growth rate to forecast the future growth rate in Compustat EPS before extraordinary items over the next one, two, three, and five years. Their sample covers the period from 1982 to 1998.

| Alphabet | Growth Rate | | 2020 | 2019 | 2018 | 2017 | 2016 |
|---|---|---|---|---|---|---|---|
| Sales | 15% | | 182.350 | 161.402 | 136.958 | 111.024 | 89.733 |
| Net Income | 16% | | 40.269 | 34.343 | 30.736 | 12.662 | 19.478 |
| | | | | | | | |
| Diluted Shares | 0% | | 687.028 | 698.556 | 703.285 | 703.584 | 698.706 |
| | | | | | | | |
| Sales/Share | 16% | | 265.42 | 231.05 | 194.74 | 157.80 | 128.43 |
| EPS | 16% | | 58.61 | 49.16 | 43.70 | 18.00 | 27.88 |
| | | | | | | | |
| **Apple** | **Growth Rate** | | **2020** | **2019** | **2018** | **2017** | **2016** |
| Sales | 10% | | 365.817 | 274.150 | 259.968 | 265.809 | 228.572 |
| Net Income | 14% | | 94.680 | 57.411 | 55.256 | 59.531 | 48.351 |
| | | | | | | | |
| Diluted Shares | -4% | | 16.865 | 17.528 | 18.596 | 20.000 | 21.007 |
| | | | | | | | |
| Sales/Share | 15% | | 21.69 | 15.64 | 13.98 | 13.29 | 10.88 |
| EPS | 20% | | 5.61 | 3.28 | 2.97 | 2.98 | 2.30 |

**Fig. 1** Example illustrating how firm-level and per-share growth rates can differ. This figure presents an example of how firm-level growth can differ from per-share growth. We calculate the annualized growth rates in sales, net income, diluted shares, sales per share, and earnings per share over the period from 2016 to 2020 for Alphabet Inc. and Apple Inc

years (Thomson Financial 2008). In contrast, our research uses imputed EPS growth rates that are based on analysts' multi-year annual EPS forecasts. As we will show later in the paper, these imputed forecasts are significantly more accurate than analysts' explicit long-term earnings growth rates in predicting growth rates in operating EPS over the next three to five years.[9] Third, research has found that EPS growth rates are difficult to predict beyond two years into the future (e.g., Lakonishok et al. 1994; Chan et al. 2003). The predictive variables used in this research include not only past EPS growth rates and analysts forecasts of future earnings growth rates but also a variety of historical financial metrics that are hypothesized to forecast EPS growth rates (e.g., book-to-market ratios, R&D intensity, and past stock returns). Thus, the established consensus emerging from this research is that long-term EPS growth rates have low predictability.

The low predictability of EPS growth rates presents a challenge for explaining the significant observed cross-sectional variation in valuation ratios, such as the earnings-to-price ratio. Prior research argues that low valuation ratios instead reflect irrationally high forecasts of future EPS growth rates that fail to materialize (e.g., Lakonishok et al. 1994; La Porta 1996; Dechow and Sloan 1997; Chan et al. 2003). This causes the future returns of stocks with low valuation ratios to be relatively low, as the high growth expectations embedded in these stocks are missed (e.g., Lakonishok et al. 1994; La Porta 1996; Dechow and Sloan 1997; Chan et al. 2003).

Proponents of value investing continue to rely on these findings. For example, Israel et al. (2021) recommend treating expected growth in EPS beyond two

[9] As described later in the paper, we measure the future EPS growth rates using operating EPS provided by Compustat. In unreported tests, we also measure future EPS growth rates using EPS before extraordinary items provided by Compustat and actual EPS provided by I/B/E/S (defined as reported EPS adjusted to reflect the basis that the majority of contributors use to value the stock). We find similar results using these alternative measures of realized EPS.

years into the future as speculation. They justify this approach by describing it as a deliberate choice designed to avoid the strong mean-reverting tendency implicit in longer-term EPS growth expectations. In support of their claim, they cite evidence on mean reversion in earnings growth from Nissim and Penman (2001) and on the optimistic bias in analyst long-term earnings growth rate forecasts from Dechow and Sloan (1997). Moreover, recent research by De la O et al. (2023) using long-horizon variance decomposition analysis also concludes that variation in valuation ratios is dominated by variation in implied returns rather than variation in expected EPS growth rates. But as with earlier research, this paper uses data from the pre-1998 period, in this case going back to the 1960s. Its use of ten-year variance decomposition windows is also susceptible to survivorship bias. In contrast to this existing research, we provide direct evidence that EPS growth rates beyond two years are both predictable and reflected in both observed earnings-to-price ratios and analysts' multi-year annual earnings forecasts.

While proponents of value investing continue to rely on these findings, recent research also indicates that EPS growth rates have some predictability. In particular, Gao and Wu (2014) confirm the poor predictive ability of analyst long-term earnings growth forecasts but nevertheless find that a parsimonious set of forecasting variables achieves adjusted R-squareds averaging up to 25% in industry-year regressions. Kryzanowski and Mohsni (2014) use a similar set of explanatory variables and report adjusted R-squareds of up to 31% in panel regressions incorporating year fixed effects. More recently, Tengulov et al. (2023) use a variety of firm and industry variables (including the analyst long-term earnings growth forecast) to predict long-term per-share growth rates in sales and EBITDA. They report adjusted R-squareds of 14.7% and 7.2% in explaining future five-year per-share growth rates in sales and EBITDA, respectively.[10] They also provide some evidence that their forecasted growth rates are related to future stock returns, though this evidence is concentrated among microcap stocks. Finally, Kok et al. (2017) find that traditional value strategies identify securities with temporarily high earnings and book values rather than temporarily low prices, though their analysis is restricted to one-year-ahead growth.

In light of these recent findings, we conduct a reexamination of prior research. Our examination extends previous research in several respects. First, we employ refined explanatory variables that lead to better forecasts of the future EPS growth rate. Our most significant refinement is the use of a different measure of analyst-forecasted EPS growth. Most previous research uses the I/B/E/S analyst consensus forecast of the long-term earnings growth rate (*IBES_LTG*). This is an analyst-supplied number that I/B/E/S defines as "an expected annual increase in operating earnings over the company's next full business cycle" (Thomson Financial 2008). Note that this description suggests that *IBES_LTG* is a firm-level growth rate ($G$),

[10] Tengulov et al. (2023) use growth in sales and EBITDA as opposed to earnings. The analysis in Section 2.1 indicates that the relation between sales growth and firm value also depends on the assumption of a constant net margin, while the relation between EBITDA growth and firm value also depends on the assumption of a constant EBITDA margin.

as opposed to the per-share growth rate ($g$) specified in Eq. (3).[11] Previous research has found *IBES_LTG* to provide upwardly biased and inaccurate forecasts of future EPS growth rates over the next five years (e.g., Dechow and Sloan 1997; Chan et al. 2003). Yet recent research continues to use this variable (e.g., Gao and Wu 2014; Kryzanowski and Mohsni 2014). Moreover, the availability of this variable has been declining over time. For example, between 1998 and 2020, the percentage of our sample with availability for *IBES_LTG* drops from 58 to 33% (see Fig. 2).

In an effort to improve on this variable, we employ alternative measures of expected EPS growth that are imputed from analyst-provided forecasts of annual EPS for several years into the future. Many analysts routinely provide annual EPS forecasts for as many as five future annual periods. Moreover, the availability of these forecasts has been increasing over time. For example, between 1998 and 2020, the percentage of our sample with availability for three-year-ahead consensus annual EPS forecasts increased from 25 to 80% (see Fig. 2). Existing research by Da and Warachka (2011) and Lacina et al. (2011) has attempted to use such measures but with mixed results.

Da and Warachka (2011) find that firms with high *IBES_LTG* but low growth rates implied by one-year-ahead annual EPS forecasts (*FY1/FY0*) have lower future stock returns and downward revisions in future *IBES_LTG* forecasts. Da and Warachka (2011) also construct their implied growth measure incorporating the two-year-ahead annual EPS forecasts in the numerator but find slightly *weaker* results using this measure. They posit that the weaker results are likely due to the smaller sample size available for two-year-ahead EPS forecasts. While our results are related to those of Da and Warachka (2011), they differ in two important respects. First, the focus of our study is on forecasting future EPS growth rates, which is not examined in Da and Warachka (2011). Second, we find that using growth rates implied by analysts' two- and three-year-ahead EPS forecasts leads to improved results in our research setting. This contrasts with the weaker results reported by Da and Warachka (2011) in their setting. They use data from 1983 through 2006, and the availability of two-year-ahead EPS forecasts has increased dramatically since then (see Fig. 2). Thus, we attribute our improved results to the increased availability and accuracy of two- (*FY2*) and three-year-ahead (*FY3*) annual EPS forecasts.

Lacina et al. (2011) examine the accuracy of analysts' annual EPS forecasts and find that one-, two- and three-year-ahead forecasts are more accurate than a random walk model, though the increases in accuracy decline with the forecast horizon. They also find that EPS growth rates implied by analysts' explicit forecasts of annual EPS through four years into the future are generally more accurate than those implied by *IBES_LTG*. While our results relate to those of Lacina et al. (2011), their sample covers the period from 1988 through 2003, during which the availability of annual EPS forecasts beyond one year into the future was extremely limited. For example, *FY3* is only available for 28% of firms in their early sample period. By the

[11] We analyze the predictive ability of the I/B/E/S long-term earnings growth forecast in our later analysis (see Table 7) and confirm that it is a more accurate predictor of firm-level growth in earnings than of per-share growth in earnings.

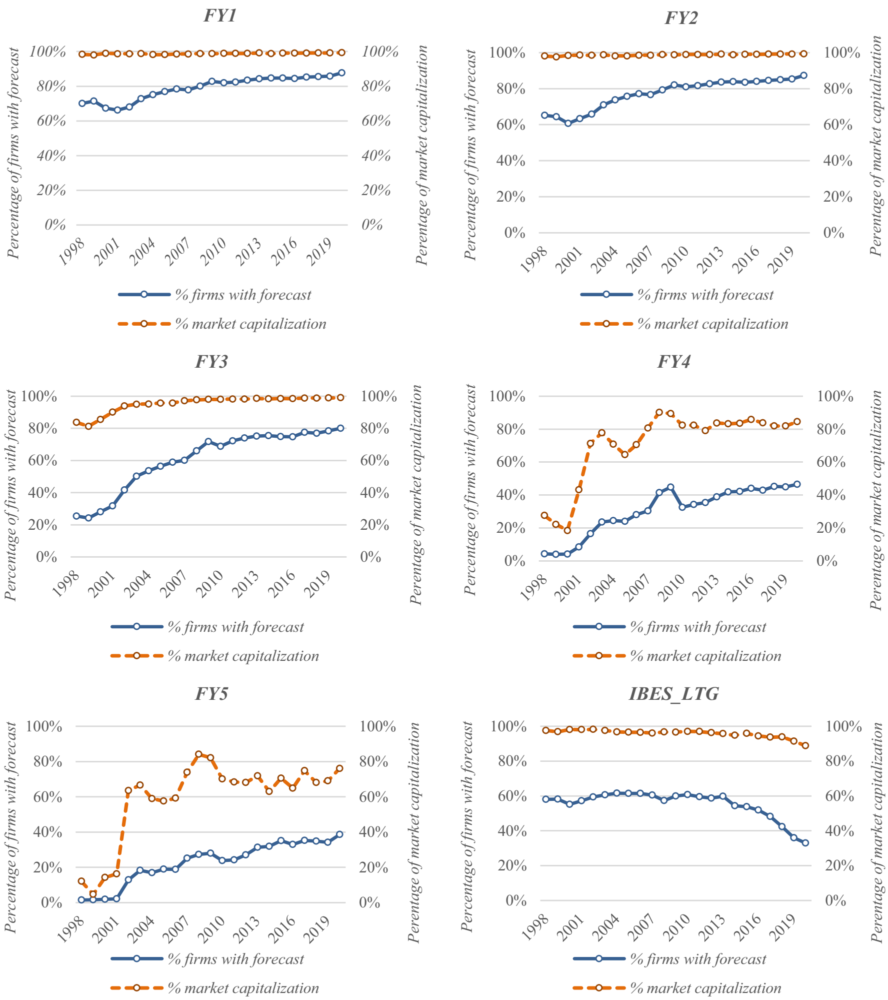


**Fig. 2** Percentage of firms with analyst forecast data and percentage of total market capitalization represented by such firms. This figure presents the percentage of firms in our sample with analyst forecast data and the percentage of total market capitalization represented by such firms each year over the period from 1998 to 2020. We examine the availability of analyst consensus EPS forecasts made for each year over the five years following the most recently announced year (*FY1*, *FY2*, *FY3*, *FY4*, and *FY5*) and analyst consensus long-term growth forecasts (*IBES_LTG*). We require that consensus forecasts be available following the annual earnings announcement of the base year and before the fiscal year-end of the first year following the base year. Our sample includes all domestic firms with common stocks listed on New York, American, and NASDAQ exchanges. We select firms with data available at the end of each fiscal year from 1998 to 2020. Appendix 1 provides detailed variable definitions

end of our sample period, however, *FY3* is available for 80% of firms (see Fig. 2). The paucity of annual EPS forecasts beyond one year forced Lacina et al. (2011) to rely heavily on *IBES_LTG* in their study, leading them to caution against the use of analysts' long-term annual EPS forecasts. In contrast to Lacina et al. (2011), we show that long-term annual EPS forecasts are now more widely available and provide significant increases in the predictive ability. Thus, we encourage future research to use EPS growth rates implied by long-term annual EPS forecasts instead of relying on the relatively inaccurate *IBES_LTG* forecasts.

We also incorporate several additional refinements in our analyses. The first is our measure of EPS, for which most prior research uses the Compustat variable "income before extraordinary items" (Compustat Mnemonic *IB*) in the numerator. This measure of earnings contains significant nonrecurring items that reduce its ability to predict future earnings (Rouen et al. 2021). Since the role of current earnings in equity valuation is to serve as the basis for forecasting future earnings, we follow Rouen et al. (2021) in using the recurring component of current earnings. To facilitate the measurement of recurring EPS, starting in the 1990s, Compustat provides a measure of EPS from operations (Compustat Mnemonic *OPEPS*), which represents "EPS excluding all nonrecurring events." This recurring measure of EPS is more persistent and should be more relevant for equity valuation.[12] Second, Erhard and Sloan (2020) show that high EPS growth requires the interaction of high firm-level growth and high profitability, and we incorporate their suggested proxies for these variables in our model. Finally, we extend the sample period to fiscal year 2020. This encompasses the more recent period during which value investing has struggled to outperform.

## 3 Sample and data

Our sample includes all U.S. domestic firms with common stocks listed on the New York, American, and NASDAQ exchanges. We select firms with data available on the CRSP/Compustat Merged files at the end of each fiscal year from 1998 to 2020. We begin our sample in 1998. The sample used in Chan et al. (2003) ends in 1997. Thus, we also replicate their key results on our sample period to make sure that their key results are not just specific to their sample period. Our sample period ends in fiscal year 2020 because this is the last year in which we could measure earnings growth and stock returns for at least one year into the future. The latest Compustat fiscal year end for the 2020 fiscal year is May 2021, which requires stock returns through August 2022. The number of firms drops from 6,510 in our first sample selection year to 3,538 in 2020, with an average of 4,324 firms per year.

[12] Note that this measure differs from the Compustat variable "operating income after depreciation" (Compustat Mnemonic *OIADP*). *OIADP* excludes many recurring components of earnings, including interest expense, interest income, earnings of equity affiliates, income tax expense, noncontrolling interests in earnings, and preferred dividends. The exclusion of these recurring expenses clearly violates the clean surplus relation that underlies Eq. (4) in our valuation model. *OPEPS*, in contrast, excludes only the after-tax impact of nonrecurring items. We acknowledge that, to the extent the nonrecurring items excluded from *OPEPS* are systematically negative, *OPEPS* will also tend to overstate *EPS*, but any such overstatements will be less severe. For this reason, most practicing analysts value firms as a multiple of their recurring EPS (Pinto et al. 2019).

