The behavior of aggregate corporate investment

S.P. Kothari
Sloan School of Management, MIT

Jonathan Lewellen
Tuck School of Business, Dartmouth College

Jerold B. Warner
Simon School of Business, University of Rochester

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Abstract

We study the behavior of aggregate corporate investment from 1952–2010. Investment grows rapidly following high profits and stock returns but, contrary to standard predictions, is largely unrelated to recent changes in market volatility, interest rates, or the default spread on corporate bonds. At the same time, higher investment predicts a decline in subsequent profits and is associated with low stock returns when investment data are publicly released, implying that a jump in investment coincides with bad news. Our analysis also shows that the investment decline following the financial crisis of 2008 was not unusual given the drop in GDP and profits at the end of 2008.

1. Introduction

Corporate investment is the subject of a large and, at times, contentious literature (Hubbard 1998; Caballero 1999; Stein 2003). The determinants of investment are well-understood theoretically, but empirical studies provide mixed, often contadictory, evidence on the link between investment and corporate profits, stock prices, discount rates, uncertainty, and sentiment.[1]

Our paper offers new evidence on the behavior of aggregate corporate investment, focusing on two key questions: (1) What macroeconomic variables help to predict investment? and (2) How does investment relate to corporate performance? Our tests are motivated by rational and behavioral theories of investment but largely sidestep issues of causation and endogeneity, i.e., we make no claim that our predictors 'cause' investment or that investment 'causes' profits. Instead, our approach is to estimate basic, reduced-form empirical relations as a benchmark for comparison with theoretical models. As an example, Cochrane (1991) argues that expected investment growth and expected stock returns should be closely linked if firms make optimal investment decisions, but we show that investment growth is highly predictable using variables that have no special predictive power for stock returns. Thus, our evidence helps to inform and evaluate theory even if we cannot provide direct evidence of causation. More generally, the predictability of investment and the equilibrium relation between investment and other variables sheds light on business cycles, macroeconomic policy, and the speed with which investment reacts to news.

A key feature of our tests is that we study how quarterly investment relates to both past and future changes in a variety of variables. The overall pattern of results—before, concurrent with, and after investment—is more informative than any of the relations would be in isolation. For example, many models predict that profits and stock returns will lead investment, but the behavior of profits and stock returns following investment depends on whether discount rates, profitability, or behavioral factors are most important. The lead-lag relations found

[1] See, e.g, Fazzari, Hubbard, and Petersen (1988), Barro (1990), Morck, Shleifer, and Vishny (1990), Cochrane (1991), Blanchard, Rhee, and Summers (1993), Kaplan and Zingales (1997), Lamont (2000), Erickson and Whited (2000, 2012), Fairfield, Whisenant, and Yohn (2003), Baker, Stein, and Wurgler (2003), Titman, Wei, and Xie (2004), Fama and French (2006), Rauh (2006), Lamont and Stein (2006), Cooper, Gulen, and Schill (2008), Bloom (2009), Phillipon (2009), Wu, Zhang, and Zhang (2010), Lam and Wei (2011), Baker and Bloom (2013), Gilchrist and Zakrajsek (2012), Gilchrist, Sim, and Zakrajsek (2013), Arif and Lee (2014), and Chen, Da, and Larrain (2016).

in quarterly data are especially useful because investment turns out to relate very differently to subsequent profits and stock returns than to prior profits and stock returns, effects that can get washed out over longer horizons. Quarterly data also allow us to better identify investment surprises and to explore how the market reacts to investment news.

Our initial tests focus on the behavior of expected investment. We show that investment growth is highly predictable, up to 1½ years in advance, from past profits and stock returns but, after controlling for those variables, has little connection to other predictors proposed in the literature. For example, while an increase in short-term interest rates and a decrease in credit spreads predict high investment going forward, consistent with the business-cycle properties of the variables, neither effect is strong or lasts beyond one quarter. The predictive power of short-term interest rates is perhaps surprising because, while higher rates are associated with higher corporate investment, they actually predict *lower* profit, GDP, and noncorporate investment growth. Thus, corporate investment seems to increase at the same time that interest rates rise and expected profit, GDP, and noncorporate investment growth all decline.

The link between expected investment and market volatility is also interesting: high volatility predicts below-average investment growth for a few quarters, but the effects are small and actually become positive once we control for profits and stock returns. The evidence contradicts standard models with irreversible investment and recent empirical studies which suggest that high uncertainty dampens investment (Caballero 1999; Bloom 2009; Baker and Bloom 2013; Gilchrist, Sim, and Zakrajsek 2013).

The second issue we study is how firms perform in the quarters following investment. We show that high investment growth predicts *lower* future profits and stock returns, the latter effect concentrated in the one to two quarters after investment (when expenditure data become public). The correlation with future profits is so strong that it almost fully reverses the profit growth leading up to investment, i.e., the profit growth observed prior to investment turns out to be largely transitory. The relation with subsequent stock returns is also striking, especially if investment growth is not explained by recent profits: Large spikes in abnormal investment (the portion that is unexpected given prior profit growth) are followed by excess market returns of

-0.9% over six months, while large declines in abnormal investment are followed by excess returns of +8.8%. Our results imply that high investment growth coincides with bad news, contrary to traditional models of corporate investment, but provide little evidence of long-term predictability in returns after the market reacts to investment news.[2]

It is important to note that a large increase in investment forecasts a decline in actual *profits*, not just a decline in *profitability*. Aggregate profits drop 3.1% in the five quarters following a large spike in investment (top quartile of the historical distribution) but grow 22.9% after a large investment decline (bottom quartile). Thus, our findings cannot be attributed simply to decreasing returns to scale. More broadly, while it is difficult to reject all optimal investment models, the strong negative link between investment and stock returns suggests that rapid investment growth is bad news for corporate value. A potential explanation is that changes in investment tend to be poorly timed: managers increase investment at the end of expansions just as profits peak and decrease investment at the end of recessions just as profits start to rebound. This suggests that investment is less closely tied to rational expectations of future profitability than predicted by traditional q-theory models of corporate investment. The patterns we document are generally consistent with the extrapolative-expectations model of Gennaioli, Ma, and Shleifer (2015).

Our final results focus on the behavior of corporate investment during the recent financial crisis. Investment dropped 21% in 2009—the largest decline during our sample—and there seems to be a widely-held belief that a significant portion of the decline can be attributed to problems in the banking sector and credit markets (e.g., Campello et al. 2010). It seems interesting, then, to ask how much of the decline would be predicted by movement in real variables alone (profits, GDP, etc.) without appealing to anything special about the financial crisis. In fact, our regressions show the investment decline is fairly typical given the behavior of profits and GDP. For example, of the 23% total drop from 2008Q4–2009Q4, more than three-fourths (18.1%) would be

[2] The latter result contrasts with Arif and Lee (2014), who show that a different measure of aggregate corporate investment has significant predictive power for stock returns. A key difference is that we focus on capital expenditures (from the U.S. Flow of Funds accounts), while Arif and Lee sum up firm-level changes in net operating assets and R&D from Compustat. Their measure is much more volatile and less persistent than ours and includes not just capital expenditures but also acquisitions, depreciation, asset write-downs, and other long-term accruals. Our results suggest that the predictability they find comes from items other than capital expenditures.

predicted simply by the decline in GDP and corporate profits in the fourth quarter of 2008. Our results provide little evidence that unusual conditions in the credit markets led to a large drop in investment over and above what would be expected given changes in the real economy, consistent with Kahle and Stulz's (2013) evidence on the behavior of firm-level investment.

The remainder of the paper is organized as follows: Section 2 summarizes the data; Section 3 studies the behavior of expected investment; Section 4 studies how investment relates to subsequent changes in profits and stock returns; Section 5 explores the behavior of investment following the 2008 financial crisis; and Section 6 concludes.

2. Data and descriptive statistics

Our data come from three main sources, including the U.S. Flow of Funds accounts (investment and profits); the Center for Research in Security Prices (stock returns and interest rates); and the FRED database compiled by the Federal Reserve Bank of St. Louis (inflation, GDP, and corporate bond yields).

The U.S. Flow of Funds accounts track income, savings, and expenditures for broad sectors of the economy. Our tests focus on seasonally-adjusted profits and fixed investment for nonfinancial corporations, available quarterly starting in 1952 (converted into real terms using the CPI). Many of our tests use changes in the variables scaled by lagged corporate assets valued at historical cost. In this calculation, we difference the raw series first and then divide by lagged assets, so changes in the variables are similar to growth rates (we scale both variables by lagged assets in order to compare their magnitudes more easily; results using actual growth rates are similar and summarized in the text). Since at least the mid-1990s, the data have been released in the third month following each quarter. We generally interpret quarter t+1 as the 'announcement' quarter for investment and profits, though the information may not have been widely disseminated as quickly in early years of the sample.

The time-series behavior of the variables is summarized in Table 1 and plotted in Figs. 1 and 2. Quarterly

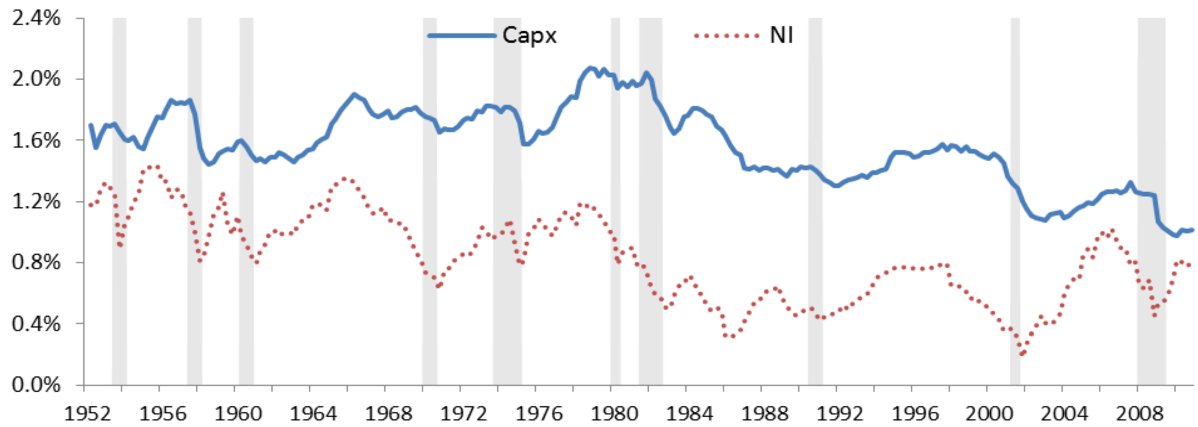

Fig. 1. Quarterly fixed investment (Capx) and after-tax profits (NI) scaled by lagged total assets for nonfinancial corporations from 1952–2010. Data come from the Federal Reserve's seasonally-adjusted Flow of Funds accounts. Shaded regions indicate NBER recessions.

investment averages 1.56% of assets, roughly double average quarterly profits of 0.83%. Both variables are highly persistent and trend downward during the sample. Investment reaches a high of 2.07% at the end of 1978 and a low of 0.97% in the first quarter of 2010 after dropping dramatically during the recent financial crises. More generally, investment shows a clear business-cycle pattern, growing in expansions (except during the late-1980s) and dropping in recessions. One notable pattern is that the largest investment declines occur at the end of recessions, just as the economy starts to rebound.

