Earnings Expectations and Corporate Investment

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Abstract

We study the connection between earnings expectations and U.S. aggregate corporate investment. Theory predicts that investment should be high when expected profitability is high. We show, however, that investment is more tightly linked to past earnings than to future earnings. Investment responds positively, with a significant delay, to an increase in profits and profitability but has no relation to future profitability and a strong negative relation to future profit growth. Investment is also only weakly related to earnings forecasts from the Survey of Professional Forecasters. Overall, our evidence suggests that managers are backward looking and overreact to transitory changes in earnings.

1. Introduction

Earnings expectations play a central role in theories of corporate investment. In traditional models, managers are rational, and higher expected profitability leads to higher investment. However, a number of studies argue that managers' biases may also be important. For example, Malmendier and Tate (2005) find that CEO overconfidence distorts investment, while Greenwood and Hanson (2015) and Gennaioli, Ma, and Shleifer (2016) provide evidence that managers overextrapolate from recent profitability when making investment decisions.

Our paper studies the connection between earnings expectations and U.S. aggregate corporate investment, building on the arguments of Greenwood and Hanson (2015) and Gennaioli, Ma, and Shleifer (2016). In particular, we test the simple proposition that the well-established link between aggregate investment and recent (past) earnings reflects the fact that recent earnings are a proxy for rational beliefs about profitability going forward. We provide evidence to the contrary: Investment has little connection to subsequent profitability and, in fact, higher investment is actually associated with lower future profits in many of our tests.

To begin, we replicate the findings of earlier studies that investment is positively related to past profits and stock returns. From 1952–2016, annual profit growth and market returns together predict 44% of the variation in next year's investment growth. At a quarterly frequency, investment seems to respond with a significant lag to past performance, with high investment growth for up to six quarters after high profit growth or high stock returns. These results suggest that managers' beliefs about investment opportunities are tightly linked to recent performance.

In contrast, investment is negatively related to future profit growth. By itself, investment growth predicts, with a negative sign, 17% of the variation in next year's profit growth. A 10% increase in annual investment is associated with 13% lower profits over the subsequent year and 18% lower profits over two

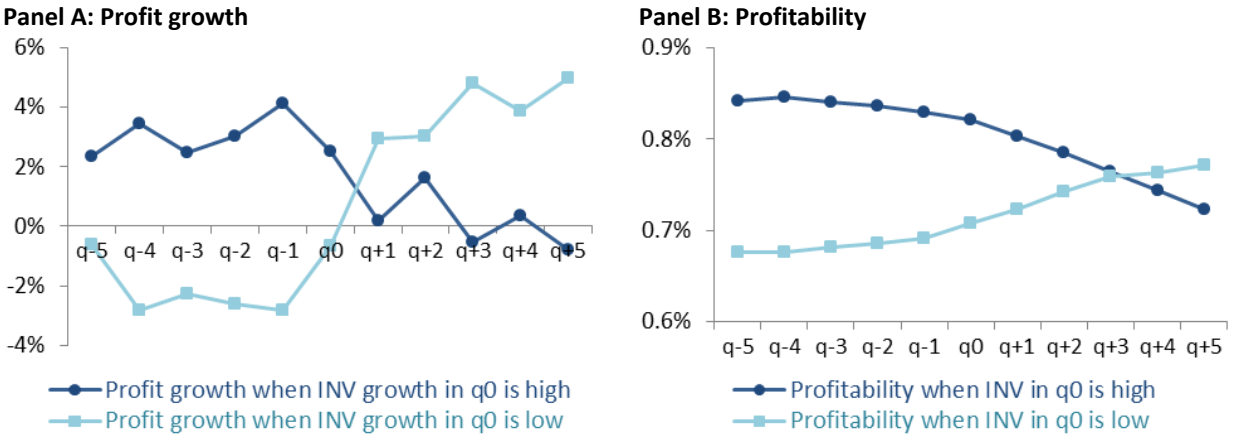


Fig. 1. Panel A shows profit growth in the quarters leading up to and following high or low investment growth. Panel B shows the level of profitability in the quarters leading up to and following high or low investment (profits and investment are both scaled by lagged total assets). Quarters (q0) with high and low investment (growth or levels) represent the top and bottom quartiles, respectively, of the historical distribution from 1952–2016. Investment, profits, and assets come from the seasonally adjusted Flow of Funds accounts for nonfinancial corporations.

years (both highly significant).

Similarly, in levels, investment is significantly positively related to recent profitability but, because profit growth is low going forward, high investment forecasts a rapid drop in profitability to mediocre levels within a few quarters.

These findings are illustrated in the graphs above, which show the evolution of profits and profitability in the quarters leading up to and following quarters (q0) with high or low investment. The dark lines show how profits evolve when investment in q0 is high, while the light lines show how profits evolve when investment in q0 is low. ('High' and 'low' investment represent the top and bottom quartiles, respectively, of the historical distribution from 1952–2016; the data come from the U.S. Flow of Funds accounts and are described in detail later.)

In Panel A, profit growth is high before a jump in investment and low before an investment decline. But the pattern reverses in the subsequent year; in fact, the differential between profit growth following high versus low investment almost fully offsets the differential leading up to investment. The results are

consistent with the idea that managers are backward looking and react to transitory changes in earnings (Greenwood and Hanson 2015; Gennaioli, Ma, and Shleifer 2016).

Panel B of Fig. 1 shows a similar relation for profit and investment levels (both scaled by total assets). Investment is high when profitability has been high, but the link between investment and profitability vanishes within a few quarters following investment. Put differently, there is no evidence that investment is positively related to rational expectations of future profitability, contrary to the most basic prediction of standard q-theoretic models (see Section 2).

We also report tests using earnings forecasts from the Survey of Professional Forecasters. First, we show that SPF earnings forecasts are informative about future earnings growth, with a predictive slope greater than but insignificantly different from one. Second, SPF forecasts have modest explanatory power for investment after controlling for recent profit growth and stock returns, but the impact on the regression R^2 is small. This result again suggests that investment is more tightly linked to prior profits than to expectations of future profits. Third, SPF forecasts only partially reflect the negative relation between investment and subsequent profits, i.e., SPF forecast errors are predictably related to recent investment. Our results suggest that SPF forecasters, like managers, do not fully recognize that profitability mean reverts quickly following higher investment.

Finally, we study the link between investment and subsequent stock returns. The negative relation between investment and future profits suggests that higher investment, when revealed to the market, might be associated with bad news and low stock returns. In fact, we find some evidence that higher investment in quarter t predicts low stock returns in quarters t+1 and t+2, when investment data likely become public, but the results are only borderline significant (t-statistics right around -2). We also find some evidence that investment predicts returns over longer horizons, consistent with the predicted relation between investment and discount rates.

Our paper contributes to the large literature on the connections between earnings, q, and investment. Our tests with prior profits and stock returns update the findings of Barro (1990), Morck, Shleifer, and Vishny (1990) and Blanchard, Rhee, and Summers (1993), among others, who study the relative importance of profits and stock prices for investment. In our tests, both variables are highly significant and have similar predictive power for investment.

Fewer studies investigate how investment relates to future earnings and earnings expectations. Gilchrist and Himmelberg (1995) and Cummins, Hassett, and Oliner (2006) find that firm-level investment is positively related to forecasted profits (fitted values from a VAR or analyst forecasts), but neither paper studies aggregate investment or tests whether investment relates to actual future profits. In the accounting literature, Fairfield, Whisenant, and Yohn (2003), Richardson et al. (2005), Lewellen and Resutek (2016), and others show that firm-level investment is positively related to future profitability but negatively related to future changes in profits.

Our conclusions are most closely related to Greenwood and Hanson (2015) and Gennaioli, Ma, and Shleifer (2016). Greenwood and Hanson show that profits in the dry bulk shipping industry are volatile and mean reverting, yet ship prices and capital expenditures do not seem to recognize the transitory nature of profits. Gennaioli, Ma, and Shleifer show that firms' investment decisions are closely tied to survey-based earnings expectations that are not fully rational. Like us, both papers suggest that managers overextrapolate from recent profitability when making investment decisions, though neither paper explicitly studies the link between investment and subsequent profits.

The remainder of the paper is organized as follows: Section 2 provides theoretical background for our tests; Section 3 describes the data; Section 4 studies how investment relates to past and future earnings; Section 5 studies how investment relates to SPF earnings forecasts; Section 6 studies how investment relates to stock returns. Section 7 concludes.

2. Motivating framework

To set the stage for our tests, we begin with some basic predictions about the relation between investment, profits, and stock returns. Our analysis assumes that managers maximize the value of firm based on their expectations, which may or may not be rational.

In the simplest setting, managers choose investment, I_t, at the beginning of the period to maximize the present value of expected payouts discounted at a constant rate. A firm's operating cash flow, $Y_t = Y(K_t)$, depends on its existing capital stock K_t, and its (end-of-period) payout equals cash flow net of investment and adjustment costs associated with investment, $C_t = C(I_t, K_t)$. The value of the firm equals

$$V_t = \sum_{j\geq 0} \beta^{j+1} E_t[Y(K_{t+j}) - I_{t+j} - C(I_{t+j}, K_{t+j})], \quad (1)$$

given expectations $E_t[\cdot]$ at the beginning of period t. Capital evolves according to $K_{t+1} = (1-\delta) K_t + I_t$, where δ is the depreciation rate. Assuming constant returns to scale and quadratic adjustment costs, $C(I_t,K_t) = b\,(I_t/K_t - s)^2 K_t$ for some parameters b and s, the firm's optimal investment policy has the familiar form (Hayashi 1982):

$$I_t/K_t = c_1 + c_2\, Q_t, \quad (2)$$

where $c_2 > 0$ and $Q_t \equiv E_t[V_{t+1}/K_{t+1}]$ is the value of an additional dollar of capital. Alternatively, we can write eq. (2) in terms of expected future profits, $\Pi_{t+j} \equiv Y_{t+j} - \delta K_{t+j} - C_{t+j}$, using the fact that the value-to-book ratio, V_t/K_t, is mechanically related to future profitability $ROA_{t+j} \equiv \Pi_{t+j}/K_{t+j}$ and future stock returns r_{t+j} (e.g., Abel and Blanchard 1986; Lettau and Ludvigson 2002; Vuolteenaho 2002):

$$V_t/K_t \approx \sum_{j\geq 0} \rho^j E_t[ROA_{t+j} - r_{t+j}], \quad (3)$$

for some linearization constant $\rho < 1$. Eqs. (2) and (3) together imply

$$I_t/K_t \approx c_3 + c_4 \sum_{j\geq 1} \rho^{j-1} E_t[ROA_{t+j} - r_{t+j}]. \quad (4)$$

Eq. (4) captures the key intuition that investment should be positively related to expected profitability and negatively related to expected stock returns (discount rates). We explore the latter effect in our empirical

tests but, given the difficulty in measuring expected stock returns, our primary interest in this paper is on the link between investment and future earnings.