Our primary analysis employs earnings per share from operations from Compustat (*OP_EPS*).[13] Compustat defines *OP_EPS* as "basic earnings per share adjusted to remove the effect of all special items from the calculation. This item reflects an earnings per share figure, which excludes the effect of all nonrecurring events." Prior research confirms that this measure excludes many nonrecurring items, but also finds that the exclusions are not complete (e.g., Rouen et al. 2021). We also report selected results for the three indicators of operating performance employed by Chan et al. (2003). They are "net sales," "operating income before depreciation," and "income before extraordinary items available for common equity." We divide each of these three indicators by the number of common shares outstanding (basic) to express them on a per-share basis. We denote these three measures by *SALES_PS*, *EBITDA_PS*, and *EPS*, respectively.

We compute growth rates in each of the four measures of operating performance over various periods ranging up to ten years. For firms with negative base year measures, we leave the growth rates undefined, but follow Chan et al. (2003) in imputing growth rates for several tests (as will be explained in Footnote 16). Around 37% of firms have negative base year *OP_EPS*. We adjust EPS growth rates for stock splits and dividends and also assume that cash dividends and other special distributions are reinvested in the stock each year.[14] The mean (median) dividend yield for our sample averaged across all years is 1.04% (0.00%).

Our analyses employ three different analyst-based proxies for forecast of the long-term EPS growth rate. First, following previous research, we use the median long-term earnings growth rate from I/B/E/S (*IBES_LTG*), which is defined as the "expected annual increase in operating earnings over the company's next full business cycle" (Thomson Financial 2008). As detailed earlier, previous research has found *IBES_LTG* to provide biased and inaccurate forecasts of future EPS growth rates (e.g., Dechow and Sloan 1997; Chan et al. 2003). Also, the availability of this variable has been decreasing over our sample period. Figure 2 shows the availability of *IBES_LTG* was fairly constant at about 60% until 2013 and has been steadily dropping since then, reaching a low of 33% by 2020. In contrast, the availability of analysts' forecasts of annual EPS for two, three, four, and five years ahead has been steadily increasing. In particular, by 2020, availability was 87% for two-year-ahead forecasts and 80% for three-year-ahead forecasts.[15] Moreover, these forecasts only tend to be missing for the smallest firms, such that when measured by percentage

[13] In unreported tests, we find similar results using actual EPS from I/B/E/S. I/B/E/S defines this variable as a corporation's reported earnings, adjusted to reflect the basis that the majority of contributors use to value the stock. This measure of earnings can exclude both recurring and nonrecurring items (e.g., Bradshaw and Sloan 2002).

[14] Specifically, we first measure the growth in *OP_EPS* over the next five years for firms with positive base year earnings and adjust for stock splits and dividends ($\frac{OPEPS_{t+5}/AJEX_{t+5}}{OPEPS_t/AJEX_t} - 1$). We also calculate the dividend yield each year over the next five years ($\frac{DVC_{t+n}/CSHPRI_{t+n}}{PRCC\_F_{t+n}}$). Then we adjust the growth rate for reinvestment of cash dividends and other special distributions and annualize the growth rate $\left(\left(\frac{OPEPS_{t+5}/AJEX_{t+5}}{OPEPS_t/AJEX_t} \times \prod_{n=1}^{5}\left(1 + \frac{DVC_{t+n}/CSHPRI_{t+n}}{PRCC\_F_{t+n}}\right)\right)^{\frac{1}{5}} - 1\right)$.

[15] *FY2* and *FY3* forecasts tend to be missing for smaller firms, less profitable firms, and more financially distressed firms.

of market capitalization, availability is 99% for both two- and three-year-ahead forecasts. We therefore compute the two- and three-year-ahead EPS growth rates implied by the median values of these forecasts, which we refer to as *FY2/FY0* and *FY3/FY0*, respectively. As our subsequent analyses show, these alternative long-term EPS growth rates have not only become more widely available than *IBES_LTG* but are also considerably more accurate in predicting future EPS growth rates. We also report results using *FY1/FY0* for comparability. Variable definitions are detailed in Appendix 1.

## 4 Empirical results

### 4.1 The distribution of growth rates

Panel A of Table 1 provides descriptive statistics on the distribution of annualized growth rates over one year, five years, and ten years, respectively. We report growth rates for *SALES_PS*, *EBITDA_PS*, and *EPS*, which are the three financial metrics considered by Chan et al. (2003). In addition, we report growth rates for *OP_EPS*, the Compustat measure of EPS before nonrecurring items. For each horizon, we measure growth rates for surviving firms with positive base year earnings. Using *OP_EPS* as an example, there are on average 4,324 firms available for the sample selection at each year-end. Among these firms, 3,895 also have *OP_EPS* available in the next year. The calculation of the one-year growth rate in *OP_EPS* is based on 2,717 of these surviving firms, since the remaining 1,178 have negative values of *OP_EPS* in the base year.

We start with descriptive statistics for the per-share measures. *SALES_PS* and *EBITDA_PS* have significantly higher means and medians than *EPS* and *OP_EPS*. This arises because the former two measures exclude many recurring expenses. It is also noteworthy that *OP_EPS* has a smaller standard deviation than *EPS*. This is because *OP_EPS* is cleansed of many nonrecurring items, such as asset impairment charges. Next, we report descriptive statistics on one-year growth rates in the variables. The most notable results here are that *EPS* has a much lower mean (-15.94%) and a much higher standard deviation (307.59%) than the other metrics. This likely reflects the impact of negative nonrecurring items, such as asset impairments, which are included in *EPS*. These results also illustrate how *OP_EPS* mitigates the impact of such nonrecurring charges on growth rates. Finally, we report descriptive statistics on the five-year and ten-year growth rates. *EPS* continues to have the highest standard deviation in the annualized five-year growth rates, but *OP_EPS* has the highest standard deviation in the ten-year growth rates. This result may seem counterintuitive since *OP_EPS* is cleansed of transitory items. *EPS*, however, is eliminated for observations with negative *EPS* in the base year. This means that the samples are not comparable, because firms with negative *EPS* sometimes have positive *OP_EPS*. To make an apples-to-apples comparison in this respect, Panel B of Table 1 reports descriptive statistics using the intersection of all observations that are available to compute each of the respective growth rates. Here we see that growth rates computed using *EPS* consistently have the highest standard deviation. Thus, these results confirm that *OP_EPS* produces more stable growth rates.

### 4.2 The persistence of growth rates

Table 2 reports results on the persistence of growth rates computed using each of the metrics. This table reports both the number and the percentage of observations that have a growth rate above the median for the specified number of consecutive years.[16] The final row shows the percentage of observations that would be expected to have a growth rate above the median under the assumption of zero persistence in growth rates. Thus, the greater the observed percentages relative to these expected percentages, the more persistent the growth rate.

The first takeaway from Table 2 is that all metrics except for *EPS* exhibit percentages greater than expected. For example, focusing on five consecutive years of above median growth, 3.1% of observations would be expected to make this cut by chance. Yet the observed percentages are 10.3% for *SALES_PS*, 5.0% for *EBITDA_PS*, and 3.8% for *OP_EPS*. It is also noteworthy that the percentages for *SALES_PS* and *EBITDA_PS* are significantly higher than reported by Chan et al. (2003), who reported 6.3% for *SALES_PS* and 3.6% for *EBITDA_PS*. In summary, Table 2 contains two notable findings. First, growth rates computed using the refined measure of EPS, *OP_EPS*, are more persistent than would be expected by chance, confirming that EPS growth rates do persist once they are cleansed of nonrecurring items. Second, the persistence of growth rates in *SALES_PS* and *EBITDA_PS* are somewhat higher in our more recent sample than in the earlier sample used by Chan et al. (2003), indicating that these growth rates have become more persistent in recent years.[17]

While Table 2 reports growth rates for all firms, persistence may be stronger in subsets of firms, such as glamour stocks. Table 3 reports the persistence of growth

[16] Earnings growth rates cannot be calculated for a subset of firms with negative base year earnings. For the results in Tables 2, 3, and 4, we follow Chan et al. (2003) in addressing this sample selection issue by imputing the growth rates for such firms in the following way. For each earnings measure, we calculate both the percentage growth rates (not applicable for firms with negative base year earnings) and the change in earnings scaled by price. For example, we have $(OP\_EPS_{t+1} - OP\_EPS_t)/OP\_EPS_t$ and $(OP\_EPS_{t+1} - OP\_EPS_t)/Price_t$. We obtain the percentile rank for each firm in a given year based on its change in earnings scaled by price. For that year, we also find the corresponding percentile value from the distribution of percentage growth rates for firms with positive base year earnings. Then we assign this percentile value to the firm with negative base year earnings that has the same percentile rank in the distribution of change in earnings scaled by price. Following Chan et al. (2003), we only apply this imputation procedure to the analyses in Tables 2, 3, and 4. In Online Appendix A, we also apply this imputation procedure to the analyses in Tables 1, 5, 6, 7, 8, 9, and 10. While many of the results are somewhat weaker, they are broadly consistent with those reported in the paper and indicate that our primary results are robust to the inclusion of firms with negative base year earnings.

[17] We also replicate the results in Chan et al. (2003) using our implementation of their variable measurement and research design and using their sample period. The results (reported in Online Appendix B) are broadly consistent with theirs. Thus, the remainder of the paper attributes differences between our results and those of Chan et al. (2003) to differences in either the sample period used or improvements in our variable measurement and/or research design.

**Table 1** Descriptive statistics on the distribution of growth rates

| Variable | Total *N* | Avg. *N* each year | Mean | Std. Dev | Percentiles | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | P10 | P25 | P50 | P75 | P90 |
| **Panel A: Allows the number of observations to vary across measures based on data availability** | | | | | | | | | |
| **Per-share measures** | | | | | | | | | |
| *SALES_PS* | 99,441 | 4,324 | 21.97 | 32.49 | 0.72 | 3.70 | 10.63 | 26.31 | 52.97 |
| *EBITDA_PS* | 99,441 | 4,324 | 2.79 | 3.99 | −0.68 | 0.11 | 1.82 | 4.28 | 7.54 |
| *EPS* | 99,441 | 4,324 | 0.64 | 2.41 | −1.56 | −0.40 | 0.48 | 1.67 | 3.15 |
| *OP_EPS* | 99,441 | 4,324 | 0.83 | 2.16 | −1.17 | −0.25 | 0.57 | 1.76 | 3.23 |
| *Dividend/ Price* | 99,441 | 4,324 | 1.04% | 1.98% | 0.00% | 0.00% | 0.00% | 1.45% | 3.33% |
| **One-year growth rate** | | | | | | | | | |
| *SALES_PS* | 88,276 | 3,838 | 8.99% | 40.99% | −23.27% | −4.91% | 6.41% | 16.94% | 34.06% |
| *EBITDA_PS* | 71,076 | 3,090 | 8.53% | 100.92% | −53.30% | −12.88% | 7.71% | 25.65% | 62.90% |
| *EPS* | 59,862 | 2,603 | −15.94% | 307.59% | −147.26% | −38.46% | 6.40% | 37.95% | 112.64% |
| *OP_EPS* | 62,485 | 2,717 | −2.97% | 203.98% | −102.29% | −25.07% | 8.36% | 33.50% | 88.96% |
| **Annualized growth rate over 5 years** | | | | | | | | | |
| *SALES_PS* | 54,237 | 2,855 | 4.48% | 15.97% | −11.65% | −0.93% | 5.93% | 11.76% | 18.75% |
| *EBITDA_PS* | 42,521 | 2,238 | 7.44% | 17.42% | −11.83% | −0.57% | 7.66% | 15.20% | 25.37% |
| *EPS* | 32,545 | 1,713 | 10.78% | 21.99% | −13.75% | −0.23% | 10.06% | 20.12% | 34.67% |
| *OP_EPS* | 35,204 | 1,853 | 9.98% | 21.13% | −13.19% | 0.05% | 9.78% | 19.06% | 32.32% |
| **Annualized growth rate over 10 years** | | | | | | | | | |
| *SALES_PS* | 30,073 | 2,148 | 4.35% | 10.97% | −7.35% | 0.34% | 5.55% | 10.09% | 14.85% |
| *EBITDA_PS* | 24,179 | 1,727 | 6.37% | 11.09% | −6.70% | 1.21% | 7.03% | 12.22% | 18.10% |
| *EPS* | 18,522 | 1,323 | 8.27% | 12.68% | −6.55% | 1.97% | 8.54% | 14.72% | 22.26% |
| *OP_EPS* | 20,122 | 1,437 | 7.80% | 13.22% | −6.54% | 1.98% | 8.47% | 14.33% | 21.52% |
| **Panel B: Restricts the number of observations to those available to compute all performance metrics within each category** | | | | | | | | | |
| **Per-share measures** | | | | | | | | | |
| *SALES_PS* | 99,441 | 4,324 | 21.97 | 32.49 | 0.72 | 3.70 | 10.63 | 26.31 | 52.97 |
| *EBITDA_PS* | 99,441 | 4,324 | 2.79 | 3.99 | −0.68 | 0.11 | 1.82 | 4.28 | 7.54 |
| *EPS* | 99,441 | 4,324 | 0.64 | 2.41 | −1.56 | −0.40 | 0.48 | 1.67 | 3.15 |
| *OP_EPS* | 99,441 | 4,324 | 0.83 | 2.16 | −1.17 | −0.25 | 0.57 | 1.76 | 3.23 |
| *Dividend/ Price* | 99,441 | 4,324 | 1.04% | 1.98% | 0.00% | 0.00% | 0.00% | 1.45% | 3.33% |
| **One-year growth rate** | | | | | | | | | |
| *SALES_PS* | 58,545 | 2,545 | 8.69% | 21.68% | −10.65% | −0.30% | 7.89% | 16.34% | 27.92% |
| *EBITDA_PS* | 58,545 | 2,545 | 4.49% | 64.81% | −41.43% | −9.90% | 7.76% | 22.74% | 46.52% |
| *EPS* | 58,545 | 2,545 | −11.53% | 288.06% | −136.43% | −35.79% | 6.93% | 37.82% | 109.93% |
| *OP_EPS* | 58,545 | 2,545 | −1.76% | 171.89% | −88.08% | −22.23% | 8.50% | 31.72% | 78.15% |
| **Annualized growth rate over 5 years** | | | | | | | | | |
| *SALES_PS* | 31,846 | 1,676 | 8.15% | 8.91% | −1.38% | 3.47% | 7.90% | 12.59% | 18.11% |
| *EBITDA_PS* | 31,846 | 1,676 | 9.16% | 12.84% | −4.91% | 2.43% | 8.69% | 15.10% | 23.33% |
| *EPS* | 31,846 | 1,676 | 10.79% | 21.35% | −13.13% | 0.00% | 10.10% | 20.01% | 34.03% |
| *OP_EPS* | 31,846 | 1,676 | 10.67% | 18.75% | −10.15% | 1.36% | 10.16% | 18.94% | 31.04% |

**Table 1** (continued)

| Variable | Total *N* | Avg. *N* each year | Mean | Std. Dev | Percentiles | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | P10 | P25 | P50 | P75 | P90 |
| **Annualized growth rate over 10 years** | | | | | | | | | |
| *SALES_PS* | 18,066 | 1,290 | 6.85% | 7.21% | −0.94% | 3.29% | 7.01% | 10.80% | 14.71% |
| *EBITDA_PS* | 18,066 | 1,290 | 7.70% | 8.73% | −2.16% | 3.30% | 7.83% | 12.36% | 17.29% |
| *EPS* | 18,066 | 1,290 | 8.38% | 12.35% | −6.06% | 2.18% | 8.61% | 14.70% | 22.10% |
| *OP_EPS* | 18,066 | 1,290 | 8.42% | 11.56% | −4.59% | 2.83% | 8.77% | 14.34% | 20.96% |

This table presents the descriptive statistics on the distribution of per-share performance metrics and annualized growth rates over the next year, five years, and ten years, respectively. Our sample includes all domestic firms with common stocks listed on New York, American, and NASDAQ exchanges. We select firms with data available at the end of each fiscal year from 1998 to 2020. We report growth in earnings per share from operations (*OP_EPS*) and three per-share performance metrics used by Chan et al. (2003): sales (*SALES_PS*), operating income before depreciation (*EBITDA_PS*), and income before extraordinary items available for common equity (*EPS*). We adjust the growth rates for stock splits and dividends. We also assume that cash dividends and other special distributions are reinvested in the stock each year. For firms with negative base year earnings, we leave the growth rates undefined. Panel A allows the number of observations to vary across measures based on data availability. Panel B requires available data to compute all performance metrics within each category. We calculate the number of observations, mean value, standard deviation, and percentile values from the distribution of each year and report the simple average across all years over our sample period. Appendix 1 provides detailed variable definitions

rates using the same categories as used by Chan et al. (2003): technology stocks, value stocks, glamour stocks, large stocks, mid-cap stocks, and small stocks. Two categories stand out as having significantly higher persistence in growth rates. The first category is glamour stocks, which are priced to anticipate persistence in growth. For example, if we focus on persistent growth in *OP_EPS* over five years, 3.1% are expected by chance, 3.8% are observed for the whole sample in Table 2, and 4.6% are observed for glamour stocks in Table 3. The second category is large stocks, which dominate stock market capitalization. Focusing again on growth in *OP_EPS* over five years, 3.1% are expected by chance, 3.8% are observed for the whole sample in Table 2, and 4.8% are observed for large stocks in Table 3. These results again represent a notable departure from those of Chan et al. (2003) and from our results using the bottom-line *EPS* measure, where the percentages do not significantly differ from those expected by chance. In summary, using the more recent sample period along with a measure of EPS that is cleansed of nonrecurring items, we see robust evidence of persistence in EPS growth rates, particularly for glamour stocks and large stocks.

