The behavior of aggregate corporate investment

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Abstract

We study the factors that drive aggregate corporate investment from 1952–2010. Quarterly investment responds strongly to prior profits and stock returns but, contrary to standard predictions, is largely unrelated to changes in interest rates, market volatility, or the default spread on corporate bonds. At the same time, high investment is associated with low profit growth going forward and low quarterly stock returns when investment data are publicly released, suggesting that high investment signals aggregate overinvestment. Our analysis also shows that the investment decline following the financial crisis of 2008 represents a fairly typical response to changes in profits and GDP at the end of 2008 rather than an unusual reaction to problems in the credit markets.

1. Introduction

Corporate investment is highly variable through time. For example, from 1952–2010, the growth rate of aggregate fixed investment by U.S. corporations had an annual standard deviation of 7.6%, more than three times the variability of GDP growth (see Fig. 1). As a consequence, corporate investment's share of GDP ranges from a low of 6.1% to a high of 9.4% during this period.

Several factors might contribute to the variability of investment (see, e.g., Hubbard, 1998; Stein, 2003). First, and most obviously, investment should depend on a firm's investment opportunities, driven by changes in the firm's expected profitability, risk, or cost of capital. Second, if financing constraints are important, investment might depend on a firm's supply of internal funds or its access to relatively cheap bank financing. Third, investment might react to changes in investor sentiment if managers exploit any mispricing of the firm's debt and equity or have the same biases as other investors. Finally, investment could reflect the preferences of managers rather than those of shareholders.

The importance of each factor has been the subject of much debate. For example, in the time-series literature on aggregate investment, there is conflicting evidence on the role of discount-rate changes and disagreement about the relative importance of stock returns, corporate profits, and sentiment in driving investment (Barro, 1990; Morck, Shleifer, and Vishny, 1990; Cochrane, 1991; Blanchard, Rhee, and Summers, 1993; Lamont, 2000; Arif, 2012). In the cross-sectional literature, recent studies find a negative relation between investment and subsequent returns, leading to an active debate over whether the results are consistent with rational pricing or reflect a combination of wasteful investment, diminishing marginal returns, and equity mispricing (Fairfield, Whisenant, and Yohn, 2003; Titman, Wei, and Xie, 2004; Fama and French, 2006; Cooper, Gulen, and Schill, 2008; Lam and Wei, 2011; Wu, Zhang, and Zhang, 2010).

Our paper provides new evidence on the factors that drive aggregate corporate investment. Our goal is to understand how investment responds to changes in profits, stock prices, uncertainty, and discount rates and to shed new light on theories of investment behavior. A key feature of our tests is that we study how the different

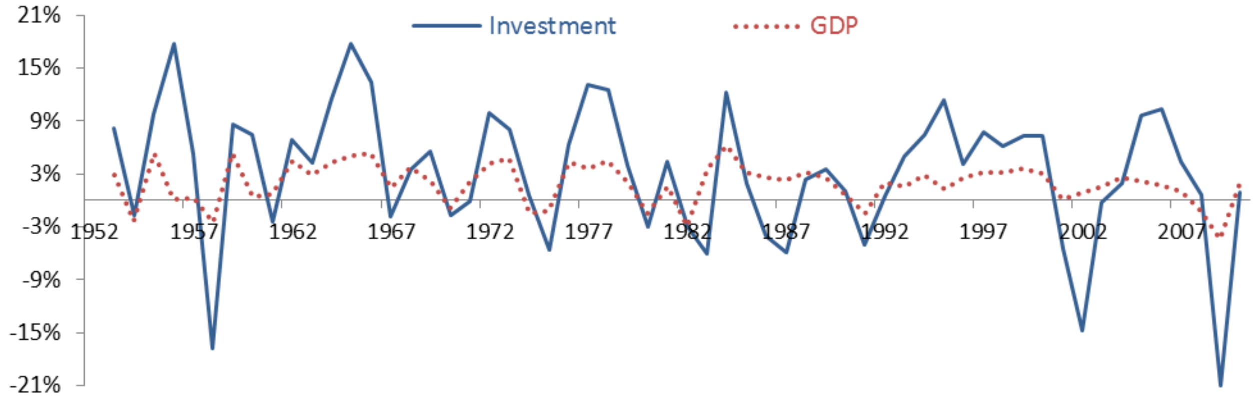


Fig. 1. Annual growth rate of real GDP (dotted line) and real fixed investment by U.S. nonfinancial corporations (solid line), 1952–2010, from the Federal Reserve's Flow of Funds accounts. The growth rate of GDP has a mean of 3.1% and a standard deviation of 2.3%, while the growth rate of corporate fixed investment has a mean of 3.2% and a standard deviation of 7.6%.

variables behave both leading up to and following investment. The overall pattern of results—before, concurrent with, and after investment—is more informative about the factors driving investment than any of the relations would be in isolation. For example, many theories suggest that profits and stock returns should lead investment, but the behavior of profits and stock returns following investment depends on whether an increase in investment represents good or bad news.