Eq. (4) focuses on the level of investment and profitability. The empirical literature sometimes studies changes or growth rates instead. Following Gennaioli, Ma, and Shleifer (2016), suppose expected stock returns are constant and the weighted sum of expected future profitability in eq. (4) is captured well by the one-step-ahead forecast $E_t[\Pi_t/K_t]$. In this case,

$$I_t/K_t \approx c_5 + c_6\, E_t[\Pi_t/K_t]. \quad (5)$$

Taking a log-linear approximation of an equation similar to eq. (5), Gennaioli, Ma, and Shleifer show that investment growth can be expressed as

$$\log(I_t/I_{t-1}) \approx c_7\, E_t[\log(\Pi_t/\Pi_{t-1})] + c_8 \log(K_t/K_{t-1}). \quad (6)$$

Eq. (6) says that investment growth should be tied to expected profit growth: investment increases when profits are expected to go up because profitability will be higher going forward. (The last term in the equation controls for changes in the capital stock and has little impact on our results.) As Gennaioli, Ma, and Shleifer observe, this specification is similar to the investment growth regressions in a number of studies.

Eq. (6) can be extended to encompass profit growth over longer windows—replacing profit growth in period t with profit growth over several periods, $\log(\Pi_{t+j}/\Pi_{t-1})$—in order to test whether investment is related to longer-term changes in profits. This specification follows from the analysis above by either adapting eq. (5) to focus on longer-term profit expectations, $E_t[\Pi_{t+j}/K_t]$, or recognizing that investment growth is positively related to both future profitability, Π_{t+j}/K_{t+j}, and future capital, implying that it should also be positively related to the future profit growth.

The analysis above implicitly focuses on *managers'* expectations of profits and stock returns. If

managers' expectations are rational, and investment decisions line up with the q-theoretic predictions above, the link between investment and expected earnings in eqs. (4) and (6) should show up as a positive relation between investment and actual future earnings. The alternative we consider, following Greenwood and Hanson (2015) and Gennaioli, Ma, and Shleifer (2016), is that managers are biased because they overreact to transitory changes in earnings, in which case their expectations will line up with past, but not necessarily future, earnings.

3. Data

Aggregate investment and profits come from the U.S. Federal Reserve's Flow of Funds accounts. We focus on real, inflation-adjusted fixed investment and after-tax profits for nonfinancial corporations (from table F.103), available quarterly since 1952. In levels, investment and profitability are scaled by lagged total assets valued at replacement cost (from table B.103).[1]

Stock returns come from the Center for Research in Security Prices (CRSP). Returns are measured either in real terms or net of the 3-month Tbill rate, depending on the test.

Our tests also use earnings forecasts from the Survey of Professional Forecasters (SPF), a well-known source of macroeconomic forecasts since 1968q4.[2] In the second month of each quarter, after release of the 'advance report' of prior-quarter GDP, SPF participants provide forecasts of nominal after-tax corporate profits (and other variables) for the current and subsequent four quarters. We convert these forecasts into real terms using inflation expectations from the same survey. The SPF measure of corporate profits differs from our main profit series, but the series' ex post growth rates are highly correlated (0.91 in annual data) and their expected growth rates are likely to be similar as well. Indeed,

[1] Profits exclude foreign earnings retained abroad, so, for consistency, we also exclude direct investment abroad from total assets. Our results are similar if we include direct investment abroad or scale by other measures of capital (e.g., property, plant, and equipment or net worth).

[2] A list of academic articles using the survey data can be found at https://www.philadelphiafed.org/research-and-data/real-time-center/survey-of-professional-forecasters/academic-bibliography.

Table 1

Summary statistics, 1952–2016

This table summarizes the time-series properties of the variables (average, median, standard deviation, minimum, maximum, and autocorrelation). Data are quarterly, in percent, and inflation adjusted. Corporate investment and profits come from the Federal Reserve's seasonally adjusted Flow of Funds accounts for nonfinancial corporations (table F.103); in levels, the variables are scaled by lagged total assets (table B.103). Value-weighted stock returns come from CRSP. SPF forecasts of profit growth come from the Federal Reserve Bank of Philadelphia.

Variable	Description	Avg	Med	Std	Min	Max	Auto
Capx	Fixed investment / total assets	1.43	1.39	0.17	1.10	1.81	0.98
NI	After-tax profits / total assets	0.72	0.74	0.22	0.17	1.17	0.96
dCapx	Growth rate of fixed investment	0.83	0.98	2.50	-10.63	7.89	0.45
dNI	Growth rate of after-tax profits	1.07	1.18	8.99	-39.69	44.10	0.16
SPF	SPF forecast of t+1 profit growth*	0.65	0.81	2.30	-8.90	7.02	0.64
dNI	Growth rate of after-tax profits*	1.02	1.10	9.44	-39.69	44.10	0.17
MKT	Stock market returns	2.04	3.02	8.26	-26.98	22.36	0.09

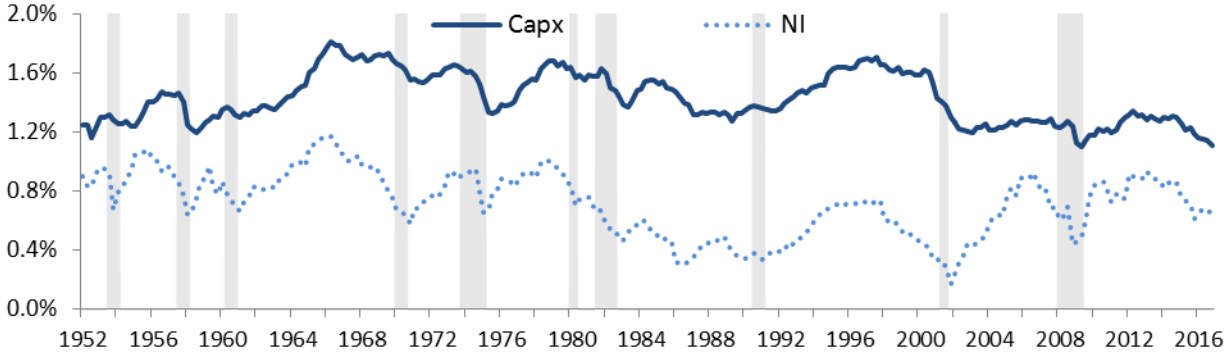
*1969–2016

we will see that SPF forecasts do a good job forecasting earnings growth in our data.

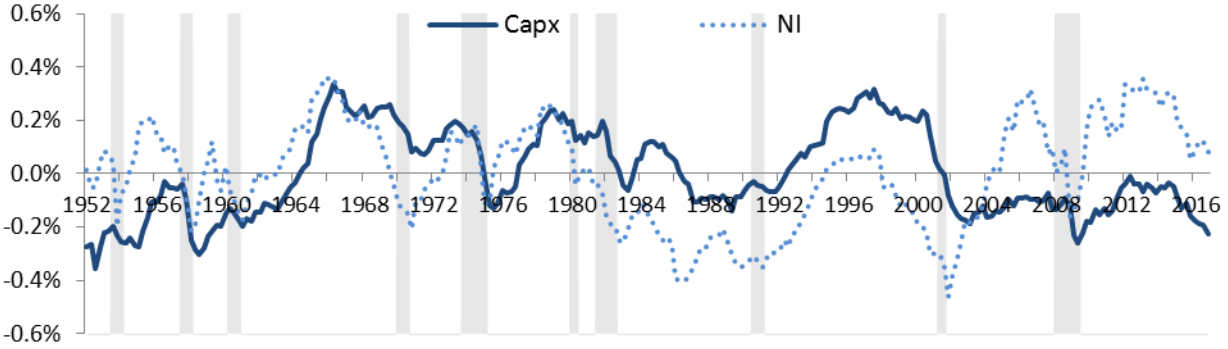
Table 1 reports summary statistics for the variables, and Fig. 2 plots the time series of investment and profits. Quarterly investment averages 1.43% of assets and quarterly profitability averages 0.72%. Both series are highly persistent and trend modestly downward during the sample. Investment reaches a high of 1.81% in 1966 and a low of 1.10% in 2009 at the end of the financial crisis. More generally, investment shows a clear business-cycle pattern, growing in expansions and dropping in recessions. One notable pattern, foreshadowing our later results, is that the largest declines in investment occur at the end of recessions, just as the economy starts to rebound.

Profits are always lower than investment and tend to be more volatile, with a standard deviation of 0.22% in levels and 8.99% in growth rates (compared with 0.17% and 2.50%, respectively, for investment). Quarterly profitability reaches a high of 1.17% in 1965 and a low of 0.17% at the end of 2001, reflecting in part the downward trend in profitability through time. Profits exhibit a clear business-cycle pattern and a clear correlation with investment, though we will show later that changes in investment typically lag changes in profits.