One concern with the results in Tables 2 and 3 is the impact of survivorship bias. Firms must survive for a growth rate to be computed, and, if growth rates are higher for surviving firms, there could be a hindsight bias built into our results. To investigate the impact of survivorship bias, we follow the procedure of Chan et al. (2003) and divide our sample into two groups. The group of survivors consists of firms that survive the full ten years over which we compute future growth. The set of nonsurvivors consists of firms that survive at least five but less than ten years. For each group, Panel A of Table 4 reports the percentage of observations with above median

**Table 2** Persistence in growth rates

| Variable | Firms with above-median growth each year for the indicated number of years | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| ***SALES_PS*** | | | | | | | | | | |
| Average number of valid firms | 3,838 | 3,517 | 3,244 | 3,010 | 2,803 | 2,620 | 2,456 | 2,307 | 2,173 | 2,057 |
| Average number of above-median firms | 1,919 | 1,096 | 665 | 428 | 290 | 201 | 142 | 104 | 78 | 59 |
| Percentage above median | 50.0% | 31.2% | 20.5% | 14.2% | 10.3% | 7.7% | 5.8% | 4.5% | 3.6% | 2.9% |
| ***EBITDA_PS*** | | | | | | | | | | |
| Average number of valid firms | 3,907 | 3,574 | 3,291 | 3,049 | 2,835 | 2,646 | 2,476 | 2,321 | 2,185 | 2,066 |
| Average number of above-median firms | 1,952 | 965 | 487 | 257 | 142 | 81 | 48 | 30 | 19 | 12 |
| Percentage above median | 50.0% | 27.0% | 14.8% | 8.4% | 5.0% | 3.0% | 1.9% | 1.3% | 0.9% | 0.6% |
| ***EPS*** | | | | | | | | | | |
| Average number of valid firms | 3,896 | 3,556 | 3,272 | 3,028 | 2,814 | 2,625 | 2,453 | 2,297 | 2,160 | 2,041 |
| Average number of above-median firms | 1,947 | 863 | 378 | 168 | 78 | 38 | 19 | 10 | 6 | 4 |
| Percentage above median | 50.0% | 24.3% | 11.5% | 5.5% | 2.8% | 1.4% | 0.8% | 0.4% | 0.3% | 0.2% |
| ***OP_EPS*** | | | | | | | | | | |
| Average number of valid firms | 3,895 | 3,556 | 3,271 | 3,028 | 2,814 | 2,625 | 2,454 | 2,298 | 2,161 | 2,040 |
| Average number of above-median firms | 1,947 | 927 | 442 | 215 | 106 | 54 | 29 | 17 | 11 | 8 |
| Percentage above median | 50.0% | 26.1% | 13.5% | 7.1% | 3.8% | 2.1% | 1.2% | 0.8% | 0.5% | 0.4% |
| Expected percentage above median | **50.0%** | **25.0%** | **12.5%** | **6.3%** | **3.1%** | **1.6%** | **0.8%** | **0.4%** | **0.2%** | **0.1%** |

This table presents the number of firms with valid growth rates, the number and percentage of firms with growth rates exceeding the median growth rates each year for the indicated number of years. Our sample includes all domestic firms with common stocks listed on New York, American, and NASDAQ exchanges. We select firms with data available at the end of each fiscal year from 1998 to 2020. We measure year-over-year growth in earnings per share from operations (*OP_EPS*) and three per-share performance metrics used by Chan et al. (2003): sales (*SALES_PS*), operating income before depreciation (*EBITDA_PS*), and income before extraordinary items available for common equity (*EPS*). We adjust the growth rates for stock splits and dividends. We also assume that cash dividends and other special distributions are reinvested in the stock each year. We calculate the number of valid firms and the number of firms with growth rates exceeding the median values each year for the indicated number of years. We report the simple average across all years over our sample period and express the average number of above-median firms as a percentage of the average number of valid firms. To avoid the sample selection issue, we impute growth rates for firms with negative (or zero) base year earnings based on the distribution of change in earnings scaled by price. Therefore, the number of firms with valid growth rates includes firms with both positive and negative base year earnings. We also report the expected percentage of above-median firms under the assumption of zero persistence in growth rates. Appendix 1 provides detailed variable definitions

**Table 3** Persistence in growth rates by equity classes

| Variable | Percentage of firms with above-median growth each year for the indicated number of years | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| **Technology stocks** | | | | | | | | | | |
| *SALES_PS* | 48.6% | 30.3% | 20.9% | 15.4% | 11.9% | 9.5% | 7.8% | 6.4% | 5.3% | 4.6% |
| *EBITDA_PS* | 50.2% | 27.9% | 15.9% | 9.5% | 6.1% | 4.1% | 2.7% | 1.9% | 1.3% | 0.8% |
| *EPS* | 48.7% | 23.4% | 10.9% | 5.3% | 2.7% | 1.5% | 0.7% | 0.4% | 0.3% | 0.3% |
| *OP_EPS* | 49.5% | 25.7% | 13.3% | 6.9% | 3.8% | 2.2% | 1.3% | 0.8% | 0.6% | 0.5% |
| **Value stocks** | | | | | | | | | | |
| *SALES_PS* | 41.2% | 23.7% | 14.2% | 8.9% | 5.9% | 3.9% | 2.6% | 1.8% | 1.4% | 1.2% |
| *EBITDA_PS* | 48.3% | 24.9% | 12.8% | 6.7% | 3.6% | 2.0% | 1.1% | 0.7% | 0.5% | 0.4% |
| *EPS* | 50.4% | 24.9% | 11.8% | 5.4% | 2.6% | 1.2% | 0.8% | 0.5% | 0.4% | 0.4% |
| *OP_EPS* | 50.0% | 26.3% | 13.4% | 6.8% | 3.5% | 1.8% | 1.0% | 0.6% | 0.5% | 0.4% |
| **Glamour stocks** | | | | | | | | | | |
| *SALES_PS* | 60.1% | 40.7% | 29.5% | 22.4% | 17.5% | 13.7% | 10.9% | 8.8% | 7.1% | 5.8% |
| *EBITDA_PS* | 51.8% | 29.6% | 17.5% | 11.0% | 7.1% | 4.7% | 3.1% | 2.2% | 1.5% | 1.0% |
| *EPS* | 49.2% | 23.8% | 11.7% | 6.0% | 3.1% | 1.8% | 1.0% | 0.6% | 0.4% | 0.3% |
| *OP_EPS* | 50.0% | 26.2% | 14.1% | 7.9% | 4.6% | 2.7% | 1.7% | 1.2% | 0.8% | 0.6% |
| **Large stocks** | | | | | | | | | | |
| *SALES_PS* | 63.7% | 44.9% | 32.8% | 24.6% | 18.9% | 14.6% | 11.5% | 9.5% | 7.7% | 6.3% |
| *EBITDA_PS* | 55.9% | 33.0% | 19.5% | 11.9% | 7.3% | 4.6% | 3.0% | 2.1% | 1.3% | 0.7% |
| *EPS* | 52.4% | 25.0% | 11.8% | 5.8% | 3.0% | 1.7% | 1.0% | 0.7% | 0.6% | 0.5% |
| *OP_EPS* | 53.0% | 29.0% | 15.4% | 8.5% | 4.8% | 2.6% | 1.6% | 1.2% | 0.7% | 0.6% |
| **Mid-cap stocks** | | | | | | | | | | |
| *SALES_PS* | 57.9% | 38.2% | 25.9% | 18.8% | 13.8% | 10.4% | 7.9% | 6.1% | 4.8% | 3.7% |
| *EBITDA_PS* | 50.2% | 27.8% | 15.7% | 9.4% | 5.7% | 3.5% | 2.2% | 1.6% | 1.1% | 0.8% |
| *EPS* | 49.2% | 23.7% | 11.4% | 5.7% | 2.9% | 1.6% | 0.9% | 0.5% | 0.3% | 0.3% |
| *OP_EPS* | 49.5% | 26.2% | 14.1% | 7.8% | 4.4% | 2.4% | 1.4% | 0.9% | 0.7% | 0.5% |
| **Small stocks** | | | | | | | | | | |
| *SALES_PS* | 44.6% | 25.9% | 15.9% | 10.2% | 7.0% | 4.9% | 3.5% | 2.6% | 2.1% | 1.7% |
| *EBITDA_PS* | 49.1% | 25.8% | 13.6% | 7.4% | 4.3% | 2.5% | 1.6% | 1.0% | 0.6% | 0.5% |
| *EPS* | 50.0% | 24.4% | 11.6% | 5.4% | 2.6% | 1.3% | 0.7% | 0.4% | 0.3% | 0.2% |
| *OP_EPS* | 49.8% | 25.6% | 12.9% | 6.5% | 3.3% | 1.8% | 1.0% | 0.6% | 0.4% | 0.4% |
| **Expected percentage above median** | **50.0%** | **25.0%** | **12.5%** | **6.3%** | **3.1%** | **1.6%** | **0.8%** | **0.4%** | **0.2%** | **0.1%** |

This table presents the percentage of firms with growth rates exceeding the median growth rates each year for the indicated number of years by equity classes. Our sample includes all domestic firms with common stocks listed on New York, American, and NASDAQ exchanges. We select firms with data available at the end of each fiscal year from 1998 to 2020. We measure year-over-year growth in earnings per share from operations (*OP_EPS*) and three per-share performance metrics used by Chan et al. (2003): sales (*SALES_PS*), operating income before depreciation (*EBITDA_PS*), and income before extraordinary items available for common equity (*EPS*). We adjust the growth rates for stock splits and dividends. We also assume that cash dividends and other special distributions are reinvested in the stock each year. We study the following equity classes: (1) technology stocks with SIC codes starting with 283,

**Table 3** (continued)

357, 366, 38, 48, or 737; (2) value stocks, whose ranks based on book-to-market value of equity using the NYSE breakpoints are in the top three deciles; (3) glamour stocks, whose ranks based on book-to-market value of equity using the NYSE breakpoints are in the bottom three deciles; (4) large stocks, whose ranks based on market value of equity using the NYSE breakpoints are in the top two deciles; (5) mid-cap stocks, whose ranks based on market value of equity using the NYSE breakpoints are in the third through seventh deciles; and (6) small stocks, whose ranks based on market value of equity using the NYSE breakpoints are in the bottom three deciles. We calculate the number of valid firms and the number of firms with growth rates exceeding the median values each year for the indicated number of years. We then take the simple average across all years over our sample period and report the average number of above-median firms as a percentage of the average number of valid firms. To avoid the sample selection issue, we impute growth rates for firms with negative base year earnings based on the distribution of change in earnings scaled by price. Therefore, the number of firms with valid growth rates includes firms with both positive and negative base year earnings. We also report the expected percentage of above-median firms under the assumption of zero persistence in growth rates. Appendix 1 provides detailed variable definitions

growth rates in *OP_EPS* for consecutive years. While the percentages are generally slightly smaller for nonsurvivors, they still consistently exceed the percentages expected by chance. Panel B of Table 4 compares the distribution of the growth rates. For survivors, we report the annualized growth rates over ten years. For nonsurvivors, we report the annualized growth rates over all years that they survive. These two sets of firms have comparable distributions for *OP_EPS*. For example, the interquartile range of annualized ten-year growth rates in *OP_EPS* is from 2.3% to 14.4% for survivors and from -0.4% to 17.1% for nonsurvivors. Thus, survivorship bias does not seem to have a marked impact on the results.

## 4.3 The predictability of growth rates

### 4.3.1 Evidence from earnings-to-price ratios

Table 5 provides preliminary descriptive evidence on the extent to which valuation ratios anticipate future EPS growth. This table ranks firms into deciles based on realized *OP_EPS* growth rates over five-year periods (*5YR OP_EPS Growth*). The table then reports the median ratios of earnings-to-price, book-to-market, and sales-to-price at both the beginning and the end of the five-year periods.

To the extent that these valuation ratios capture investors' anticipation of EPS growth at the beginning of the period, we should observe deciles with higher EPS growth rates having lower beginning earnings-to-price (*E/P*) ratios. This is exactly what we see, with the beginning *E/P* (base year) ratios monotonically decreasing as we move up the deciles. The ratios decline from 0.070 in the lowest *5YR OP_EPS Growth* decile to 0.027 in the highest *5YR OP_EPS Growth* decile. These results contrast with the results of Chan et al. (2003), who only find evidence of somewhat lower *E/P* in the highest growth decile.

