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Profitability, investment and average returns ☆

Eugene F. Fama[a], Kenneth R. French[b,*]

[a]Graduate School of Business, University of Chicago, Chicago, IL, 60637, USA
[b]Amos Tuck School of Business, Dartmouth College, Hanover, NH, 03755, USA

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Abstract

Valuation theory says that expected stock returns are related to three variables: the book-to-market equity ratio (B_t/M_t), expected profitability, and expected investment. Given B_t/M_t and expected profitability, higher expected rates of investment imply lower expected returns. But controlling for the other two variables, more profitable firms have higher expected returns, as do firms with higher B_t/M_t. These predictions are confirmed in our tests.

JEL classification: G12

Keywords: Average returns; Profitability; Investment; Book-to-market equity

1. Introduction

In the dividend discount model, the market value of a share of a firm's stock is the present value of expected dividends,

$$M_t = \sum_{\tau=1}^{\infty} \mathrm{E}(D_{t+\tau})/(1+r)^{\tau}, \tag{1}$$

where M_t is the price at time t, $\mathrm{E}(D_{t+\tau})$ is the expected dividend in period $t+\tau$, and r is (approximately) the long-term average expected stock return or, more precisely, the

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*Corresponding author.
E-mail address: kfrench@dartmouth.edu (K.R. French).

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internal rate of return on expected dividends. With clean surplus accounting, the time t dividend, D_t, is equity earnings per share, Y_t, minus the change in book equity per share, $dB_t = B_t - B_{t-1}$. The dividend discount model then becomes

$$M_t = \sum_{\tau=1}^{\infty} \mathrm{E}(Y_{t+\tau} - dB_{t+\tau})/(1+r)^{\tau} \tag{2}$$

or, dividing by time t book equity,

$$\frac{M_t}{B_t} = \frac{\sum_{\tau=1}^{\infty} \mathrm{E}(Y_{t+\tau} - dB_{t+\tau})/(1+r)^{\tau}}{B_t}. \tag{3}$$

Eq. (3) makes three predictions about expected stock returns. (1) Controlling for expected earnings and expected changes in book equity (both measured relative to current book equity), a higher book-to-market equity ratio, B_t/M_t, implies a higher expected stock return, r. This is the motivation for using the book-to-market ratio as a proxy for expected returns. (2) Controlling for B_t/M_t and expected growth in book equity due to reinvestment of earnings, more profitable firms—specifically, firms with higher expected earnings relative to current book equity—have higher expected returns. (3) Given B_t/M_t and expected earnings relative to book equity, firms with higher expected growth in book equity due to reinvestment of earnings have lower expected stock returns.

We test for the book-to-market, profitability, and investment effects in expected returns predicted by the valuation equation (3). This is not virgin territory. Though our methods are different, our work can be viewed as providing a unifying perspective on many papers that link average stock returns to book-to-market equity and proxies for expected profitability and investment.

For example, there is much evidence that firms with higher book-to-market ratios have higher average stock returns (Rosenberg, Reid, and Lanstein, 1985; Chan, Hamao, and Lakonishok, 1991; Fama and French, 1992; Capaul, Rowley, and Sharpe, 1993; Lakonishok, Shleifer, and Vishny, 1994). Haugen and Baker (1996) and Cohen, Gompers, and Vuolteenaho (2002) find that, controlling for book-to-market equity, average returns are positively related to profitability. Fairfield, Whisenant, and Yohn (2003), Richardson and Sloan (2003), and Titman, Wei, and Xie (2004) show a negative relation between average returns and investment. An extensive literature initiated by Sloan (1996) shows that accruals are negatively related to future profitability and that higher accruals predict lower stock returns. (See Xie, 2001; Fairfield, Whisenant, and Yohn, 2003; Richardson, Sloan, Soliman, and Tuna, 2004, 2005; Chan, Chan, Jegadeesh, and Lakonishok, 2006.) Working within the confines of a valuation equation like Eq. (2), Abarbanell and Bushee (1998), Frankel and Lee (1998), Dechow, Hutton, and Sloan (2000), and Lee, Ng, and Swaminathan (2004) combine analyst forecasts of earnings with assumptions about future investment to estimate expected stock returns. The general result is that higher expected net cash flows (expected profitability minus expected investment) relative to current market value forecast higher stock returns. Finally, Piotroski (2000) and Griffin and Lemmon (2002) show that composite measures of firm strength, which are proxies for expected net cash flows, are positively related to future stock returns. All these results are in line with Eq. (3).

In this earlier work, evidence that the book-to-market ratio, expected profitability, and expected investment are related to future stock returns is typically attributed to mispricing. As usual, irrational pricing is not the only possibility. With rational pricing, the book-to-market, profitability, and investment effects in expected returns implied by the valuation equations are due to differences in risk: Controlling for other variables, more profitable firms and firms with higher book-to-market ratios are more risky, and faster-growing firms are less risky. We take no stance on whether the patterns in average returns observed here are rational or irrational. Indeed, one of our themes is that tests based (explicitly or implicitly) on the valuation equations are generally powerless to determine whether observed relations between average returns and B_t/M_t, profitability, and investment are due to rational or irrational pricing.

What do we add on the empirical side? Most existing papers look for book-to-market, profitability, or investment effects in average returns and treat them as isolated anomalies. Our setup says that all this evidence is consistent with the predictions of valuation theory. Working within the confines of valuation theory makes it clear, however, that cleanly identifying book-to-market, profitability, or investment effects in expected returns requires controls for the other two variables, which are often missing in earlier tests. Our goal is to provide an overall perspective on how the three combine to explain the cross section of average stock returns.

The paper proceeds as follows. Section 2 discusses what tests based on the valuation equation (3) can and cannot reveal about expected returns and the rationality of asset prices. Section 3 uses cross-section regressions to develop proxies for expected profitability and investment. We find that lagged values of many variables, including size, accounting fundamentals, stock returns, analyst earnings forecasts, and two measures of firm strength forecast profitability and investment. Section 4 uses cross-section return regressions to examine whether the book-to-market ratio and various proxies for expected profitability and investment (including the fitted values from the regressions of Section 3) help explain average returns in the manner predicted by Eq. (3). These cross-section return regressions identify book-to-market, profitability, and investment effects in average stock returns, but they do not give a clean picture of their economic importance. Section 5 presents portfolio tests that address this issue. The concluding Section 6 summarizes our evidence and inferences.

2. Tests of valuation equations: strengths and weaknesses

Campbell and Shiller (1988) emphasize that the valuation equation (1) is a tautology that defines the internal rate of return, r. Given the stock price and estimates of expected dividends, there is a discount rate r that solves Eq. (1). With clean surplus accounting, Eq. (2) is equivalent to Eq. (1), so Eq. (2) is a tautology. Eq. (3) is obtained by dividing Eq. (2) by book equity, so Eq. (3) is also a tautology.

Tautology, however, does not mean Eq. (3) lacks content. In fact, the tautology conclusion confers some robustness on tests that infer the discount rate, r, from Eq. (3). For example, as long as firms are expected to follow clean surplus accounting in the future, the past accounting rules that generate book equity, B_t, do not affect inferences about r. Suppose two all-equity firms have identical current market values and identical expected future earnings and investments. With clean surplus accounting, we can use Eq. (2) to infer that the firms must have the same expected return, r. And because we derive Eq. (3) from

Eq. (2) simply by dividing both sides by current book equity, Eq. (3) also implies they have the same r – even if the two firms' assets are carried at different book values. The fact that they have different B_t cancels out in Eq. (3), leaving the discount rate r unaffected. The important implication is that if firms are expected to use clean surplus accounting, then our cross-section tests to estimate how expected returns vary with B_t/M_t, expected profitability, and expected investment are valid, as long the tests control for all three variables. And this serves to emphasize the importance of joint controls for the three variables, which are typically missing in earlier work.

Deviations from clean surplus accounting are a potential problem. But there are reasons to expect that actual deviations are not fatal. First, the transition from Eq. (1) to Eq. (2) requires clean surplus only in expectation. Firms can deviate from clean surplus as long as the expected value of future deviations is zero. Second, the intuition behind Eq. (2) is that if two firms have the same stock price and the same expected growth in book equity, but one has higher expected earnings, it must have a higher expected stock return (cost of equity capital). Likewise, if two firms have the same stock price and expected earnings but one requires more expected equity investment to generate the earnings, it must have a lower expected stock return. We judge that accounting problems must be severe to obscure all traces of these predictions. There is evidence that this is not the case. Thus, despite the vagaries of accounting, the existing literature identifies differences in average stock returns associated with B_t/M_t, expected profitability, and expected investment, even without simultaneous controls for all three.

Now comes perhaps the most important point. Even with clean surplus accounting, tests of Eq. (3) face a timeworn problem: We cannot tell whether the book-to-market, profitability, and investment effects in average stock returns are due to rational or irrational pricing. To see the point, note first that Eqs. (1) to (3) hold (they are tautologies) whether the expected values of profitability and investment in the equations are rational or irrational. The implied discount rate, r, does vary with the expectations that are used. When the expected values are rational, r is the discount rate (roughly the true expected stock return) implied by rational beliefs. When the expected values are irrational, r is the expected return implied by these irrational beliefs (and it is not the true expected return).

Next consider what we measure. Our estimates of expected profitability and investment (for example, from regressions of future profitability and investment on lagged predictors) are estimates of rational (actual or true) conditional expected values. And our return tests provide estimates of how rationally assessed (actual or true) expected returns (proxied by observed average returns) vary with the book-to-market ratio and rational assessments of expected profitability and investment. If the estimates of expected profitability and investment implicit in the pricing of stocks are also rational, then, up to sampling error, the variation in expected returns we measure corresponds to that predicted by investors.

Suppose, however, that stock prices are based on irrational profitability and investment forecasts, so the book-to-market ratio B_t/M_t contains an irrational price. Eq. (3) still implies that, as long as we use rational assessments of expected profitability and growth, our tests provide estimates of how true expected returns vary with rational assessments of expected profitability and investment and a book-to-market ratio that contains an irrational price. In other words, the true expected returns we measure vary in the same way with rational assessments of expected profitability and growth whether or not the price in B_t/M_t is based on these rational assessments. Irrational beliefs about expected profitability and investment do affect our estimates of true expected returns through their effects on the price M_t in B_t/M_t. And here we face the usual conundrum: Definitive statements about how variation across firms in B_t/M_t in Eq. (3) splits between differences in rational risks and irrational beliefs are (in our view) impossible. In short, despite common claims to the contrary in the literature, tests of Eq. (3) cannot in themselves tell us whether the investor forecasts of profitability and investment that determine M_t are rational or irrational. We revisit this issue throughout the paper.