Profits are always lower than investment and tend to be more variable, with a standard deviation of 0.29% in levels and 0.07% in changes (compared with 0.25% and 0.04%, respectively, for investment). Quarterly profitability reaches a high of 1.44% near the start of the sample and a low of 0.18% in the fourth quarter of 2001, reflecting in part the downward trend in profitability through time. Profits show a clear business-cycle pattern and a clear correlation with investment.

Table 1 also reports statistics for quarterly stock returns (the CRSP value-weighted index), GDP growth, inflation, quarterly stock volatility (the square root of the sum of squared daily returns on the value-weighted index), the interest rate on 1-year Treasury notes ('R'), the spread between 10-year and 1-year Treasury yields ('Term'), and the spread between Baa and Aaa corporate bond yields ('Def'). These variables are often used

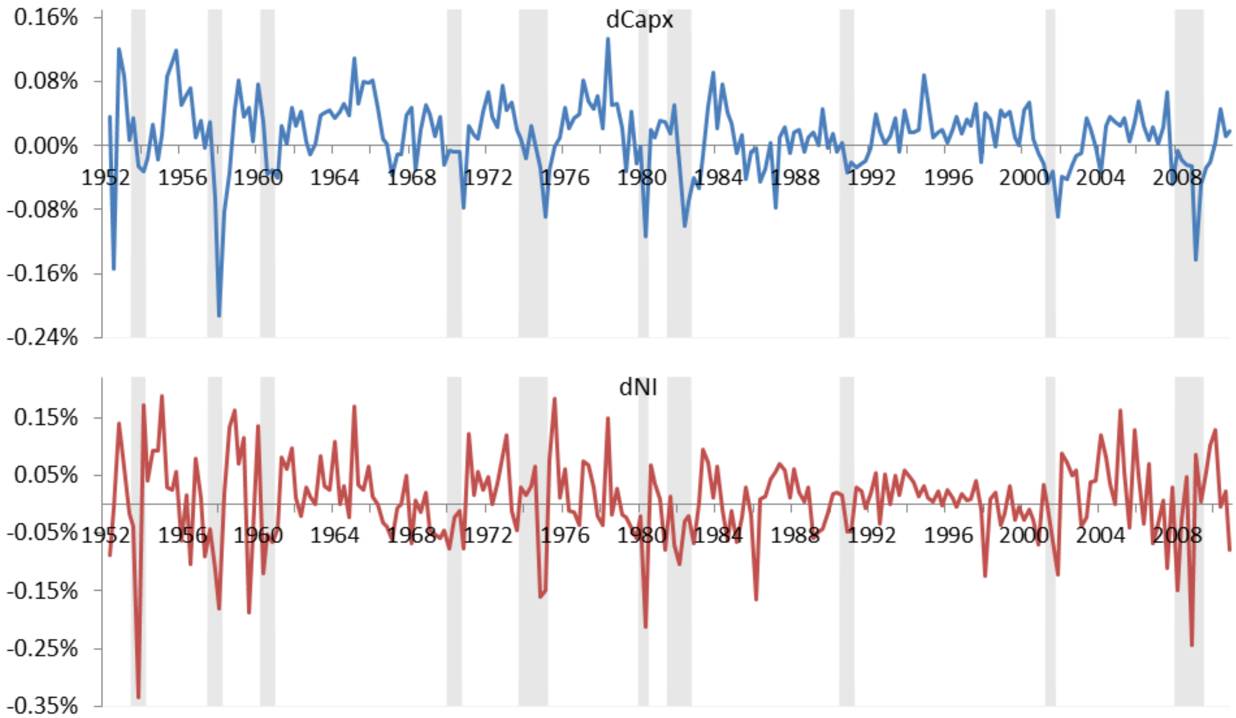

Fig. 2. Quarterly changes in fixed investment (dCapx) and after-tax profits (dNI), scaled by lagged total assets, for nonfinancial corporations from 1952–2010. Data come from the Federal Reserve's seasonally-adjusted Flow of Funds accounts. Shaded regions indicate NBER recessions.

as proxies for aggregate business conditions and discount rates (e.g., Fama and French 1989; Cochrane 1991; Ferson and Harvey 1999; Baker and Wurgler 2012). Market volatility serves as a proxy for aggregate uncertainty, following Bloom (2009) and others. The logic is that stock volatility should provide a timely and forward-looking measure of uncertainty.

Fig. 3 shows how the discount-rate variables behave through time. Short-term interest rates typically fall in and around recessions, while the term and default spreads exhibit the opposite behavior. The default spread probably shows the clearest business-cycle behavior, with large spikes in recessions followed by fairly steady declines in expansions. The term spread tends to increase and remain high for many quarters after the official end of a recession and to decline only in the second half of an expansion. Thus, the three variables seem to pick up different aspects of the business cycle.

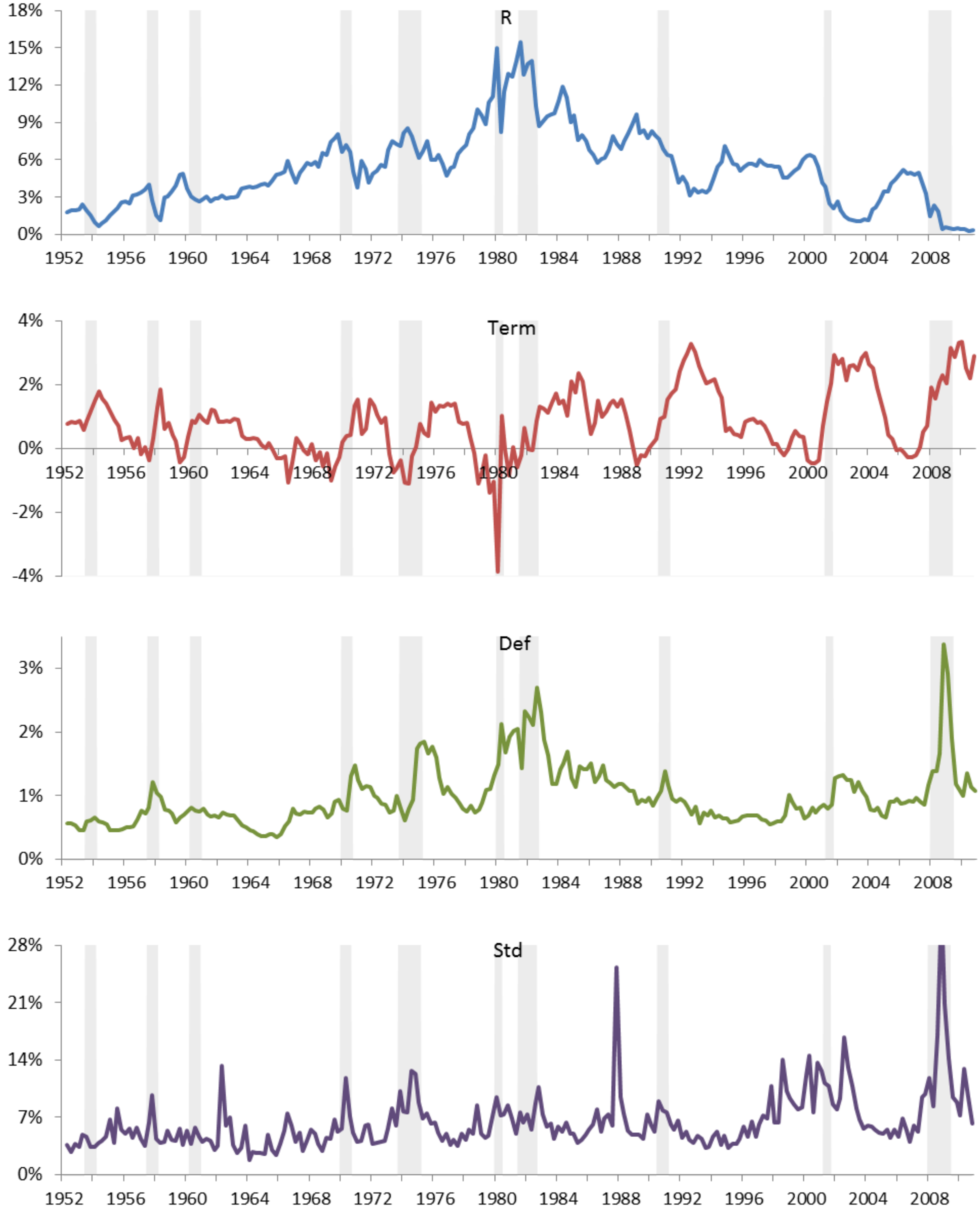

Fig. 3. Quarterly 1-year Tnote rate (R), term premium (Term; the yield spread between 10-year and 1-year Tnotes), default spread (Def; the yield spread between Baa- and Aaa-rated corporate bonds), and stock volatility (Std; the square root of the sum of squared daily market returns) from 1952–2010. Interest rates and stock returns come from CRSP and corporate bond yields come from the St. Louis Fed. Shaded regions indicate NBER recessions.

Stock volatility, in the bottom panel of Fig. 3, trends upward during the sample. Volatility jumps around the stock market crash in October 1987, increases steadily in the second half of the 1990s before dropping in the mid-2000s, and then spikes up again during the financial crisis in 2008. There is some evidence of an increase in volatility during recessions but the cyclical behavior is modest.

Table 2 reports correlations between the variables. Given the high persistence of the variables, Table 2 and our subsequent tests focus on changes in investment, profits, interest rates, and stock volatility rather than levels (stock returns, GDP growth, and inflation are not differenced since they are already growth rates). As observed above, investment and profits are procyclical, exhibiting a positive correlation with GDP growth, inflation, and short-term interest rates and a negative correlation with changes in the term and default spreads. Investment and profits are also positively correlated with each other but weakly negatively correlated with contemporaneous stock returns.

3. Expected investment

The predictability of aggregate investment is the focus of much research. For example, Barro (1990), Morck, Shleifer, and Vishny (1990), and Blanchard, Rhee, and Summers (1993) study how investment relates to past profits and stock prices, motivated by q-theory and sentiment-based models of investment. Cochrane (1991) argues that expected investment growth should be tightly linked to expected stock returns, in the sense that both should be predicted by the same variables. More recently, Philippon (2009), Bloom (2009), Gilchrist and Zakrajsek (2012), and Gilchrist, Sim, and Zakrajsek (2013) show that expected investment is related to bond prices and stock volatility. In this section, we study the joint predictive power of key variables from the literature in order to better understand the behavior of expected investment.

3.1. Univariate relations

To begin, Table 3 explores how quarterly investment (dCapx) relates to current and past changes in profits (dNI), stock prices (Mkt), market volatility (dStd), short-term interest rates (dR), the term spread (dTerm), and the default spread (dDef). All variables represent changes or growth rates and should approximate shocks to the variables given their high persistence in levels (see Table 1).