The inconsistency between these results is largely explained by a specific research design choice made by Chan et al. (2003) (see their page 670). They note the existence of nonrecurring components in the earnings of the base year induces a mechanical association between the level of earnings in the base year and future growth

**Table 4** Persistence of growth rates for surviving versus nonsurviving firms

**Panel A: Persistence in growth rates**

| **Variable** | **Percentage of firms with above-median growth in *OP_EPS* each year for the indicated number of years** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** |
| **Survivors** | | | | | | | | | | |
| Average number of valid firms | 2,040 | 2,040 | 2,040 | 2,040 | 2,040 | 2,040 | 2,040 | 2,040 | 2,040 | 2,040 |
| Percentage above median | 52.3% | 28.5% | 14.9% | 7.9% | 4.2% | 2.2% | 1.3% | 0.8% | 0.5% | 0.4% |
| **Nonsurvivors** | | | | | | | | | | |
| Average number of valid firms | 1,311 | 1,311 | 1,311 | 1,311 | 1,311 | 1,038 | 774 | 513 | 256 | 0 |
| Percentage above median | 50.0% | 25.9% | 13.1% | 6.6% | 3.3% | 1.8% | 1.0% | 0.6% | 0.4% | |
| **Expected percentage above median** | **50.0%** | **25.0%** | **12.5%** | **6.3%** | **3.1%** | **1.6%** | **0.8%** | **0.4%** | **0.2%** | **0.1%** |

**Panel B: Annualized growth rates over 10 years (the years survived) for survivors (nonsurvivors)**

| ***OP_EPS*** | **Percentiles** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **P10** | **P25** | **P40** | **P50** | **P60** | **P75** | **P90** |
| Survivors | −5.9% | 2.3% | 6.5% | 8.6% | 10.7% | 14.4% | 21.5% |
| Nonsurvivors | −12.7% | −0.4% | 5.5% | 8.6% | 11.6% | 17.1% | 29.2% |

This table compares the persistence in growth rates and the distribution of annualized growth rates for two sets of firms: (1) firms that survive the next ten years (survivors), and (2) firms that survive the next five years but fail to survive the tenth year (nonsurvivors). Our sample includes all domestic firms with common stocks listed on New York, American, and NASDAQ exchanges. We select firms with data available at the end of each fiscal year from 1998 to 2020. We report growth in earnings per share from operations (*OP_EPS*). We adjust the growth rates for stock splits and dividends. We also assume that cash dividends and other special distributions are reinvested in the stock each year. Panel A of this table presents the number of valid firms and the percentage of firms with growth rates exceeding the median growth rates each year for the indicated number of years. Note that this requires the calculation of year-over-year growth rates. We take the simple average across all years over our sample period and express the average number of above-median firms as a percentage of the average number of valid firms. To avoid the sample selection issue, we impute growth rates for firms with negative base year earnings based on the distribution of change in earnings scaled by price. Therefore, the number of firms with valid growth rates includes firms with both positive and negative base year earnings. We also report the expected percentage of above-median firms under the assumption of zero persistence in growth rates. Panel B of this table presents the descriptive statistics on the distribution of annualized growth rates over the next ten years (the years survived) for survivors (nonsurvivors). For firms with negative base year earnings, we leave the growth rates undefined. We calculate the percentile values from the distribution of each year and report the simple average across all years over our sample period. Appendix 1 provides detailed variable definitions

**Table 5** Median values of valuation ratios and related characteristics for stocks classified by realized growth rates

| Variable | *5YR OP_EPS Growth* Decile | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Median *5YR OP_EPS Growth* | −0.233 | −0.073 | 0.000 | 0.047 | 0.082 | 0.113 | 0.147 | 0.191 | 0.262 | 0.458 |
| Beg. *Size Decile Rank* | 3.624 | 4.066 | 4.470 | 4.800 | 4.865 | 4.942 | 4.872 | 4.611 | 4.097 | 3.310 |
| End. *Size Decile Rank* | 2.929 | 3.577 | 4.237 | 4.685 | 4.931 | 5.152 | 5.226 | 5.186 | 4.992 | 4.307 |
| Beg. *E/P* (base year) | 0.070 | 0.067 | 0.066 | 0.064 | 0.062 | 0.061 | 0.058 | 0.056 | 0.048 | 0.027 |
| Beg. *E/P* (1-yr prior to base year) | 0.059 | 0.060 | 0.060 | 0.060 | 0.059 | 0.056 | 0.055 | 0.052 | 0.047 | 0.037 |
| End. *E/P* | 0.023 | 0.046 | 0.055 | 0.059 | 0.061 | 0.062 | 0.062 | 0.062 | 0.063 | 0.068 |
| Beg. *B/M* | 0.535 | 0.520 | 0.510 | 0.499 | 0.506 | 0.483 | 0.495 | 0.498 | 0.514 | 0.636 |
| End. *B/M* | 0.745 | 0.662 | 0.602 | 0.547 | 0.515 | 0.463 | 0.436 | 0.412 | 0.396 | 0.433 |
| Beg. *S/P* | 0.900 | 0.826 | 0.751 | 0.696 | 0.656 | 0.674 | 0.682 | 0.719 | 0.853 | 1.012 |
| End. *S/P* | 1.174 | 0.948 | 0.824 | 0.708 | 0.619 | 0.599 | 0.552 | 0.555 | 0.595 | 0.667 |
| Beg. *ROE* | 0.133 | 0.132 | 0.133 | 0.129 | 0.126 | 0.127 | 0.122 | 0.114 | 0.094 | 0.044 |
| End. *ROE* | 0.030 | 0.069 | 0.092 | 0.105 | 0.115 | 0.127 | 0.138 | 0.147 | 0.155 | 0.159 |
| Beg. *NM* | 0.082 | 0.081 | 0.087 | 0.092 | 0.093 | 0.092 | 0.088 | 0.077 | 0.057 | 0.027 |
| End. *NM* | 0.018 | 0.046 | 0.068 | 0.086 | 0.098 | 0.108 | 0.111 | 0.110 | 0.105 | 0.101 |

This table reports the valuation ratios and related characteristics for stocks classified by annualized realized growth rates over the next five years. Our sample includes all domestic firms with common stocks listed on New York, American, and NASDAQ exchanges. We select firms with data available at the end of each fiscal year from 1998 to 2020. We measure growth in earnings per share from operations (*OP_EPS*). We adjust the growth rates for stock splits and dividends. We also assume that cash dividends and other special distributions are reinvested in the stock each year. For firms with negative base year earnings, we leave the growth rates undefined. We classify stocks into decile portfolios based on annualized realized growth rates in earnings per share from operations over the next five years (*5YR OP_EPS Growth*). For each year, we obtain the following statistics for each decile portfolio: the median annualized realized growth rate over the next five years, the average size decile rank at the beginning and end of the growth horizon, and the median financial ratios at the beginning and end of the growth horizon, including earnings-to-price, book-to-market value of equity, sales-to-price, return on equity, and net margin. We report the simple average values across all years over our sample period. Appendix 1 provides detailed variable definitions

**Table 6** Fama–MacBeth regressions of median valuation ratios on median realized growth rates and other control variables

**Panel A: Regressions of beginning values of valuation ratios on realized EPS growth**

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | Beg. *E/P* | Beg. *B/M* | Beg. *S/P* | Beg. *B/M* | Beg. *S/P* |
| *Intercept* | 0.064*** | 0.505*** | 0.758*** | 0.850*** | 1.395*** |
| | (30.86) | (31.59) | (21.81) | (13.49) | (15.29) |
| *5YR OP_EPS Growth* | −0.062*** | 0.107** | 0.131 | −0.267*** | −0.459*** |
| | (−15.18) | (2.68) | (1.66) | (−4.33) | (−8.82) |
| Beg. *ROE* | | | | −2.655*** | |
| | | | | (−7.24) | |
| Beg. *NM* | | | | | −7.556*** |
| | | | | | (−8.99) |
| Average adjusted $R^2$ | 78.38% | 17.38% | 8.18% | 62.47% | 78.92% |
| Number of observations | 190 | 190 | 190 | 190 | 190 |

**Panel B: Regressions of ending values of valuation ratios on realized EPS growth**

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | End. *E/P* | End. *B/M* | End. *S/P* | End. *B/M* | End. *S/P* |
| *Intercept* | 0.050*** | 0.569*** | 0.797*** | 0.921*** | 1.324*** |
| | (36.51) | (27.42) | (20.26) | (18.04) | (18.48) |
| *5YR OP_EPS Growth* | 0.059*** | −0.544*** | −0.828*** | 0.240*** | 0.178** |
| | (12.03) | (−10.20) | (−10.02) | (4.80) | (2.61) |
| End. *ROE* | | | | −3.764*** | |
| | | | | (−11.29) | |
| End. *NM* | | | | | −7.663*** |
| | | | | | (−10.82) |
| Average adjusted $R^2$ | 62.34% | 64.25% | 46.85% | 89.75% | 92.60% |
| Number of observations | 190 | 190 | 190 | 190 | 190 |

This table reports the results from Fama–MacBeth regressions of median valuation ratios on median realized EPS growth rates over the next five years. Our sample includes all domestic firms with common stocks listed on New York, American, and NASDAQ exchanges. We select firms with data available at the end of each fiscal year from 1998 to 2020. We measure growth in earnings per share from operations (*OP_EPS*). We adjust the growth rates for stock splits and dividends. We also assume that cash dividends and other special distributions are reinvested in the stock each year. For firms with negative base year earnings, we leave the growth rates undefined. We classify stocks into decile portfolios based on annualized realized growth rates in earnings per share from operations over the next five years (*5YR OP_EPS Growth*). For each year, we obtain the median values of the following variables for each decile portfolio: the annualized realized growth rate over the next five years (*5YR OP_EPS Growth*) and the financial ratios at the beginning and end of the growth horizon, including earnings-to-price, book-to-market value of equity, sales-to-price, return on equity, and net margin. Panel A reports the regression results of beginning values of valuation ratios on realized growth rates. Panel B reports the regression results of ending values of valuation ratios on realized growth rates. We run regressions using the median values from the decile portfolios each year and report the average estimated coefficients and *t*-statistics in parentheses across all years over our sample period. ***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.10 levels (two-tailed), respectively. Appendix 1 provides detailed variable definitions

**Table 7** Median values of realized growth rates for stocks classified by analyst growth forecasts

| | Quintile of *IBES_LTG* | | | | | Quintile of *FY1/FY0* | | | | | Quintile of *FY2/FY0* | | | | | Quintile of *FY3/FY0* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| **Analyst growth forecasts** | | | | | | | | | | | | | | | | | | | | |
| Median value | 5.8 | 10.0 | 13.1 | 17.1 | 26.0 | −17.4 | 4.1 | 11.5 | 20.6 | 57.2 | −0.5 | 8.4 | 13.3 | 20.3 | 47.2 | −0.3 | 8.2 | 12.8 | 19.1 | 40.1 |
| **Growth rate in year 1** | | | | | | | | | | | | | | | | | | | | |
| *OP_EPS* | 4.7 | 9.1 | 11.6 | 14.9 | 19.4 | −23.1 | 4.5 | 13.0 | 22.8 | 52.1 | −11.7 | 6.7 | 14.2 | 22.7 | 47.3 | −12.5 | 6.2 | 13.7 | 22.6 | 48.7 |
| Firm-level *OPE* | 2.0 | 6.7 | 9.7 | 15.3 | 22.1 | −24.1 | 2.0 | 11.2 | 22.7 | 56.5 | −13.6 | 4.3 | 12.6 | 23.4 | 52.6 | −14.2 | 3.7 | 11.8 | 23.2 | 54.2 |
| Firm-level *Sales* | 2.6 | 4.9 | 7.3 | 10.7 | 18.4 | −0.3 | 4.2 | 7.7 | 12.5 | 16.3 | 0.2 | 4.7 | 8.3 | 12.8 | 15.6 | 0.5 | 4.6 | 7.9 | 12.1 | 16.5 |
| **Annualized growth rate over 2 years** | | | | | | | | | | | | | | | | | | | | |
| *OP_EPS* | 8.0 | 10.3 | 11.5 | 13.8 | 18.4 | −0.1 | 6.9 | 11.8 | 16.6 | 32.5 | 0.9 | 8.1 | 12.4 | 17.3 | 35.7 | −0.3 | 7.5 | 12.3 | 17.3 | 37.7 |
| Firm-level *OPE* | 5.6 | 8.0 | 9.6 | 14.0 | 20.9 | −1.7 | 4.3 | 9.6 | 16.1 | 36.0 | −1.3 | 5.5 | 10.7 | 17.5 | 39.2 | −2.6 | 4.9 | 10.3 | 17.5 | 42.3 |
| Firm-level *Sales* | 3.0 | 4.7 | 6.6 | 9.5 | 14.7 | 2.1 | 4.4 | 6.9 | 10.2 | 11.8 | 1.9 | 4.7 | 7.3 | 10.7 | 11.9 | 1.5 | 4.7 | 7.1 | 10.4 | 13.2 |
| **Annualized growth rate over 3 years** | | | | | | | | | | | | | | | | | | | | |
| *OP_EPS* | 8.1 | 9.9 | 10.4 | 12.0 | 16.0 | 2.9 | 7.6 | 10.7 | 14.0 | 24.4 | 3.1 | 8.4 | 11.1 | 14.8 | 26.8 | 2.2 | 7.9 | 11.1 | 15.0 | 28.6 |
| Firm-level *OPE* | 5.7 | 7.6 | 8.8 | 11.5 | 17.6 | 1.5 | 5.2 | 8.6 | 13.2 | 26.4 | 1.0 | 5.9 | 9.3 | 14.3 | 29.1 | 0.2 | 5.5 | 9.2 | 14.6 | 31.3 |
| Firm-level *Sales* | 3.1 | 4.7 | 6.3 | 9.0 | 12.9 | 3.2 | 4.6 | 6.6 | 9.0 | 9.8 | 2.9 | 4.8 | 7.0 | 9.5 | 9.7 | 2.5 | 4.6 | 6.8 | 9.4 | 11.0 |
| **Annualized growth rate over 5 years** | | | | | | | | | | | | | | | | | | | | |
| *OP_EPS* | 8.2 | 10.0 | 10.3 | 11.7 | 12.8 | 5.8 | 8.2 | 10.0 | 12.0 | 20.0 | 5.2 | 8.7 | 10.4 | 12.9 | 21.5 | 4.9 | 8.2 | 10.5 | 13.2 | 22.6 |
| Firm-level *OPE* | 6.2 | 7.7 | 8.5 | 10.8 | 14.1 | 4.5 | 6.1 | 7.9 | 11.1 | 20.8 | 3.3 | 6.4 | 8.5 | 12.1 | 23.1 | 3.1 | 5.8 | 8.5 | 12.2 | 24.3 |
| Firm-level *Sales* | 3.4 | 4.7 | 6.3 | 8.3 | 11.5 | 3.8 | 4.6 | 6.3 | 8.2 | 8.6 | 3.5 | 4.8 | 6.6 | 8.6 | 8.8 | 3.2 | 4.6 | 6.5 | 8.5 | 9.7 |
| **Size-adjusted return in year 1** | | | | | | | | | | | | | | | | | | | | |
| Average value | 3.6 | 2.3 | 2.3 | 2.3 | 0.7 | 4.0 | 1.7 | 1.6 | 1.7 | 3.1 | 2.3 | 2.3 | 2.0 | 1.8 | 4.5 | −1.4 | 1.4 | 3.8 | 3.7 | 9.6 |
| **Earnings surprise in year 1** | | | | | | | | | | | | | | | | | | | | |
| Median value | −0.3 | −0.3 | −0.4 | −0.6 | −0.8 | −0.8 | −0.2 | −0.2 | −0.2 | −0.7 | −0.5 | −0.2 | −0.2 | −0.3 | −0.8 | −1.0 | −0.2 | −0.1 | −0.1 | −0.4 |
| Average value | −3.0 | −1.8 | −2.1 | −2.8 | −3.3 | −3.8 | −1.1 | −0.9 | −1.0 | −2.3 | −3.4 | −1.0 | −1.0 | −1.1 | −2.3 | −3.5 | −1.0 | −0.7 | −0.7 | −1.6 |

Table 7 (Continued)