3. Expected profitability and investment

The first step in our tests of the valuation equation (3) is to develop proxies for expected profitability and investment. The more complicated proxies are fitted values from cross-section regressions to predict profitability, $Y_{t+\tau}/B_t$, and the growth of assets, $dA_{t+\tau}/A_t = (A_{t+\tau} - A_t)/A_t$, one, two, and three years ahead ($\tau = 1, 2, 3$). The explanatory variables, measured at the end of fiscal year t, are accounting fundamentals, the firm's stock return for fiscal year t and its combined return for years t-1 and t-2, analyst earnings forecasts for t+1, and the composite measures of firm strength of Piotroski (2000) and Ohlson (1980). We use the expected profitability and asset growth estimates given by the fitted values from these first-stage regressions as explanatory variables in second-stage cross-section return regressions that test for profitability and investment effects in average returns (Section 4).

The accounting fundamentals used as explanatory variables in the proxies for expected profitability and investment include lagged values of B_t/M_t, a dummy variable for negative earnings, profitability (Y_t/B_t) for firms with positive earnings, accruals relative to book equity for firms with positive ($+AC_t/B_t$) and negative ($-AC_t/B_t$) accruals, investment (dA_t/A_{t-1}), a dummy variable for firms that do not pay dividends (*No* D_t), and the ratio of dividends to book equity (D_t/B_t). The book-to-market ratio is known to be negatively related to profitability and investment (firms with lower B_t/M_t tend to be more profitable and to invest more), and profitability and investment are known to be persistent (Penman, 1991; Lakonishok, Shleifer, and Vishny, 1994; Fama and French, 1995). It also seems reasonable that current profitability is related to future investment and that current investment is related to future profitability. There is evidence that accruals forecast profitability (Sloan, 1996; Fairfield, Whisenant, and Yohn, 2002, 2003; Richardson, Sloan, Soliman, and Tuna, 2004, 2005). Previous work also shows that dividend-paying firms tend to be more profitable but to grow more slowly (Fama and French, 2001). We include firm size (the log of total market cap, ln MC_t) among the fundamental variables because smaller firms tend to be less profitable (Fama and French, 1995). The precise definitions of the variables are in the Appendix.

Consistent with the logic of the valuation equations, all accounting variables are on a per share basis. Throughout the paper, the dating convention is that year t includes the accounting data for fiscal yearends in calendar year t. For consistency, the lagged returns and market cap used in the profitability and growth regressions are also measured at the end of a firm's fiscal year. Finally, the valuation equation (3) calls for equity investment, $dB_{t+\tau}/B_t$, but we measure investment as asset growth, $dA_{t+\tau}/A_t$, which we judge gives a better picture of investment. And we call $Y_{t+\tau}/B_t$ profitability, but for $\tau > 1$, it clearly is a mix of current profitability and future earnings growth.

The explanatory variables used in the first-stage regressions to develop proxies for expected profitability and asset growth also include I_t/B_t, the *I/B/E/S* consensus forecast of earnings per share one year ahead (as available at the end of a firm's fiscal year) divided by book equity per share at t; PT_t, the composite measure of firm strength used by Piotroski (2000) to predict stock returns; and OH_t, the probability of debt default developed by Ohlson (1980) and used by Griffin and Lemmon (2002) to forecast stock returns. Piotroski (2000) assigns firms binary scores, 0 (bad) and 1 (good) each year on nine accounting fundamentals (including measures of profitability and past earnings growth). PT_t is the sum of a firm's scores on the nine variables at the end of fiscal year t, with higher values indicating stronger past performance. OH_t is the fitted value from Ohlson's (1980) cross-section logit regression (Model 1) that uses accounting fundamentals for year t to assess the probability of default on debt, with higher values implying weaker firms. From the construction of PT_t and OH_t (see Appendix), it is clear that the two variables are proxies for expected net cash flows (the spread of expected earnings over investment) in Eq. (3). Finally, $I/B/E/S$ earnings forecasts begin in 1976, and PT_t requires data from cash flow statements, which are not available on Compustat until 1971. The period for most of our tests is 1963–2003, but tests that use $I/B/E/S$ forecasts or PT_t are limited to periods of data availability.

Tables 1 and 2 show average slopes and their t-statistics for year-by-year cross-section profitability and asset growth regressions, estimated in the manner of Fama and MacBeth (1973). The tables show results only for the full sample period for each regression, but we can report that average slopes for the first and second halves of the sample period support inferences about the marginal explanatory power of different variables much like those from the full-period tests.

We drop firms from the tests for several reasons. First, we exclude financial firms (Standard Industrial Classification codes between 6000 and 6999). In addition, to be included in the sample for calendar year t (predicting profitability and asset growth for t+1, t+2, and t+3 in Tables 1 and 2, and predicting returns for July of t+1 to June of t+2 in Tables 3 and 4), a firm must have Compustat data for year t on book equity, earnings before extraordinary items, dividends, shares outstanding, and accruals, as well as data for assets for t and t-1. A firm must also have market cap (price times shares outstanding) available in the Center for Research in Security Prices (CRSP) database for its (last) fiscal yearend in t, December of t, and June of t+1. We exclude firms with negative book equity in year t. Firms are also deleted from specific regressions if they do not have other data, such as PT_t, OH_t, and I_t/B_t, required for that regression. To avoid influential observation problems, we delete a firm from the profitability and growth regressions if an explanatory variable in the regression is outside the 0.5 or 99.5 percentile for that variable in year t. (We consider only the upper or lower bound for one-sided variables, such as $+AC_t/B_t$, $-AC_t/B_t$, and D_t/B_t.) To avoid undue influence of small firms, those with total assets less than \$25 million or book equity less than \$12.5 million in year t are also excluded. (Using \$5 million and \$2.5 million as the cutoffs produces similar results.)

When the forecast horizon is more than a year ahead, there is overlap in the dependent variables in the year-by-year profitability and growth regressions. This can produce autocorrelation of the slopes that affects the standard errors of the average slopes. Inspection of the autocorrelations (not shown) in the asset growth regressions suggests no evidence of a problem for any forecast horizon. The autocorrelations of the slopes in the multiyear profitability regressions are more often positive, but they are not systematically large. Given the large standard errors of the autocorrelations, we are reluctant to impose corrections that may not be warranted. Moreover, there is no overlap in the year-by-year regressions that forecast profitability and growth one year ahead, and the one-year and multiyear regression results are always generically similar.

Table 1

Regressions to predict profitability and asset growth

The table shows average slopes and their Fama-MacBeth t-statistics from annual cross-section regressions to predict profitability, $Y_{t+\tau}/B_t$, and asset growth, $dA_{t+\tau}/A_t = (A_{t+\tau}-A_t)/A_t$, one, two, and three years ahead ($\tau = 1,2,3$). Y_t, D_t, and AC_t are earnings, dividends, and accruals per share for the fiscal year ending in calendar year t. $-AC_t$ is accruals for firms with negative accruals (zero otherwise) and $+AC_t$ is accruals for firms with positive accruals. B_t, A_t, and M_t are book equity, total assets, and stock price per share at the end of fiscal year t. MC_t is market capitalization (price times shares outstanding) at the end of fiscal year t. I_t is the I/B/E/S consensus forecast of earnings for the coming year, sampled at the end of fiscal year t. $1Yr_t$ is the stock return for the year up to the end of fiscal year t, and $2–3Yr_t$ is the two-year return for the years up to the end of fiscal year $t-1$. OH_t is the probability of default on debt, estimated at the end of fiscal year t, from the logit regression model of Ohlson (1980). PT_t is the Piotroski (2000) composite index of firm strength. $Neg\ Y_t$ is a dummy variable that is one for firms that have negative earnings for fiscal year t (zero otherwise), and $No\ D_t$ is a dummy variable that is one for firms that pay no dividends during fiscal year t. The regressions are univariate (dA_t/A_t and I_t/B_t) or they use natural subsets of explanatory variables ($\ln B_t/M_t$ and $\ln M_t$, or $Neg\ Y_t$, Y_t/B_t, $-AC_t/B_t$, and $+AC_t/B_t$, or $No\ D_t$ and D_t/B_t, or $1Yr_t$ and $2–3Yr_t$, or OH_t and PT_t). The time period for the dependent variable in the regressions that forecast profitability and growth one year ahead is 1963–2004, except for the regressions that use I_t/B_t, where the period is 1977–2003, and the regressions that use PT_t, where the time period is 1972–2004. Overhead lines indicate the explanatory variables used in a regression.