Panel A reports slopes from simple regressions that consider each variable separately:

$$dCapx_{t+k} = a_k + b_k X_t + e_{t+k}, \tag{1}$$

where $dCapx_{t+k}$ is the quarterly change in investment (scaled by lagged assets), X_t is the predictor variable shown in the left-most column, and k takes values of zero to five as indicated at the top of each column. Since $dCapx_t$ is a one-quarter change, the cumulative change in investment can be inferred by summing the slopes in a given row. We report Newey-West t-statistics below the slopes, incorporating two lags of autocorrelation (doubling the number of lags produces very similar results).

Investment is most strongly related to recent profits, stock returns, and the default spread. Higher profits are associated with a contemporaneous increase in investment (t-statistic of 3.30) and additional growth in each of the subsequent five quarters (t-statistics of 2.80 to 5.32). The strongest effect shows up in quarter t+1, for which a $1 increase in profits predicts a $0.25 increase in quarterly investment (profits and investment are scaled by the same variable, so the slopes show how investment grows following a $1 increase in profits). Summing the slopes for all quarters, an extra dollar of profits is associated with just under $1.00 of additional investment in quarter t+5. (Slopes for quarters t+6 and t+7 are also positive but insignificant.) Thus, investment is strongly correlated either with the information reflected in profits or with the additional supply of internal financing brought by higher profits.

Stock returns also predict investment growth for up to six quarters, consistent with a lag between a shock to investment opportunities and changes in actual expenditures. The predictive power of stock returns is strongest in quarter t+4, but the slopes for quarters t+2 through t+6 are all highly significant, with t-statistics of 2.85–4.10. The slopes indicate that a 10% increase in stock prices forecasts a 0.007–0.014% increase in investment as a percentage of total assets in every quarter t+1 to t+6. To put these numbers in perspective, if we instead use investment growth as the dependent variable (scaling by lagged investment rather than lagged assets), a 10% increase in stock prices predicts 0.5–0.9% of additional investment growth in each quarter t+1 to t+6, cumulating to 4.3% of additional investment in quarter t+6.

Short-term interest rates (dR) correlate positively with investment growth in quarters t and t+2, while the default spread (dDef) correlates negatively with investment growth in quarters t+1 through t+4. The first result is puzzling viewed from the perspective that higher interest rates should dampen investment. However, the results are consistent with the procyclical behavior of short-term interest rates and the countercyclical behavior of the default spread (see Fig. 3). Thus, dR and dDef seem to capture information about changes in either profitability or the equity premium over the business cycle. At the same time, the predictive power of both variables is weaker than that of profits and stock returns and, as we discuss next, largely disappears in multiple regressions.

Finally, Panel A shows that market volatility is weakly correlated with subsequent investment growth. The slopes are negative for all quarters t+1 through t+5 but marginally significant, at best, in only two quarters (the strongest t-statistic is -1.79). The evidence suggests that shocks to aggregate uncertainty have little impact on investment even before we control for movement in the other variables.[3]

3.2. Multiple regressions

Panel B of Table 3 studies the joint predictive power of profits, stock returns, volatility, and interest rates. The results confirm many of the relations discussed above, with a few key differences. Controlling for the other variables, stock returns now predict a stronger and more rapid increase in investment beginning as soon as quarter t+1 (the slopes for quarters t+1 to t+4 all increase compared with Panel A, while the slopes for t+5 and t+6 stay the same). The rapid increase following high stock returns suggests that firms either have substantial flexibility to react to changes in investment opportunities or sentiment, or have private information that allows them to start planning investment before the market learns about a shock.

A second notable difference is that interest-rate shocks are less significant in Panel B than in Panel A. Changes in short-term interest rates continue to be positively related to investment in quarters t and t+1, but

[3] Fig. 3 shows that market volatility is punctuated by two large spikes in 1987Q4 and 2008Q4. The predictive power of dStd in Panel A becomes marginally stronger if we reduce the impact of those spikes by setting the minimum value of dStd to -8% and the maximum value of dStd to 10% (roughly equivalent to winsorizing it at the 1st and 99th percentiles). In this case, the slope for quarter t+2 has a t-statistic of -2.26, though the slopes for all other quarters remain insignificant (the t-statistics range from -0.53 to -1.55).

changes in the default spread lose much of their predictive power (the slopes drop roughly in half and only the t-statistic for quarter t+1 is less than -2.0). The results suggest that the explanatory power of dR and dDef in Panel A can be attributed largely to their correlations with profits (0.32 and -0.34, respectively). Further, to the extent that profits and lagged investment do a good job controlling for variation in the business cycle, the positive slope on short-term interest rates in the multiple regressions is hard to reconcile with the hypothesis that Federal-Reserve-driven movements in interest rates have a first-order impact on corporate investment. The slope is never significantly negative, out to quarter t+8, and remains positive in quarters t+0 through t+2 even if we add GDP growth to the regressions.[4] Thus, there is no evidence that, conditional on current profit and GDP growth, higher interest rates dampen investment going forward.

A potential explanation for these results is that interest rates and investment are both driven by expectations of future economic activity. However, we find little support for that hypothesis in the data: higher interest rates are, in fact, *negatively* associated with subsequent GDP growth. For example, if we forecast GDP growth using the variables in Table 3 (keeping the specification the same as Panel B), the slopes on dR_t are marginally negative in quarters t+2 through t+5 (t-statistics of -1.44 to -1.93) and, together, those slopes are jointly significant (their sum has a t-statistic of -2.11; a 1% increase in dR_t predicts 0.7% lower GDP growth). Higher interest rates also predict lower household and nonprofit investment (HI), the second most important component (after Capx) of U.S. gross private domestic investment: using the predictive model in Panel B, dR_t is strongly negatively related to dHI_{t+k} in quarters t+1 through t+5, with t-statistics of -2.00 to -4.47. (The predicted decline in HI more than offsets the predicted increase in corporate investment, leading to a weak negative relation between interest rates and total U.S. fixed investment.) The puzzle, then, is why expected investment growth increases at the same time that interest rates rise and expected GDP, noncorporate investment, and, as we show later, profit growth all decline.

The third notable result in Panel B is that market volatility actually becomes positively related to investment

[4] GDP growth is highly correlated with changes in corporate profits (dNI) and has similar predictive power for investment. If GDP growth is added to the regressions in Panel B, it and dNI are both significant but their t-statistics are much smaller than when the variables are used separately. We omit GDP from Table 3 to avoid problems with multicollinearity, but it is useful to note that GDP does have incremental predictive power.

growth once we control for profits, stock returns, and the other variables. The predictive slope on $dStd_t$ is positive at all horizons and significant for quarters t+1, t+3, and t+4. Thus, the negative relation in Panel A is attributable to the correlation between volatility and stock returns (-0.50) rather than a direct link between volatility and investment. The results provide no evidence that corporations cut investment in response to an increase in aggregate uncertainty, contrary to conventional wisdom, formal models with irreversible investment or fixed adjustment costs (e.g., Caballero 1999; Bloom 2009), and, to some extent, prior evidence, though we do not know of a directly comparable test in the literature. For example, Bloom (2009) argues that an increase in uncertainty reduces investment and output in the short run but leads to a rebound over longer horizons, as uncertainty subsides and 'firms address their pent-up demand for labor and capital' (p. 625). However, we find no evidence for this pattern in aggregate corporate investment.

The joint explanatory power of the variables in Panel B is substantial, predicting 33% of the variation in investment growth in quarter t+1 and an average of 16% in the three subsequent quarters. (Using annual data, the predictive R^2 for the model is greater than 60%.) To illustrate the results, Fig. 4 plots the investment growth predicted by a one-standard-deviation increase in profits and stock returns, starting with the predicted effect in quarter t+1 and cumulating out to quarter t+5. The estimates come from multiple regressions like those in Table 3—using investment growth rates instead of investment changes scaled by assets—and the t-statistics adjust for correlation between slopes at different horizons.

The graph shows that a one-standard-deviation increase in profits predicts 1.1% of additional investment in quarter t+1, growing to 3.6% of additional investment in quarter t+5 (with a t-statistic of 6.64); a one-standard-deviation increase in stock returns predicts 0.7% of additional investment in quarter t+1, growing to 4.0% of additional investment in quarter t+5 (with a t-statistic of 5.67). These effects are large relative to average investment growth of 3.2% annually from 1952–2010. Thus, investment grows rapidly following high profits and stock returns—consistent with virtually any model of corporate investment—but can take up to a year and a half to fully adjust. These results update, and somewhat revise, the findings of Barro (1990), Morck, Shleifer, and Vishny (1990) and Blanchard, Rhee, and Summers (1993), who disagree about whether profits or stock prices are more important for investment. Our evidence suggests that both variables are highly significant,

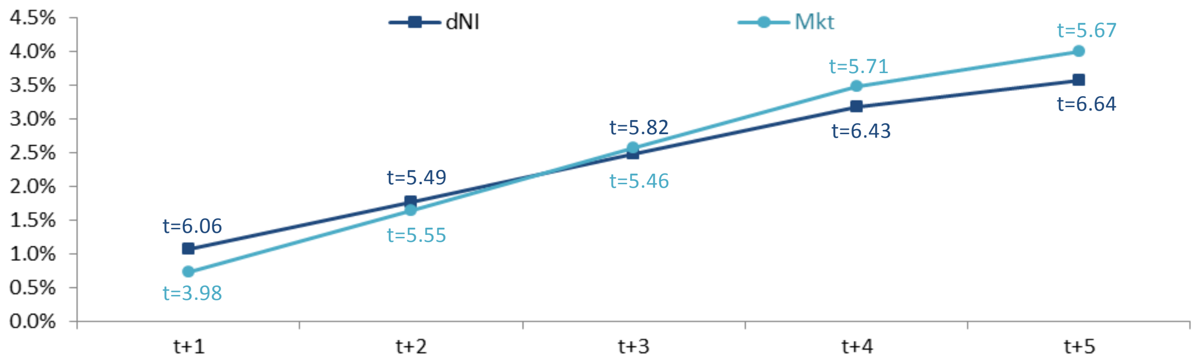

Fig. 4. Cumulative growth in quarterly investment following a one-standard-deviation increase in corporate profits (dNI_t) or stock returns (Mkt_t), controlling for the other predictors in Table 3. Investment and profits come from the seasonally-adjusted Flow of Funds accounts for nonfinancial corporations; stock returns come from CRSP. Newey-West t-statistics are reported next to each point.

with very similar predictive power for investment, and largely subsume the information captured by the business-cycle variables in Table 3.[5]

3.3. Other predictors

Our conclusions are similar if we include other predictors proposed in the literature:

Tobin's q. Theoretically, investment should be closely linked to Tobin's *q*, the market value of capital divided by its replacement cost. We find that changes in *q* do predict investment but, as in Barro (1990) and Blanchard, Rhee, and Summers (1993), the effects are better captured by stock returns than actual changes in *q* (estimated from Flow of Funds data). Used alone, changes in *q* are significantly related to investment growth in quarters t+1 through t+5, but *q* adds no predictive power when included in the regressions in Panel B (t-statistics of -0.69 to 0.60).