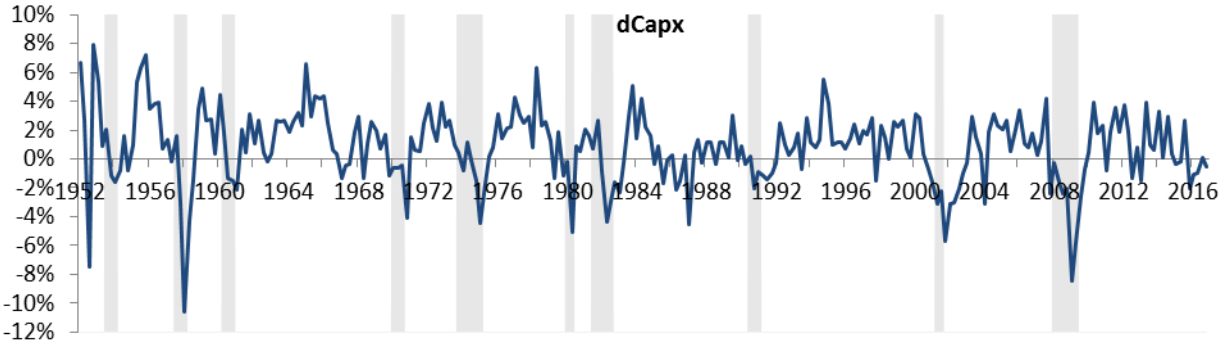
Panel A: Investment and profitability



Panel B: Detrended investment and profitability (removing a time trend)



Panel C: Investment growth



Panel D: Profit growth

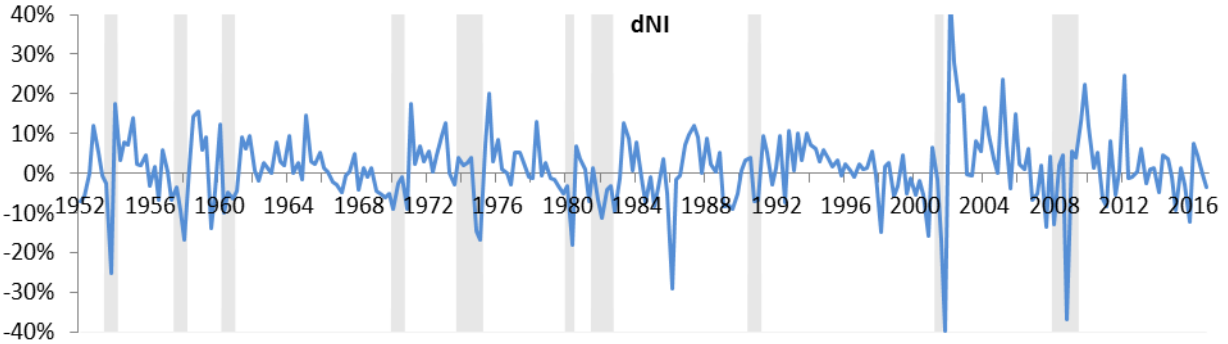


Fig. 2. Quarterly fixed investment (Capx) and after-tax profits (NI) for nonfinancial corporations from 1952–2016. In panels A and B, Capx and NI are scaled by lagged total assets. Data come from the Federal Reserve's seasonally-adjusted Flow of Funds accounts. Shaded regions indicate NBER recessions.

The downward trend in investment and profitability is a potential concern for some of our tests—and one of the reasons that we, like earlier work, study both growth rates and levels. As a robustness check, we also report tests using detrended variables, measured as the residuals when investment and profitability are regressed on a time trend. The detrended series are plotted in panel B of Fig. 2.

Earnings forecasts from the Survey of Professional Forecasters are discussed in more detail later, but Table 1 shows that they tend to underestimate actual profit growth: average forecasted growth is 0.65% quarterly, compared with actual earnings growth of 1.02% during the same time period. This result is largely attributable to the difference between our measure of corporate profits and the one used by the SPF survey, which has grown more slowly—by 0.27% per quarter—than our variable. For our purposes, the average growth rate is less important than the ability of SPF forecasts to predict variation in profit growth through time.

4. Investment and earnings

In this section, we study the link between investment and earnings. The goal is to understand how strongly investment relates to recent performance and whether investment decisions are truly forward looking, i.e., predictive of future earnings.

As a first step, Table 2 provides a basic overview of how investment correlates with past, current, and future earnings. The left-hand columns focus on the level of investment and profits (Capx and NI) and the right-hand columns focus on growth rates (dCapx and dNI). The data are quarterly, but growth rates are compounded over four quarters (on a rolling basis).

Table 2 illustrates several key facts that lie at the heart of the paper. First, in column (1), investment is positively related to past earnings: a one percentage point increase in profitability predicts a 0.27 percentage point increase in the investment rate four quarters later, while a one percentage point increase

Table 2

Investment and earnings, 1952–2016

This table reports slopes, t-statistics, and R^2s when the level (Capx) or growth (dCapx) of investment is regressed on past, contemporaneous, or subsequent profitability (NI) or profit growth (dNI). The data are quarterly but growth rates are rolling 4-quarter sums. Corporate investment and profits come from the Federal Reserve's seasonally adjusted Flow of Funds accounts for nonfinancial corporations (table F.103); in levels, the variables are scaled by lagged total assets (table B.103). Newey-West t-statistics, below the point estimates, adjust for 12 lags of autocorrelation.

	$Capx_t$ regressed on profitability levels					$dCapx_{t-3,t}$ regressed on profit growth			
	(1)	(2)	(3)	(4)		(1)	(2)	(3)	(4)
NI_{t-4}	0.27			0.26	$dNI_{t-7,t-4}$	0.15			0.14
	2.37			1.87		3.94			4.24
NI_t		0.20		0.32	$dNI_{t-3,t}$		0.07		0.07
		1.74		2.85			1.76		2.02
NI_{t+4}			0.02	-0.40	$dNI_{t+1,t+4}$			-0.13	-0.12
			0.19	-3.08				-6.46	-5.83
R^2	0.11	0.06	0.00	0.20	R^2	0.21	0.05	0.17	0.40

in annual profit growth predicts a 0.15 percentage point increase in next year's investment growth. At the same time, in column (3), investment is uncorrelated with future profitability and negatively related to future profit growth. In fact, the negative correlation between investment growth and subsequent profit growth (R^2 of 0.17, with a t-statistic of -6.46) is nearly as strong as the positive relation between investment growth and prior profit growth (R^2 of 0.21, with a t-statistic of 3.94). The results provide the first clue that investment decisions are linked to recent profitability but not to rational forecasts of future profitability, contrary to one of the basic predictions of q theory.

4.1. Investment and past profits

One message from Table 2 is that investment is significantly related to past earnings, consistent with prior research (e.g., Barro 1990; Morck, Shleifer, and Vishny 1990; Blanchard, Rhee, and Summers 1993). Tables 3 and 4 study in more detail how investment evolves following a change in earnings, focusing on investment in the subsequent two years.

Table 3 reports tests using growth rates (quarterly and annual). We regress investment growth in period t+k, $dCapx_{t+k}$, on lagged profit growth dNI_t, lagged market returns MKT_t, and lagged investment growth

Table 3

Profit growth and future investment growth, 1952–2016

This table reports slopes, t-statistics, and R^2s when investment growth (dCapx) is regressed on contemporaneous and past profit growth (dNI) and stock returns (MKT). The left-hand columns focus on quarterly growth and returns, while the right-hand columns focus on annual growth and returns (4-quarter rolling windows). Corporate investment and profits come from the Federal Reserve's seasonally adjusted Flow of Funds accounts for nonfinancial corporations (table F.103) and stock returns come from CRSP. Newey-West t-statistics, below the point estimates, adjust for 8 lags of autocorrelation. Boldface indicates slopes that are more than 1.96 standard errors from zero.

	Quarterly growth							Annual growth		
	$dCapx_t$	$dCapx_{t+1}$	$dCapx_{t+2}$	$dCapx_{t+3}$	$dCapx_{t+4}$	$dCapx_{t+5}$	$dCapx_{t+6}$	$dCapx_t$	$dCapx_{t+1}$	$dCapx_{t+2}$
$dCapx_{t+k}$ regressed on dNI_t										
dNI_t	**0.05**	**0.09**	**0.07**	**0.06**	**0.06**	**0.04**	0.02	0.07	**0.15**	0.04
	2.13	3.13	3.49	4.06	3.83	3.31	1.14	1.71	3.66	1.57
R^2	0.03	0.10	0.06	0.05	0.06	0.02	0.00	0.05	0.21	0.01
$dCapx_{t+k}$ regressed on dNI_t and MKT_t										
dNI_t	**0.05**	**0.09**	**0.07**	**0.06**	**0.07**	**0.04**	0.02	0.07	**0.13**	0.04
	2.11	3.41	3.90	4.69	3.93	3.42	1.17	1.57	4.34	1.54
MKT_t	-0.01	**0.05**	**0.07**	**0.08**	**0.08**	**0.05**	**0.05**	0.01	**0.20**	0.00
	-0.70	2.44	3.61	4.06	4.37	3.25	3.10	0.22	6.55	-0.06
R^2	0.03	0.12	0.12	0.11	0.13	0.05	0.03	0.04	0.44	0.01
$dCapx_{t+k}$ regressed on dNI_t, MKT_t, and $dCapx_t$										
dNI_t	**0.05**	**0.07**	**0.06**	**0.05**	**0.06**	**0.05**	0.02	0.07	**0.12**	**0.06**
	2.11	3.24	3.58	4.11	4.06	3.56	1.46	1.57	4.48	2.00
MKT_t	-0.01	**0.05**	**0.08**	**0.08**	**0.08**	**0.05**	**0.05**	0.01	**0.20**	0.00
	-0.70	3.03	3.86	4.16	4.38	3.18	2.94	0.22	6.72	0.05
$dCapx_t$	.	**0.41**	**0.27**	**0.19**	0.02	-0.04	-0.12	.	0.07	**-0.31**
	.	4.38	2.82	2.51	0.33	-0.73	-1.89	.	0.78	-3.09
R^2	0.03	0.29	0.18	0.14	0.12	0.05	0.04	0.04	0.45	0.10

$dCapx_t$. Market returns are included as a simple control for discount-rate shocks—a drop in discount rates should push up stock prices and investment—and as a proxy for changes in q (Barro 1990 argues that stock returns are a better proxy than changes in actual measures of q). Lagged investment growth is included in the bottom panel to absorb any persistence in investment growth, potentially important if investment decisions take several quarters to implement.