This table reports the stock returns and earnings surprises in percentage over the next year and annualized realized growth rates in percentage over the next year, two years, three years, and five years for stocks classified by analyst long-term growth forecasts and expected EPS growth rates imputed from analysts' multi-year annual EPS forecasts. Our sample includes all domestic firms with common stocks listed on New York, American, and NASDAQ exchanges. We select firms with data available at the end of each fiscal year from 1998 to 2020. We report the annualized realized growth rates in earnings per share from operations (*OP_EPS*). We adjust the growth rates for stock splits and dividends. We also assume that cash dividends and other special distributions are reinvested in the stock each year. We also report the annualized realized growth rates in firm-level operating earnings (*OPE*) and firm-level sales (*Sales*). *OPE* is calculated as the earnings per share from operations times the number of common shares. For firms with negative base year earnings, we leave the growth rates undefined. We form quintile portfolios each year based on analyst consensus long-term growth forecasts (*IBES_LTG*) and expected EPS growth rates imputed from analyst EPS forecasts made for the first, second, and third year following the most recently announced year (*FY1/FY0*, *FY2/FY0*, and *FY3/FY0*), respectively. We calculate the median value of annualized growth rates from the distribution of each year and report the simple average across all years over our sample period. We also report the average value of size-adjusted stock returns and the median and average values of earnings surprises over the next year. Size-adjusted return (*Size-Adjusted Return*) is cumulated over the next twelve months starting from four months after the fiscal year-end of the base year with adjustment for delisting returns following Shumway (1997). We form size portfolios using the NYSE breakpoints based on market value of equity of the current year. Earnings surprise (*Earnings Surprise*) is measured as *OP_EPS* minus analyst consensus EPS forecast made for the first year following the most recently announced year (*FY1*) divided by price per share as of the fiscal year-end of the base year. Appendix 1 provides detailed variable definitions

**Table 8** Median values of realized growth rates for stocks classified by two-year forward earnings-to-price ratio

| Quintile rank of *FY2/Price* | *FY2/Price* | Annualized growth rate in *OP_EPS* | | |
|---|---|---|---|---|
| | | In FY3 | Over FY3-FY5 | Over FY3-FY7 |
| 1 | −2.25% | 6.27% | 20.24% | 16.34% |
| 2 | 4.76% | 11.18% | 12.17% | 11.25% |
| 3 | 6.85% | 10.01% | 10.08% | 9.83% |
| 4 | 8.66% | 6.98% | 9.48% | 9.18% |
| 5 | 12.21% | 1.88% | 8.45% | 8.23% |

This table reports the annualized realized growth rates over the next year, three years, and five years starting from two years following the base year for stocks classified by two-year forward earnings-to-price ratio (*FY2/Price*). Our sample includes all domestic firms with common stocks listed on New York, American, and NASDAQ exchanges. We select firms with data available at the end of each fiscal year from 1998 to 2020. We measure growth in earnings per share from operations (*OP_EPS*). We adjust the growth rates for stock splits and dividends. We also assume that cash dividends and other special distributions are reinvested in the stock each year. For firms with negative earnings in FY2, we leave the growth rates undefined. We form quintile portfolios each year based on analyst consensus EPS forecast made for the second year following the most recently announced year divided by price per share as of the current fiscal year-end (*FY2/Price*). We calculate the median value of annualized growth rates from the distribution of each year and report the simple average across all years over our sample period. Appendix 1 provides detailed variable definitions

rates. To weaken this link, they measure earnings one year prior to the base year. Since our tests employ earnings before nonrecurring items, the impact of nonrecurring items on growth rates is mitigated. When we follow Chan et al. (2003) and compute *E/P* using earnings from the year prior to the base year, we also get weaker results, though not quite as weak as those reported by them. This is to be expected, since Chan et al.'s (2003) approach uses stale earnings information.

We next report the *E/P* ratio at the end of the five-year period. If investors naively extrapolate past growth, as argued by Lakonishok et al. (1994), then we should see a negative relation between ending *E/P* and *5YR OP_EPS Growth*. Instead, we see a positive and monotonic relation. Thus, investors are clearly aware that firms with high past growth are likely at peak earnings and do not extrapolate this past growth into the future.

Chan et al. (2003) argue that book-to-market (*B/M*) ratios overcome the mechanical association caused by nonrecurring items in *E/P* ratios. They find that firms in the highest five-year EPS growth deciles have modestly higher beginning *B/M* ratios and argue that "the modest ex ante valuations suggest that the market fails to anticipate their subsequent growth." Similar evidence is reported by Lakonishok et al. (1994), who interpret it as consistent with naive extrapolation of past growth. We also replicate these results, finding that the highest *5YR OP_EPS Growth* decile has the highest median beginning *B/M* ratio. It turns out, however, that there is an alternative interpretation of these results. Recall from our analysis in Section 2.1 that while *B/M* is decreasing in expected future EPS growth, it is also decreasing in current return on equity (*ROE*). The intuition here is that a higher *ROE* implies less book value for a given level of earnings, which in turn implies a lower *B/M* ratio. We

**Table 9** Fama–MacBeth regressions of future growth rates on forecasting variables

| | **Panel A:** Chan et al.'s (2003) **forecasting model** | | | | | |
|---|---|---|---|---|---|---|
| | **Dep. Var. =** | | | | | |
| | **Annualized growth rate in EPS** | | | **Annualized growth rate in OP_EPS** | | |
| | **In year 1** | **Over 3 years** | **Over 5 years** | **In year 1** | **Over 3 years** | **Over 5 years** |
| *Intercept* | 0.412*** | 0.077*** | 0.081*** | 0.187*** | 0.088*** | 0.096*** |
| | (3.13) | (5.24) | (6.21) | (3.71) | (5.78) | (8.50) |
| *E/P_Prior YR* | −1.937** | −0.740*** | −0.546*** | −1.197*** | −0.761*** | −0.614*** |
| | (−2.41) | (−3.53) | (−4.50) | (−3.32) | (−4.71) | (−7.03) |
| *IBES_LTG* | 0.888* | 0.437*** | 0.235*** | 0.684*** | 0.380*** | 0.204*** |
| | (1.92) | (11.86) | (7.11) | (4.62) | (12.46) | (8.53) |
| *Past Sales Growth* | −0.074*** | −0.005 | −0.001 | −0.032** | −0.003 | −0.003 |
| | (−3.41) | (−1.64) | (−0.59) | (−2.45) | (−1.43) | (−1.25) |
| *Sustainable Growth* | −0.369 | −0.258*** | −0.142** | −0.513*** | −0.236*** | −0.125*** |
| | (−1.32) | (−3.04) | (−2.29) | (−4.56) | (−4.19) | (−3.18) |
| *R&D/Sales* | −0.703 | 0.264*** | 0.175*** | −0.354 | 0.087 | 0.109 |
| | (−1.16) | (3.43) | (3.46) | (−1.67) | (0.84) | (1.32) |
| *Tech* | 0.043 | 0.003 | −0.005 | −0.007 | 0.010 | 0.002 |
| | (0.77) | (0.26) | (−0.65) | (−0.26) | (1.07) | (0.27) |
| *B/M* | −0.599** | 0.089*** | 0.062*** | −0.125 | 0.071*** | 0.049*** |
| | (−2.20) | (8.63) | (7.40) | (−1.50) | (6.76) | (4.93) |
| *Past Return* | 0.877*** | 0.047*** | 0.035*** | 0.522*** | 0.066*** | 0.041*** |
| | (6.11) | (2.72) | (2.72) | (6.91) | (6.83) | (3.87) |
| *Dividend/Price* | 0.912 | −0.354 | −0.218 | −0.368 | −0.488* | −0.384 |
| | (0.64) | (−1.23) | (−0.79) | (−1.10) | (−2.01) | (−1.42) |
| Average adjusted $R^2$ | 5.77% | 5.84% | 6.29% | 9.26% | 8.50% | 9.03% |
| Number of observations | 25,006 | 18,567 | 15,337 | 25,006 | 18,567 | 15,337 |

**Table 9** (continued)

**Panel B: Refined forecasting model**

| | **Dep. Var. = Annualized growth rate in OP_EPS** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Model 1 (using *FY1/FY0*)** | | | **Model 2 (using *FY2/FY0*)** | | | **Model 3 (using *FY3/FY0*)** | | |
| | **In year 1** | **Over 3 years** | **Over 5 years** | **In year 1** | **Over 3 years** | **Over 5 years** | **In year 1** | **Over 3 years** | **Over 5 years** |
| *Intercept* | 0.147*** | 0.231*** | 0.191*** | 0.206*** | 0.203*** | 0.175*** | 0.212*** | 0.193*** | 0.167*** |
| | (3.37) | (13.47) | (11.71) | (6.44) | (12.37) | (11.02) | (7.77) | (10.79) | (10.14) |
| *E/P* | −1.328** | −2.585*** | −1.897*** | −2.026*** | −2.373*** | −1.768*** | −2.036*** | −2.265*** | −1.694*** |
| | (−2.64) | (−19.11) | (−9.18) | (−6.30) | (−19.90) | (−8.34) | (−6.23) | (−19.71) | (−8.22) |
| *FY1/FY0* | 0.729*** | 0.153*** | 0.089*** | | | | | | |
| | (17.58) | (12.30) | (7.91) | | | | | | |
| *FY2/FY0* | | | | 0.312*** | 0.109*** | 0.064*** | | | |
| | | | | (7.39) | (12.12) | (6.41) | | | |
| *FY3/FY0* | | | | | | | 0.209*** | 0.080*** | 0.047*** |
| | | | | | | | (6.95) | (17.86) | (7.91) |
| *Past Sales Growth* | −0.020 | 0.001 | −0.002 | −0.023* | −0.000 | −0.003 | −0.026* | −0.001 | −0.003 |
| | (−1.63) | (0.35) | (−0.60) | (−1.78) | (−0.08) | (−0.90) | (−1.86) | (−0.21) | (−0.91) |
| *Sustainable Growth* | −0.060 | 0.014 | 0.031 | −0.052 | 0.008 | 0.026 | −0.051 | 0.006 | 0.027 |
| | (−1.11) | (0.54) | (1.18) | (−0.99) | (0.29) | (0.98) | (−0.98) | (0.24) | (1.03) |
| *R&D/Sales* | −0.397* | 0.009 | 0.030 | −0.653** | −0.047 | 0.000 | −0.629** | −0.054 | −0.002 |
| | (−1.69) | (0.09) | (0.42) | (−2.43) | (−0.45) | (0.00) | (−2.58) | (−0.53) | (−0.03) |
| *Tech* | 0.007 | 0.003 | −0.001 | 0.006 | 0.006 | −0.000 | 0.002 | 0.006 | −0.000 |
| | (0.28) | (0.34) | (−0.20) | (0.23) | (0.65) | (−0.06) | (0.06) | (0.71) | (−0.01) |
| *B/M* | −0.228*** | 0.071*** | 0.054*** | −0.244*** | 0.063*** | 0.050*** | −0.261*** | 0.053*** | 0.043*** |
| | (−3.09) | (7.54) | (7.78) | (−3.26) | (6.50) | (7.87) | (−3.35) | (5.23) | (7.44) |
| *RE/M* | 0.151*** | 0.017 | 0.009 | 0.159*** | 0.022** | 0.010 | 0.170*** | 0.028** | 0.014* |
| | (8.10) | (1.62) | (1.23) | (7.86) | (2.04) | (1.30) | (6.48) | (2.56) | (1.96) |

**Table 9** (continued)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Past Return* | 0.384*** | 0.019* | 0.010 | 0.459*** | 0.029** | 0.013 | 0.474*** | 0.035*** | 0.017 |
| | (5.30) | (1.72) | (0.97) | (6.04) | (2.54) | (1.33) | (6.07) | (2.95) | (1.67) |
| *Dividend/Price* | 0.925*** | −0.046 | −0.028 | 0.928** | 0.076 | 0.029 | 1.076*** | 0.164 | 0.081 |
| | (3.42) | (−0.22) | (−0.12) | (2.51) | (0.37) | (0.12) | (2.96) | (0.84) | (0.33) |
| *Rank NTG* | −0.050 | −0.009 | −0.012* | −0.062 | −0.007 | −0.013* | −0.070* | −0.006 | −0.010 |
| | (−1.39) | (−0.93) | (−1.84) | (−1.64) | (−0.65) | (−1.71) | (−1.76) | (−0.63) | (−1.48) |
| *ROA* | −0.330 | −0.410*** | −0.289*** | −0.519** | −0.369*** | −0.265** | −0.592** | −0.371*** | −0.251** |
| | (−1.27) | (−4.34) | (−2.95) | (−2.33) | (−3.63) | (−2.66) | (−2.58) | (−3.57) | (−2.55) |
| *Rank NTG×ROA* | 0.611** | 0.046 | 0.159* | 0.743** | 0.035 | 0.164 | 0.834*** | 0.037 | 0.138 |
| | (2.13) | (0.39) | (1.76) | (2.44) | (0.27) | (1.64) | (2.73) | (0.29) | (1.42) |
| Average adjusted $R^2$ | 22.88% | 25.48% | 25.13% | 17.65% | 26.49% | 26.27% | 17.84% | 27.73% | 27.39% |
| Number of observations | 25,006 | 18,567 | 15,337 | 25,006 | 18,567 | 15,337 | 25,006 | 18,567 | 15,337 |

This table reports the Fama–MacBeth regression results from the forecasting models for annualized growth rates in earnings over the next year, three years, and five years, respectively. Panel A reports the results using Chan et al.'s (2003) forecasting model. They measure growth in income before extraordinary items available for common equity on a per-share basis (*EPS*). Panel B reports the results using our refined forecasting model. We measure growth in earnings per share from operations (*OP_EPS*). Chan et al.'s (2003) forecasting variables include earnings-to-price ratio one year prior to the base year (*E/P_Prior YR*), analyst consensus long-term growth forecasts (*IBES_LTG*), sales growth over the past five years (*Past Sales Growth*), sustainable growth (*Sustainable Growth*), R&D expenditures as a percentage of sales (*R&D/Sales*), an indicator for technology stocks (*Tech*), book-to-market value of equity (*B/M*), the cumulative stock return over the past six months (*Past Return*), and dividend yield (*Dividend/Price*). We refine the forecasting model by replacing *E/P_Prior YR* with the earnings-to-price ratio of the base year (*E/P*) and replacing *IBES_LTG* with expected EPS growth rates imputed from analysts' multi-year annual EPS forecasts (*FY1/FY0*, *FY2/FY0*, and *FY3/FY0*). We also incorporate additional forecasting variables in the model, including retained earnings-to-market value of equity (*RE/M*), the quintile rank of net-to-gross PP&E ratio (*Rank NTG*), return on assets (*ROA*), and the interaction between *Rank NTG* and *ROA*. Our sample includes all domestic firms with common stocks listed on New York, American, and NASDAQ exchanges. We select firms with data available at the end of each fiscal year from 1998 to 2020. We exclude stocks with negative book-to-market value of equity. We adjust the growth rates for stock splits and dividends. We also assume that cash dividends and other special distributions are reinvested in the stock each year. For firms with negative base year earnings, we leave the growth rates undefined. We winsorize all financial variables except for past stock returns at the top and bottom one percentiles. We report the average estimated coefficients across all years over our sample period and *t*-statistics in parentheses based on Newey-West standard errors with a lag of three, as well as the number of observations with available data and the average adjusted $R^2$ of the model. ***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.10 levels (two-tailed), respectively. Appendix 1 provides detailed variable definitions

**Table 10** Fama–MacBeth regressions of future stock returns on trailing earnings yields and analyst growth forecasts

**Panel A: Using one-year-ahead EPS growth rates**

| | **Dep. Var. = *Return*** | | | | | |
|---|---|---|---|---|---|---|
| | **Equal weighted** | | | **Value weighted** | | |
| *Intercept* | 0.028 | 0.042* | 0.014 | 0.005 | 0.008 | 0.001 |
| | (1.32) | (1.74) | (0.92) | (0.21) | (1.05) | (0.04) |
| *E/P* | 0.232 | | 0.349 | 0.125 | | 0.160 |
| | (0.81) | | (1.09) | (0.37) | | (0.46) |
| *Lagged RE/M* | −0.003 | | −0.003 | −0.009 | | −0.006 |
| | (−0.30) | | (−0.25) | (−0.25) | | (−0.19) |
| *FY1/FY0* | | 0.011 | 0.016 | | 0.011 | 0.020 |
| | | (0.72) | (0.90) | | (0.65) | (1.21) |
| Average adjusted $R^2$ | 1.77% | 0.39% | 2.27% | 4.07% | 1.19% | 5.36% |
| Number of observations | 25,006 | 25,006 | 25,006 | 25,006 | 25,006 | 25,006 |