Bond market q. Philippon (2009) shows that an estimate of Tobin's *q* derived from corporate bond prices (q_{bond}) has strong predictive power for private nonresidential fixed investment. We find that q_{bond}, available on Phillipon's website from 1953Q2–2007Q2, also predicts aggregate capital expenditures: By itself, changes in

[5] The other variables add little to the regression R^2s, but the cumulative slopes on dStd and dDef are significant. A one-standard-deviation increase in dStd predicts 1.3% greater investment in quarter t+5 (t-statistic of 3.48), while a one-standard-deviation increase in Def predicts 1.6% less investment (t-statistic of -3.01).

q_{bond} are significantly positively related to dCapx in quarters t+1 through t+4 with t-statistics greater than four in quarters t+1 and t+2. The relation with $dCapx_{t+1}$ remains significant controlling for the other variables in Table 3, but q_{bond} does not predict investment reliably after quarter t+1 and has little impact on our other results (profits and stock returns continue to have strong predictive power in quarters t+1 through t+5).

Volatility shocks. Unlike the other predictors in Table 3, market volatility has a relatively low autocorrelation of 0.61, implying that changes in volatility are predictable. We find similar results if volatility shocks from an AR1 model are used in place of volatility changes, though the negative relation between volatility and investment in Panel A becomes stronger (t-statistics of -2.34 to -3.29 in quarters t+1 through t+4) and the positive relation between volatility and investment in Panel B becomes weaker (t-statistics of -0.47 to 1.40). The robust conclusion seems to be that volatility has little predictive power for investment growth after controlling for profits, stock returns, and the other variables.

Idiosyncratic volatility. Philippon (2009) and Gilchrist, Sim, and Zakrajsek (2013) show that idiosyncratic volatility predicts aggregate investment, but neither paper controls for profits or stock returns. Our tests suggest that idiosyncratic volatility predicts about as well as market volatility. (We measure idiosyncratic volatility in the same way as Philippon, based on the cross-sectional dispersion of firm-level stock returns.) Changes in idiosyncratic volatility are weakly negatively related to investment growth in both simple regressions (t-statistics of -0.59 to -1.57 in quarters t+1 through t+4) and multiple regressions controlling for the other predictors in Table 3 (t-statistics of -0.85 to -1.94).

Federal funds rate. The federal funds rate is often used as a proxy for short-term interest rates, in part because it may reflect monetary policy more directly than the one-year Tbond rate. Our results are similar using either variable. The federal funds rate is positively related to subsequent investment growth in simple regressions but has little predictive power controlling for the other predictors.

Credit spreads. Gilchrist and Zakrajsek (2012) show that a credit spread measure (GZ) derived from matching individual corporate bonds to a portfolio of zero-coupon Tbonds with the same cash flows has strong predictive power for GDP and other macro variables. A component of this spread, the 'excess bond premium' (EBP), is especially significant. Both series are available on the *American Economic Review* website from 1973Q1–2010Q3. We find mixed evidence that GZ and EBP predict investment in our data. Used alone, levels and changes in the variables are negatively related to subsequent investment growth, with t-statistics as high as -7.64 (using EBP_t to predict $dCapx_{t+1}$). However, when GZ and EBP are added to our multiple regressions, only the level of the variables has reliable predictive power and much of that comes from the fact that GZ and EBP are highly correlated with prior profits and stock returns. In our preferred specification, using changes in the variables, GZ is not significant at any horizon (t-statistics of -1.73 to 1.13) and EBP is significant only in quarters t+4 and t+5 (t-statistics of -2.10 and -2.63). The conclusions regarding our other variables do not change.

Sentiment. Arif and Lee (2014) show that several proxies for investor sentiment are correlated with a measure of aggregate investment derived from firm-level changes in net operating assets on Compustat. However, our tests suggest that neither investor nor consumer sentiment has strong predictive power for aggregate Capx. We use the Baker-Wurgler (2006) index as a proxy for investor sentiment (available on Wurgler's website from 1966–2010) and the University of Michigan index as a proxy for consumer sentiment. Changes in the indices tend to be positively related to investment growth in quarters t+1 to t+5, with univariate t-statistics ranging from -1.55 to 2.77 for investor sentiment and 1.32 to 4.75 for consumer sentiment, but only the latter is significant if we control for the other predictors in Table 3 (t-statistics of 2.05–3.28 in quarters t+3 to t+5). Consumer sentiment adds modestly to the regression R^2s—the average R^2 increases by about 1%—and has little impact on the other slopes and t-statistics.

4. Investment and future corporate performance

We reverse the timing of the regressions in this section, focusing on the link between investment and *future* profits and returns. The main questions we ask are: (1) How does investment relate to subsequent profit growth? (2) How do stock prices behave when investment becomes publicly known? (3) Does the relation between investment and future stock returns provide evidence that either discount rates or sentiment explain significant variability in investment growth?

4.1. Investment and future profits

Table 4 looks at the connection between investment and future profits, either using investment by itself or controlling for lagged profits, stock returns, volatility, and interest rates. The table is organized along the lines of Table 3, with simple regressions of dNI_{t+k} on each variable in Panel A and multiple regressions using all of the predictors together in Panel B.

For our purposes, the key result in Table 4 is the strong negative relation between investment and future profit growth. Higher investment predicts low profit growth in every quarter t+1 to t+4, significant in both simple regressions (t-statistics of -1.40 to -5.06) and multiple regressions controlling for stock returns, volatility, and interest rates (t-statistics of -1.78 to -4.83). The relation is strongest in quarters t+2 and t+3, in which an extra dollar of $dCapx_t$ predicts roughly $0.70 lower profits. (Recall that dNI and dCapx are both scaled by lagged assets, so the slopes can be interpreted as the change in profits predicted by a $1 increase in investment.) The slopes are also negative in quarters t+5 and t+6, but the estimates are not statistically significant in either simple or multiple regressions.

The strength and speed of the effects suggest that the relation between investment and future profits is not causal. Higher investment could, in principle, reduce profits by increasing costs faster than revenues, but it seems unlikely that a $1 increase in investment would *cause* a $0.21 drop in profits in the subsequent quarter or, summing the slopes across quarters in Panel B, a $1.36 drop in profits in quarter t+5. Additional support for this view comes from the fact that, in supplemental tests, we find that higher investment predicts not just lower profits but also lower GDP growth. Specifically, while $dCapx_t$ is positively related to GDP growth in quarter t+1, it is negatively related to GDP growth in quarters t+2 through t+5. The relation is not as strong as it is for profit growth, but the slope is significant in quarter t+3 with a t-statistic of -2.96 (or -3.48 in multiple regressions like those in Panel B). We can think of no reason that higher investment would *cause* a drop in subsequent GDP growth.

Fig. 5 graphs the relation between investment and profits. It shows, in particular, how profits evolve in the

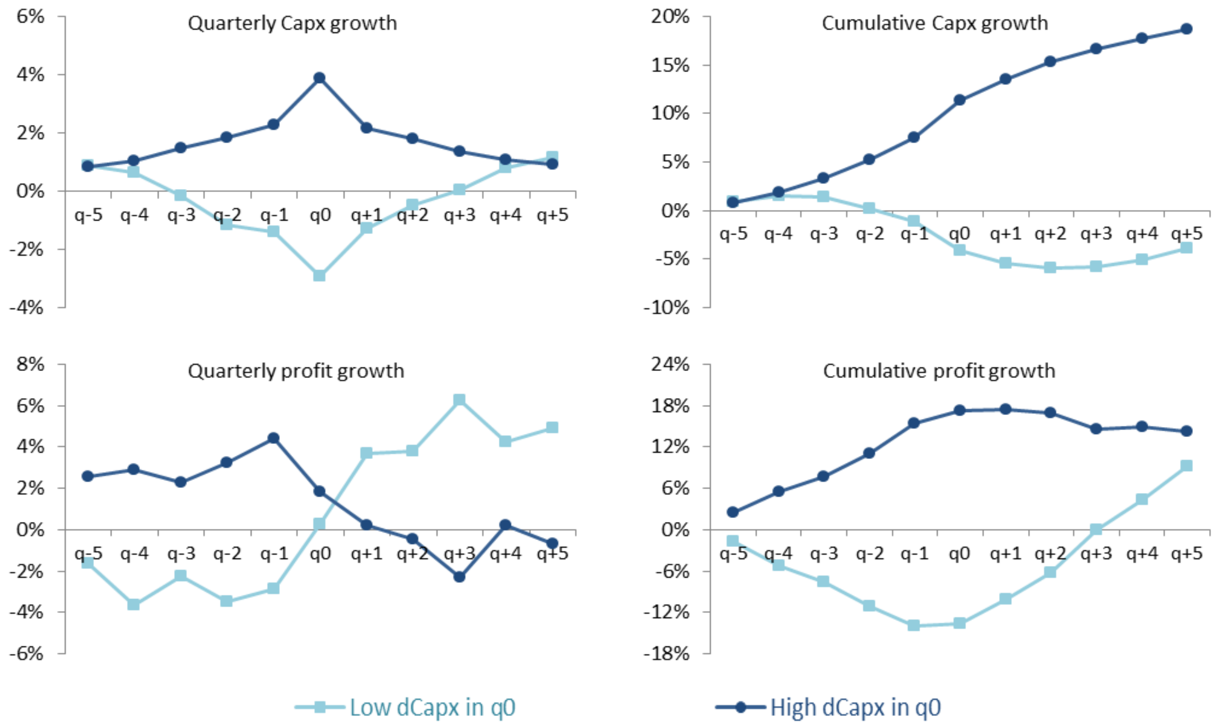

Fig. 5. Investment and profit growth in quarters leading up to and following a large increase (dark line) or decrease (light line) in quarterly investment (dCapx in q0). The top panels show the quarterly and cumulative growth rate of investment; the bottom panels show the quarterly and cumulative growth rate of profits. Investment and profits come from the seasonally adjusted Flow of Funds accounts for nonfinancial corporations.

quarters leading up to and following large changes in investment, defined as the top and bottom quartiles of dCapx historically (the top two panels of Fig. 5 show that investment growth itself is persistent). Remarkably, the negative relation between investment and future profits is nearly as strong as the positive relation between investment and prior profits. Profits grow 5.2% slower per quarter in the five quarters after a large increase in investment than after a large decrease, almost completely reversing the 5.9% quarterly profit differential leading up to investment. As a consequence, profit growth over the full 11-quarter window is nearly the same around big increases and big decreases in investment. Investment seems to grow strongly following what turns out to be a largely transitory shock to profits.

The negative relation between investment and future profits presents a challenge for traditional models of corporate investment, which predict that high investment should be associated with good news and persistently higher profits. The fact that a spike in investment predicts slow GDP growth and a drop in profits suggests that large changes in investment can be bad news for corporate value. This interpretation is consistent with the low stock returns in quarters t+1 and t+2 that we document in the next section.