Investment is strongly related to recent profit growth and stock returns. Focusing on the middle panel, higher quarterly profits are associated with a contemporaneous increase in investment (t-statistic of 2.11) and additional investment growth in the subsequent five quarters (t-statistics of 3.41 to 4.69). The effect

is strongest in quarter t+1, for which a 1% increase in profits predicts a 0.09% increase in investment. Summing the slopes across quarters, a 1% increase in profits today predicts 0.40% higher investment in quarter t+6 (or 0.35% if we leave out the contemporaneous effect).

Stock returns also predict investment growth for up to six quarters. The predictive power is strongest in quarters t+3 and t+4, but the slopes for all six quarters are highly significant, with t-statistics of 2.44–4.37. A 10% increase in stock prices forecasts 0.5–0.8% of additional investment growth in each quarter t+1 to t+6, cumulating to 3.8% of additional investment in quarter t+6.

At the annual horizon, in the right-hand columns of Table 3, profit growth alone predicts 21% of the variation in next year's investment growth, and profit growth and stock returns together predict 44% of the variation in next year's investment growth.

Table 4 repeats the analysis for the level of investment and profits (scaled by assets).[3] The results are similar to those for growth rates: Investment is significantly positively related to recent profitability and stock returns, with an effect that peaks around quarter t+4 for profitability and t+6 for stock returns. The results are stronger when we include four-quarter lagged investment in the regressions, which helps control for the slow-moving component of investment that is largely unrelated to recent profits and stock returns (the slopes on NI and MKT in the middle and bottom panels are very similar but the t-statistics in the bottom panel are higher).

The takeaway from Tables 3 and 4 is that managers' beliefs about investment opportunities, as reflected in their investment decisions, are strongly linked to recent performance. Investment increases quickly following a change in profits and stock prices but takes up to a year and half to fully adjust, consistent with the idea that there are significant lags in the investment process. The key question we address next is

[3] We report results only using quarterly data in Table 4 because the high persistence of investment and profit levels makes the distinction between quarterly and annual data less interesting.

Table 4

Profitability and future investment, 1952–2016

This table reports slopes, t-statistics, and R^2s when quarterly investment (Capx, scaled by total assets) is regressed on contemporaneous and past quarterly profitability (NI) and stock returns (MKT). Corporate investment, profits, and assets come from the Federal Reserve's seasonally adjusted Flow of Funds accounts for nonfinancial corporations (tables F.103 and B.103) and stock returns come from CRSP. Newey-West t-statistics, below the point estimates, adjust for 12 lags of autocorrelation. Boldface indicates slopes that are more than 1.96 standard errors from zero.

	Quarterly investment (levels)										
	$Capx_t$	$Capx_{t+1}$	$Capx_{t+2}$	$Capx_{t+3}$	$Capx_{t+4}$	$Capx_{t+5}$	$Capx_{t+6}$	…	$Capx_{t+8}$	$Capx_{t+12}$	$Capx_{t+16}$
$Capx_{t+k}$ regressed on NI_t											
NI_t	0.20	**0.23**	**0.25**	**0.26**	**0.27**	**0.26**	**0.25**		0.23	0.19	0.18
	1.74	2.08	2.25	2.35	2.37	2.27	2.13		1.81	1.40	1.31
R^2	0.06	0.08	0.10	0.11	0.11	0.11	0.10		0.08	0.06	0.05
*$Capx_{t+k}$ regressed on NI_t and MKT_t**											
NI_t	0.20	**0.23**	**0.25**	**0.26**	**0.27**	**0.26**	**0.25**		0.23	0.19	0.18
	1.74	2.08	2.25	2.36	2.38	2.29	2.16		1.83	1.40	1.30
MKT_t	-0.17	-0.12	-0.03	0.06	0.13	0.18	**0.22**		0.18	0.02	-0.08
	-1.37	-1.00	-0.27	0.55	1.36	1.85	2.33		1.91	0.23	-0.85
R^2	0.06	0.08	0.10	0.11	0.11	0.11	0.11		0.09	0.05	0.05
$Capx_{t+k}$ regressed on NI_t, MKT_t, and $Capx_t$*											
NI_t	**0.19**	**0.23**	**0.25**	**0.26**	**0.26**	**0.26**	**0.25**		**0.23**	0.19	0.17
	4.11	4.05	3.79	3.49	3.21	2.89	2.58		2.04	1.40	1.21
MKT_t	-0.11	-0.07	0.02	0.11	**0.18**	**0.22**	**0.26**		**0.23**	0.05	-0.07
	-1.52	-0.90	0.28	1.38	2.27	2.60	3.06		2.26	0.60	-0.73
$Capx_{t-4}$	**0.86**	**0.81**	**0.76**	**0.72**	**0.68**	**0.64**	**0.60**		**0.53**	**0.41**	0.29
	18.98	14.73	12.24	10.49	9.15	8.12	7.30		5.71	3.29	1.87
R^2	0.80	0.74	0.67	0.62	0.57	0.52	0.47		0.37	0.22	0.13

*MKT slopes are multipled by 100.

whether the apparent reaction to past performance is actually forward looking, especially given the delays in investment: Do managers anticipate how future profits will evolve by the time investment decisions are implemented and investment becomes productive?

4.2. Investment and future profits

Tables 5 and 6 look at this question in detail. We reverse the regressions above to test whether investment is related to future profitability (Table 5) and profit growth (Table 6). In these tests, investment is the independent variable, used to predict profitability and profit growth over the subsequent few years.

Table 5

Investment and future profitability, 1952–2016

This table reports slopes, t-statistics, and R^2s when quarterly profitability (NI, scaled by total assets) is regressed on contemporaneous and past quarterly investment (Capx) and stock returns (MKT). In the second panel, NI and Capx are detrended by regressing both on a time trend. Corporate investment, profits, and assets come from the Federal Reserve's seasonally adjusted Flow of Funds accounts for nonfinancial corporations (tables F.103 and B.103) and stock returns come from CRSP. Newey-West t-statistics, below the point estimates, adjust for 12 lags of autocorrelation. Boldface indicates slopes that are more than 1.96 standard errors from zero.

	Quarterly profitability										
	NI_t	NI_{t+1}	NI_{t+2}	NI_{t+3}	NI_{t+4}	NI_{t+5}	NI_{t+6}	...	NI_{t+8}	NI_{t+12}	NI_{t+16}
NI_{t+k} regressed on $Capx_t$											
$Capx_t$	0.32	0.24	0.17	0.10	0.04	-0.01	-0.06		-0.16	-0.31	-0.38
	1.70	1.27	0.86	0.48	0.19	-0.06	-0.31		-0.80	-1.60	-1.86
R^2	0.06	0.03	0.01	0.00	0.00	0.00	0.00		0.01	0.05	0.08
Detrended NI_{t+k} regressed on detrended $Capx_t$											
$Capx_t$	0.17	0.09	0.01	-0.06	-0.12	-0.17	-0.21		-0.31	**-0.45**	**-0.50**
	1.12	0.59	0.07	-0.40	-0.75	-1.04	-1.32		-1.90	-2.80	-2.97
R^2	0.02	0.00	0.00	0.00	0.01	0.02	0.03		0.06	0.14	0.17
*NI_{t+k} regressed on $Capx_t$ and MKT_t**											
$Capx_t$	0.32	0.25	0.18	0.11	0.05	0.00	-0.06		-0.16	-0.32	**-0.40**
	1.69	1.29	0.91	0.54	0.24	-0.02	-0.29		-0.81	-1.66	-1.99
MKT_t	0.00	0.13	0.26	0.27	0.23	0.18	0.07		-0.09	-0.22	**-0.39**
	-0.02	0.73	1.52	1.50	1.37	1.18	0.44		-0.64	-1.71	-3.08
R^2	0.06	0.03	0.02	0.01	0.00	0.00	-0.01		0.01	0.06	0.10
NI_{t+k} regressed on $Capx_t$, MKT_t, and NI_{t-4}*											
$Capx_t$	-0.01	-0.07	-0.13	-0.19	-0.25	**-0.31**	**-0.36**		**-0.44**	**-0.55**	**-0.62**
	-0.16	-0.68	-1.11	-1.47	-1.72	-1.99	-2.21		-2.58	-3.30	-3.54
MKT_t	-0.03	0.11	**0.24**	**0.25**	0.22	0.16	0.03		-0.12	**-0.25**	**-0.40**
	-0.27	0.87	1.97	2.04	1.96	1.70	0.41		-1.37	-2.36	-3.74
NI_{t-4}	**0.82**	**0.79**	**0.77**	**0.74**	**0.71**	**0.69**	**0.66**		**0.61**	**0.52**	**0.47**
	11.95	9.96	8.46	7.18	6.19	5.49	4.96		4.23	3.69	3.45
R^2	0.67	0.60	0.56	0.50	0.46	0.42	0.39		0.33	0.29	0.29

*MKT slopes are multipled by 100.

We begin with level regressions in Table 5, which provide the most direct test of whether high investment is associated with high future profitability (eq. 4). In the top panel, investment is weakly related to contemporaneous profitability but insignificantly related to future profitability at any horizon out to quarter t+16. The slope on investment is (insignificantly) positive for a few quarters but drops below zero by quarter t+5 and becomes more negative as the forecast horizon grows. (In eq. 4, the weighted sum of future profitability from t+1 to t+16, using $\rho = 0.99$, is insignificantly negatively related to $Capx_t$, with a

t-statistic of -0.62.) In short, we find no evidence that investment is positively related to rational expectations of future profitability.