τ	$\overline{\ln B_t/M_t}$	$\overline{\ln MC_t}$	$\overline{Neg\ Y_t}$	$\overline{Y_t/B_t}$	$\overline{-AC_t/B_t}$	$\overline{+AC_t/B_t}$	$\overline{No\ D_t}$	$\overline{D_t/B_t}$	$\overline{dA_t/A_t}$	$\overline{1\ Yr_t}$	$\overline{2-3Yr_t}$	$\overline{OH_t}$	$\overline{PT_t}$	$\overline{I_t/B_t}$
Regressions to predict asset growth, $dA_{t+\tau}/A_t$														
Average slopes														
1	−0.11	−0.70	−0.06	0.58	0.00	0.01	0.02	−0.25	0.16	0.10	0.05	−2.61	1.23	0.62
2	−0.22	−1.71	−0.06	1.23	−0.11	0.01	0.05	−0.48	0.30	0.20	0.09	−4.67	2.24	1.23
3	−0.32	−2.87	−0.03	1.93	−0.08	−0.02	0.08	−0.78	0.43	0.28	0.12	−6.78	3.03	1.88
t-statistics														
1	−16.79	−4.27	−8.52	18.97	0.05	0.62	2.50	−4.56	12.42	17.72	14.91	−17.79	8.42	9.12
2	−18.91	−6.19	−3.74	20.07	−1.40	0.18	4.16	−4.23	10.63	17.65	12.95	−18.77	9.74	9.94
3	−17.97	−6.69	−1.21	19.27	−0.97	−0.48	5.55	−4.06	10.02	14.76	13.63	−20.02	7.61	10.59
Regressions to predict profitability, $Y_{t+\tau}/B_t$														
Average slopes														
1	−0.08	1.05	−0.08	1.01	−0.02	−0.08	−0.02	1.06	0.10	0.10	0.04	−2.37	2.47	0.97
2	−0.07	0.84	−0.03	0.98	−0.01	−0.09	−0.00	1.14	0.08	0.08	0.03	−1.71	1.89	0.89
3	−0.07	0.77	−0.01	1.01	−0.05	−0.07	0.00	1.17	0.07	0.06	0.02	−1.51	1.53	0.91
t-statistics														
1	−12.19	4.72	−6.23	58.31	−1.10	−8.44	−2.30	27.19	6.68	11.89	11.22	−18.26	13.05	34.56
2	−8.03	3.56	−1.97	40.67	−0.49	−6.76	−0.50	24.24	5.02	9.62	9.33	−17.15	12.10	27.54
3	−6.52	2.78	−0.58	33.06	−3.25	−4.33	0.35	21.31	3.99	8.63	4.94	−10.22	11.08	20.42

Table 2

Multiple regressions to predict profitability and asset growth

The table shows average slopes and their Fama-MacBeth t-statistics from annual cross-section regressions to predict profitability, $Y_{t+\tau}/B_t$, and asset growth, $dA_{t+\tau}/A_t = (A_{t+\tau}-A_t)/A_t$, one, two, and three years ahead (τ = 1,2,3). Y_t, D_t, and AC_t are earnings, dividends, and accruals per share for the fiscal year ending in calendar year t. $-AC_t$ is accruals for firms with negative accruals (zero otherwise) and $+AC_t$ is accruals for firms with positive accruals. B_t, A_t, and M_t are book equity, total assets, and stock price per share at the end of fiscal year t. MC_t is market capitalization (price times shares outstanding) at the end of fiscal year t. I_t is the $I/B/E/S$ consensus forecast of earnings for the coming year, sampled at the end of fiscal year t. $1Yr_t$ is the stock return for the year up to the end of fiscal year t, and and $2\text{–}3Yr_t$ is the two-year return for the years up to the end of fiscal year $t-1$. OH_t is the probability of default on debt, estimated at the end of fiscal year t, from the probit regression model of Ohlson (1980). PT_t is the Piotroski (2000) composite index of firm strength. *Neg* Y_t is a dummy variable that is one for firms that have negative earnings for fiscal year t (zero otherwise), and *No* D_t is a dummy variable that is one for firms that pay no dividends during fiscal year t. Firms is the average number of firms in the regressions. The time period for the dependent variable in the regressions that forecast profitability and asset growth one year ahead is 1963–2004, except for the regressions that use I_t/B_t, where the period is 1977–2003, and the regressions that use PT_t, where the time period is 1972-2004. *Int* is the regression intercept and the regression R^2 is adjusted for degrees of freedom.

τ	Firms	*Int*	ln B_t/M_t	ln MC_t	*Neg* Y_t	Y_t/B_t	$-AC_t/B_t$	$+AC_t/B_t$	dA_t/A_t	*No* D_t	D_t/B_t	$1Yr_t$	$2\text{–}3Yr_t$	OH_t	PT_t	I_t/B_t	R^2
Regressions to predict asset growth, $dA_{t+\tau}/A_t$																	
Average slopes																	
1	1,953	1.13	−0.10	−0.53	−0.09	0.19	0.03	−0.09	0.05	−0.01	−1.13						0.12
2	1,810	1.25	−0.19	−1.23	−0.14	0.46	−0.04	−0.21	0.10	−0.02	−2.16						0.15
3	1,675	1.40	−0.28	−2.03	−0.15	0.79	0.04	−0.36	0.11	−0.03	−3.26						0.16
t-statistics																	
1		131.46	−12.93	−3.25	−13.55	4.51	1.02	−5.73	6.82	−2.56	−14.26						
2		69.97	−15.98	−4.42	−6.49	5.66	−0.46	−8.58	5.80	−2.62	−15.09						
3		47.87	−16.46	−5.23	−4.14	6.91	0.35	−9.42	5.46	−2.76	−14.25						
Average slopes																	
1	1,458	1.09	−0.08	−0.31	−0.06	0.10	0.06	−0.10	0.00	−0.02	−1.07	0.04	0.02	−1.11	−0.03	0.09	0.16
2	1,353	1.16	−0.17	−0.87	−0.09	0.25	0.03	−0.17	0.00	−0.04	−2.02	0.08	0.04	−2.28	0.26	0.10	0.20
3	1,259	1.25	−0.27	−1.60	−0.10	0.43	0.10	−0.28	−0.02	−0.05	−3.17	0.12	0.05	−3.12	0.81	0.12	0.20
t-statistics																	
1		57.52	−10.72	−0.89	−11.22	3.25	2.64	−3.40	0.04	−2.89	−7.82	3.53	6.66	−11.14	−0.24	2.28	
2		30.42	−12.11	−1.60	−8.37	3.64	0.82	−3.93	0.10	−2.89	−10.90	7.80	5.25	−13.12	1.07	1.18	
3		18.28	−13.33	−2.25	−3.74	2.50	1.40	−4.16	−0.51	−2.63	−10.44	5.58	4.68	−10.10	1.45	1.22	

Regressions to predict profitability, $Y_{t+\tau}/B_t$

Average slopes																	
1	1,953	0.03	−0.04	0.00	−0.07	0.78	−0.03	−0.07	−0.00	−0.03	0.02						0.39
2	1,810	0.04	−0.04	−0.03	−0.02	0.71	−0.03	−0.07	−0.02	−0.02	0.13						0.26
3	1,675	0.15	−0.04	0.02	−0.01	0.70	−0.07	−0.05	−0.02	−0.02	0.14						0.20
t-statistics																	
1		3.95	−8.05	0.00	−7.50	35.16	−2.21	−7.89	−0.81	−10.21	0.51						
2		3.67	−5.32	−0.27	−2.84	21.04	−1.89	−5.35	−3.15	−6.42	2.15						
3		3.11	−3.80	0.15	−1.13	14.82	−4.18	−2.82	−3.23	−3.86	1.56						
Average slopes																	
1	1,458	−0.04	−0.04	0.21	−0.05	0.47	−0.02	−0.11	−0.02	−0.03	0.04	0.04	−0.00	−0.25	0.43	0.37	0.39
2	1,353	−0.03	−0.04	0.36	−0.01	0.41	−0.02	−0.09	−0.03	−0.03	0.07	0.02	−0.00	−0.09	0.42	0.35	0.24
3	1,259	−0.04	−0.04	0.57	−0.01	0.45	−0.06	−0.07	−0.02	−0.03	−0.03	0.00	−0.02	−0.11	0.30	0.45	0.18
t-statistics																	
1		−3.86	−9.37	2.18	−8.83	10.94	−0.83	−10.30	−3.26	−9.01	0.78	6.16	−0.65	−3.23	5.12	7.19	
2		−1.99	−7.41	2.56	−1.83	9.12	−0.78	−3.71	−4.31	−8.22	1.11	2.48	−1.64	−0.93	3.16	8.90	
3		−1.70	−3.99	3.19	−0.68	6.63	−2.29	−2.45	−1.92	−4.03	−0.29	0.11	−1.79	−0.45	2.33	5.96	

The multiple regressions to forecast profitability and asset growth that provide our proxies for expected profitability and investment are in Table 2. Table 1 is background. It summarizes preliminary regressions to show that, used alone or in small natural subgroups, all variables in the multiple regressions of Table 2 forecast profitability or asset growth, and typically both. Our discussion largely focuses on the evidence about marginal explanatory power from the multiple regressions of Table 2. There are two sets of regressions in Table 2. The first uses only lagged size and accounting fundamentals to forecast profitability and growth. The second set adds lagged returns, analyst earnings forecasts, and the two general measures of firm strength, PT_t and OH_t, to the explanatory variables.

3.1. Asset growth

Consider the Table 2 regressions to forecast asset growth. In the first set, all accounting fundamentals are related to future asset growth in plausible ways. Smaller firms and more profitable firms tend to grow faster, but firms that pay more dividends grow more slowly. Firms with higher book-to-market ratios (so-called value firms) grow less rapidly than low B_t/M_t firms (growth firms). Among firms with positive accruals (reported earnings exceed cash earnings from operations), larger accruals are associated with slower future asset growth. The relation between accruals and growth is not discernible when accruals are negative. In terms of *t*-statistics, B_t/M_t and D_t/B_t have the strongest explanatory power, with average slopes more than 12 standard errors from zero. Lagged asset growth also helps predict future growth, but in economic terms the effects are small. Without showing the details, we can report that adding more lags of growth to the multiple regressions in Table 2, or replacing the first lag of growth with a three-year average, does not produce stronger evidence for the importance of lagged asset growth in predicting future growth. This is in contrast to the univariate regressions in Table 1, in which lagged growth shows strong power to forecast asset growth up to three years ahead.

Adding lagged returns, $I/B/E/S$ profitability forecasts, PT_t, and OH_t to the asset growth regressions tends to reduce the size and precision of other slopes, which nevertheless continue to have explanatory power, with two exceptions. The average slopes on size are still negative, but they are now less than two standard errors from zero for forecasts one and two years ahead. More interesting, lagged asset growth loses its power to forecast future growth, a result of some import in interpreting the return regressions later. Lagged returns and OH_t have marginal forecast power in the full regressions, and $I/B/E/S$ profitability forecasts may have explanatory power, at least for forecasts one year ahead. Not surprisingly, firms with higher past returns and higher forecasted profitability tend to invest more, while firms with higher probability of default (OH_t) grow less rapidly. Used alone, there is a strong positive relation between the Piotroski measure of firm strength and future asset growth (Table 1), but in the full regressions, PT_t does not have reliable forecast power.