It is important to note that investment's predictive power does not simply capture mean reversion in profitability (profits scaled by assets) over the business cycle. In principle, a spike in investment might optimally follow an increase in profits and profitability and, at the same time, predict low profit growth going forward as profitability reverts toward its long-run mean (see Fig. 1). Empirically, however, investment continues to have strong predictive power even if we include lagged profitability or additional lags of profit growth in the regressions (or both). For example, if we add lagged profitability to the regressions in Panel B, the slope on $dCapx_t$ remains negative in every quarter t+1 to t+5 (t-statistics of -0.32 to -3.92) and the cumulative slope, summing across all five quarters, drops only marginally from -1.36 in Table 4 to -1.17 (t-statistic of -3.25). Investment growth is also strongly negatively related to future *profitability*, controlling for current profitability and the other predictors in Table 4. Thus, a spike in investment is bad news for future profits over and above business-cycle mean reversion in profitability.

One story that fits the data is that spikes in investment are simply poorly timed: Managers raise investment following high profits and stock returns but, by the time investment growth peaks, subsequent profit growth turns out to be low. The opposite tends to be true after low profits and returns, consistent with the observation in Fig. 1 that the largest declines in investment occur at the very end of recessions just before profits rebound. These patterns suggest that investment is less closely tied to rational expectations of future profitability than implied by traditional q-theoretic models of investment.

This is not to say that an optimal investment model could not generate some of the patterns we find, at least qualitatively. The challenge for traditional stories, however, lies in the strength and speed of the effects. For example, controlling for the downward trend in profitability observed in Fig. 1, we find that the increase in profitability observed prior to a spike in investment almost fully reverses within six to seven quarters after the spike. Again, this suggests that investment reacts strongly—perhaps excessively—to what turns out to be transitory shocks to profitability. Traditional models also do not generate the negative stock market reaction to investment we document below.

4.2. Investment and future stock returns

Higher investment is bad news for future profits, but the results above do not provide any indication of when the market learns about the effects. In this section, we study the link between investment and future stock returns, both in the short run when expenditures become public and in the long run after expenditures are known. Prior studies have looked at whether investment predicts returns, but the evidence is mixed and often does not distinguish between short-run 'announcement' effects and true predictability, given the delay in the observability of aggregate expenditures.

Because stock returns should correlate differently with expected and unexpected investment—in an efficient market, only the latter reflects new information—we explore the predictive power of both the total change in investment and estimates of the expected and unexpected change. Our analysis in Section 3 shows that investment growth is highly predictable based on recent changes in investment, profits, and stock prices. Therefore, to forecast investment, we estimate a model that includes two lags of each of those variables (adding another lag or including the other predictors from Section 3 has little impact on the results). As shown in Table 5, the predictors are highly significant (t-statistics of 1.87–5.37) and together predict 38% of the variation in dCapx. We use the fitted values and residuals from this regression as our measures of expected and unexpected investment.

Table 6 documents the link between investment and subsequent stock returns. Again, the basic format is the same as our earlier tables, with stock returns for quarters t through t+5 (Mkt_{t+k}) regressed on either the total change in investment in quarter t ($dCapx_t$) or the expected and unexpected changes in investment ($E[dCapx_t]$ and $U[dCapx_t]$). Panels C and D add a variety of control variables to the regression, including the change in profits (dNI_t), the change in market volatility ($dStd_t$), and either the level or change in short-term interest rates (R), the term spread (Term), and the default spread (Def), supplemented with lagged market returns and dividend yield (DY_t). For this table, market returns are measured net of the three-month Tbill rate in order to test for predictability in excess returns.

The table shows that stock returns, like profits, are negatively related to prior investment growth, concentrated in quarters t+1 and t+2 when the market likely learns about investment. The slopes for those two quarters are highly significant, with t-statistics of -3.18 and -2.45 using the total change in investment in Panel A and -3.22 and -3.21 using the unexpected change in investment in Panel B. The slopes in subsequent quarters, as well as the slopes on expected investment, are also predominantly negative but their statistical significance is weaker. The results suggest that high investment is associated with bad news but provide little evidence of longer-term predictability after expenditures become known.

Economically, the point estimates in Table 6 are large. A one-standard-deviation increase in $dCapx_t$ predicts that market returns will be 1.6% lower in quarter t+1 and a combined 2.9% lower in quarters t+1 and t+2 (the latter has a t-statistic of -3.29). Similarly, a one-standard-deviation increase in $U[dCapx_t]$ implies that market returns will be 1.4% lower in quarter t+1 and a combined 2.8% lower in quarters t+1 and t+2 (the latter has a t-statistic of -4.51).

For additional perspective, Fig. 6 plots stocks returns in the quarters leading up to and following a big increase or decrease in investment (top and bottom quartiles of the historical distribution of dCapx). Returns are nearly 25% higher in the five quarters before a jump in investment than before a big investment decline, but, as we saw with profits, the pattern flips after investment: excess returns are -0.4% in the six months after a spike in investment and 5.6% in the six months after a big decline. The graph provides some evidence that the pattern continues after quarter t+2 but the return spread narrows. In the five-quarter post-investment window, excess returns are just 1.8% after a big increase but 13.9% after a big decline. The numbers become 3.3% and 17.5%, respectively, if returns for quarter t are included.

The behavior of stock prices mimics the behavior of profits in Fig. 5 but seems to be shifted forward one quarter in event time. Again, a remarkable fact is that the return spread in quarters t+1 to t+5 offsets a large fraction of the pre-investment return spread, so cumulative returns over the full 11-quarter window differ by less than 10% around big spikes versus big declines in investment (returns of 21.1% and 11.4%, respectively). In principle, the basic pattern—a positive return spread before and a negative return spread after—could be

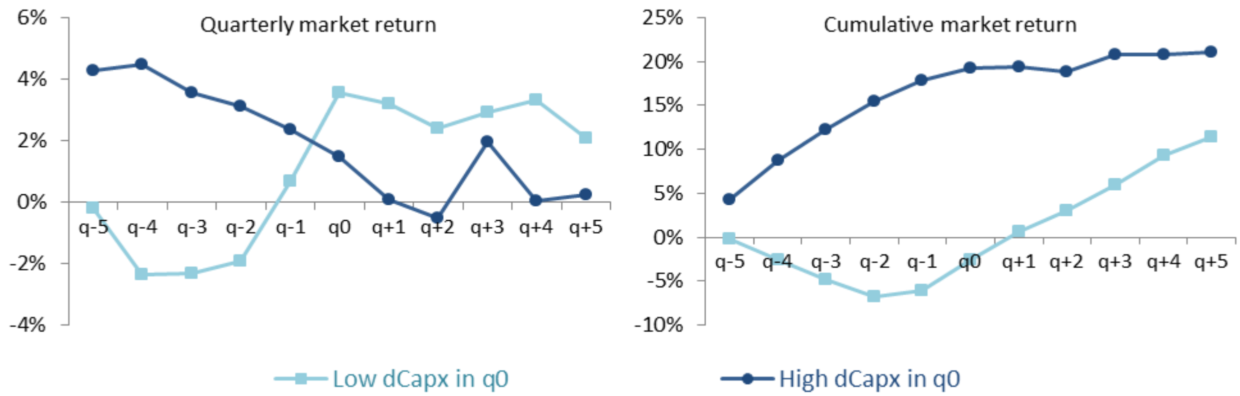

Fig. 6. Excess stock market returns in quarters leading up to and following a large increase (dark line) or decrease (light line) in quarterly investment (dCapx in q0). Investment comes from the seasonally adjusted Flow of Funds accounts for nonfinancial corporations; stock market returns and three-month Tbill rates come from CRSP.

explained by discount-rate effects, but the size and speed of the reversal seems more consistent with the view that a spike in investment is associated with bad news (concentrated in quarters t+1 and t+2). In addition, the fact that cumulative profit growth is a bit higher around spikes in investment likely explains part of the cumulative return spread observed in Fig. 6, implying that any discount-rate effects imbedded in stock prices that persist beyond the end of the window must be small.

It is important to note that, while the patterns in profits and returns are similar, they seem to be distinct effects. To illustrate, Fig. 7 replicates Fig. 6 but, rather than focus on quarters with high or low dCapx, we look at quarters in which investment changes a lot controlling for prior profits, i.e., we focus on quarters that have a big positive or negative residual when $dCapx_t$ is regressed on profit growth from quarter t-5 to t-1. Like the total change in investment, this component is strongly negatively related to market returns in quarters t+1 and t+2. In fact, market returns are more extreme when investment changes unexpectedly given prior profit growth: excess returns are -0.9% in the six months after an unexpected jump in investment and 8.8% after an unexpected decline, for a spread of 9.7% (compared with 6.0% in Fig. 6). The spreads in quarters t+1 and t+2 are both significant, with t-statistics of -4.31 and -2.85, respectively.

4.3. Discussion

Our results show that high investment growth is associated with bad news. The evidence is hard to reconcile

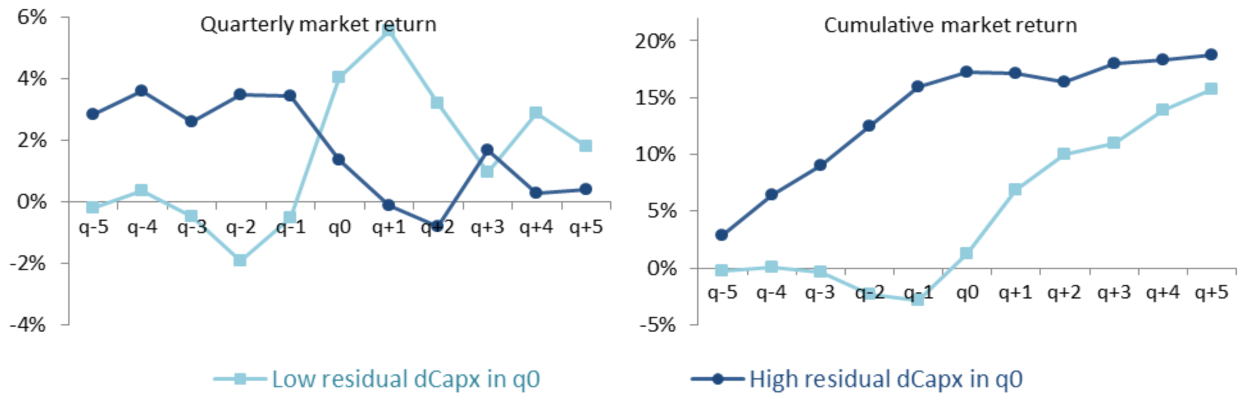

Fig. 7. Excess stock market returns in quarters leading up to and following a large increase (dark line) or decrease (light line) in the component of investment that is uncorrelated with prior profit growth. Investment comes from the seasonally adjusted Flow of Funds accounts for nonfinancial corporations; stock returns come from CRSP.

with traditional models of corporate investment, which predict that higher investment should be positively associated with stock returns and persistently higher profits.