It is worthwhile to note that the lack of a significant positive slope is not due to low power. For example, if we repeat the regressions using *prior* profitability as the dependent variable instead of future profitability, the slope on investment is, in fact, significantly positive for many quarters (t-1 to t-6), consistent with the evidence in Table 4. This suggests that the regressions have enough power to detect a relation if it exists. In addition, the slopes in Table 5 are not just insignificant but actually negative for many horizons and more than one standard error below zero after t+8.

The second panel of Table 5 reports similar results when we remove time trends from investment and profitability (by regressing the variables on a time trend). The slopes for all horizons are somewhat lower (less positive or more negative) than those in the top panel, implying that, if anything, the time trend in the variables inflates any link between investment and future profitability. In fact, with detrended variables, investment is significantly negatively related to profitability in quarters t+9 and beyond, and the weighted sum of future profitability from t+1 to t+16 (using $\rho = 0.99$ in eq. 4) is 1.56 standard errors below zero (untabulated).

The third panel in Table 5 shows that adding stock returns to regressions, as a simple control for discount-rate shocks, has little impact on the results. In unreported regressions, we also find very similar results with 1- and 2-year lagged annual stock returns in the regressions.

The bottom panel, with lagged profitability added to the regressions, explores a somewhat different question. The most direct interpretation is that, controlling for recent profitability (four quarters prior), high investment is negatively related to future profitability at all horizons, with statistical significance after quarter t+4. A one percentage point increase in investment relative to assets, over and above what would be expected given past profitability, is associated with 0.3–0.6% lower profitability in quarters t+5

Table 6

Investment and future profit growth, 1952–2016

This table reports slopes, t-statistics, and R^2s when profit growth (dNI) is regressed on contemporaneous and past investment growth (dCapx) and stock returns (MKT). The left-hand columns focus on quarterly growth and returns, while the right-hand columns focus on annual growth and returns (4-quarter rolling windows). Corporate investment and profits come from the Federal Reserve's seasonally adjusted Flow of Funds accounts for nonfinancial corporations (table F.103) and stock returns come from CRSP. Newey-West t-statistics, below the point estimates, adjust for 8 lags of autocorrelation. Boldface indicates slopes that are more than 1.96 standard errors from zero.

	Quarterly growth							Annual growth		
	dNI_t	dNI_{t+1}	dNI_{t+2}	dNI_{t+3}	dNI_{t+4}	dNI_{t+5}	dNI_{t+6}	dNI_t	dNI_{t+1}	dNI_{t+2}
dNI_{t+k} regressed on $dCapx_t$										
$dCapx_t$	**0.65**	-0.44	**-0.53**	**-0.91**	**-0.60**	-0.51	**-0.62**	**0.69**	**-1.28**	-0.56
	2.74	-1.85	-2.13	-3.98	-2.86	-1.56	-2.47	2.50	-4.23	-1.83
R^2	0.03	0.01	0.02	0.06	0.03	0.02	0.03	0.05	0.17	0.03
dNI_{t+k} regressed on $dCapx_t$ and MKT_t										
$dCapx_t$	**0.65**	-0.40	**-0.50**	**-0.91**	**-0.61**	-0.52	**-0.64**	**0.66**	**-1.28**	-0.52
	2.73	-1.65	-1.96	-3.97	-2.88	-1.57	-2.66	2.32	-4.26	-1.81
MKT_t	0.00	**0.23**	**0.18**	0.03	-0.05	-0.06	**-0.17**	0.17	0.00	**-0.30**
	-0.02	3.16	2.23	0.41	-1.00	-0.87	-3.52	1.19	0.04	-2.43
R^2	0.03	0.05	0.04	0.06	0.02	0.02	0.05	0.06	0.17	0.08
dNI_{t+k} regressed on $dCapx_t$, MKT_t, and dNI_t										
$dCapx_t$	**0.65**	**-0.52**	**-0.52**	**-0.98**	**-0.58**	-0.51	**-0.69**	**0.66**	**-1.33**	-0.51
	2.73	-2.21	-2.11	-4.50	-2.67	-1.47	-2.96	2.32	-4.89	-1.78
MKT_t	0.00	**0.23**	**0.18**	0.03	-0.05	-0.06	**-0.17**	0.17	-0.01	**-0.30**
	-0.02	3.30	2.25	0.40	-1.02	-0.87	-3.47	1.19	-0.12	-2.46
dNI_t	.	**0.18**	0.04	0.10	-0.04	-0.03	0.08	.	0.07	0.00
	.	2.78	0.64	1.76	-0.58	-0.46	1.93	.	0.74	0.01
R^2	0.03	0.08	0.04	0.06	0.02	0.01	0.05	0.06	0.17	0.08

through t+16.[4] A second interpretation is that high investment is associated with a significant *drop* in profitability compared with four quarters prior to investment, i.e., the slope on $Capx_t$ in these regressions would be identical if we used the change in profitability, $NI_{t+k} - NI_{t-4}$, as the dependent variable. In essence, the weakening relation between $Capx_t$ and future profitability as the horizon grows in the top two panels is indicative of a statistically significant decline.

Table 6 looks at growth rates. Investment growth has a modest positive relation with contemporaneous

[4] The slopes on $Capx_t$ are similar, but a bit more negative, if we control for one-quarter lagged profitability instead of four-quarter lagged profitability. We use four-quarter lagged profitability to accommodate delays in investment.

profit growth but is strongly negatively related to future profit growth. High investment growth, $dCapx_t$, predicts low profit growth in every quarter t+1 through t+6, with t-statistics of -1.56 to -3.98 when used alone or -1.47 to -4.50 when controlling for stock returns and lagged profit growth. By itself, a 1% increase in quarterly investment is associated with contemporaneous profit growth of 0.65% but a decline in profits of 0.44–0.91% in each of the next six quarters, cumulating to total profit growth of -2.98% from quarter t to t+6. (If we extend the horizon, the slopes remain negative but insignificant through quarter t+10.) In the right-hand columns, annual investment growth by itself predicts 17% of the variation in next year's profit growth—a remarkably strong effect that, for example, swamps the signal in market returns about future profits. Thus, higher investment is associated with a significant decline in both future profits and future profitability.

Fig. 3 illustrates how profits evolve leading up to and following quarters with high or low investment growth (Panel A is similar to Fig. 1a). Here, 'high' and 'low' investment growth represent the top and bottom quartiles of the historical distribution from 1952–2016. (dCapx averages 3.70% in the 'high' quarters and -2.33% in the 'low' quarters, with a persistent but smaller spread between 'high' and 'low' dCapx in the surrounding quarters.) As in our regressions, investment is positively related to prior profit growth and negatively related to subsequent profit growth. Profits grow 4.41% per quarter faster in the six quarters leading up to high investment growth than leading up to low investment growth (2.51% vs. -1.89%), for a cumulative difference of 26.4%. The pattern completely reverses over the subsequent six quarters: Profit growth averages -0.26% after a large jump in investment and 3.92% after a large decline, for a cumulative difference of -25.1% from quarter t+1 to t+6.

In sum, investment grows strongly following what turns out to be a largely transitory shock to profits that reverses over the subsequent year and a half. The results are difficult to reconcile with the idea that investment decisions are based on rational, forward-looking beliefs about profitability. Instead, they support Greenwood and Hanson's (2015) and Gennaioli, Ma, and Shleifer's (2016) argument that

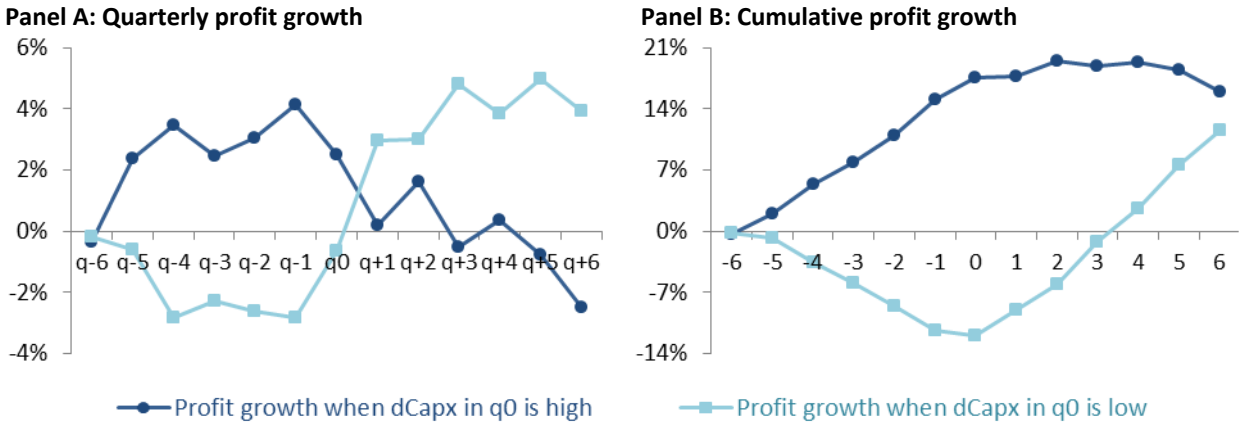


Fig. 3. Quarterly and cumulative profit growth in the quarters leading up to and following high investment growth (dark line) and low investment growth (light line). Quarters (q0) with high and low investment growth represent the top and bottom quartiles of the historical distribution from 1952–2016. Investment and profits come from the seasonally adjusted Flow of Funds accounts for nonfinancial corporations.

managers overextrapolate from recent profits when making investment decisions.

4.3. Recessions

A striking example of the patterns documented above occurs around recessions. In particular, Fig. 4 shows how investment and profits behave before and after the last quarter of a recession (q0), as dated by the NBER, averaging over all recessions from 1952–2016. Panel A plots cumulative investment and profit growth starting in q-6, while Panel B plots the level of investment and profits scaled by total assets (indexed to 100% in quarter q-6).