3.2. Profitability

When size and the accounting fundamentals are used to forecast profitability, $Y_{t+\tau}/B_t$, one, two, and three years ahead ($\tau = 1, 2, 3$), lagged profitability has by far the strongest forecast power. For example, the average slope on Y_t/B_t for forecasts one year ahead, 0.78, is 35.16 standard errors from zero. Thus, there is considerable persistence in profitability. But profitability is mean reverting; the one-year slope on lagged profitability is about ten standard errors below 1.0, and the slope decays to 0.70 for forecasts three years ahead. Without showing the details, we can report that adding more lags of profitability, or replacing the first lag with a three-year average, does not produce stronger evidence for the importance of lagged profitability in predicting future profitability than the first lag of profitability alone.

As expected, the book-to-market ratio helps predict profitability; firms with higher B_t/M_t (value firms) tend to be less profitable. The forecast power of the ratio of dividends to book equity, which shows up clearly in the regressions of Table 1, largely disappears when placed in competition with other fundamentals in Table 2. But the multiple regressions of Table 2 produce stronger evidence that firms that do not pay dividends are less profitable.

The link between lagged asset growth and future profitability merits discussion. In univariate regressions (Table 1), lagged growth is positively related to future profitability, but the slope turns negative in the multivariate regressions of Table 2. Thus, with controls for size and other fundamentals (especially past profitability), higher asset growth is associated with lower future profitability and growth in earnings. (We return to this finding later.)

When lagged returns, $I/B/E/S$ earnings forecasts, and the Piotroski and Ohlson measures of firm strength (PT_t and OH_t) are added to the profitability regressions, not much happens to the average slopes for B_t/M_t, the ratios of negative and positive accruals to book equity, and the ratio of dividends to book equity. But the slopes on lagged profitability are smaller, and the slopes on lagged asset growth tend to be more reliably negative. When the two lagged returns are used alone to forecast profitability, their average slopes are strongly positive (Table 1), but in competition with other variables (Table 2), the slopes on lagged returns decline and only the first lagged return (year $t-1$) shows reliable forecast power. OH_t produces strong negative average slopes when used alone to forecast profitability; higher probability of default is (not surprisingly) associated with lower future profitability. But in the multiple regressions, OH_t loses most of its explanatory power, at least for forecasts more than a year ahead. In contrast, though the positive average slopes on the PT_t measure of firm strength are smaller when other variables are in the profitability regressions, they remain more than 2.3 standard errors from zero.

Used alone to forecast profitability (Table 1), lagged profitability and analyst earnings forecasts have average slopes close to 1.0. Thus differences in lagged profitability or in analyst forecasts show up roughly one for one in future profitability. But in the multiple regressions that use the full set of variables to forecast profitability (Table 2), the slopes on lagged profitability and analyst forecasts typically fall to less than half the values observed in Table 1, and the sum of the slopes is now less than 1.0. The average slopes for both variables are more than 5 standard errors from zero. Thus, in the multiple regressions, the two variables (correlated 0.35) split the information they share about future profitability. Moreover, many variables help forecast profitability in the full regressions. This result confirms earlier evidence that analysts overlook information when making earnings forecasts. (See, for example, Ali, Klein, and Rosenfeld, 1992; Abarbanell and Bernard, 1992; Easterwood and Nutt, 1999; Ahmed, Nainar, and Zhang, 2003.)

Spawned by Sloan (1996), a large literature shows that accruals result in transitory variation in earnings. The negative slopes on accruals in the profitability regressions confirm this result. Note, however, that the average slopes for $+AC_t/B_t$ in the one- and two-year profitability regressions of Table 2 are more negative than for $-AC_t/B_t$, but the slope for $+AC_t/B_t$ tends to become less negative for longer horizons, and the coefficient for $-AC_t/B_t$ becomes more negative. As a result, the slopes for positive and negative accruals are about equal in the three-year regressions, around -0.06. The behavior of the slopes suggests that the reversal of positive accruals in reported earnings occurs faster, but positive and negative accruals have comparable long-run transitory effects on earnings.

Accruals, however, do not mean revert much faster than the cash component of earnings. In the Table 2 regressions that use only size and lagged accounting fundamentals to forecast profitability, the mean reversion of profitability (which includes cash earnings and accruals) is picked up by lagged profitability and accruals, with accruals measuring marginal mean reversion beyond that captured by lagged profitability. (Other explanatory variables in the regressions largely just allow for differences in long-term average profitability across firms.) The point estimates of the accrual slopes, around minus 6% at the three-year horizon, suggest that the long-term marginal mean reversion of profitability associated with accruals is small.

Sloan's (1996) hypothesis, adopted near uniformly in the literature on stock returns and accruals, is that investors do not understand the faster mean reversion of the accruals part of earnings. This leads to a negative relation between current accruals and future stock returns observed when the mean reversion of accruals hits measured earnings. But the fact that accruals do not mean revert much faster than the cash component of earnings suggests that Sloan's story cannot in itself explain large spreads in average returns associated with accruals. And our estimates of the marginal mean reversion of profitability due to accruals are similar to those of Sloan (1996) and others.

The profitability regressions in Table 2 that include all explanatory variables produce the same or slightly lower R^2 than the regressions that use only size and accounting fundamentals to forecast profitability. Thus, though lagged returns, PT_t, and analyst forecasts have marginal explanatory power in the profitability regressions, it comes at the expense of other variables, primarily lagged profitability. Lagged returns, PT_t, and analyst forecasts do not add to the overall power of the profitability forecasts provided by size and the accounting fundamentals. Without showing the details, we can also report that lagged profitability alone produces profitability forecasts near as powerful (in terms of R^2) as those from the expanded regressions in Table 2. These comments may be pertinent when we find next that a small set of explanatory variables (including lagged profitability) seem to provide a simple proxy for expected profitability that shows more power to forecast stock returns than the fitted values from the profitability regressions in Table 2.

4. Expected returns: cross-section regressions

We test for the profitability and investment effects in expected returns predicted by the valuation equation (3) in three steps. We first present cross-section regressions that explain average stock returns with lagged values of size, B_t/M_t, asset growth, profitability, accruals, and the PT_t and OH_t measures of firm strength. The goal is to examine whether simple proxies for expected profitability and asset growth add to the explanation of average returns provided by size and B_t/M_t. We then use more complicated proxies for expected profitability and asset growth—the fitted values from the regressions of Table 2—to test for profitability and investment effects in average returns. The final tests use portfolios to examine whether the profitability and investment effects identified in the cross-section regressions are large and pervasive in the sample as a whole and within portfolios formed on size and B_t/M_t.

We estimate cross-section return regressions monthly, starting in July 1963, with the explanatory variables updated annually, at the end of June. To ensure that the explanatory variables are known at the beginning of the month of the dependent returns, the accounting variables in the regressions are for fiscal years that end in the calendar year preceding the July when they are first used. Thus we use data from fiscal yearends between January and December of year t to forecast monthly returns from July of t+1 to June of t+2. As in Fama and French (1992), market equity for the size variable is measured at the end of June of t+1, and market equity in the book-to-market ratio is for the end of December of t. To reduce the impact of outliers, we winsorize the independent variables in the return regression at the 0.5% level. Thus extreme values are shrunk to the 0.5 and 99.5 percentiles for year t. (As in Tables 1 and 2, we consider only the upper or lower bound for one-sided variables.)

4.1. Baseline tests

Confirming previous evidence, Table 3 shows that when size and the book-to-market ratio are used alone to explain returns, there is a strong positive relation between average return and B_t/M_t. The t-statistic for the average B_t/M_t slope is near three standard errors from zero. Thus high book-to-market (value) firms have higher average returns than low book-to-market (growth) firms. As in previous work, small (low market cap) firms have higher average returns than big firms, but the negative average size slope is only -1.20 standard errors from zero.

More interesting, simple proxies for expected profitability and asset growth seem to confirm the positive profitability and negative growth effects in average returns predicted by the valuation equation (3). When lagged profitability and asset growth are added to the return regressions that include size and B_t/M_t, there is a strong positive relation between profitability and average return ($t = 2.55$) and a stronger negative relation between average return and asset growth ($t = -3.87$). Moreover, adding lagged profitability and asset growth to the return regressions has almost no effect on the average slope for B_t/M_t and enhances the average slope for size, which is now -1.83 standard errors from zero. We can also report that adding lags of profitability and growth or replacing the first lags with averages of three years of past values does not produce reliable improvements in explanatory power.

Because accruals are negatively related to future profitability (Table 2), the valuation equation (3) predicts a negative relation between accruals and future returns. The average slope for positive accruals, $+AC_t/B_t$, in the return regressions of Table 3 is reliably negative ($t = -6.82$). This is consistent with earlier evidence (Sloan, 1996; Collins and Hribar, 2000; Chan, Chan, Jegadeesh, and Lakonishok, 2006) that accruals predict returns. The average slope on negative accruals, $-AC_t/B_t$, is also negative but less than one standard error from zero. Thus, with controls for other variables, negative accruals do not reliably predict higher future returns. This result does not seem to have a precedent in the literature.

Some of the information in positive accruals about future returns is related to the information in lagged growth. The average correlation between $+AC_t/B_t$ and dA_t/A_t is

Table 3
Monthly cross-section return regressions

The table shows average slopes and their Fama-MacBeth t-statistics from monthly cross-section regressions to predict stock returns. Y_t, D_t, and AC_t are earnings, dividends, and accruals per share for the fiscal year ending in calendar year t. $-AC_t$ is accruals for firms with negative accruals (zero otherwise) and $+AC_t$ is accruals for firms with positive accruals. B_t, A_t, and M_t are book equity, total assets, and stock price per share at the end of fiscal year t. MC_t is market capitalization (price times shares outstanding) at the end of June of year t+1. I_t is the I/B/E/S consensus forecast of earnings for the coming year, sampled at the end of fiscal year t. $1Yr_t$ is the stock return for the year up to the end of fiscal year t, and 2–3Yr_t is the two-year return for the years up to the end of fiscal year $t-1$. OH_t is the probability of default on debt, estimated at the end of fiscal year t, from the logit regression model of Ohlson (1980). PT_t is the Piotroski (2000) composite index of firm strength. $Neg\ Y_t$ is a dummy variable that is one for firms that have negative earnings for fiscal year t (zero otherwise), and $No\ D_t$ is a dummy variable that is one for firms that pay no dividends during fiscal year t. $F(Y_{t+\tau}/B_t)$ and $F(dA_{t+\tau}/A_t)$, expected profitability and asset growth, are fitted values from the first pass regressions in Table 2 that include lagged fundamentals (ln B_t/M_t, ln MC_t, $Neg\ Y_t$, Y_t/B_t, $-AC_t/B_t$, $+AC_t/B_t$, dA_t/A_t, $No\ D_t$, and D_t/B_t) and lagged fundamentals, lagged returns, I_t/B_t, OH_t, and PT_t. Firms is the average number of firms in the regressions. The regressions are estimated monthly, beginning in July of 1963, using explanatory variables that are updated at the end of each June. The accounting explanatory variables in the regression for July of year t+1 are for fiscal years ending in calendar year t. The size variable, ln MC_t, is measured at the end of June of year t+1, but in B_t/M_t, M_t is measured at the end of December of year t. The time period for the dependent returns in the regressions is July 1963 to December 2004, except for the regressions that require I_t/B_t, where the period is July 1977 to December 2003, and the regressions that require PT_t, where the period is July 1972 to December 2004. *Int* is the regression intercept and the regression R^2 is adjusted for degrees of freedom.