**Panel B: Using two-year-ahead EPS growth rates**

| | **Dep. Var. = *Return*** | | | | | |
|---|---|---|---|---|---|---|
| | **Equal weighted** | | | **Value weighted** | | |
| *Intercept* | 0.028 | 0.039* | 0.002 | 0.005 | 0.006 | −0.007 |
| | (1.32) | (1.72) | (0.12) | (0.21) | (0.71) | (−0.31) |
| *E/P* | 0.232 | | 0.436 | 0.125 | | 0.241 |
| | (0.81) | | (1.24) | (0.37) | | (0.77) |
| *Lagged RE/M* | −0.003 | | −0.001 | −0.009 | | −0.006 |
| | (−0.30) | | (−0.14) | (−0.25) | | (−0.17) |
| *Annualized FY2/FY0* | | 0.035 | 0.062* | | 0.035 | 0.059 |
| | | (1.22) | (1.75) | | (0.75) | (1.40) |
| Average adjusted $R^2$ | 1.77% | 0.36% | 2.39% | 4.07% | 1.81% | 6.10% |
| Number of observations | 25,006 | 25,006 | 25,006 | 25,006 | 25,006 | 25,006 |

**Panel C: Using three-year-ahead EPS growth rates**

| | **Dep. Var. = *Return*** | | | | | |
|---|---|---|---|---|---|---|
| | **Equal weighted** | | | **Value weighted** | | |
| *Intercept* | 0.028 | 0.023 | −0.042** | 0.005 | −0.002 | −0.024 |
| | (1.32) | (1.23) | (−2.47) | (0.21) | (−0.38) | (−0.88) |
| *E/P* | 0.232 | | 0.882** | 0.125 | | 0.381 |
| | (0.81) | | (2.14) | (0.37) | | (1.06) |
| *Lagged RE/M* | −0.003 | | −0.010 | −0.009 | | 0.001 |
| | (−0.30) | | (−0.77) | (−0.25) | | (0.03) |
| *Annualized FY3/FY0* | | 0.162*** | 0.228*** | | 0.084 | 0.127** |
| | | (2.82) | (3.45) | | (1.44) | (2.24) |
| Average adjusted $R^2$ | 1.77% | 0.82% | 3.47% | 4.07% | 1.73% | 6.72% |
| Number of observations | 25,006 | 25,006 | 25,006 | 25,006 | 25,006 | 25,006 |

**Table 10** (continued)

This table reports the results from the equal- and value-weighted Fama–MacBeth regressions of future stock returns on earnings-to-price ratio (*E/P*), retained earnings-to-market ratio of the prior year (*Lagged RE/M*), and the annualized expected EPS growth rates imputed from analysts' multi-year annual EPS forecasts. The dependent variable is the cumulative market-adjusted return over the next twelve months starting from four months after the fiscal year-end of the base year with adjustment for delisting returns following Shumway (1997). Panels A, B, and C use the annualized expected EPS growth rates imputed from analyst EPS forecasts made for the first, second, and third year following the most recently announced year (*FY1/FY0*, *Annualized FY2/FY0*, and *Annualized FY3/FY0*), respectively. Our sample includes all domestic firms with common stocks listed on New York, American, and NASDAQ exchanges. We select firms with data available at the end of each fiscal year from 1998 to 2020. We winsorize earnings-to-price ratios, retained earnings-to-market ratio of the prior year, and the annualized expected EPS growth rates at the top and bottom one percentiles. We report the average estimated coefficients across all years over our sample period and *t*-statistics in parentheses based on Newey-West standard errors with a lag of three. ***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.10 levels (two-tailed), respectively. Appendix 1 provides detailed variable definitions

therefore report the beginning *ROE* for each *5YR OP_EPS Growth* decile. There is a clear negative relation between beginning *ROE* and *5YR OP_EPS Growth*. *ROE* therefore appears to be a correlated omitted variable in the analysis of the relation between *B/M* ratios and *5YR OP_EPS Growth*.

In order to control for *ROE* as a correlated omitted variable, we employ the following procedure. First, similar to the analysis in Table 5, we rank all observations annually into deciles based on *5YR OP_EPS Growth*. Next, we take the median values of beginning *B/M*, *5YR OP_EPS Growth*, and beginning *ROE* for each decile. Finally, we conduct a Fama–Macbeth regression analysis of the relation between the median beginning *B/M* and the median *5YR OP_EPS Growth*, both with and without controlling for median beginning *ROE*. The results are presented in Panel A of Table 6. Column (2) reports results from a simple regression of beginning *B/M* on *5YR OP_EPS Growth*. Consistent with the results in Table 5, there is evidence of a positive relation. Column (4) adds beginning *ROE* to the regression. Beginning *ROE* enters with a highly significant negative coefficient, and the coefficient on *5YR OP_EPS Growth* becomes significantly negative. Thus, after controlling for beginning *ROE*, beginning *B/M* has the predicted negative relation with *5YR OP_EPS Growth*.

A similar story plays out for beginning sales-to-price (*S/P*) ratios. The results in Table 5 show that firms in the highest *5YR OP_EPS Growth* decile have the highest beginning *S/P*. This appears to suggest that investors do not anticipate their subsequent EPS growth. But recall from our analysis in Section 2.1 that while *S/P* should be decreasing in expected EPS growth, it should also be decreasing in current net margin. We therefore also report the median beginning net margin (*NM*) by *5YR OP_EPS Growth* in Table 5. There is evidence of a negative relation between beginning *NM* and *5YR OP_EPS Growth*. Note, in particular, that the highest *5YR OP_EPS Growth* decile has the lowest beginning *NM*. Column (3) of Table 6 Panel A reports results from a simple regression of median beginning *S/P* on median *5YR OP_EPS Growth*. Consistent with the results in Table 5, there is evidence of a weak positive relation. Column (5) adds beginning *NM* to the regression. Beginning *NM* enters with a highly significant negative coefficient, and the coefficient on *5YR OP_EPS Growth* becomes significantly negative. Thus, after controlling for beginning *NM*, beginning *S/P* has the predicted negative relation with *5YR OP_EPS Growth*.[18]

Chan et al. (2003) also find that ending *B/M* and *S/P* ratios have a negative relation with five-year EPS growth and argue that this is consistent with investors having extrapolative biases. We replicate these results, finding consistent evidence of a negative relation. In particular, Table 5 shows that the lowest *5YR OP_EPS Growth* deciles have much higher ending *B/M* and *S/P* ratios than the other deciles. As with the beginning ratios, there is an alternative and more mechanical explanation for these results. Table 5 also provides evidence of a positive relation between *5YR OP_EPS Growth* and both ending *ROE* and ending *NM*. This is particularly evident in the lowest *5YR OP_EPS Growth* deciles, where ending *ROE* and ending *NM* are substantially lower than for the other deciles. Panel B of Table 6 examines the relation of the median ending *B/M* and *S/P* ratios to *5YR OP_EPS Growth* using Fama–MacBeth regressions. In the absence of controls for ending *ROE* and ending *NM*, there are strong negative relations between the ending ratios and *5YR OP_EPS Growth*. After controlling for ending *ROE* and ending *NM* respectively, these relations become significantly positive. Thus, after including the appropriate controls, there is no evidence of extrapolative biases.

To summarize, the evidence in Tables 5 and 6 indicates that beginning earnings-to-price ratios rationally anticipate future EPS growth and that ending earnings-to-price ratios do not naively extrapolate past EPS growth. These tables also provide an alternative interpretation of previous research using book-to-market and sales-to-price ratios to make inferences regarding investors' expectations about EPS growth. Sorts on realized EPS growth induce sorts on return on equity and net margin. These induced sorts can create the mistaken impression that investors do not anticipate future EPS growth. But after controlling for return on equity and net margin, we find consistent evidence that investors do anticipate EPS growth.

#### 4.3.2 Evidence from analysts' earnings forecasts

The evidence in Table 5 shows that the expectations embedded in stock prices anticipate future EPS growth. Next, we look directly at analyst consensus forecasts of EPS growth to assess the accuracy of these forecasts with respect to future EPS growth. We begin by looking at analyst consensus forecasts of long-term earnings growth rates from I/B/E/S (*IBES_LTG*). This variable is defined by I/B/E/S as the expected annual percentage increase in operating earnings over the next full business cycle, referring to a period between three and five years (Thomson Financial 2008). Prior research by La Porta (1996), Dechow and Sloan (1997), and Chan et al. (2003) finds that these forecasts are too extreme, particularly for the highest growth stocks. Table 7 follows Table IX of Chan et al. (2003) in forming quintiles based on *IBES_LTG*.

[18] Lakonishok et al. (1994) also perform a double sort on past sales growth and current cash flow to price ratios, finding that value stocks with low past sales growth and high current cash flow to price ratios have similar future EPS growth as glamour stocks with high past sales growth and low current cash flow to price ratios. This definition of value, however, is also negatively associated with beginning *NM*, and so this analysis suffers from a similar correlated omitted variable problem.

The range in the median *IBES_LTG* between the bottom and top quintiles is from 5.8% to 26.0%. The corresponding range in Chan et al. (2003) is from 6.0% to 22.4%. Next, we report the annualized realized growth rates in *OP_EPS* over periods ranging from one year to five years. We focus here on the three-year growth rates, as this is the short end of the range indicated by I/B/E/S. The median annualized realized three-year growth rate in *OP_EPS* ranges from 8.1% to 16.0%. The corresponding range in Chan et al. (2003) for income before extraordinary items is from 3.1% to 11.5%. Their numbers are lower because they measure realized growth rates using income before extraordinary items, which includes large negative nonrecurring items, such as asset impairments. The difference in the median annualized realized three-year growth rates in *OP_EPS* between our top and bottom quintiles is only 7.9% versus a corresponding spread of 20.2% for *IBES_LTG*, corroborating earlier findings that the *IBES_LTG* forecasts are too extreme.

Recall that one potential limitation of *IBES_LTG* as a measure of expected future EPS growth is that it is defined by I/B/E/S to measure growth in *operating earnings* (as opposed to EPS), which suggests that it is a firm-level as opposed to a per-share forecast of growth. To test whether *IBES_LTG* is better at forecasting firm-level growth, in Table 7 we next report the annualized growth rates in firm-level operating earnings (*OPE*). *IBES_LTG* does a somewhat better job at predicting the growth rate in *OPE*. The median annualized realized three-year growth rate in firm-level *OPE* ranges from 5.7% for the bottom quintile to 17.6% for the top quintile, representing a spread of 11.9% versus only 7.9% for *OP_EPS*. Thus, consistent with the I/B/E/S definition, *IBES_LTG* is a better measure of firm-level growth in earnings. Finally, to check whether this measure of growth anchors on top-line growth in sales, we report the annualized realized growth rates in firm-level sales (*Sales*). The median annualized realized three-year growth rate in *Sales* ranges from 3.1% for the bottom quintile to 12.9% for the top quintile, representing a spread of 9.8% versus 7.9% for *OP_EPS*. Thus, *IBES_LTG* is actually better at predicting firm-level sales growth than it is at predicting EPS growth.

The poor performance of *IBES_LTG* at predicting EPS growth highlights the need for a better predictor. Figure 2 shows that analysts are increasingly providing explicit forecasts of annual EPS for several years into the future.Moreover, earlier research suggests that the growth rates implied by these explicit EPS forecasts can be more accurate than analysts' long-term growth forecasts themselves (e.g., Lacina et al. 2011). We therefore provide a comparable analysis based on the growth rates implied by explicit forecasts of annual EPS from I/B/E/S for the first, second, and third year following the most recently announced year. We denote these growth rates by *FY1/FY0*, *FY2/FY0*, and *FY3/FY0*, respectively.

The results reported in Table 7 indicate that the ranges between the top and bottom quintiles of these variables are significantly greater than for *IBES_LTG*. In particular, the range for median annualized *FY1/FY0* is from -17.4% to 57.2%, the range for *FY2/FY0* is from -0.5% to 47.2%, and the range for *FY3/FY0* is from -0.3% to 40.1%. We also see that the spread in realized *OP_EPS* growth rates is much greater than it is using *IBES_LTG*. For example, when sorting on *FY3/FY0*, the median annualized realized three-year growth rate in *OP_EPS* ranges from 2.2% to 28.6%. The spread of 26.4% is over three times as large as the spread of 7.9% when sorting on *IBES_LTG*. There is, however, still some evidence that the realized growth rates fall short of the forecasted growth rates, especially in the fourth and top quintiles. For example, when sorting on *FY3/FY0*, the median annualized realized three-year growth rate in *OP_EPS* for the top quintile is 28.6%, as compared to the median forecasted growth rate of 40.1%. Nevertheless, the spread of 26.4% between the top and bottom quintiles provides strong evidence that analysts are able to predict considerable variation in long-term EPS growth rates. This is in stark contrast to the weak evidence reported in previous research using *IBES_LTG*. Figure 3 provides a visual comparison of the spreads across the top and bottom quintiles in realized *OP_EPS* growth rates using the different measures, highlighting the dramatic improvements using *FY1/FY0*, *FY2/FY0*, and *FY3/FY0* relative to *IBES_LTG*.

Turning to firm-level growth rates, we see that *FY1/FY0*, *FY2/FY0*, and *FY3/FY0* are also effective at predicting growth in firm-level *OPE*. For example, when sorting on *FY3/FY0*, the median annualized realized three-year growth rate in *OPE* ranges from 0.2% for the bottom quintile to 31.3% for the top quintile. This represents a spread of 31.1%, which is greater than the corresponding spread of 26.4% for growth in *OP_EPS*. This indicates that analysts tend to fixate on firm-level growth even when they intend to forecast per-share growth. With respect to firm-level sales growth, we see that *FY1/FY0*, *FY2/FY0*, and *FY3/FY0* are all relatively poor at predicting firm-level growth in *Sales*. For example, when sorting on *FY3/FY0*, the median annualized realized three-year growth rate in *Sales* ranges from 2.5% to 11.0%, representing a spread of 8.5%. This spread is even smaller than the corresponding spread of 9.8% when sorting on *IBES_LTG*. Thus, while *IBES_LTG* provides a poor forecast of the EPS growth, it provides a relatively good forecast of firm-level sales growth. It appears that some analysts may focus on firm-level sales growth when generating *IBES_LTG* forecasts. As demonstrated in Section 2.1, this firm-level growth rate is not the appropriate variable for explaining variation in valuation ratios.

Table 7 also reports one-year-ahead stock returns and earnings surprises for each portfolio. For *IBES_LTG*, we find evidence consistent with La Porta (1996) that firms in the highest quintile have the lowest one-year-ahead stock returns and the most negative earnings surprises in the following year. However, these relations are attenuated and even reverse when using analysts' multi-year annual EPS forecasts. For example, when sorting on *FY3/FY0*, we find that firms in the *lowest* quintile of expected growth rates have the lowest one-year-ahead stock returns and the most negative earnings surprises in the following year. Overall, the evidence in Table 7 confirms that analysts' multi-year annual EPS forecasts provide more accurate forecasts of growth rates in EPS over the next three to five years.

We next focus on previous findings that EPS growth rates are essentially unpredictable beyond two years into the future (e.g., Lakonishok et al. 1994; Chan et al. 2003; Israel et al. 2021). We revisit these findings using a more direct measure of the expectations embedded in stock prices about growth beyond two years into the future: the ratio of the consensus annual EPS forecast for the second year following the most recently reported year divided by the current stock price (*FY2/P*). A low value of this ratio indicates that the expectations embedded in prices anticipate high growth in earnings beyond two years into the future.