Profits fall dramatically in recessions, with a total drop of 27.3% between q-6 and q+1 (the quarter after a recession ends), before rebounding equally impressively over the next few quarters. Within a year after a recession (q+4), profits have fully recovered and profitability is almost exactly equal to its average level over the full sample (quarterly profitability of 0.72%). Profits seem to take a transitory hit during a recession that provides little information about long-term profitability.

Investment mirrors the behavior of profits but with a lag. Investment starts to decline just two quarters

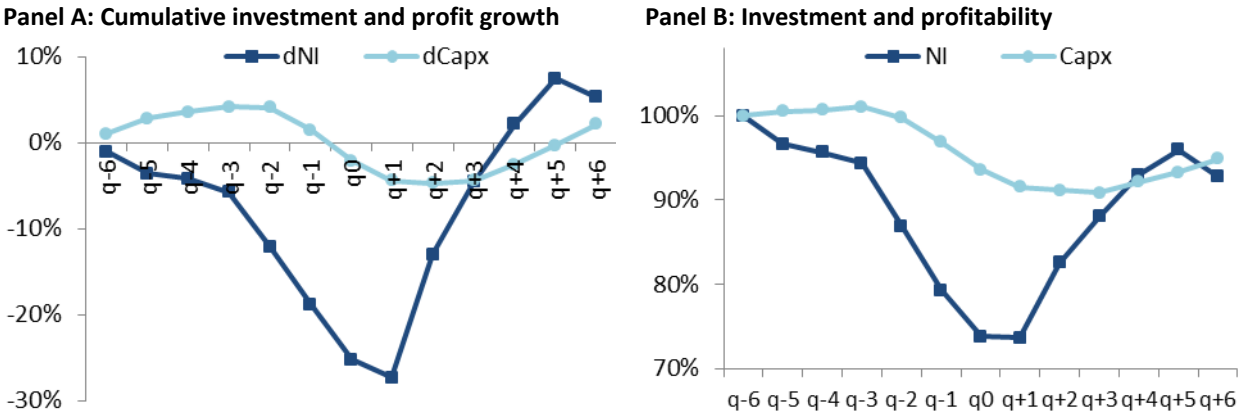


Fig. 4. Investment and profits in the quarters leading up to and following the end of a recession (q0). Panel A shows cumulative investment and profit growth starting in quarter q−6, while Panel B shows the level of investment and profitability (scaled by total assets), indexed to 100% in quarter q-6. Investment and profits come from the seasonally adjusted Flow of Funds accounts for nonfinancial corporations. Recession end dates come from NBER.

before the end of a recession (q-2) and does not bottom out until two to three quarters into an economic expansion, after profits have almost fully rebounded to their average level. The investment rate (scaled by assets) peaks at about the worst time—just before profits decline dramatically—and hits its minimum value in q+3 even though, by that time, profitability going forward has returned to normal. Like our earlier results, the general picture that emerges is that investment reacts with a delay to prior performance but has little connection to future profitability.

5. Investment and SPF profit forecasts

The behavior of investment suggests that managers' beliefs about future profitability are linked to recent performance. While managers' beliefs are not directly observable, we can observe earnings forecasts from the Survey of Professional Forecasters (SPF). These forecasts are interesting in their own right, in part because they provide a public signal about future profits that should inform managers' decisions (even if managers' expectations are different). We explore the reliability of SPF forecasts, how SPF forecasts relate to corporate investment, and whether SPF forecasts recognize the negative relation between investment and future earnings documented in Section 4.

5.1. SPF forecasts and future profits

Table 7 starts with the most basic question: Do SPF forecasts actually predict profits? The top panel reports regressions of profit growth in quarters t through t+4 on SPF forecasts made in quarter t (specifically, forecasts made in quarter t of profits in quarter t+k). In these regressions, the intercepts should be zero and the slopes should be one if SPF forecasts are unbiased. We focus on the slopes because, as observed in Section 3, the average growth rate embedded in SPF forecasts has historically been lower than the actual growth rate of profits, largely because the profit series in the SPF survey differs from the one we use (though the two series are highly correlated).

SPF forecasts do have reliable predictive power for future earnings. In the top panel, the slopes for all horizons are significantly different from zero but not from one. A one percentage point increase in forecasted growth is associated with 1.10–1.82 percentage points of actual growth, depending on the horizon, with t-statistics of 2.65–4.95. SPF forecasts predict 24% of the variation in current (quarter t) profit growth and 5–7% of the variation in profit growth in each of the subsequent four quarters. At an annual horizon, SPF forecasts predict 22% of the variation in profit growth from quarter t to t+3 and 17% of the variation from t+1 to t+4 (both highly significant).

SPF forecasts should subsume the predictive power of other variables if they reflect available information. The middle panel of Table 7 shows that SPF forecasts capture the modest amount of persistence in profit growth and the predictive power of market returns documented earlier: The slopes on SPF_t remain significant and indistinguishable from one at all horizons, and neither lagged profit growth or lagged market returns add significant predictive power.

The bottom panel of Table 7 uses lagged profitability in place of lagged profit growth as a predictor, to test whether SPF forecasts reflect mean reversion in profitability. While the slopes on SPF forecasts are again close to one, lagged profitability has significant incremental predictive power for profit growth in

Table 7

SPF forecasts and future profits, 1969–2016

This table reports slopes, t-statistics, and R^2s when profit growth (dNI) in quarters t through t+4 is regressed on SPF forecasts made in quarter t along with market returns (MKT), profit growth, and investment growth (dCapx) from quarter t-1. Corporate investment and profits come from the Federal Reserve's seasonally adjusted Flow of Funds accounts for nonfinancial corporations (tables F.103 and B.103); SPF forecasts come from the Federal Reserve Bank of Philadelpha; and market returns come from CRSP. Newey-West t-statistics, below the point estimates, adjust for 12 lags of autocorrelation. Boldface indicates slopes that are more than 1.96 standard errors from zero.

	Quarterly growth					Annual growth	
	dNI_t	dNI_{t+1}	dNI_{t+2}	dNI_{t+3}	dNI_{t+4}	$dNI_{t,t+3}$	$dNI_{t+1,t+4}$
dNI_{t+k} regressed on SPF_t							
SPF_t	**1.54**	**1.10**	**1.18**	**1.55**	**1.82**	**1.66**	**1.77**
	4.95	4.41	3.23	2.90	2.65	4.15	3.34
R^2	0.24	0.07	0.05	0.06	0.05	0.22	0.17
dNI_{t+k} regressed on SPF_t, MKT_{t-1}, and dNI_{t-1}							
SPF_t	**1.46**	**1.02**	**1.21**	**1.58**	**1.81**	**1.66**	**1.87**
	4.55	3.07	3.49	2.93	2.58	3.71	3.13
MKT_{t-1}	0.08	0.07	-0.04	-0.06	-0.05	0.06	-0.22
	1.39	0.77	-0.47	-0.85	-0.70	0.46	-1.00
dNI_{t-1}	0.03	-0.02	0.08	-0.05	-0.04	-0.06	-0.16
	0.43	-0.29	1.18	-0.55	-0.79	-0.27	-0.71
R^2	0.24	0.06	0.05	0.05	0.05	0.21	0.17
dNI_{t+k} regressed on SPF_t, MKT_{t-1}, and NI_{t-1}							
SPF_t	**1.46**	**0.88**	**1.05**	**1.32**	**1.64**	**1.43**	**1.55**
	5.02	3.11	2.66	2.57	2.65	4.02	2.93
MKT_{t-1}	0.07	0.08	-0.04	-0.06	-0.06	0.09	-0.19
	1.16	0.93	-0.49	-0.95	-0.84	0.61	-1.05
NI_{t-1}	-2.85	-5.23	-5.20	**-6.76**	**-7.47**	-20.97	-23.51
	-0.84	-1.42	-1.51	-2.21	-2.66	-1.54	-1.95
R^2	0.24	0.07	0.05	0.07	0.07	0.24	0.20

quarters t+3 and t+4 (t-statistics of -2.21 and -2.66) and weaker negative slopes at all horizons. (The results are very similar if we lag profitability an extra quarter to help ensure that profitability is known when the forecasts are made.) In unreported tests, the slopes on lagged profitability are roughly 50% more negative—and significant at all horizons beyond the first quarter—when SPF forecasts are omitted from the regressions, so SPF participants partially incorporate mean reversion of profitability into their forecasts even if they do not do so fully.

The results are interesting to compare to our findings on the behavior of corporate investment. One

interpretation of our earlier results is that investment reacts to transitory profit shocks because managers do not fully understand that profitability is mean reverting. Table 7 provides evidence that SPF participants behave in a similar way, i.e., SPF forecasts have predictive power for future profits but do not seem to fully recognize mean reversion in profitability.

5.2. SPF forecasts and investment

Tables 8 and 9 study the connection between SPF earnings forecasts and investment. The central question is whether expected earnings growth and investment are positively related, as predicted by q theory, using SPF forecasts as a proxy for expected profits. At the same time, SPF forecasts should be negatively related to past investment if forecasters understand the link between investment and subsequent earnings found in Section 4.

In Table 8, we test how SPF forecasts relate to investment growth, either by themselves or controlling for past profits and stock returns. For simplicity, we focus on SPF forecasts of current-quarter profit growth ($SPF_{t,0}$) and SPF forecasts of profit growth over the next year ($SPF_{t,1\text{-}4}$).

Table 8 shows three main results. First, expected current-quarter profit growth ($SPF_{t,0}$) is strongly positively related to investment growth in quarters t through t+4 (t-statistics of 2.92–5.23). The results mirror the predictive power of realized profit growth in quarter t (Table 3), but the slopes here are larger and a bit more significant, suggesting that realized profits contain 'noise' that is uncorrelated with investment. Indeed, $SPF_{t,0}$ largely drives out actual growth (dNI_t) when both are included in the regressions (bottom panel), although dNI_t continues to have some predictive power for investment in quarters t+3 through t+5.