	Firms	*Int*	ln B_t/M_t	ln MC_t	Neg Y_t	Y_t/B_t	$-AC_t/B_t$	$+AC_t/B_t$	dA_t/A_t	OH_t	PT_t	R^2
Part A: Regressions use lagged profitability, asset growth, accruals, OH_t, and PT_t												
Average	2,058	1.66	0.28	−0.06								0.02
t-statistics		3.85	2.97	−1.20								
Average	2,058	1.69	0.28	−0.08	−0.00	1.10			−0.40			0.03
t-statistics		4.36	2.74	−1.83	−0.02	2.55			−3.87			
Average	2,058	1.83	0.26	−0.10	−0.00	1.38	−0.24	−1.42	−0.19			0.04
t-statistics		4.93	2.61	−2.37	−0.03	3.21	−0.80	−6.82	−1.99			
Average	2,253	1.35	0.34	−0.07						−0.04	0.06	0.03
t-statistics		2.43	3.02	−1.33						−2.25	2.58	
Average	2,253	1.51	0.34	−0.09	0.11	1.51	−0.09	−1.32	−0.25	−0.03	0.04	0.03
t-statistics		3.44	2.89	−1.76	0.77	3.40	−0.41	−5.42	−2.44	−1.55	2.55	

τ	Firms	*Int*	ln B_t/M_t	ln MC_t	$F(dA_{1+\tau}/A_t)$	$F(Y_{t+\tau}/B_t)$	R^2
Part B: Regressions use expected profitability, $F(Y_{t+\tau}/B_t)$, and asset growth, $F(dA_{t+\tau}/A_t)$, from first-stage regressions							
Expected profitability and growth estimated with lagged fundamentals							
Average slopes							
1	2,058	1.61	0.37	−0.08	0.04	1.58	0.03
2	2,058	1.11	0.48	−0.08	0.39	2.05	0.03
3	2,058	0.97	0.53	−0.07	0.42	2.04	0.03
t-statistics							
1		1.86	3.42	−1.92	0.05	2.03	
2		1.92	3.87	−1.76	0.87	2.37	
3		1.89	4.14	−1.56	1.34	2.40	
Expected profitability and growth estimated with lagged fundamentals, lagged returns, I_t/B_t, OH_t, and PT_t							
Average slopes							
1	1,530	2.06	0.20	−0.09	−0.20	1.27	0.03
2	1,530	1.75	0.25	−0.10	0.08	1.58	0.03
3	1,530	1.57	0.28	−0.09	0.21	1.43	0.03
t-statistics							
1		1.97	1.49	−1.75	−0.18	1.28	
2		2.75	1.67	−1.80	0.16	1.49	
3		2.71	1.92	−1.71	0.66	1.64	

0.29, and adding accruals to the return regressions cuts the average slope on asset growth in half, from −0.40 ($t = -3.87$) to −0.19 ($t = -1.99$). This is in line with previous evidence that the accruals may in part pick up a growth effect in average returns (Fairfield, Whisenant, and Yohn, 2003). Another interpretation, however, is that asset growth predicts returns because it helps predict profitability, and accruals absorb some of the profitability information in asset growth. This is consistent with the evidence (Table 2) that with controls for other variables (primarily lagged profitability) the marginal relation between lagged asset growth and future profitability is negative. In contrast, adding accruals to the return regressions increases the slope on lagged profitability, from 1.10 ($t = 2.55$) to 1.38 ($t = 3.21$). This is in line with previous evidence that adding accruals helps clean up the information in lagged profitability about future profitability (Sloan, 1996). The important point, however, is that all these results on how B_t/M_t, profitability, growth, and accruals predict returns are consistent with the valuation equation (3).

Similarly, the PT_t and OH_t measures of firm strength are proxies for expected net cash flows. The valuation equation (3) thus implies that they are candidates for identifying variation in average returns missed by size and B_t/M_t. Confirming Piotroski (2000) and Griffin and Lemmon (2002), Table 3 shows that PT_t and OH_t have explanatory power (average slopes more than 2.2 standard errors from zero) when added to return regressions that include size and B_t/M_t. Controlling for size and B_t/M_t, stronger firms (higher PT_t) have higher average returns, and firms with higher default probabilities (OH_t) have lower average returns.

Adding lagged profitability, asset growth, and accruals to the return regressions dampens the average slopes for PT_t and OH_t, from 0.06 to 0.04 ($t = 2.55$) for PT_t and from −0.04 to −0.03 ($t = -1.55$) for OH_t (Table 3). Collinearity thus takes its toll, but each of these variables (lagged profitability, growth, accruals, PT_t, and OH_t) seems to capture information about average returns missed by the others. (Without showing the details, we can report that adding the two dividend variables, $No\ D_t$ and D_t/B_t, and the I/B/E/S earnings forecast variable, I_t/B_t, does not enhance the explanatory power of the return regressions.)

Finally, the previous literature typically interprets observed relations between returns and lagged profitability, investment, accruals, PT_t, and OH_t as evidence of mispricing. But as emphasized in Section 2, the profitability, investment, and net cash flow effects in average returns captured by these variables are consistent with the valuation equation (3) whether or not pricing is rational. And tests of Eq. (3) cannot in themselves distinguish rational from irrational pricing.

4.2. "Better" proxies for expected profitability and investment

The valuation equation (3) suggests that profitability, asset growth, accruals, PT_t, and OH_t predict returns because they have information about expected profitability and asset growth. If so, it seems reasonable that the fitted values from the first-stage profitability and growth regressions in Table 2, which aggregate the information in these and other variables about expected profitability and growth, should forecast returns at least as well. The monthly return regressions that use the fitted values, in Panel B of Table 3, do not support this conclusion.

When lagged accounting fundamentals (including profitability, asset growth, and accruals) are used along with size and B_t/M_t to construct proxies for expected profitability and growth, there is a reliable positive relation between expected profitability and average return. The t-statistics for the average slopes on expected profitability are 2.03 in the return regressions that use expected profitability and expected growth one year ahead and more than 2.3 in the regressions that use forecasts two and three years ahead. Contrary to the predictions of the valuation equation (3), however, the return regressions of Table 3 produce positive average slopes on the Table 2 regression proxies for expected asset growth, but they are not reliably different from zero.

Table 2 says that lagged returns, analyst earnings forecasts, PT_t, and OH_t have explanatory power in the first-stage profitability and asset growth regressions that also control for size, B_t/M_t, and lagged accounting fundamentals. But Table 3 says that the fitted values from these full first-stage profitability and growth regressions produce weaker evidence of profitability effects in average returns (the largest t-statistic is 1.64), and there is still no evidence of asset growth effects.

4.3. Discussion

Why do the simple proxies for expected profitability and investment provided by lagged profitability, asset growth, accruals, PT_t, and OH_t produce better descriptions of average returns than the more complicated proxies from the first-stage profitability and asset growth regressions that summarize the information in these and other variables? We offer some possibilities.

There are two potential measurement error problems in the way we use the first-stage profitability and asset growth regressions in the second-stage return regressions. First, though the profitability and asset growth regressions identify many variables that have forecast power, the average slopes have measurement error, so there is a measurement error problem when the regression fitted values are used as explanatory variables for returns. Second, the fitted values from the first-stage regressions used in the second-stage return regressions are computed with full-period average slopes from the year-by-year first-stage regressions. The implicit assumption is that the true first-stage slopes are constant. If the slopes are not constant, full-period average slopes produce noisy period-by-period estimates of expected profitability and growth.

To explore whether variation in the true first-stage slopes affects our results, we estimate the second-stage return regressions using fitted values from rolling first-stage profitability and growth regressions. Specifically, we estimate each year's fitted values with the average slopes from the first-stage regressions for the most recent ten years. If the true first-stage slopes are constant, fitted values constructed from a rolling ten years of slopes should not work as well in the second-stage return regressions as fitted values that use full-period average slopes. But without showing the details, we can report that the forecasts of profitability and growth based on rolling ten-year average slopes work about as well as (no better or no worse than) forecasts that use the full-period average slopes from the first-stage regressions. This suggests that there is enough variation in the true slopes to offset the larger estimation error of ten-year average first pass regression slopes.

More positively, we suggest that entering lagged size, B_t/M_t, profitability, asset growth, accruals, PT_t, and OH_t directly as explanatory variables in the return regressions provides a flexible solution to these measurement error problems. Specifically, entering the explanatory variables for expected profitability and asset growth into the monthly return regressions in an unrestricted way implicitly allows them to pick up whatever first-stage slopes are currently relevant for predicting profitability and growth.

The failure of the fitted values from the profitability and asset growth regressions in the second-stage return regressions may in part be due to collinearity. We use the same explanatory variables in the profitability and growth regressions. Many variables affect the two fitted values in similar ways. The coefficients on B_t/M_t, $Neg\ Y_t$, $+AC_t/B_t$, and $No\ D_t$ are negative in both sets of regressions (Table 2), and the coefficients on Y_t/B_t are positive. As a result, the fitted values from the first-stage regressions are highly correlated. For example, the average of the annual correlations between the one-year-ahead fitted values from the comprehensive first pass profitability and growth regressions is 0.76.