Table 8 reports subsequent annualized growth rates in *OP_EPS* for different periods. We focus on the results over the next three years starting from two years following the base year (FY3-FY5). The median annualized growth rate declines monotonically from 20.24% in the lowest *FY2/P* quintile to 8.45% in the highest *FY2/P* quintile for a spread of 11.79%. Thus, contrary to claims in previous research, there is strong evidence that stock prices anticipate growth in EPS beyond two years into the future.

Thus far, we have focused on the standalone ability of earnings-to-price ratios and analyst forecasts to predict future EPS growth rates. We conclude this analysis by investigating the combined ability of these variables and other potential predictors to explain future EPS growth rates. We first replicate the results of Chan et al. (2003) by using their explanatory variables for our sample period. These variables are the earnings-to-price ratio one year prior to the base year (*E/P_Prior YR*), analyst consensus long-term earnings growth forecast (*IBES_LTG*), the sales growth rate over the past five years (*Past Sales Growth*), the sustainable growth rate assuming no external financing (*Sustainable Growth*), the R&D-to-sales ratio (*R&D/Sales*), a technology industry indicator (*Tech*), the book-to-market ratio (*B/M*), the past six-month stock return (*Past Return*), and the dividend yield (*Dividend/Price*). Next, we try to explain future *OP_EPS* growth using our new and improved explanatory variables. Specifically, we replace *E/P_Prior YR* with the current earnings-to-price ratio computed using *OP_EPS* (*E/P*). We further replace *IBES_LTG* with either *FY1/FY0* (Model 1), *FY2/FY0* (Model 2), or *FY3/FY0* (Model 3). Recall that while *FY3/FY0* represents a longer-term growth forecast, it is available for fewer observations. We also include the seven additional variables used by Chan et al. (2003) and add the retained earnings-to-market ratio (*RE/M*) suggested by Ball et al. (2020). Finally, Erhard and Sloan (2020) show that a combination of high investment intensity and high profitability drives a high EPS growth rate. Following Erhard and Sloan (2020), we include the quintile rank of the ratio of net PP&E to gross PP&E (*Rank NTG*) to measure investment intensity and we use earnings per share from operations divided by assets per share (*ROA*) to measure profitability.

Following Chan et al. (2003), we use the Fama and MacBeth (1973) approach to estimate annual cross-sectional regressions for each year in our sample and report the coefficient averages, t-statistics, and the average adjusted R-squareds.[19] The results of the Chan et al. (2003) replication using our more recent sample period are reported in Panel A of Table 9. These results are somewhat stronger than those reported by Chan et al. (2003). For example, using their variables and focusing on growth in *EPS* over the next five years, we obtain an average adjusted R-squared of 6.29% versus a comparable R-squared of around 3% in Chan et al. (2003). The first three columns in Panel A define earnings following Chan et al. (2003), which includes nonrecurring items. The next three columns use our measure of recurring earnings. The results show that this change alone improves the average adjusted R-squared from 6.29% to 9.03%.

The results using our improved set of forecasting variables are presented in Panel B of Table 9. From Panel B, we can see that the average adjusted R-squareds improve substantially. For example, when predicting future five-year growth rates in *OP_EPS*, the R-squareds are 25.13% using *FY1/FY0*, 26.27% using *FY2/FY0*, and 27.39% using *FY3/FY0*. Of particular note is that both the earnings-to-price ratio

[19] We use the Fama and MacBeth (1973) approach for comparability with Chan et al. (2003). More recently, the approach of estimating pooled regressions with firm and year fixed effects and clustered standard errors is recommended (Petersen 2009). In Online Appendix C, we replicate the results in Tables 6, 9, and 10 using this approach instead of the Fama and MacBeth (1973) approach. The results are broadly consistent across the two approaches.

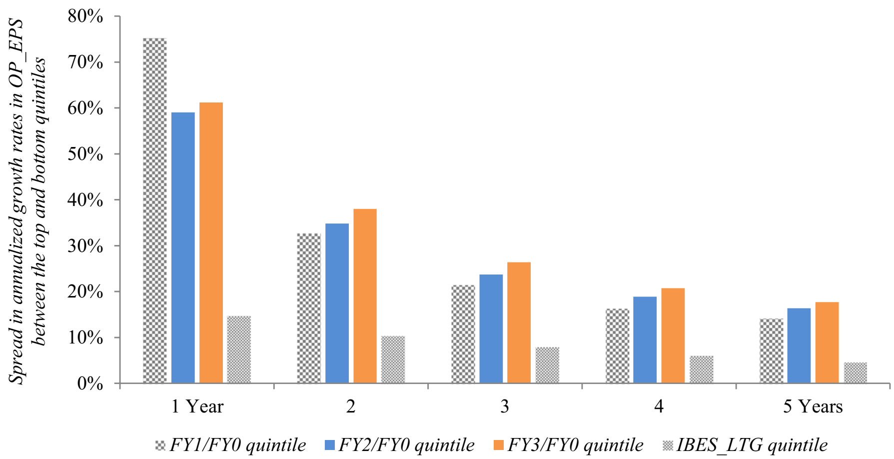


**Fig. 3** Spread in realized growth rates between the top and bottom quintiles by analyst growth forecasts. This figure presents the spread in median annualized realized EPS growth rates over the indicated number of years between the top and bottom quintile portfolios based on analyst consensus forecast of growth in earnings. Our sample includes all domestic firms with common stocks listed on New York, American, and NASDAQ exchanges. We select firms with data available at the end of each fiscal year from 1998 to 2020. We measure growth in earnings per share from operations (*OP_EPS*). We adjust the growth rates for stock splits and dividends. We also assume that cash dividends and other special distributions are reinvested in the stock each year. For firms with negative base year earnings, we leave the growth rates undefined. We form quintile portfolios each year based on analyst consensus long-term growth forecasts (*IBES_LTG*) and expected EPS growth rates imputed from analyst EPS forecasts made for the first, second, and third year following the most recently announced year (*FY1/FY0*, *FY2/FY0*, and *FY3/FY0*), respectively. We calculate the median value of annualized growth rates from the distribution of each year and then obtain the spread in the median values of annualized growth rates between the top and bottom quintile portfolios. We plot the simple average of the spread in annualized growth rates in earnings per share from operations (*OP_EPS*) over the indicated number of years across all years over our sample period. Appendix 1 provides detailed variable definitions

and the analyst forecast variables (*FY1/FY0, FY2/FY0*, and *FY3/FY0*) are highly significant in forecasting *OP_EPS* growth over the next three and five years. These results are in stark contrast to those of Chan et al. (2003), where the comparable variables have little predictive ability. The significant improvements stem primarily from the use of current year operating EPS in *E/P* and our improved measures of the forecast EPS growth rate (*FY1/FY0, FY2/FY0*, and *FY3/FY0*). Of the seven additional variables considered by Chan et al. (2003), only *B/M* has consistent incremental predictive ability, but it enters with a positive coefficient when forecasting both the three- and five-year *OP_EPS* growth, which is opposite to the negative coefficient predicted by the growth story. It is also noteworthy that *R&D/Sales*, which was positive and significant in Chan et al. (2003), is either insignificant or significantly negative in our tests. *RE/M* has the same positive sign as in Ball et al. (2020), but its magnitude and statistical significance wanes when predicting earnings growth rates beyond one year. Similarly, the interaction between *Rank NTG* and *ROA* enters with the same positive sign as in Erhard and Sloan (2020), but its incremental explanatory power is low. Our refined *E/P*, *FY1/FY0, FY2/FY0*, and *FY3/FY0* variables largely subsume these additional variables. Thus, in stark contrast to Chan et al. (2003), we document robust evidence of predictability in long-term EPS growth rates.

It is also important to establish whether our forecasting model is an improvement on the long-run EPS growth forecasting models provided by Gao and Wu (2014) and Kryzanowski and Mohsni (2014). Recall that their models continue to use *IBES_LTG* as an explanatory variable, while we employ more accurate forecasts based on *FY1/FY0, FY2/FY0*, and *FY3/FY0*. A simple comparison across the results reported in the papers is not meaningful because of the use of different samples and research designs. We therefore replicate their results (not reported) using their explanatory variables but with our sample and research design.[20] When we replicate the results of Gao and Wu (2014) for predicting the five-year growth rate in EPS, we obtain an average adjusted R-squared of only 10.05% versus 27.39% for our model using *FY3/FY0*. After replacing *IBES_LTG* with *FY3/FY0* in their model, the average adjusted R-squared increases from 10.05% to 20.29%. Similarly, when we replicate the results of Kryzanowski and Mohsni (2014), we obtain an average adjusted R-squared of 16.71% versus 27.39% for our model using *FY3/FY0*. After replacing *IBES_LTG* with *FY3/FY0* in their model, the average adjusted R-squared increases from 16.71% to 21.30%.[21] Thus, we conclude that our refined measures of analyst-forecasted EPS growth rate contribute significantly to the predictability of EPS growth.

### 4.4 Earnings yields, expected EPS growth rates, and stock returns

The results thus far indicate that EPS growth rates are both highly predictable and anticipated in stock prices. We finish by analyzing the implications of these findings for investment strategies based on valuation ratios. We can manipulate Eq. (3) to solve for the implied return ($r$) as a function of earnings-to-price ratio, dividend payout ($\delta$), and expected EPS growth rate ($g$):

$$r = \frac{e_1 \cdot \delta}{p_0} + g \tag{8}$$

Equation (8) indicates that the implied future stock return is a function of both the earnings-to-price ratio and the expected EPS growth rate. Specifically:

(i) Implied return is increasing in the earnings-to-price ratio, holding dividend payout and expected EPS growth rate constant; and
(ii) Implied return is increasing in the expected EPS growth rate, holding dividend payout and earnings-to-price ratio constant.

[20] For consistency, we use Compustat *OPEPS* for all variables that require measures of current, lagged, or future EPS realizations. Gao and Wu (2014) use earnings realizations from I/B/E/S, while Kryzanowski and Mohsni (2014) use Compustat income before extraordinary items divided by common shares outstanding.

[21] Over our full sample period, on average, *FY3* and *IBES_LTG* are available for 61% and 55% of firms each year, respectively. However, for the most recent ten years of our sample period (2010–2020), *FY3* forecasts are available for 75% of firms each year, while *IBES_LTG* are available for only 51% of firms each year.

Moreover, we know from our earlier analysis that earnings-to-price ratios are strongly negatively correlated with future EPS growth rates. For example, the (unreported) pooled Pearson (Spearman) correlation between *E/P* and *FY3/FY0* is -0.42 (-0.49). This means that the expected EPS growth rate is a correlated omitted variable when using earnings-to-price ratios to model implied returns. Ignoring the expected EPS growth rate will bias the coefficient on the earnings-to-price ratio toward zero.

We illustrate these relations empirically in Table 10. This table presents the results from Fama–MacBeth regressions of realized future annual stock returns on earnings-to-price ratios and expected EPS growth rates over the period from 1998 to 2020. We calculate the cumulative stock return over the twelve months starting from four months after the fiscal year-end. To proxy for earnings-to-price ratio, we include both *E/P* and *Lagged RE/M*, where the latter denotes lagged retained earnings-to-market ratio. The reason for including the latter is that Ball et al. (2020) argue that *RE/M* is a superior measure of earnings yield because it is less affected by transitory items. However, while Ball et al. (2020) use a measure of earnings that includes transitory items, we use a measure of earnings that excludes transitory items. Thus, there is less reason to expect *Lagged RE/M* to be a superior measure of earnings yield in our tests. To proxy for expected EPS growth rates, we use *FY1/FY0* in Panel A, *FY2/FY0* in Panel B, and *FY3/FY0* in Panel C. We present results using both equal-weighted (left-side columns) and value-weighted regressions (right-side columns). The results indicate that the coefficients on both *E/P* and all three of the expected future growth rates are uniformly positive and are larger in magnitude in the multiple regressions that include both explanatory variables. Thus, there is some evidence that earnings-to-price ratios predict future stock returns, and this evidence becomes stronger when we control for expected EPS growth rates. However, only the coefficients in the equal-weighted regressions in Panel C are statistically significant. In contrast, the coefficients on *Lagged RE/M* are mostly negative and close to zero. Thus, in contrast to the results of Ball et al. (2020), there is no evidence that *Lagged RE/M* provides a superior proxy for earnings yield in our tests.[22]

Overall, these results suggest that, over our later 1998–2020 sample period, there is only limited evidence of predictable variation in implied returns. These regressions confirm previous findings that traditional valuation ratios have had limited ability to predict stock returns in more recent years. Instead, variation in valuation ratios primarily reflects rationally anticipated variation in EPS growth rates. A natural explanation for these results is that variation in implied returns across our sample of stocks is relatively small. In the earlier 1964–1997 sample period, mispricing appeared to be more prevalent. But perhaps due to the widespread documentation of this mispricing, it has been largely arbitraged away in the more recent sample period (McLean and Pontiff 2016).

Figure 4 provides a visual representation of the value-weighted hedge returns between the top and bottom quintile portfolios formed on value (*E/P*) and growth (*FY3/FY0*) for each year in our sample period. It is evident from the figure that the returns

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[22] In unreported tests, we are able to replicate the results of Ball et al. (2020) using their research design and 1964–2017 sample period. However, we find no evidence that *Lagged RE/M* is a significant return predictor using our later 1998–2020 sample period. We also find that *Lagged RE/M* becomes insignificant in their earlier sample period if we drop their market capitalization restriction and log transformations of explanatory variables.

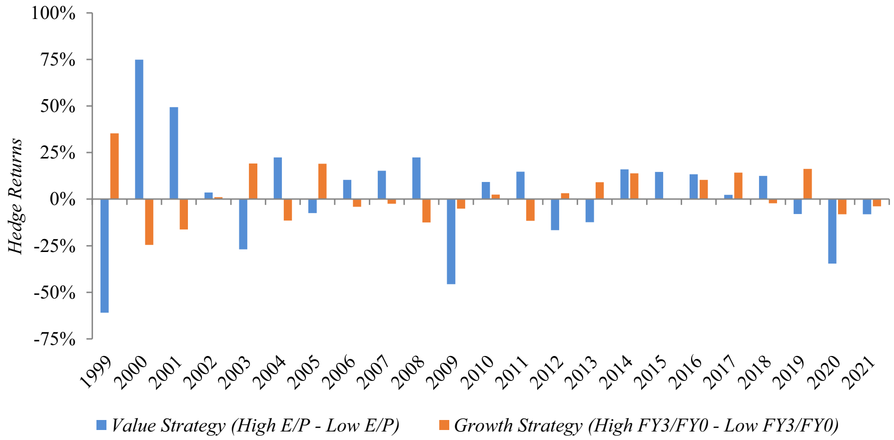


**Fig. 4** Hedge returns for value and growth strategies. This figure presents the value-weighted hedge portfolio returns of the value and growth strategies each year over the measurement period from 1999 to 2021. The value strategy is formed based on earnings-to-price ratio (*E/P*), and the growth strategy is formed based on expected EPS growth rates imputed from analyst EPS forecasts made for the third year following the most recently announced year (*FY3/FY0*). We calculate the cumulative return over the next twelve months starting from four months after the fiscal year-end of the base year with adjustment for delisting returns following Shumway (1997). The hedge return of the value strategy is the value-weighted return of the top quintile portfolio of *E/P* minus the value-weighted return of the bottom quintile portfolio of *E/P*. The hedge return of the growth strategy is the value-weighted return of the top quintile portfolio of *FY3/FY0* minus the value-weighted return of the bottom quintile portfolio of *FY3/FY0*. Our sample includes all domestic firms with common stocks listed on New York, American, and NASDAQ exchanges. We select firms with data available at the end of each fiscal year from 1998 to 2020. Appendix 1 provides detailed variable definitions

to these strategies tend to be negatively correlated. Value does particularly poorly and growth particularly well in 1999 and 2003, while growth does poorly and value does well in 2000 and 2001. Over the full period, value has a slightly higher Sharpe ratio than the market (0.364 versus 0.343, not reported). If we remove the first three calendar years of 1999, 2000, and 2001, then value has a Sharpe ratio of only 0.361 versus 0.467 for the market (not reported). Thus, since 2001, a tilt toward value has not provided sufficient return to offset the increased risk. In other words, a strategy of diversifying across both value and growth stocks has provided superior risk-adjusted returns.