Second, SPF forecasts of *future* profit growth ($SPF_{t,1\text{-}4}$) are negatively related to current investment growth, $dCapx_t$, with a t-statistic of -2.93. This finding suggests that SPF participants understand that quarters with higher investment are followed by lower profit growth. However, the relation between

Table 8

SPF forecasts and future investment, 1969–2016

This table reports slopes, t-statistics, and R^2s when investment growth (dCapx) in quarters t+k is regressed on SPF forecasts made in quarter t for profit growth in quarters t ($SPF_{t,0}$) and quarters t+1 though t+4 ($SPF_{t,1-4}$), along with actual profit growth (dNI) and stock returns (MKT) in quarter t. The right-hand columns focus on investment growth in the two years after quarter t, regressed on $SPF_{t,0}$, $SPF_{t,1-4}$, and lagged annual profit growth and returns. Corporate investment and profits come from the Federal Reserve's seasonally adjusted Flow of Funds accounts for nonfinancial corporations (table F.103), SPF forecasts come from the Federal Reserve Bank of Philadelphia, and stock returns come from CRSP. Newey-West t-statistics, below the point estimates, adjust for 12 lags of autocorrelation. Boldface indicates slopes that are more than 1.96 standard errors from zero.

	Quarterly growth							Annual growth	
	$dCapx_t$	$dCapx_{t+1}$	$dCapx_{t+2}$	$dCapx_{t+3}$	$dCapx_{t+4}$	$dCapx_{t+5}$	$dCapx_{t+6}$	$dCapx_{t+1}$	$dCapx_{t+2}$
$dCAPX_{t+k}$ regressed on $SPF_{t,0}$ and $SPF_{t,1-4}$									
$SPF_{t,0}$	**0.31**	**0.30**	**0.26**	**0.22**	**0.19**	0.05	-0.07	**0.97**	-0.22
	4.32	5.23	5.00	3.54	2.92	0.78	-1.50	5.17	-1.00
$SPF_{t,1-4}$	**-0.10**	-0.03	0.01	0.04	**0.06**	**0.10**	**0.11**	0.08	**0.43**
	-2.93	-1.08	0.47	1.19	2.07	3.59	3.97	0.80	4.52
R^2	0.15	0.14	0.13	0.11	0.11	0.08	0.06	0.23	0.11
$dCAPX_{t+k}$ regressed on $SPF_{t,0}$, $SPF_{t,1-4}$, dNI_t, and MKT_t									
$SPF_{t,0}$	**0.32**	**0.25**	**0.24**	**0.19**	**0.13**	0.02	-0.08	0.31	-0.38
	3.64	4.16	4.51	3.48	2.26	0.29	-1.59	1.63	-1.53
$SPF_{t,1-4}$	**-0.10**	-0.05	0.00	0.02	0.03	**0.08**	**0.10**	0.05	**0.45**
	-2.83	-1.68	-0.05	0.72	1.37	3.23	3.68	0.55	4.36
dNI_t	0.00	0.04	0.02	**0.03**	**0.05**	**0.03**	0.01	**0.10**	**0.06**
	-0.13	1.47	1.01	2.71	2.27	2.03	0.83	3.75	2.56
MKT_t	0.00	0.04	**0.05**	**0.06**	**0.07**	**0.04**	**0.04**	**0.15**	-0.02
	0.05	1.71	2.43	2.91	3.56	2.95	2.21	3.73	-0.61
R^2	0.14	0.18	0.17	0.16	0.19	0.10	0.07	0.46	0.15

$dCapx_t$ and forecasted profits is weaker than the relation between $dCapx_t$ and actual future profit growth (in Table 6), providing indirect evidence that SPF forecasters do not fully recognize the strong empirical link between investment and future earnings (a fact we confirm below).

Third, $SPF_{t,1-4}$ has little relation to investment growth over the next year, either in the quarterly regressions in the left-hand columns or annual regressions in the right-hand columns. Expected profit growth this year only becomes significantly related to investment starting in quarter t+4 (the slopes are significant for several additional quarters if we extend the horizon beyond t+6). In untabulated results, the predictive power of $SPF_{t,1-4}$ for investment after quarter t+4 is largely eliminated by including actual profit growth from t+1 to t+4 in the regressions, implying that actual earnings are more important than

Table 9

SPF forecasts, future profits, and investment, 1969–2016

This table reports slopes, t-statistics, and R^2s when profit growth (dNI) in quarters t through t+4 is regressed on SPF forecasts made in quarter t and lagged quarterly or annual investment growth (dCapx). Corporate investment and profits come from the Federal Reserve's seasonally adjusted Flow of Funds accounts for nonfinancial corporations (tables F.103 and B.103) and SPF forecasts come from the Federal Reserve Bank of Philadelpha. Newey-West t-statistics, below the point estimates, adjust for 12 lags of autocorrelation. Boldface indicates slopes that are more than 1.96 standard errors from zero.

	Quarterly growth					Annual growth	
	dNI_t	dNI_{t+1}	dNI_{t+2}	dNI_{t+3}	dNI_{t+4}	$dNI_{t,t+3}$	$dNI_{t+1,t+4}$
SPF_t	**1.62**	**1.08**	**0.99**	**1.36**	1.28	**1.31**	**1.17**
	4.81	4.39	2.61	2.40	1.68	4.19	2.58
$dCapx_{t-1}$	**-0.80**	-0.51	**-0.85**	-0.31	**-0.80**	**-1.15**	**-1.14**
	-2.27	-1.47	-2.68	-0.89	-2.33	-2.66	-2.60
R^2	0.27	0.08	0.08	0.06	0.08	0.30	0.24

predicted earnings for subsequent investment. This result again suggests that investment decisions are more backward than forward looking.

Finally, Table 9 tests whether SPF forecasts rationally incorporate (and hence subsume) the information in investment about future profit growth. They do not: Even controlling for SPF forecasts, $dCapx_t$ is significantly negative related to profit growth in quarters t, t+2, and t+4 and weakly negatively to profit growth at all horizons. Indeed, the slopes here are similar to the corresponding slopes in Table 6 when $dCapx_t$ is used alone in the regressions. Investment also has strong incremental predictive power in the annual regressions, with t-statistics of -2.66 and -2.60, and substantially raises the R^2s relative to using SPF forecasts alone (from 22% and 17% in Table 7 to 30% and 24% here). (The slopes remain significant if we lag investment growth an extra quarter, to allow more time for information about investment to be incorporated into the forecasts.) In short, SPF forecasts do not seem fully to recognize that higher investment is associated with lower subsequent profits.

6. Investment and market returns

The fact that investment is negatively related to future profits—and neither managers nor SPF participants seem to be fully aware of this link—suggests that high investment might be associated with bad news and

low stock returns as the market learns about investment and profits. Investment might also predict returns over longer horizons if investment is high when expected returns are low (eq. 4). We explore both effects in this section. Prior studies have looked at the predictive power of investment, but the evidence is mixed and often does not distinguish between short-run 'announcement' effects and longer-term predictability (e.g., Cochrane 1991; Lamont 2000).

Table 10 focuses on the predictive power of investment growth for market returns (the dependent variable is the market return in excess of the 3-month Tbill rate). In the top panel, $dCapx_t$ by itself is negatively related to future returns in quarters t+1, t+2, and t+4, with t-statistics of -1.79 to -2.06. A 1% increase in quarterly investment is associated with 0.32–0.42% lower market returns in those quarters and 1.12% lower cumulative market returns from t+1 to t+4 (the cumulative slope has a t-statistic of -2.14).[5] Put differently, a one-standard-deviation change in quarterly investment growth—an increase of 2.50%—predicts 2.80% lower market returns in the subsequent year. In the right-hand columns, annual $dCapx_t$ has some predictive power for returns in year t+1 (t-statistic of -1.78) but little relation to returns in year t+2 (t-statistic of 0.66). The fact that the biggest negative slopes are found in quarters t+1 and t+2, and the slopes drop close to zero after roughly four quarters, is consistent with the idea that investment growth is associated with bad news in the short run but has little connection to longer-term, more persistent changes in expected returns.

The middle panel of Table 10 attempts to isolate the unexpected portion of investment in order to provide a more powerful test of whether investment is truly associated with bad news. If it is, the 'surprise' portion of investment should be more strongly negatively related to returns in the short run as investors learn about investment. We estimate the expected and unexpected portions of investment as the fitted values and residuals, respectively, from a regression of investment growth on lagged annual investment

[5] The cumulative return here represents the sum of the predicted quarterly returns for t+1 through t+4. If we instead regress annual compounded returns from t+1 through t+4 on lagged quarterly investment growth, the results are slightly stronger, with a slope of -1.26 and a t-statistic of -2.17.

Table 10

Investment and future stock returns, 1952–2016

This table reports slopes, t-statistics, and R^2s when stock market returns in excess of the 3-month Tbill rate (MKT) are regressed on past investment growth (dCapx), the 1-year Treasury yield (Y1), the spread between 10-year and 1-year Treasury yields (TERM), the spread between Baa and Aaa corporate bond yields (DEF), and the dividend yield of NYSE stocks (DY). The left-hand columns focus on quarterly returns and investment growth, while the right-hand columns focus on annual returns and investment growth (4-quarter rolling windows). In the bottom two panels, dCapx is broken into expected (E[dCapx]) and unexpected (U[dCapx]) components by regressing dCapx on lagged annual investment growth, profit growth, and market returns. Investment and profits come from the Federal Reserve's seasonally adjusted Flow of Funds accounts for nonfinancial corporations (table F.103); stock returns, dividends, and Treasury rates come from CRSP; and the default spread comes from the St. Louis Fed. Newey-West t-statistics, below the point estimates, adjust for 8 lags of autocorrelation. Boldface indicates slopes that are more than 1.96 standard errors from zero.