The fitted values from the first-stage profitability and asset growth regressions are also correlated with the size and B_t/M_t variables in the second-stage return regressions. Book-to-market is a powerful explanatory variable in the first-stage growth regressions; the correlation between the estimates of expected growth and B_t/M_t is typically about -0.8. Because B_t/M_t is also an explanatory variable in the second-stage return regressions, this collinearity may obscure the growth effects in average returns.

Both size and B_t/M_t have strong slopes in the first-stage profitability regressions and, as a result, they are correlated with the regression fitted values. The correlation of the estimates of expected profitability with size is around 0.4, and the correlation with B_t/M_t is about -0.7. These links are not as tight as those between B_t/M_t and the estimates of expected asset growth, but they do make it more difficult to identify the marginal relation between expected profitability and expected return in the second-stage return regressions.

This is a good place to note that the valuation equation (3) does not imply that there must be variation in expected returns independent of size and B_t/M_t. Suppose differences in expected returns are perfectly explained by size and B_t/M_t. Then the best possible forecasts of expected net cash flows must be perfectly correlated with linear combinations of size and B_t/M_t, so there are no profitability and investment effects in expected returns left unexplained by size and B_t/M_t. Because the proxies for expected growth from the asset growth regressions are highly correlated with B_t/M_t, this story may explain why the proxies do not identify growth effects in average returns. The proxies for expected profitability from the cross-section profitability regressions are less correlated with B_t/M_t, which may explain why they show up more strongly in the return tests.

Finally, lagged asset growth may show up in the return regressions with a negative average slope because of the information in asset growth about future profitability, not because of its information about expected growth. Lagged asset growth is not important in predicting future growth in the multiple regressions of Table 2. Moreover, in the regressions to forecast profitability (where accruals and especially lagged profitability have powerful roles), higher growth is associated with lower future profitability. This is consistent with lower expected returns for faster growing firms, especially when the return regressions control for lagged profitability and accruals.

5. Expected returns: portfolio tests

Cross-section return regressions can identify variables that help describe average stock returns, but the economic significance of the average slopes is not always easy to judge. Moreover, the average slopes from the return regressions cannot tell us whether the regressions are well-specified. For example, do the profitability and asset growth effects in average returns identified by the regressions show up in a general way among stocks in different size and book-to-market groups? This section uses portfolio tests to address these issues.

5.1. Economic significance

Table 4 shows predicted and actual returns on portfolios formed using predicted values from the cross-section return regressions of Table 3. The explanatory variables in the monthly return regressions change once a year, at the end of June. Thus, at the end of each June, we compute predicted monthly returns on individual stocks for the following year by combining the current values of the explanatory variables in the return regressions of Table 3 with the average monthly regression slopes for the full sample period. (Because the goal is to develop perspective on the results from the return regressions, the look-ahead bias suggested by our use of full-period average regression slopes is not an issue.) We then allocate stocks to high and low expected return portfolios based on whether their predicted monthly returns for the next year are above or below the sample median for the year. For each return regression in Table 3, Table 4 shows the average difference between predicted high and low returns and the average difference between actual returns. We report both equal-weight (EW) returns, which give heavy weight to the many small firms in the sample, and value-weight (VW) returns, which give heavy weight to large firms.

The first-stage profitability and asset growth regressions of Table 2 examine forecast horizons of one, two, and three years. Table 3 uses these forecasts in three separate sets of regressions to explain the cross section of average returns. We also estimate the high minus low return spreads in Table 4 using the Table 3 regressions for each of the three forecast horizons. The results for different forecast horizons are near identical. To save space, Table 4 shows only the predicted and actual return spreads based on the Table 3 return regressions that use forecasts of profitability and growth one year ahead.

Predicted average spreads are fairly similar for equal-weight and value-weight returns. This suggests that the variation across stocks in the underlying regression explanatory variables is roughly similar for small and big firms. When we equal weight returns, the average actual return spread for every regression is higher than the predicted spread, but with value weighting, actual spreads are below predicted spreads. We infer that the average return effects measured by the Table 3 regressions are stronger among smaller firms. Still, the ordering of the average spreads in actual returns produced by successive regressions in Table 4 is the same for equal-weight and value-weight returns, so we also infer (and Table 5 confirms) that, though the magnitudes differ, the average return effects observed in the regressions of Table 3 are common to small and big firms.

Table 4 confirms existing evidence that differences in size and book-to-market equity are associated with large spreads in average returns. The average spreads in high minus low returns predicted by the cross-section regressions that use just size and B_t/M_t to explain returns are 0.42% (EW) and 0.49% (VW) per month; the average actual spreads in returns are 0.52% (EW) and 0.43% (VW), and they are 4.66 and 3.42 standard errors from zero. We know from Table 3 and previous work that the lion's share of these spreads is due to the value premium identified by B_t/M_t.

The regressions in Table 3 say that lagged profitability, asset growth, and accruals have statistically reliable power to forecast returns when added to regressions that also include

Table 4

Equal-weight (EW) and value-weight (VW) predicted and actual average high minus low returns

Each month the fitted values, computed using the average monthly slopes for the full sample period from the return regressions in Table 3, are used to allocate stocks to high and low predicted return portfolios based on whether their regression fitted values for the month are above or below the sample median for the month. For each return regression in Table 3, we compute the average monthly predicted and actual spreads between the equal-weight and value-weight average high and low returns. The *t*-statistics, *t*( ), are the ratios of the average actual spreads to their time series standard errors.

The explanatory variables in the return regressions (defined in Table 3) used to allocate firms to high and low predicted return portfolios are:

1. ln B_t/M_t, ln MC_t,
2. ln B_t/M_t, ln MC_t, $Neg\ Y_t$, Y_t/B_t, dA_t/A_t,
3. ln B_t/M_t, ln MC_t, $Neg\ Y_t$, Y_t/B_t, $-AC_t/B_t$, $+AC_t/B_t$, dA_t/A_t,
4. ln B_t/M_t, ln MC_t, OH_t, PT_t,
5. ln B_t/M_t, ln MC_t, $Neg\ Y_t$, Y_t/B_t, $-AC_t/B_t$, $+AC_t/B_t$, dA_t/A_t, OH_t, PT_t,
6. ln B_t/M_t, ln MC_t, $F(Y_{t+1}/B_t)$, $F(dA_{t+1}/A_t)$,
7. ln B_t/M_t, ln MC_t, $F(Y_{t+1}/B_t)$, $F(dA_{t+1}/A_t)$.

Regressions 1–5 (*Reg*) use lagged profitability, asset growth, accruals, OH_t, and PT_t as proxies for expected profitability and asset growth. Regressions 6 and 7 use $F(Y_{t+1}/B_t)$ and $F(dA_{t+1}/A_t)$, the fitted values from the profitability and asset growth regressions of Table 2 for forecasts one year ahead, as proxies for expected profitability and asset growth. In Regression 6, $F(Y_{t+1}/B_t)$ and $F(dA_{t+1}/A_t)$ use ln B_t/M_t, ln MC_t, $Neg\ Y_t$, Y_t/B_t, $-AC_t/B_t$, $+AC_t/B_t$, dA_t/A_t, $No\ D_t$, and D_t/B_t as explanatory variables. Regression 7 adds $1\,Yr_t$, $2\text{-}3\,Yr_t$, OH_t, PT_t, and I_t/B_t to the variables used to construct $F(Y_{t+1}/B_t)$ and $F(dA_{t+1}/A_t)$. Return spreads computed using Regressions 1–3 and 6 are for July 1963 to December 2004, the spreads computed using Regressions 4 and 5 start in July 1972, and those computed using Regression 7 start in July 1977.

	Average predicted spread		Average actual spread		*t*(Average actual spread)	
Reg	EW	VW	EW	VW	EW	VW
1	0.42	0.49	0.52	0.43	4.66	3.42
2	0.51	0.52	0.58	0.48	5.16	3.71
3	0.54	0.54	0.67	0.50	6.49	4.16
4	0.48	0.52	0.55	0.42	4.56	3.16
5	0.57	0.52	0.65	0.49	5.50	3.58
6	0.43	0.50	0.53	0.47	4.60	3.72
7	0.29	0.36	0.36	0.32	2.98	2.21

size and B_t/M_t as explanatory variables. But Table 4 says that the increments to average returns produced by these variables are modest. Adding lagged profitability and asset growth to the return regressions in Table 3 (Regression 2) increases the predicted spreads in Table 4 by 0.09% (EW) and 0.03% (VW) per month; the increments to average actual spreads in returns are 0.06% (EW) and 0.05% (VW). Adding positive and negative accruals further increases average predicted return spreads by just 0.03% (EW) and 0.02% (VW) per month; the increases in average actual return spreads are 0.09% (EW) and 0.02% (VW).

If we use just PT_t and OH_t with size and B_t/M_t to forecast returns (Regression 4 in Table 4), the average predicted and actual return spreads are below the spreads produced by combining lagged profitability, asset growth, and accruals with size and B_t/M_t. And the full Regression 5 in Table 4 that uses lagged size, B_t/M_t, profitability, growth, accruals, PT_t, and OH_t to forecast returns produces average predicted and actual return spreads close to those obtained without PT_t and OH_t. In short, the Piotroski (2000) and Ohlson

Table 5

Predicted and actual average high minus low return spreads for six size-B/M groups

In June of each year, the NYSE, Amex, and Nasdaq firms in our sample are allocated to two size groups, small (*S*) and big (*B*), according to whether their market cap is below or above the NYSE median. Firms are also allocated to three book-to-market groups depending on whether their B_t/M_t is in the bottom 30% (*L*), middle 40% (*M*), or top 30% (*H*) of B_t/M_t for NYSE firms. Intersecting the size and B_t/M_t groups produces six portfolios, *SL*, *SM*, *SH*, *BL*, *BM*, and *BH*. Each month the fitted values, computed using the average monthly slopes for the full sample period from the return regressions in Table 3, are used to allocate stocks in each of the six size-B_t/M_t groups to high and low predicted return portfolios based on whether their regression fitted values for the month are above or below their group's median. For each return regression in Table 3 and for each of the six size-B_t/M_t groups, the table shows the average predicted and actual differences between the equal-weight average high and low returns. The table also shows time series averages of simple monthly averages (Ave) of the six value-weight return spreads. The explanatory variables in the return regressions (defined in Table 3) used to allocate firms to high and low predicted return portfolios are:

1. $\ln B_t/M_t$, $\ln MC_t$,
2. $\ln B_t/M_t$, $\ln MC_t$, $Neg\ Y_t$, Y_t/B_t, dA_t/A_t,
3. $\ln B_t/M_t$, $\ln MC_t$, $Neg\ Y_t$, Y_t/B_t, $-AC_t/B_t$, $+AC_t/B_t$, dA_t/A_t,
4. $\ln B_t/M_t$, $\ln MC_t$, OH_t, PT_t,
5. $\ln B_t/M_t$, $\ln MC_t$, $Neg\ Y_t$, Y_t/B_t, $-AC_t/B_t$, $+AC_t/B_t$, dA_t/A_t, OH_t, PT_t,
6. $\ln B_t/M_t$, $\ln MC_t$, $F(Y_{t+1}/B_t)$, $F(dA_{t+1}/A_t)$,
7. $\ln B_t/M_t$, $\ln MC_t$, $F(Y_{t+1}/B_t)$, $F(dA_{t+1}/A_t)$.