## 5 Conclusion

We provide robust evidence of predictability in future EPS growth rates. There are three primary reasons why we report evidence of greater predictability in EPS growth rates than previous research. First, we use a refined measure of analyst-forecasted long-term EPS growth that we impute from analysts' multi-year annual EPS forecasts. These imputed growth rates are much more accurate than the explicit long-term growth rates provided by analysts. Moreover, the availability of these multi-year annual EPS forecasts has been increasing, while the availability of explicit long-term earnings growth forecasts has been decreasing. Second, we use a refined measure of EPS that is cleansed of nonrecurring items. Third, EPS growth rates have become more persistent and predictable in our more recent sample period, particularly for large firms.

Our findings have important implications for equity valuation and return prediction. The value of a stock is a function of both its current EPS and its anticipated future EPS growth rate. We show that EPS growth rates are highly predictable and, as such, are an important determinant of equity prices. Similarly, implied future stock returns are a function of both the current earnings-to-price ratios and expected EPS growth rates. Prior research has argued that EPS growth rates are largely unpredictable and concluded that current earnings-to-price ratios measure implied returns. In contrast, we show that EPS growth rates are highly predictable and that it is important to control for expected EPS growth rates when using earnings-to-price ratios to measure implied returns. Moreover, using our more recent sample period, we show that even after controlling for expected EPS growth rates, earnings-to-price ratio are only weakly positively related to future stock returns. We conclude that cross-sectional variation in implied returns has been much smaller in our sample period, because mispricing that existed in earlier periods has been largely arbitraged away (McLean and Pontiff 2016).

Our findings also have implications for researchers and practitioners using measures of earnings yields and expected EPS growth rates. With respect to earnings yields, prior research has used either bottom-line EPS (e.g., Chan et al. 2003) or retained earnings (Ball et al. 2020) in the numerator. We show that our measure of earnings yield computed using recurring EPS is superior to these variables at predicting expected earnings growth and future stock returns. Our findings also indicate that researchers and practitioners requiring analysts' forecasts of long-term EPS growth rates should use the growth rates implied by analysts' multi-year annual EPS forecasts. Prior research has warned against using the analyst-supplied long-term earnings growth forecasts, as they are highly inaccurate (e.g., La Porta 1996; Lacina et al. 2011). Moreover, we show that these forecasts are increasingly becoming unavailable. At the same time, analysts' multi-year annual EPS forecasts through three years into the future are now widely available and produce much more accurate forecasts of expected EPS growth. This mitigates the need to rely on the analyst-supplied long-term earnings growth forecasts or on growth forecasts estimated using historical financial data (e.g., Li and Mohanram 2014).

Finally, our findings highlight the risks of traditional value investing strategies that take positions in companies with high valuation ratios. Such strategies position investors in stocks with relatively low expected EPS growth rates and expose them to the unique risks associated with such stocks. For example, stocks with low expected EPS growth have more of their value represented by near term cash flows and so suffer greater losses in value in the face of short-term macroeconomic disruptions (Dechow et al. 2021). Investment strategies that combine both value and growth stocks diversify such risks.

## Appendix 1

Variable definitions

| Variable | Definition and measurement |
|---|---|
| Per-share measures | |
| *SALES_PS* | Sales per share measured as sales divided by the number of common shares $\left(\frac{SALE_t}{CSHPRI_t}\right)$ |
| *EBITDA_PS* | Operating income before depreciation divided by the number of common shares $\left(\frac{OIBDP_t}{CSHPRI_t}\right)$ |
| *EPS* | Income before extraordinary items available for common equity divided by the number of common shares $\left(\frac{IBCOM_t}{CSHPRI_t}\right)$ |
| *OP_EPS* | Earnings per share from operations ($OPEPS_t$) |
| *Dividend/Price* | Dividend yield measured as dividend per share to common shareholders divided by price per share as of the fiscal year-end $\left(\frac{DVC_t/CSHPRI_t}{PRCC\_F_t}\right)$. For firms with missing or negative *DVC*, we set the variable to zero |
| Annualized growth rates | |
| *SALES_PS* | Annualized percentage growth rate in sales per share over a certain horizon with adjustment for stock splits and dividends and with the reinvestment of cash dividends and other special distributions in the stock each year $\left(\frac{SALE_{t+k}/(CSHPRI_{t+k}\times AJEX_{t+k})}{SALE_t/(CSHPRI_t\times AJEX_t)}\times\prod_{n=1}^{k}\left(1+\frac{DVC_{t+n}/CSHPRI_{t+n}}{PRCC\_F_{t+n}}\right)\right)^{\frac{1}{k}}-1)$ |
| *EBITDA_PS* | Annualized percentage growth rate in operating income before depreciation per share over a certain horizon with adjustment for stock splits and dividends and with the reinvestment of cash dividends and other special distributions in the stock each year $\left(\frac{OIBDP_{t+k}/(CSHPRI_{t+k}\times AJEX_{t+k})}{OIBDP_t/(CSHPRI_t\times AJEX_t)}\times\prod_{n=1}^{k}\left(1+\frac{DVC_{t+n}/CSHPRI_{t+n}}{PRCC\_F_{t+n}}\right)\right)^{\frac{1}{k}}-1)$ |
| *EPS* | Annualized percentage growth rate in income before extraordinary items per share over a certain horizon with adjustment for stock splits and dividends and with the reinvestment of cash dividends and other special distributions in the stock each year $\left(\frac{IBCOM_{t+k}/(CSHPRI_{t+k}\times AJEX_{t+k})}{IBCOM_t/(CSHPRI_t\times AJEX_t)}\times\prod_{n=1}^{k}\left(1+\frac{DVC_{t+n}/CSHPRI_{t+n}}{PRCC\_F_{t+n}}\right)\right)^{\frac{1}{k}}-1)$ |
| *OP_EPS* | Annualized percentage growth rate in earnings per share from operations over a certain horizon with the adjustment for stock splits and dividends and with the reinvestment of cash dividends and other special distributions in the stock each year $\left(\frac{OPEPS_{t+k}/AJEX_{t+k}}{OPEPS_t/AJEX_t}\times\prod_{n=1}^{k}\left(1+\frac{DVC_{t+n}/CSHPRI_{t+n}}{PRCC\_F_{t+n}}\right)\right)^{\frac{1}{k}}-1)$ |
| Firm-level *OPE* | Annualized percentage growth rate in firm-level operating earnings over a certain horizon $\left(\frac{OPEPS_{t+k}\times CSHPRI_{t+k}}{OPEPS_t\times CSHPRI_t}\right)^{\frac{1}{k}}-1)$ |
| Firm-level *Sales* | Annualized percentage growth rate in firm-level sales over a certain horizon $\left(\frac{SALE_{t+k}}{SALE_t}\right)^{\frac{1}{k}}-1)$ |
| Year-over-year growth rates (Persistence tests) | |
| *SALES_PS* | Percentage growth rate in sales per share for a certain year with adjustment for stock splits and dividends and with the reinvestment of cash dividends and other special distributions in the stock $\left(\frac{SALE_{t+1}/(CSHPRI_{t+1}\times AJEX_{t+1})}{SALE_t/(CSHPRI_t\times AJEX_t)}\times\left(1+\frac{DVC_{t+1}/CSHPRI_{t+1}}{PRCC\_F_{t+1}}\right)-1\right)$ |

| Variable | Definition and measurement |
|---|---|
| *EBITDA_PS* | Percentage growth rate in operating income before depreciation per share for a certain year with adjustment for stock splits and dividends and with the reinvestment of cash dividends and other special distributions in the stock $\left(\frac{OIBDP_{t+1}/(CSHPRI_{t+1}\times AJEX_{t+1})}{OIBDP_t/(CSHPRI_t\times AJEX_t)}\times\left(1+\frac{DVC_{t+1}/CSHPRI_{t+1}}{PRCC\_F_{t+1}}\right)-1\right)$ |
| *EPS* | Percentage growth rate in income before extraordinary items per share for a certain year with adjustment for stock splits and dividends and with the reinvestment of cash dividends and other special distributions in the stock $\left(\frac{IBCOM_{t+1}/(CSHPRI_{t+1}\times AJEX_{t+1})}{IBCOM_t/(CSHPRI_t\times AJEX_t)}\times\left(1+\frac{DVC_{t+1}/CSHPRI_{t+1}}{PRCC\_F_{t+1}}\right)-1\right)$ |
| *OP_EPS* | Percentage growth rate in earnings per share from operations for a certain year with adjustment for stock splits and dividends and with the reinvestment of cash dividends and other special distributions in the stock $\left(\frac{OPEPS_{t+1}/AJEX_{t+1}}{OPEPS_t/AJEX_t}\times\left(1+\frac{DVC_{t+1}/CSHPRI_{t+1}}{PRCC\_F_{t+1}}\right)-1\right)$ |
| Valuation ratios and related characteristics | |
| *5YR OP_EPS Growth* | Annualized percentage growth rate in earnings per share from operations over the next five years with the adjustment for stock splits and dividends and with the reinvestment of cash dividends and other special distributions in the stock each year $\left(\frac{OPEPS_{t+5}/AJEX_{t+5}}{OPEPS_t/AJEX_t}\times\prod_{n=1}^{5}\left(1+\frac{DVC_{t+n}/CSHPRI_{t+n}}{PRCC\_F_{t+n}}\right)\right)^{\frac{1}{5}}-1\right)$ |
| *Size Decile Rank* | The decile rank of market value of equity as of the fiscal year-end based on the NYSE market capitalization breakpoints for each year |
| *E/P* | Earnings-to-price ratio measured as earnings per share from operations divided by price per share as of the fiscal year-end $\left(\frac{OPEPS_t}{PRCC\_F_t}\right)$ |
| *B/M* | Book-to-market ratio measured as book value of equity divided by market value of equity as of the fiscal year-end $\left(\frac{CEQ_t}{CSHO_t\times PRCC\_F_t}\right)$ |
| *S/P* | Sales-to-price ratio measured as sales per share divided by price per share as of the fiscal year-end $\left(\frac{SALE_t/CSHPRI_t}{PRCC\_F_t}\right)$ |
| *ROE* | Return on equity measured as earnings per share from operations divided by book value of equity per share $\left(\frac{OPEPS_t}{CEQ_t/CSHPRI_t}\right)$ |
| *NM* | Net margin measured as earnings per share from operations divided by sales per share $\left(\frac{OPEPS_t}{SALE_t/CSHPRI_t}\right)$ |
| Analyst forecast variables | |
| *FY0* | Actual earnings per share from I/B/E/S in fiscal year *t* |
| *FYk* | Analyst consensus EPS forecast made for the $k^{th}$ year following the most recently announced year (i.e., fiscal year *t*), where *k* equals 1, 2, 3, 4, or 5 |
| *FY1/FY0* | Expected EPS growth rate measured as the analyst consensus EPS forecast made for the first year following the most recently announced year divided by actual earnings per share from I/B/E/S in fiscal year *t* $\left(\frac{FY1_t}{FY0_t}-1\right)$. We use the first median value of analyst forecasts made after the earnings announcement of fiscal year *t* |
| *FY2/FY0* | Expected EPS growth rate measured as the analyst consensus EPS forecast made for the second year following the most recently announced year divided by actual earnings per share from I/B/E/S in fiscal year *t* $\left(\frac{FY2_t}{FY0_t}-1\right)$. We use the first median value of analyst forecasts made after the earnings announcement of fiscal year *t* |

| Variable | Definition and measurement |
|---|---|
| *FY3/FY0* | Expected EPS growth rate measured as the analyst consensus EPS forecast made for the third year following the most recently announced year divided by actual earnings per share from I/B/E/S in fiscal year $t$ ($\frac{FY3_t}{FY0_t} - 1$). We use the first median value of analyst forecasts made after the earnings announcement of fiscal year $t$ |
| *Annualized FY2/FY0* | Annualized expected EPS growth rate imputed from analyst consensus EPS forecast made for the second year following the most recently announced year ($(\frac{FY2_t}{FY0_t})^{\frac{1}{2}} - 1$) |
| *Annualized FY3/FY0* | Annualized expected EPS growth rate imputed from analyst consensus EPS forecast made for the third year following the most recently announced year ($(\frac{FY3_t}{FY0_t})^{\frac{1}{3}} - 1$) |
| *IBES_LTG* | Analyst consensus long-term growth forecast for operating earnings. We use the first median value of analyst forecasts made after the earnings announcement of fiscal year $t$ ($\frac{LTG_t}{100}$) |
| *FY2/Price* | Analyst consensus EPS forecast made for the second year following the most recently announced year divided by price per share as of the current fiscal year-end ($\frac{FY2_t}{PRCC\_F_t}$). We use the first median value of analyst forecasts made after the earnings announcement of fiscal year $t$ |
| Other variables | |
| *E/P_Prior YR* | Earnings-to-price ratio as of one year prior to the base year ($\frac{OPEPS_{t-1}}{PRCC\_F_t}$) |
| *Past Sales Growth* | Sales growth over the past five years ($\frac{SALE_t}{SALE_{t-5}} - 1$) |
| *Sustainable Growth* | Sustainable growth rate measured as return on equity multiplied by one minus the ratio of dividend to earnings from operations. For firms with negative sustainable growth rates, we set the variable to zero ($\frac{OPEPS_t}{CEQ_t/CSHPRI_t} \times (1 - \frac{DVC_t}{OPEPS_t \times CSHPRI_t})$) |
| *R&D/Sales* | R&D expenditures divided by sales ($\frac{XRD_t}{SALE_t}$). For firms with missing or negative *XRD*, we set the variable to zero |
| *Tech* | Indicator variable for technology firms that equals one if the SIC code starts with 283, 357, 366, 38, 48, or 737 and zero otherwise |
| *RE/M* | Retained earnings-to-market ratio measured as retained earnings minus accumulated other comprehensive income divided by market value of equity as of the fiscal year end ($\frac{RE_t - ACOMINC_t}{CSHO_t \times PRCC\_F_t}$) |
| *Past Return* | Cumulative market-adjusted return over the six months before the fiscal year end |
| *Rank NTG* | The quintile rank of net-to-gross PP&E ratio (*NTG*) for each year. Net-to-gross PP&E ratio is measured as net property, plant, and equipment divided by gross property, plant, and equipment ($\frac{PPENT_t}{PPEGT_t}$). For firms with missing, zero, or negative *PPENT* and *PPEGT*, we set *NTG* to 0.5 |
| *ROA* | Return on assets measured as earnings per share from operations divided by assets per share ($\frac{OPEPS_t}{AT_t/CSHPRI_t}$) |
| *Return* | Cumulative market-adjusted return over the next twelve months starting from four months after the fiscal year-end with adjustment for delisting returns following Shumway (1997) |
| *Size-Adjusted Return* | Cumulative size-adjusted return over the next twelve months starting from four months after the fiscal year-end with adjustment for delisting returns following Shumway (1997). We form size portfolios using the NYSE breakpoints based on market value of equity of the current year |

| Variable | Definition and measurement |
|---|---|
| *Earnings Surprise* | Earnings surprise in fiscal year $t+1$ measured as $OP\_EPS_{t+1}$ minus analyst consensus EPS forecast made for the first year following the most recently announced year (*FY1*) divided by price per share as of the fiscal year-end of the base year |

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