	Quarterly returns							Annual returns	
	MKT_t	MKT_{t+1}	MKT_{t+2}	MKT_{t+3}	MKT_{t+4}	MKT_{t+5}	MKT_{t+6}	MKT_{t+1}	MKT_{t+2}
MKT_{t+k} regressed on $dCapx_t$									
$dCapx_t$	-0.17	**-0.42**	-0.37	-0.02	**-0.32**	-0.14	-0.07	-0.36	0.14
	-0.84	-2.06	-1.79	-0.13	-2.04	-0.77	-0.37	-1.78	0.66
R^2	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.02	0.00
MKT_{t+k} regressed on expected and unexpected $dCapx_t$									
$U[dCapx_t]$	-0.10	**-0.52**	**-0.53**	0.17	**-0.45**	-0.07	-0.13	**-0.59**	0.33
	-0.42	-2.62	-2.14	0.60	-2.38	-0.29	-0.51	-2.48	1.19
$E[dCapx_t]$	-0.44	-0.27	-0.21	-0.36	-0.27	-0.24	0.05	-0.17	-0.23
	-1.10	-0.68	-0.66	-1.30	-0.97	-0.79	0.14	-0.59	-0.79
R^2	0.00	0.01	0.01	0.00	0.00	-0.01	-0.01	0.03	0.01
MKT_{t+k} regressed on expected and unexpected $dCapx_t$ and other predictors									
$U[dCapx_t]$	-0.06	**-0.39**	-0.38	0.25	-0.42	-0.05	-0.05	-0.40	0.56
	-0.27	-1.97	-1.54	1.03	-1.92	-0.21	-0.19	-1.68	1.81
$E[dCapx_t]$	-0.65	-0.01	0.16	-0.21	-0.25	-0.28	0.22	0.02	-0.01
	-1.06	-0.02	0.44	-0.59	-0.69	-0.73	0.49	0.06	-0.05
$Y1_t$	0.02	**-0.62**	**-0.61**	-0.38	-0.17	-0.14	-0.13	**-2.04**	-0.07
	0.07	-2.38	-2.71	-1.95	-0.87	-0.66	-0.69	-2.57	-0.10
$TERM_t$	1.11	0.13	0.07	0.49	0.83	0.75	1.09	1.06	**4.38**
	1.75	0.23	0.14	1.02	1.73	1.51	1.79	0.64	2.34
DEF_t	-1.76	0.77	1.47	-0.29	-1.38	-1.66	-0.48	0.49	-1.34
	-0.49	0.37	1.14	-0.20	-1.01	-1.32	-0.36	0.14	-0.30
DY_t	-0.59	**1.98**	**2.14**	**1.84**	**1.54**	**1.38**	**1.37**	**8.58**	3.18
	-0.76	2.82	3.19	3.01	2.75	2.61	2.62	3.39	1.50
R^2	0.02	0.05	0.06	0.03	0.02	0.01	0.01	0.20	0.06

growth, lagged annual profit growth, and lagged annual market returns, based on our earlier results that those variables predict investment (the R^2 in this first-stage regression is 43% for quarterly $dCapx_t$ and 45% for annual $dCapx_t$).

Unexpected investment is strongly negatively related to subsequent returns, especially in the six months

immediately following investment. A 1% increase in unexpected investment is associated with 0.52% and 0.53% lower market returns in quarters t+1 and t+2, with t-statistics of -2.62 and -2.14, respectively. Unexpected investment also predicts returns in quarter t+4 (t-statistic of -2.38), and the cumulative slope of -1.33 for quarters t+1 through t+4 is highly significant with a t-statistic of -3.53 (untabulated). The results suggest that unexpected investment is either linked to bad news that the market learns about over the following few quarters or to short-lived but significant variation in expected returns.

The bottom panel of Table 10 adds several common state variables from the literature, including the 1-year Treasury yield (Y1), the yield spread between 10-year and 1-year Treasuries (TERM), the yield spread between Baa- and Aaa-rated corporate bonds (DEF), and the dividend-to-price ratio of NYSE stocks (DY). These variables are meant to capture persistent variation in expected returns over the business cycle that might relate to (and affect) investment. The variables do have some predictive power for returns, consistent with prior research. For our purposes, the more important result is that unexpected investment continues to be significantly related to returns in quarter t+1 and has weaker predictive power for MKT_{t+2} and MKT_{t+4}. The cumulative slope from t+1 through t+4 remains significant with a t-statistic of -2.48 (untabulated).

Table 11 tests whether the *level* of investment is related to expected stock returns. Our focus here is on the simple relation between investment and future returns, since the goal is to explore whether the two are related (as predicted by q theory) rather than to test whether investment has incremental predictive power relative to other variables. The results provide some evidence that investment is negatively related to expected returns, with t-statistics ranging from of -0.75 to -1.52 at different horizons. A one-standard-deviation increase in the quarterly investment rate (0.17%) predicts 0.40–0.77% lower market returns in quarters t+1 through t+4, cumulating to 2.15% lower returns over the year. The slopes are largest in the first two quarters, consistent with some 'announcement' effects, but the slopes show little deterioration beyond t+3.

Table 11

Investment and future stock returns, 1952–2016

This table reports slopes, t-statistics, and R^2s when stock market returns in excess of the 3-month Tbill rate (MKT) are regressed on past investment scaled by total assets (Capx). The left-hand columns focus on quarterly returns, while the right-hand columns focus on annual returns (4-quarter rolling windows). Investment and assets come from the Federal Reserve's seasonally adjusted Flow of Funds accounts for nonfinancial corporations (tables F.103 and B.103) and stock returns come from CRSP. Newey-West t-statistics, below the point estimates, adjust for 8 lags of autocorrelation. Boldface indicates slopes that are more than 1.96 standard errors from zero.

	Quarterly returns							Annual returns	
	MKT_t	MKT_{t+1}	MKT_{t+2}	MKT_{t+3}	MKT_{t+4}	MKT_{t+5}	MKT_{t+6}	MKT_{t+1}	MKT_{t+2}
$Capx_t$	-5.12	-4.51	-3.53	-2.38	-2.53	-2.21	-2.71	-13.62	-12.96
	-1.65	-1.52	-1.20	-0.79	-0.85	-0.75	-0.93	-1.22	-1.17
R^2	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01

In supplemental tests, extending the horizon beyond the table, the slopes for quarters t+7 through t+16 are actually larger than those for t+3 to t+6, ranging from -3.45 to -5.18 with t-statistics of -1.15 to -1.84. Moreover, investment is significantly negatively related to the weighted sum of future returns (see eq. 4, with $\rho = 0.99$) from t+1 to t+16, with a t-statistic of -2.80.

Overall, investment and investment surprises seem to be negatively related to subsequent market returns, both in the short run and the long run. The short-run results provide evidence that higher investment is associated with bad news, while the long-run results are consistent with a link between high investment and a lower cost of capital.

7. Summary and interpretation

Traditional models in corporate finance presume that managers make investment decisions based on rational expectations of profitability (and stock returns). A basic prediction is that investment should be high when expected profitability is high. However, recent studies argue that managers' expectations may not be rational and, in particular, that managers extrapolate from transitory changes in earnings that do not persist. The goal of our paper is to understand the link between earnings, earnings expectations, and investment in aggregate U.S. data from 1952–2016.

Our tests establish several key facts about the behavior of aggregate corporate investment. First, consistent with prior research, investment is strongly positively related to past profits and stock returns. In annual data, profit growth alone predicts 21% of the variation in next year's investment growth, and profit growth and stock returns together predict 44% of the variation in next year's investment growth. Investment seems to respond with a significant lag to past performance, with high investment growth for up to six quarters after high profit growth or high stock returns.

Second, investment is unrelated to the level of future profitability and negatively related to future profit growth. High investment weakly predicts above-average profitability for a few quarters, but profitability returns to normal quickly and investment has little connection to expectations of profitability over the longer term (the relation is somewhat negative in the data). The decline in profitability following high investment is explained by a strong negative link between investment growth and subsequent profit growth. For example, a 10% increase in annual investment is associated with 13% lower profit growth in the subsequent year.

Our findings are hard to reconcile with traditional models that imply investment should be positively related to rational, forward-looking expectations of future profitability. Instead, investment seems to respond strongly following what turns out to be a largely transitory shock to profits that reverses over the subsequent year or two. The behavior of investment in and around recessions provides a striking example of this pattern: Investment peaks just before profits fall significantly and hits a low about two to three quarters after the recession has ended, right as profitability has rebounded to normal. The pattern supports the idea that managers are backward looking and tend to overextrapolate recent performance when making investment decisions, consistent with the arguments of Greenwood and Hanson (2015) and Gennaioli, Ma, and Shleifer (2016).

A few caveats are in order. Extrapolative biases alone do not explain some features of the data. For

example, we find that, controlling for past profits, unusually high investment is strongly negatively related to future profits, i.e., *abnormal* investment—over and above what would be expected given how managers typically extrapolate from recent performance—is an especially bad signal about future profits. This result is consistent with our evidence that high *unexpected* investment is associated with low market returns in the quarters immediately following investment, when the market learns about investment and profits.

In addition, some of the patterns we document might be explained by the way investment responds to financing constraints—including, for example, the drop in investment at the end of a recession. However, financing constraints do not explain why investment is unrelated to future profitability, why investment growth is strongly negatively related to future profit growth, or why unexpected investment is associated with low market returns.

An alternative possibility is that investment is driven by changes in the cost of capital. This explanation is consistent with our evidence that investment is positively related to past stock returns (a proxy for shocks to discount rates) and negatively related to future stock returns over the subsequent few years. On the other hand, cost-of-capital effects do not explain why investment reacts strongly to recent profits (which have no predictive power for returns) or why high unexpected investment seems to be associated with bad news in the short run. Moreover, the notion that changes in the cost of capital might explain much of the variation in investment simply reinforces our conclusion that investment is not related to (rational) expectations of future profitability.

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