We can think of only two reasons that high investment might be bad news if investment responds optimally to fundamentals. First, an increase in labor costs could simultaneously lead to low profits but high investment as firms shift away from labor. Second, if there is a difference between 'old' and 'new' capital, a negative shock to existing capital could also hurt profits yet induce higher investment as firms shift to new capital. The problem for both stories is that, if either has a first-order impact on investment growth in general, we would expect investment growth to be negatively related to both prior and subsequent profits as firms respond to wage and productivity shocks. Neither story predicts a dramatic difference in the way that investment relates to recent past and future profit growth.

The evidence supports the view that large changes in investment are, on average, poorly timed. Managers seem to overreact to prior profits and stock returns, expanding investment excessively in the late-stages of expansions and cutting investment excessively at the end of recessions. This interpretation does not mean that higher investment is, in general, wasteful or inefficient. Indeed, when investment growth is commensurate with prior profit growth—$dCapx_t$ is high or low but matches the growth expected given the typical relation between investment and profits—market returns in quarters t+1 and t+2 are not unusual.[6] Our evidence suggests, instead, that it is an *abnormal* spike in investment, given prior profit growth, that is associated with low market returns.

Our findings are consistent with agency-based theories of investment, though such theories are typically applied to acquisition decisions rather than capital expenditures (Stein 2003). The limited evidence that does exist on the market's reaction to capital expenditures suggests that announcements of high planned investment are actually viewed as good news, at least for the small sample of firms with identifiable announcements (McConnell and Muscarella 1985; Chung, Wright, and Charoenwong 1998). However, we do not know of any study that looks at the market's reaction to unexpected capital expenditures for a broad cross section of firms. (The closest might be Titman, Wei, and Xie 2004, who find that investment growth predicts low returns in the years after investment is known.)

While a detailed cross-sectional study is beyond the scope of this paper, our results seem to extend to firm-level investment. Specifically, we have repeated our tests using firm-level capital expenditures from Compustat (available quarterly from 1984–2012), measuring unexpected investment as the residual when seasonally-differenced Capx is regressed, cross sectionally, on a firm's lagged Capx, lagged market-to-book ratio of assets, lagged stock returns, and lagged earnings. In Fama-MacBeth regressions controlling for contemporaneous changes in earnings and sales, abnormal investment in quarter t is associated with a drop in stock returns in quarter t+1 similar to that found in aggregate data.[7] The slope on $dCapx_t$ is significantly negative in the full sample of firms (-0.20 with a t-statistic of -2.28) but is especially strong among firms larger than the 10th percentile of NYSE-listed companies (-0.34 with a t-statistic of -3.20). The main difference at the firm level is that Capx's predictive power persists for several quarters after expenditures are disclosed,

[6] If we repeat the exercise in Fig. 7 focusing on quarters that have high or low expected investment growth, the return spread in the six months after a spike in expected investment is slightly positive, equal to 0.07% in quarter t+1 and 0.17% in quarter t+2. Neither estimate is significantly different from zero.

[7] The results are based on 107 quarterly cross-sectional regressions from 1986–2012 (the first two years of quarterly Capx data on Compustat are needed to get lags of seasonally-differenced Capx). The average cross section has 3,379 firms with necessary data, dropping to 1,617 firms when the smallest companies based on lagged total assets are excluded from the sample. Capx and earnings are deflated by total assets. All variables other than stock returns in quarter t+1 are winsorized at their 1st and 99th percentiles. Additonal details are available on request.

rather than being concentrated in quarters t+1 and t+2.

5. Investment growth, 2008–2009

The behavior of investment during the recent financial crisis has received wide attention in both the academic literature and popular press. Many observers suggest that, due to the dramatic decline of short-term debt markets and losses in the banking sector, firms' ability to finance investment was severely restricted. For example, in a survey of chief financial officers in December 2008, Campello et al. (2010) report that 57% of U.S. respondents said their firms were 'somewhat affected' or 'very affected' by difficulties in accessing the credit markets, and a majority of respondents said their firms had to forego attractive investments because of an inability to obtain external funds. Given this narrative—that an unprecedented credit crisis induced a severe drop in investment—it seems useful to study this period in some detail.

On a basic level, the decline in investment at the end of 2008 and in 2009 was indeed unprecedented during our sample. Corporate investment dropped 21% in 2009 and declined a total of 27% from its quarterly high in 2007Q3 to its (local) minimum in 2009Q4. The decline in 2009 and the drop from 2007Q3 through 2009Q4 represent the largest annual decline and largest cumulative drawdown, respectively, observed in our data (the second largest annual decline is 17% in 1958 and the second largest cumulative drawdown is 24% from 2000Q3 to 2003Q1).

The more interesting issue, however, is whether the behavior of investment during the financial crisis was 'special,' that is, whether a significant portion of the decline represents an unusual response to the credit crisis rather than a normal reaction to changing macroeconomic conditions. Put differently, it seems clear that some portion of the investment drop in 2008 and 2009 can be tied to a decline in investment opportunities, not just an inability of firms to finance good projects. Understanding the role of each factor is important for policy makers yet remains the subject of much debate (e.g., Kahle and Stulz 2013).

Of course, unambiguously isolating the two factors is impossible. Our approach is simply to ask whether the investment decline can be explained by movements in profits, GDP, and stock prices during the crisis, without

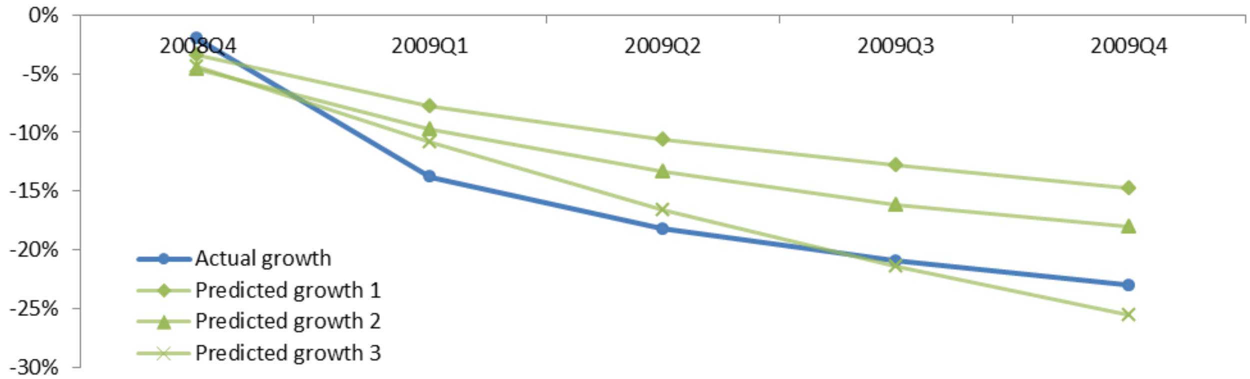

Fig. 8. Predicted vs. actual cumulative investment growth from 2008Q4 through 2009Q4. The predicted growth rate is the fitted value (given the predictors in 2008Q4) from a regression of $dCapx_t + dCapx_{t+1} + \ldots + dCapx_{t+k}$ on various predictors known in quarter t, where k equals zero for predicted growth in 2008Q4 and increases by one as the forecast horizon is lengthened (k equals five for predicted cumulative growth from 2008Q4–2009Q4). Three sets of predictors are used. Predicted growth 1 is based on lagged quarterly investment growth ($dCapx_{t-1}$) and the change in profits (dNI_t); Predicted growth 2 is based on lagged quarterly investment growth, change in profits, and GDP growth (GDP_t); Predicted growth 3 is based on lagged quarterly investment growth, change in profits, GDP growth, and stock returns (Mkt_t). Investment and profits come from the seasonally adjusted Flow of Funds accounts for nonfinancial corporations; investment is scaled by lagged investment and profits are scaled by lagged total assets. GDP comes from the St. Louis Fed's FRED database. Value-weighted stock returns come from CRSP.

appealing to anything special going on in the credit markets. The question is: How much would investment drop if it simply maintained its historical link to profits, GDP, and stock prices? Interpreted differently, if managers update investment plans based on macroeconomic signals, how much would they reduce investment if nothing incremental was happening in the credit markets?

We approach this question in a couple of ways. Fig. 8 compares the actual investment decline from 2008Q4–2009Q4 to the decline predicted given macroeconomic conditions in 2008Q4, estimated from three regression models: Model 1 predicts investment using profits (dNI_t) and lagged investment ($dCapx_{t-1}$); Model 2 adds GDP_t to the regression; and Model 3 adds both GDP_t and stock returns (Mkt_t) as predictors. The one-quarter change predicted for 2008Q4 comes from a regression of $dCapx_t$ on each set of variables; the two-quarter change predicted for 2008Q4–2009Q1 comes from a regression of $dCapx_t + dCapx_{t+1}$ on each set of variables; and so forth. Thus, the graph compares the actual decline in investment to the decline predicted based on the behavior of profits, GDP, and stock returns at the end of 2008. (The predictions equal the fitted values from the full-sample regressions; they change slightly, by less than 1.4 percentage points, if we omit the financial crisis itself from the regressions.)

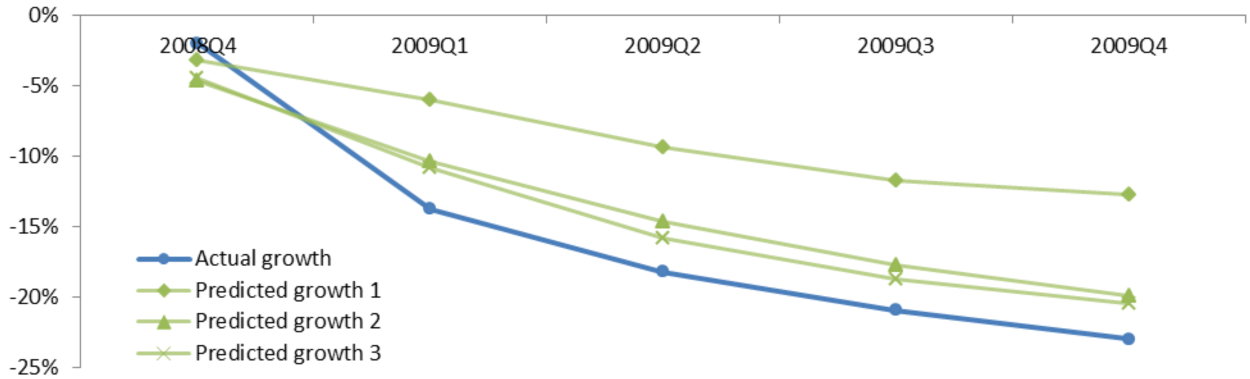

Fig. 9. Predicted vs. actual cumulative investment growth from 2008Q4 through 2009Q4. The predicted growth rate each quarter is the fitted value from a regression of $dCapx_t$ on various predictors known in quarter t. Three sets of predictors are used. Predicted growth 1 is based on the current change in profits and three lags of investment growth and profit changes; Predicted growth 2 is based on the current change in profits, current GDP growth, and three lags of investment growth, profit changes, and GDP growth; Predicted growth 3 is based on the current change in profits, current GDP growth, current market returns, and three lags of investment growth, profit changes, GDP growth, and market returns. Investment and profits come from the seasonally adjusted Flow of Funds accounts for nonfinancial corporations; investment is scaled by lagged investment and profits are scaled by lagged total assets. GDP comes from the St. Louis Fed's FRED database. Value-weighted stock returns come from CRSP.