Regressions 1–5(*Reg*) use lagged profitability, asset growth, accruals, OH_t, and PT_t as proxies for expected profitability and asset growth. Regressions 6 and 7 use $F(Y_{t+1}/B_t)$ and $F(dA_{t+1}/A_t)$, the fitted values from the profitability and asset growth regressions of Table 2 for forecasts one year ahead, as proxies for expected profitability and asset growth. In Regression 6, $F(Y_{t+1}/B_t)$ and $F(dA_{t+1}/A_t)$ use $\ln B_t/M_t$, $\ln MC_t$, $Neg\ Y_t$, Y_t/B_t, $-AC_t/B_t$, $+AC_t/B_t$, dA_t/A_t, $No\ D_t$, and D_t/B_t as explanatory variables. Regression 7 adds $1\,Yr_t$, $2\text{-}3\,Yr_t$, OH_t, PT_t, and I_t/B_t to the variables used to construct $F(Y_{t+1}/B_t)$ and $F(dA_{t+1}/A_t)$. Return spreads computed using Regressions 1–3 and 6 are for July 1963 to December 2004, the spreads computed using Regressions 4 and 5 start in July 1972, and those computed using Regression 7 start in July 1977.

Reg	*SL*	*SM*	*SH*	*BL*	*BM*	*BH*	Ave
Average spread in expected returns							
1	0.19	0.11	0.21	0.25	0.11	0.13	0.17
2	0.44	0.23	0.26	0.36	0.19	0.19	0.28
3	0.48	0.34	0.35	0.39	0.25	0.22	0.34
4	0.33	0.24	0.30	0.34	0.21	0.22	0.27
5	0.51	0.37	0.39	0.42	0.27	0.26	0.37
6	0.28	0.19	0.24	0.29	0.18	0.18	0.23
7	0.23	0.17	0.19	0.21	0.16	0.15	0.18
Average spread in actual returns							
1	0.33	0.06	0.24	0.18	0.15	0.18	0.19
2	0.60	0.31	0.34	0.34	0.23	0.25	0.35
3	0.86	0.34	0.39	0.39	0.26	0.25	0.42
4	0.45	0.25	0.37	0.22	0.14	0.32	0.29
5	0.83	0.44	0.47	0.35	0.14	0.24	0.41
6	0.49	0.08	0.28	0.26	0.26	0.23	0.27
7	0.34	0.24	0.17	0.25	0.18	0.12	0.22
t-statistics for average spread in actual returns							
1	3.41	0.66	2.50	1.72	2.11	1.94	3.93
2	4.50	4.04	3.75	2.47	3.19	3.03	5.89
3	6.57	4.41	5.05	3.09	3.88	2.86	7.30
4	3.37	3.04	4.71	2.00	1.86	3.00	5.27
5	5.82	4.94	5.82	2.42	1.85	2.19	6.12
6	3.15	0.84	3.42	1.84	3.27	2.41	3.63
7	1.83	2.05	1.43	1.94	1.82	0.99	2.64

(1980) measures of firm strength, which aggregate the information in many accounting variables, seem to have no economically important information about expected returns beyond the information in lagged profitability, growth, and accruals, which in turn seems modest.

In the return regressions of Table 3, the fitted values from the regressions to explain profitability and asset growth in Table 2 do not show consistent marginal explanatory power. We speculated that one problem may be collinearity: The fitted values from the profitability and growth regressions are highly correlated with each other and with B_t/M_t. In the return forecasts of Table 4, however, we are interested in whether the fitted values for profitability and growth together have information about average returns beyond that in size and B_t/M_t. In this task, the high correlation of the fitted values with B_t/M_t remains a problem, but collinearity between the two fitted values themselves is not a problem. There is thus reason to hope that the fitted values from the profitability and growth regressions identify substantial variation in average predicted and actual returns.

The hope is not realized. Table 4 says that, used with size and B_t/M_t as explanatory variables in the return regressions of Table 3, the fitted values from the regressions in Table 2 that use size, B_t/M_t, and accounting fundamentals to predict profitability and asset growth produce average spreads in predicted and actual returns about as large as those produced by size and B_t/M_t alone. Thus in economic terms these forecasts of profitability and investment add little or nothing to the prediction of returns provided by size and B_t/M_t. Moreover, the profitability and asset growth regressions that use the full set of apparently important explanatory variables produce lower average predicted and actual return spreads than the baseline return regressions that use just size and B_t/M_t as explanatory variables. Thus these fitted values partially obscure the return predictions provided by size and B_t/M_t.

5.2. Pervasiveness and regression specification

Table 4 gives an overall picture of the economic significance of the variation in average returns uncovered in the return regressions of Table 3. The final task is to examine whether the return regressions are well-specified in the sense that the predictions they make show up in the average returns of stocks in different size and book-to-market groups.

The size-B_t/M_t groups are the portfolios used in the construction of the *SMB* (small minus big market cap) and *HML* (high minus low B_t/M_t) returns of the three-factor model of Fama and French (1993). In June of each year beginning in 1963, NYSE, Amex, and Nasdaq firms are allocated to two size groups, small (*S*) and big (*B*), according to whether their market cap is below or above the NYSE median. Firms are also allocated to three book-to-market groups depending on whether their B_t/M_t is in the bottom 30% (*L*), middle 40% (*M*), or top 30% (*H*) of B_t/M_t for NYSE firms. Intersecting the size and B_t/M_t sorts produces six portfolios, *SL*, *SM*, *SH*, *BL*, *BM*, and *BH*.

At the end of each June, we allocate the stocks in each of the six size-B_t/M_t groups to high and low expected return portfolios based on whether their predicted monthly returns (fitted values) for the next year are above or below their group's median. We then compute the predicted and actual returns on the high and low portfolios for the next 12 months. For each return regression in Table 3 and for each of the six size-B_t/M_t groups, Table 5 shows the average difference between equal-weight predicted high and low returns and the average difference between equal-weight actual high and low returns. (Value-weight returns, omitted to save space, support the same conclusions.) Comparing average actual return spreads with the spreads predicted for the six size-B_t/M_t groups gives perspective on which groups deliver the variation in average returns predicted by the regressions. This, in turn, provides information about whether the regressions are well-specified in different size-B_t/M_t groups. Table 5 shows average predicted and actual return spreads for all the return regressions in Table 3, but the discussion below focuses on the regressions (lagged size, B_t/M_t, profitability, asset growth, and accruals as explanatory variables) that produce incremental return spreads in Table 4.

The baseline again is the return regression with only size and B_t/M_t as explanatory variables. Within each of the six size-B_t/M_t groups there is variation in size and B_t/M_t which produces rather large average spreads (from 0.11 to 0.25% per month) in predicted high minus low returns. The average actual spreads in returns reproduce the predicted spreads fairly well, with one notable exception. The average return spread for the small growth group *SL*, 0.33% per month ($t = 3.41$), is near 75% larger than the spread predicted by the within-group variation in size and B_t/M_t, 0.19%.

Adding lagged profitability and growth to return regressions that also include size and B_t/M_t as explanatory variables increases the average predicted and actual return spreads for all six size-B_t/M_t groups, so the relation between these variables and average returns is general. We infer that the regressions that predict returns with size, B_t/M_t, profitability, and growth are well-specified; they identify patterns in average returns that show up within all size-B_t/M_t groups. As in the overall return results in Table 4, however, the increments to average predicted and actual return spreads obtained by adding profitability and asset growth to the return regressions are typically modest, except again for the small growth group where the predicted average return spread rises by 0.25% per month (more than twice the increase for any other group) and the actual rises by 0.27%. We infer that there is wide variation in profitability and asset growth among small growth stocks, and it shows up as predicted in average returns.

Adding lagged accruals to the return regressions that also include lagged size, B_t/M_t, profitability, and asset growth as explanatory variables (Regression 3) increases the average predicted high minus low return spreads for the six size-B_t/M_t groups by between 0.03% and 0.11% per month. The average spreads in actual returns also increase for all groups except *BH* (big value stocks). The increases are modest, except (again) for the small growth group, where adding accruals to the return regressions causes the average high minus low return spread to rise from an already impressive 0.60% per month ($t = 4.50$) to 0.86% ($t = 6.57$). This is more than six times the predicted increase, from 0.44% to 0.48%. In short, adding accruals to the explanatory variables in the return regressions produces small increases in average high minus low returns for all groups except *SL*. We infer that small growth stocks are influential in the strong average slope for positive accruals in the return regressions of Table 3.

Our modest incremental returns associated with accruals are in contrast to returns of about 10% per year found by Sloan (1996) and others for strategies that buy the stocks of low accruals firms and short firms with high accruals. Why are our results different? First, earlier return tests do not simultaneously control for size, B_t/M_t, profitability, and growth, to isolate the marginal explanatory power of accruals. Second, the portfolio strategies examined are typically extreme, buying and shorting equal-weight portfolios of the bottom and top deciles of accruals. In contrast, we compare the top and bottom halves of predicted returns within the six size-B/M portfolios. Our results suggest that small growth stocks are probably influential in the large equal-weight returns observed for extreme strategies.