The graph shows that macroeconomic conditions at the end of 2008 would, by themselves, predict a substantial decline in investment from 2008Q4–2009Q4. If investment maintained its historical connection to profit growth, investment was predicted to drop by 14.7%, roughly two-thirds the actual decline of 23.0%. The difference between the two is due primarily to a greater-than-predicted drop in 2009Q1. If we add GDP growth to the model, the predicted decline grows to 18.1%, nearly four-fifths of the actual decline. Finally, if we add stock returns to the model, the predicted decline becomes larger (25.5%) than the actual decline. Thus, the vast majority, if not all, of the investment decline could be described as 'normal' given the behavior of profits, GDP, and stock returns at the end of 2008.

The forecasts in Fig. 8 are based solely on profits, GDP growth, and stock returns in 2008Q4. Predicted growth from 2008Q4–2009Q4 takes into account the long-run forecasting ability of the quarterly variables but does not reflect in any way the evolution of profits, stock returns, etc., after 2008Q4. An alternative approach, shown in Fig. 9, is to update forecasts of investment growth every quarter, based on the most recent behavior of the predictors. The main complication is that quarterly changes in the predictors have a long-lasting impact on investment growth, persisting for at least several quarters (see Table 3). To capture these effects, our prediction models in Fig. 10 include current profits, GDP, and stock returns, as well as three lags of those variables and prior investment growth.

Fig. 9 has a similar message as Fig. 8: The behavior of profits, GDP, and stock returns in 2008 and 2009 can explain much of the decline in investment following the financial crisis. Cumulating the predicted quarterly growth rates, investment would be predicted to decline 12.8% from 2008Q4–2009Q4 given observed changes in profits, 20.0% given observed changes in profits and GDP, and 20.5% given observed changes in profits, GDP, and stock returns. The actual decline of 23.0% is greater, but the bulk of the decline again looks like a historically typical response to macroeconomic conditions, even without any unusual behavior in the banking sector and credit markets. These results are generally consistent with the firm-level evidence of Kahle and Stulz (2013) that a reduction in the availability of external financing may have played a small role relative to changes in firms' investment opportunities.

6. Conclusions

Corporate investment is important for both long-term macroeconomic growth and short-term variation in the business cycle. Our paper provides new evidence on the factors that drive corporate investment, recognizing, of course, that our inferences come from reduced-form empirical relations rather than tests that establish causation directly.

Empirically, expected investment growth is closely linked to recent profit growth and stock returns but only weakly related to changes in interest rates, stock volatility, and the default spread. We find no evidence that investment drops following a spike in aggregate uncertainty, contrary to the predictions of many models with irreversible investment. We also find no evidence that investment growth slows after a rise in short-term or long-term interest rates, contrary to the idea that Federal-Reserve-driven movements in interest rates have a first-order impact on corporate investment (and contrary to the behavior of GDP, profit, and noncorporate investment growth).

The link between investment and past corporate performance undoubtedly reflects the impact of fundamentals on investment, but the link between investment and *future* performance suggests that fundamentals may not be the whole story: investment growth is negatively related to future profits and to quarterly stock returns when expenditures become publicly known. Investment grows rapidly following what appear to be largely transitory shocks to profits, and spikes in investment seem to coincide with bad news.

Our final tests show that the decline in investment following the 2008 financial crisis, while unprecedented in our sample, would have been predicted largely by the behavior of profits and GDP in 2008 and 2009, without needing to ascribe a special role to the banking sector and debt markets. We estimate that at least three-quarters of the investment decline can be thought of as a historically typical drop given the behavior of profits and GDP at the end of 2008. Problems in the credit markets may have played a role, but the impact on corporate investment is arguably small relative to a decline in investment opportunities following the 2008 recession and financial crisis.

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Table 1
Descriptive statistics, 1952–2010

This table summarizes the time-series properties (average, median, standard deviation, minimum, maximum, and autocorrelation) of the key variables used in the empirical tests. Data are quarterly, in percent, 1952Q2–2010Q4 (235 quarters). Aggregate corporate investment and profits come from the Federal Reserve's seasonally adjusted Flow of Funds accounts for nonfinancial corporations (table F102); levels and changes in these variables are scaled by beginning-of-quarter book value of total assets (table B102). Value-weighted stock returns and Treasury (Tnote) yields come from CRSP. Inflation, GDP growth, and the yield spread between Baa and Aaa bonds come from the St. Louis Fed's FRED database. The standard deviation of stock returns (Std) is calculate as the square root of the sum of squared daily returns during the quarter. Investment, profits, stock returns, and GDP are inflation-adjusted using the CPI.

Variable	Description	Avg	Med	Std	Min	Max	Auto
Capx	Corporate fixed investment	1.56	1.55	0.25	0.97	2.07	0.99
NI	After-tax corporate profits	0.83	0.81	0.29	0.18	1.44	0.97
dCapx	Change in Capx	0.01	0.02	0.04	-0.21	0.13	0.44
dNI	Change in NI	0.01	0.01	0.07	-0.34	0.19	0.11
Mkt	Value-weighted stock returns	1.97	2.96	8.43	-26.93	22.35	0.10
GDP	GDP growth	0.77	0.77	0.96	-2.71	3.93	0.37
CPI	Inflation	0.91	0.74	0.83	-3.44	4.16	0.62
Std	Std deviation of Mkt	6.45	5.53	3.60	1.84	33.72	0.61
R	1-year Tnote yield	5.28	5.13	3.00	0.30	15.44	0.95
Term	10-year – 1-year Tnote yield	0.79	0.76	1.05	-3.86	3.33	0.85
Def	Baa – Aaa yield	0.97	0.84	0.46	0.34	3.38	0.88
dStd	Change in Std	0.01	-0.19	3.15	-15.78	19.27	-0.28
dR	Change in R	-0.01	0.09	0.93	-6.77	3.86	-0.17
dTerm	Change in Term	0.01	0.00	0.58	-2.81	4.88	-0.24
dDef	Change in Def	0.00	0.00	0.23	-1.03	1.72	0.02

Table 2
Correlations, 1952–2010
This table reports the correlation between quarterly changes in aggregate corporate investment, profits, stock prices (i.e., returns), GDP, consumer prices, stock volatility, and interest rates. Data are quarterly, in percent, from 1952Q2–2010Q4. Aggregate investment (Capx) and after-tax profits (NI) come from the Federal Reserve's seasonally adjusted Flow of Funds accounts for nonfinancial corporations; changes in the two variables are scaled by beginning-of-quarter total assets. Value-weighted stock returns (Mkt), 1-year Tnote yields (R), and the yield spread between 10-year and 1-year Tnotes (Term) come from CRSP. GDP growth (GDP), inflation (CPI), and the yield spread between Baa and Aaa bonds (Def) come from the St. Louis Fed's FRED database. Stock volatility (Std) is defined as the square root of the sum of squared daily returns during the quarter. d(·) indicates a quarterly change.

Variable	dCapx	dNI	Mkt	GDP	CPI	dStd	dR	dTerm	dDef
dCapx	1	0.28	-0.07	0.55	-0.06	0.12	0.30	-0.31	-0.02
dNI	0.28	1	0.00	0.60	-0.04	-0.06	0.32	-0.26	-0.34
Mkt	-0.07	0.00	1	0.09	-0.19	-0.50	-0.12	0.10	-0.15
GDP	0.55	0.60	0.09	1	-0.09	0.05	0.33	-0.30	-0.25
CPI	-0.06	-0.04	-0.19	-0.09	1	-0.10	0.16	0.00	-0.09
dStd	0.12	-0.06	-0.50	0.05	-0.10	1	-0.03	-0.10	0.32
dR	0.30	0.32	-0.12	0.33	0.16	-0.03	1	-0.79	-0.35
dTerm	-0.31	-0.26	0.10	-0.30	0.00	-0.10	-0.79	1	0.16
dDef	-0.02	-0.34	-0.15	-0.25	-0.09	0.32	-0.35	0.16	1

Table 3
Predicting corporate investment, 1952–2010
This table reports simple-regression (Panel A) and multiple-regression (Panel B) slopes when changes in corporate fixed investment from zero to five quarters in the future are regressed on prior changes in fixed investment, changes in corporate profits, changes in stock volatility, changes in interest rates, and stock returns. Slopes are multiplied by 100, with Newey-West t-statistics reported in the subsequent row. Corporate investment (Capx) and profits (NI) come from the Federal Reserve's seasonally adjusted Flow of Funds accounts for nonfinancial corporations; changes in the variables are scaled by beginning-of-quarter book value of total assets. Value-weighted stock returns (Mkt), 1-year Tnote yields (R), and the yield spread between 10-year and 1-year Tnotes (Term) come from CRSP. The yield spread between Baa and Aaa bonds (Def) comes from the St. Louis Fed's FRED database. Stock volatility (Std) is defined as the square root of the sum of squared daily returns during the quarter. d(·) indicates a quarterly change. Boldface indicates slopes that are more than 1.96 standard errors from zero.

	Dependent variable					
Predictor	$dCapx_t$	$dCapx_{t+1}$	$dCapx_{t+2}$	$dCapx_{t+3}$	$dCapx_{t+4}$	$dCapx_{t+5}$
Panel A: Simple regressions (predictors used individually)						
$dCapx_{t-1}$	**43.54**	**30.63**	**17.35**	2.93	-3.50	**-14.19**
	5.07	4.27	2.41	0.39	-0.55	-2.17
dNI_t	**17.39**	**24.97**	**17.06**	**15.53**	**14.89**	**9.97**
	3.30	5.32	4.04	3.50	3.33	2.80
Mkt_t	-0.04	0.07	**0.13**	**0.12**	**0.14**	**0.09**
	-1.03	1.73	3.44	3.89	4.10	2.91
$dStd_t$	0.17	-0.08	-0.19	-0.07	-0.09	-0.05
	1.49	-0.72	-1.79	-1.37	-1.63	-0.86
dR_t	**1.47**	0.96	**1.09**	0.44	0.08	0.03
	5.09	1.55	2.85	1.45	0.28	0.12
$dTerm_t$	**-2.40**	-0.89	**-1.55**	-0.77	-0.03	-0.37
	-4.74	-0.98	-2.43	-1.35	-0.07	-1.05
$dDef_t$	-0.32	**-5.12**	**-4.29**	**-3.14**	**-3.46**	-2.02
	-0.20	-2.98	-3.22	-2.86	-3.29	-1.84
Panel B: Multiple regressions (predictors used together)						
$dCapx_{t-1}$	**43.83**	**39.49**	**24.34**	10.31	5.51	-10.08
	5.90	6.15	3.86	1.45	0.92	-1.55
dNI_t	**18.19**	**22.94**	**15.13**	**15.31**	**14.64**	**9.25**
	3.64	5.93	3.43	3.07	3.00	2.39
Mkt_t	0.07	**0.13**	**0.17**	**0.16**	**0.17**	**0.09**
	1.39	4.20	5.18	4.39	4.33	2.39
$dStd_t$	0.19	**0.18**	0.06	**0.18**	**0.20**	0.10
	1.35	2.69	0.75	2.20	2.59	1.23
dR_t	**0.84**	**0.74**	0.52	-0.05	-0.10	-0.63
	2.03	2.22	1.09	-0.11	-0.20	-1.17
$dTerm_t$	-0.35	1.29	-0.20	-0.21	0.41	-0.96
	-0.56	1.86	-0.26	-0.30	0.53	-1.11
$dDef_t$	1.74	**-2.84**	-1.61	-1.56	-2.29	-1.26
	1.43	-2.26	-1.33	-1.19	-1.86	-0.98
R^2	0.33	0.33	0.22	0.13	0.13	0.05

Table 4
Investment and future profits, quarterly, 1952–2010
This table reports simple-regression (Panel A) and multiple-regression (Panel B) slopes when changes in corporate profits from zero to five quarters in the future are regressed on lagged changes in corporate profits, changes in fixed investment, changes in stock volatility, changes in interest rates, and stock returns. Slopes are multiplied by 100, with Newey-West t-statistics reported in the subsequent row. Corporate investment (Capx) and profits (NI) come from the Federal Reserve's seasonally adjusted Flow of Funds accounts for nonfinancial corporations; changes in the variables are scaled by the beginning-of-quarter book value of total assets. Value-weighted stock returns (Mkt), 1-year Tnote yields (R), and the yield spread between 10-year and 1-year Tnotes (Term) come from CRSP. The yield spread between Baa and Aaa bonds (Def) comes from the St. Louis Fed's FRED database. Stock volatility (Std) is defined as the square root of the sum of squared daily returns during the quarter. d(·) indicates a quarterly change. Boldface indicates slopes that are more than 1.96 standard errors from zero.

	Dependent variable					
Predictor	dNI_t	dNI_{t+1}	dNI_{t+2}	dNI_{t+3}	dNI_{t+4}	dNI_{t+5}
Panel A: Simple regressions (predictors used individually)						
$dCapx_t$	**45.23**	-13.56	**-23.91**	**-47.90**	**-23.39**	-9.96
	4.16	-1.40	-2.35	-5.06	-2.21	-0.56
dNI_{t-1}	10.93	3.93	2.75	-10.21	-4.38	5.80
	1.44	0.60	0.35	-1.44	-0.55	0.84
Mkt_t	0.00	**0.21**	**0.24**	0.05	-0.01	-0.05
	-0.03	3.46	4.35	0.97	-0.17	-1.04
$dStd_t$	-0.13	-0.21	-0.31	-0.05	0.01	0.19
	-0.67	-1.38	-1.87	-0.43	0.05	1.27
dR_t	**2.49**	0.33	-0.64	-0.63	-0.78	**-0.81**
	5.29	0.44	-1.77	-1.19	-1.20	-2.17
$dTerm_t$	**-3.22**	0.34	0.45	0.73	0.82	0.63
	-4.35	0.30	0.68	0.90	0.78	1.11
$dDef_t$	**-11.06**	**-5.54**	-2.97	-0.18	0.20	**3.30**
	-5.85	-1.97	-1.51	-0.09	0.10	2.21
Panel B: Multiple regressions (predictors used together)						
$dCapx_t$	**35.81**	-21.08	**-29.04**	**-51.20**	-21.50	-13.44
	3.06	-1.85	-2.52	-4.83	-1.78	-0.62
dNI_{t-1}	1.87	10.26	11.04	1.99	1.04	8.46
	0.23	1.72	1.52	0.30	0.12	1.20
Mkt_t	-0.01	**0.24**	**0.23**	0.05	-0.03	-0.04
	-0.20	3.90	3.89	0.78	-0.46	-0.71
$dStd_t$	0.00	0.26	0.04	0.10	0.00	0.08
	-0.03	1.68	0.28	0.71	0.01	0.45
dR_t	0.71	1.49	-1.01	-0.29	-1.11	-1.04
	0.90	1.89	-1.33	-0.41	-1.81	-1.27
$dTerm_t$	-0.84	1.92	-1.47	-0.82	-1.00	-0.97
	-0.74	1.36	-1.12	-0.75	-0.81	-1.01
$dDef_t$	**-9.64**	-4.18	-2.98	-0.65	-1.25	1.54
	-5.24	-1.41	-1.66	-0.37	-0.57	0.72
R^2	0.19	0.08	0.09	0.07	0.00	0.00

Table 5
Expected investment, quarterly, 1952–2010
This table reports slopes and t-statistics when changes in corporate investment are regressed on lagged investment, lagged profits, and lagged stock returns:

$$dCapx_t = a + b_1\, dCapx_{t-1} + b_2\, dCapx_{t-2} + b_3\, dNI_{t-1} + b_4\, dNI_{t-2} + b_5\, Mkt_{t-1} + b_6\, Mkt_{t-2} + e_t.$$

The slopes are multiplied by 100. Aggregate fixed investment (Capx) and profits (NI) come from the seasonally adjusted Flow of Funds accounts for nonfinancial corporations; changes in the variables are scaled by the beginning-of-quarter book value of assets. Value-weighted stock returns (Mkt) come from CRSP. d(·) indicates a quarterly change. Boldface indicates slopes that are more than 1.96 standard errors from zero.

	b_1	b_2	b_3	b_4	b_5	b_6	R^2
Slope	**20.05**	**26.44**	**18.56**	5.78	**0.10**	**0.08**	0.38
t-statistic	2.70	4.25	5.37	1.87	3.44	2.91	

Table 6

Corporate investment and stock returns, quarterly, 1952–2010

This table reports slopes and t-statistics when excess stock returns from zero to five quarters in the future are regressed on investment, profits, stock volatility, interest rates, dividend yield, and lagged stock returns. Corporate investment (Capx) and profits (NI) come from the seasonally adjusted Flow of Funds accounts for nonfinancial corporations; changes in the variables are scaled by lagged assets. Expected and unexpected changes in investment (E[dCapx] and U[dCapx]) are the fitted values and residuals from the regression shown in Table 5. Value-weighted stock returns in excess of the three-month Tbill rate (Mkt), 1-year Tnote yields (R), the yield spread between 10-year and 1-year Tnotes (Term), and annual dividend yield (DY) come from CRSP. The yield spread between Baa and Aaa bonds (Def) comes from the St. Louis Fed's FRED database. Stock volatility (Std) is the square root of the sum of squared daily returns during the quarter. d(·) indicates a quarterly change. Boldface indicates slopes that are more than 1.96 standard errors from zero.

	Dependent variable					
Predictor	Mkt_t	Mkt_{t+1}	Mkt_{t+2}	Mkt_{t+3}	Mkt_{t+4}	Mkt_{t+5}
Panel A: dCapx						
$dCapx_t$	-13.57	**-35.61**	**-29.40**	-2.19	-16.33	-3.92
	-1.08	-3.18	-2.45	-0.17	-1.56	-0.34
R^2	0.00	0.03	0.02	0.00	0.00	0.00
Panel B: Expected vs. unexpected dCapx						
$U[dCapx_t]$	2.73	**-39.57**	**-40.95**	6.94	-21.41	7.24
	0.19	-3.22	-3.21	0.41	-1.38	0.51
$E[dCapx_t]$	-44.19	-28.59	-20.77	-21.70	-13.98	-15.74
	-1.95	-1.22	-0.92	-1.22	-0.71	-0.78
R^2	0.01	0.03	0.02	0.00	0.00	-0.01
Panel C: dCapx, lagged market returns, changes in volatility, and changes in discount-rate variables						
$U[dCapx_t]$	13.90	**-34.70**	**-45.49**	2.97	-23.56	5.50
	0.82	-2.68	-3.08	0.17	-1.44	0.33
$E[dCapx_t]$	-22.44	-22.26	-27.66	-24.90	-15.59	-21.26
	-1.18	-0.96	-1.18	-1.32	-0.77	-1.02
dNI_t	-4.89	-0.77	12.06	2.19	2.95	-4.81
	-0.59	-0.10	1.46	0.24	0.33	-0.58
Mkt_{t-1}	**0.26**	-0.07	-0.06	0.00	-0.01	-0.06
	3.69	-0.96	-0.70	0.06	-0.14	-0.71
$dStd_t$	**-1.57**	-0.04	0.31	-0.08	0.07	0.12
	-7.09	-0.23	1.69	-0.35	0.40	0.66
dR_t	**-2.44**	**-2.59**	-1.72	0.06	0.35	-0.62
	-2.47	-2.37	-1.57	0.06	0.33	-0.58
$dTerm_t$	-2.33	**-3.33**	-2.41	-0.73	0.46	-2.44
	-1.49	-2.22	-1.41	-0.48	0.26	-1.42
$dDef_t$	0.79	-5.99	1.29	3.10	2.43	-2.51
	0.31	-1.92	0.42	1.01	0.94	-0.78
R^2	0.32	0.04	0.04	-0.02	-0.02	-0.01
Panel D: dCapx, lagged market returns, changes in volatility, and levels of discount-rate variables						
$U[dCapx_t]$	12.74	**-35.30**	**-41.08**	11.12	-20.61	8.21
	0.85	-2.43	-2.72	0.60	-1.21	0.52
$E[dCapx_t]$	-26.73	-16.21	-12.50	-11.07	-17.31	-21.73
	-1.33	-0.68	-0.54	-0.52	-0.76	-0.91
dNI_t	-12.23	-0.83	8.52	-0.91	-1.71	-4.21
	-1.37	-0.12	1.16	-0.10	-0.22	-0.51

Mkt_{t-1}	**0.22**	-0.02	-0.06	-0.01	-0.03	-0.03
	3.43	-0.32	-0.87	-0.09	-0.37	-0.41
$dStd_t$	**-1.44**	-0.13	**0.37**	0.00	0.15	0.12
	-7.42	-0.51	2.39	0.01	0.83	0.76
R_t	-0.19	-0.50	-0.48	-0.29	-0.09	-0.02
	-0.60	-1.79	-1.82	-1.06	-0.38	-0.08
$Term_t$	0.44	0.32	0.21	0.61	1.03	1.09
	0.71	0.53	0.35	0.98	1.63	1.88
Def_t	-0.38	-0.34	0.46	-0.35	-2.13	-2.60
	-0.17	-0.17	0.28	-0.17	-1.25	-1.88
DY_t	-0.27	**1.80**	**1.92**	**1.71**	**1.56**	**1.44**
	-0.51	2.96	3.28	3.14	2.72	2.51
R^2	0.31	0.05	0.07	0.01	0.01	0.00