Fama and French (1993) find that small growth stocks are a problem for their three-factor asset pricing model, and Mitchell and Stafford (2000) find that small growth stocks are influential in many high profile event study anomalies. The evidence presented here suggests that small growth stocks are also influential in the accruals anomaly.

6. Conclusions

The valuation equation (3) says that controlling for expected profitability and investment, firms with higher book-to-market equity have higher expected stock returns; given B_t/M_t and expected investment, higher expected profitability also implies higher expected returns; and given B_t/M_t and expected profitability, higher expected rates of investment are associated with lower expected returns.

Our evidence tends to confirm these predictions. Specifically our cross-section regressions say that lagged profitability, asset growth, and accruals, used as simple proxies for expected profitability and investment, are related to average returns in the manner predicted by Eq. (3). The Piotroski (2000) and Ohlson (1980) measures of firm strength, which are proxies for expected net cash flows (earnings minus investment), are also related to average returns in the manner predicted by Eq. (3).

A puzzle arises when the fitted values from the cross-section regressions to forecast profitability and asset growth are used as proxies for expected profitability and investment in the cross-section return regressions. Many variables contribute to regression forecasts of profitability and asset growth. Thus there is information about expected profitability and asset growth beyond that in lagged profitability and asset growth. Better proxies for expected profitability and investment should do a better job identifying the profitability and investment effects in average returns predicted by Eq. (3). But this is not what we observe. We suggest that the problem is some combination of measurement error in the fitted values from the first-stage profitability and asset growth regressions, and collinearity between these fitted values and the book-to-market variable in the second-stage return regressions. We argue that the measurement error problem is implicitly resolved by entering important explanatory variables from the first-stage profitability and asset growth regressions (lagged profitability, growth, accruals, and the PT_t and OH_t measures of firm strength) directly as explanatory variables in the second-stage return regressions.

Qualitatively, our results are in line with much existing evidence. It is not a surprise that book-to-market equity is a powerful variable in describing the cross section of average stock returns (for example, Fama and French, 1992). Existing evidence also says that more profitable firms have higher expected returns (for example, Haugen and Baker, 1996), and firms that invest more have lower average returns (for example, Fairfield, Whisenant, and Yohn, 2003). Sloan (1996) and many subsequent papers show that higher current accruals imply lower future profitability and lower future stock returns. Piotroski (2000) and Griffin and Lemmon (2002) find that the PT_t and OH_t proxies for expected net cash flows are related to average stock returns. At a minimum, our framing of the evidence emphasizes that all these results are consistent with valuation theory, as summarized in Eq. (3).

Our evidence, however, provides more than perspective on existing results. Previous work typically examines return effects one variable at a time. In contrast, we examine how lagged B_t/M_t, profitability, asset growth, accruals, and the PT_t and OH_t proxies for expected net cash flows contribute to the description of average returns in tests that examine incremental effects. Specifically, we examine the spreads in realized average returns obtained when we allocate stocks to high and low expected return portfolios based on the fitted values from cross-section return regressions that successively add variables identified by us and others as important. The spreads in realized average returns are large, but the lion's share is absorbed by the book-to-market ratio, with an assist from size. The average high minus low portfolio returns from cross-section regressions that use size and B_t/M_t to explain returns are 5% to 6% per year. Adding lagged profitability and growth to the regressions increases the average return spreads by less than 1% per year. When we add accruals to these regressions, the incremental return is again less than 1% per year, and most of this seems to be due to small growth stocks. Finally, adding PT_t and OH_t to regressions that include lagged size, B_t/M_t, profitability, asset growth, and accruals as explanatory variables adds nothing to high minus low average returns.

We emphasize throughout that there is one important issue on which our results are silent: whether the relations between average returns and B_t/M_t, profitability, asset growth, accruals, PT_t, and OH_t are due to rational or irrational pricing. To reiterate, the valuation equation (3) says that expected returns vary with rational assessments of expected profitability and growth (like those we measure) whether pricing is rational or irrational. Irrational beliefs about expected profitability and investment do affect expected returns, through their effects on the price M_t in B_t/M_t. Tests based implicitly or explicitly on the valuation equation, however, cannot reveal how the relation between average returns and B_t/M_t splits between differences in rational risks and the effects of irrational beliefs. In short, despite common claims to the contrary, tests of Eq. (3) cannot by themselves tell us whether the investor forecasts of profitability and investment that determine M_t are rational or irrational.

7. Appendix

The base accounting variables, from Compustat, are A_t, total assets (Compustat data item 6); Y_t, income before extraordinary items (18); AC_t, accruals [the change in current assets (4), minus the change in cash and short term investments (1), minus the change in current liabilities (5), plus the change in debt in current liabilities (34)]; D_t, total dividends [dividends per share by ex date (26) times common shares outstanding (25)]; and B_t, book equity [total assets (6), minus liabilities (181), plus balance sheet deferred taxes and investment tax credit (35) if available, minus preferred stock liquidating value (10) if available, or redemption value (56) if available, or carrying value (130)]. The accounting variables for year t are measured at the fiscal yearend that falls in calendar year t. Market capitalization MC_t (price times shares outstanding) is from CRSP.

We compute the book-to-market ratio for year t, B_t/M_t, as book equity for the fiscal yearend in calendar year t divided by market equity at the end of December of t. The market cap variable, ln MC_t, used to measure size in the profitability and growth regressions of Tables 1 and 2, is measured at the fiscal yearend. The market cap variable, ln MC_{t+1}, used to measure size in the Table 3 return regressions for July of t+1 to June of t+2 and when assigning firms to the six size-B_t/M_t portfolios at the end of June of t+1 in Table 4 is for the end of June of t+1.

We compute two summary measures of firm strength. The first, OH_t, is a measure of bankruptcy risk developed by Ohlson (1980). Ignoring the constant, OH_t is defined as

$$\begin{aligned} OH_t = & -4.07 \ln A_t + 6.03\, L_t/A_t - 1.43(CA_t - CL_t)/A_t + 0.0757\, CL_t/CA_t \\ & - 2.37\, NI_t/A_t + 0.285\, Loss_t - 1.72 NegBook_t - 0.521 \Delta NI_t - 1.83\, Op_t/L_t, \end{aligned} \tag{4}$$

where ln A_t is the natural log of assets; L_t is liabilities (Compustat item 181); CA_t is current assets (4); CL_t is current liabilities (5); NI_t is net income (1 7 2); $Loss_t$ is 1 if net income is negative in t and t-1, and 0 otherwise; $NegBook_t$ is 1 if liabilities exceed assets and 0 otherwise; ΔNI_t is the change in net income from t-1 to t divided by the sum of the absolute values of net income in t-1 and t, $(NI_t - NI_{t-1})/(|NI_{t-1}| + |NI_t|)$; and Op_t, funds from operations, is earnings before extraordinary items (18), plus income statement deferred taxes (50), if available, plus equity's share of depreciation expense, which we define as $MC_t/(A_t - B_t + MC_t)$ times total depreciation expense (14).

The second composite measure of firm strength, PT_t, is from Piotroski (2000). It is the sum of nine binary variables, each equal to 1 if a given condition holds and 0 otherwise. The nine conditions are: (1) income before extraordinary items, Y_t, is positive; (2) cashflow from operations, CFO_t, is positive; (3) the change in the return on assets, defined as income before extraordinary items at yearend divided by assets at the beginning of the year, Y_t/B_t, is positive; (4) cashflow from operations exceeds income before extraordinary items; (5) the change in leverage, defined as long-term debt at fiscal yearend (Compustat items 9 and 44) divided by assets at yearend, is negative; (6) the change in liquidity, defined as current assets divided by current liabilities, is positive; (7) the change in the gross margin ratio, defined as one minus the ratio of the cost of goods sold (41) to sales (12), is positive; (8) the change in turnover, defined as sales divided by beginning of year assets, is positive; and (9) the company has a positive cashflow from the sale of common and preferred (108). The changes are measured from year t-1 to t. If the Compustat format code for the statement of cashflows (310) indicates the company does report a statement of cashflows (format code 7), cashflow from operations, CFO_t, is net cash from operating activities (308). If the company reports a statement of working capital (format code 1), CFO_t is funds from operations, Op_t, minus other changes in working capital (236, if available). For other format codes, CFO_t is funds from operations, Op_t, plus other changes in working capital (if available). Because each binary variable is 0 if a condition does not hold, PT_t increases with firm strength.

Analyst earnings forecasts are from Thomson Financial's $I/B/E/S$ database. I_t is the median forecast of earnings per share for fiscal year t+1 that is available at the end of fiscal year t. (Using the forecasts for year t+2 or t+3 does not change the results materially.) I_t/B_t is the median forecast at the end of fiscal year t times the $I/B/E/S$ split factor for that month (to reverse adjustments $I/B/E/S$ makes for stock splits that occur after t) times the shares outstanding at t reported by Compustat (data item 25) divided by book equity for fiscal year t. We do not use an $I/B/E/S$ forecast if the split adjusted version of the stock price reported by $I/B/E/S$ at the end of the fiscal year differs by more than 5% from the price reported by CRSP.

All variables except ln MC_t and ln A_t (in OH_t) are on a per share basis. We use CRSP's share factor ($FACSHR$) for stock splits and stock dividends (distribution codes 5510-5559) to adjust nonsynchronous variables, such as Y_{t+1}/B_t and dA_{t+1}/A_t.

To reduce the influence of outliers, we delete a firm from the year t profitability and growth regressions of Tables 1 and 2 if an explanatory variable is outside the 0.5 or 99.5 percentile for that variable in year t. But we do not delete firms with extreme values when computing the fitted values from the profitability and growth regressions for use as explanatory variables in the return regressions of Table 3. Instead, we winsorize the explanatory variables in the first-pass regressions at the 0.5% level, shrinking extreme values to the 0.5 and 99.5 percentiles for year t. Thus we delete firms with variables outside the 0.5 and 99.5 percentiles when estimating the profitability and growth regressions, but we shrink extreme values when estimating expected profitability and growth for the return regressions. We consider only the upper or lower bound for one-sided variables, such as $+AC_t/B_t$ and $-AC_t/B_t$. We also winsorize other independent variables in the return regressions at the 0.5 and 99.5 percentiles.

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