A second key feature of our tests is that we study quarterly investment, whereas prior work typically focuses on annual investment. The use of quarterly data allows us to study more powerfully and precisely the lead-lag relations between investment and other macroeconomic factors. This feature is particularly important because investment turns out to have a much different relation to subsequent profits and stock returns than to prior profits and stock returns, effects that get washed out over longer horizons. Quarterly data also allow us to isolate better how stock prices behave when investment surprises become known, and thereby to explore how the market reacts to investment news.

Our results produce a rich picture of aggregate corporate investment. First, we find that investment responds strongly to both profits and stock returns, beginning as soon as the next quarter and persisting for six additional quarters. A one-standard-deviation increase in each variable predicts roughly 3.5% of additional investment by quarter four, implying a large increase relative to average growth of just over 3% per year. Our evidence that profits and stock returns have similar predictive power updates, and somewhat revises, the findings of Barro (1990), Morck, Shleifer, and Vishny (1990) and Blanchard, Rhee, and Summers (1993) regarding the importance of stock returns for investment (Barro finds that stock prices are more significant than profits, while the other two papers suggest that stock prices only play a minor role).

Second, we find little evidence that discount-rate variables—short-term interest rates, the spread between 10-year and 1-year interest rates, and the yield spread between low-grade and high-grade corporate debt—predict investment after controlling for profits and stock returns. Investment is positively related to prior-quarter changes in 1-year interest rates and negatively related to prior-quarter changes in the default spread, consistent with the business-cycle properties of the variables, but neither effect is strong or lasts beyond one quarter. Our results suggest that discount-rate changes either have a minor impact on the variability of investment or are better captured by prior stock returns than interest-rate changes. The positive relation between 1-year interest rates and investment is hard to reconcile with the idea that Federal-Reserve-driven movements in interest rates have a first-order impact on investment.

Third, we find no evidence that investment reacts negatively to changes in market volatility. While an increase in market volatility is weakly related to investment growth over the subsequent few quarters, the effects are insignificant and actually become positive once we control for profits, stock returns, and interest rates. The evidence suggests that aggregate uncertainty has little impact on investment growth, contrary to typical models of irreversible investment and real options (e.g., Bloom, 2009).

Fourth, we find that rapid investment growth is bad news for future profits and stock returns. Profit growth is low in the quarter immediately following a jump in investment and remains low in the subsequent three quarters. Stock returns also react negatively to investment, concentrated in the two quarters following investment when expenditure data are publicly released. A one-standard-deviation shock to investment leads to a market decline of nearly 3% in the subsequent two quarters. The timing does not appear to be consistent with discount-rate or risk-based explanations for changes in aggregate investment. For example, if high investment reflects lower discount rates, market returns should be low for more than two quarters in the future. Similarly, if high investment were a signal of lower risk (Gomes, Kogan, and Zhang, 2003; Anderson and Garcia-Feijoo, 2006), the market should react positively, not negatively, to higher investment. Instead, the results seem most consistent with the view that an increase in spending is a sign of either aggregate overinvestment or bad market timing by managers: Investment responds strongly to recent changes in profits and stock returns but, by the time investment growth peaks, subsequent profits and GDP growth turn out to be low. The reason for this behavior—managerial waste or error—is an open question.

Finally, we study the behavior of corporate investment following the financial crisis in 2008. The tests explore a simple question: From an historical perspective, how unusual was the investment decline in 2008 and 2009? Fig. 1 shows that investment dropped 21% in 2009, representing the largest percentage 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 (see, e.g., Campello et al., 2010). It seems interesting, then, to ask how much of the decline can be explained by movements in real variables alone—profits, GDP, etc.—without appealing to anything special about the financial crisis.

Our results suggest that a sizable fraction, perhaps all, of the investment decline represents a typical response to changing macroeconomic conditions. For example, of the 23% total drop from 2008Q4–2009Q4, more than three-quarters (18.1%) can be explained by the drop in GDP and corporate profits in the fourth quarter of 2008. If we add stock returns to the model, the entire decline looks like a normal response to the drop in profits, GDP, and stock returns at the end of 2008. While stock prices are forward looking and should reflect the impact of any credit crunch, these results suggest that the investment decline in 2009 is largely consistent with its historical behavior.

The remainder of the paper is organized as follows. Section 2 discusses the prior literature and provides additional perspective on our tests. Section 3 introduces the data. Section 4 studies the predictive power of profits, stock returns, discount rates, and market volatility for subsequent investment, while Section 5 studies the predictive power of investment for subsequent profits and stock returns. Section 6 explores the behavior of investment following the financial crisis of 2008. Section 7 concludes.

2. Background and predictions

Our analysis focuses on the joint dynamics of corporate investment, profits, stock returns, market volatility, and discount rates. In this section, we discuss how investment should react to and predict the other variables. We argue that the overall pattern of the lead and lag relations is informative about the relative importance of different factors that drive investment.

2.1. Discount rates

A standard theoretical prediction is that investment should rise when discount rates fall. The most common way to test this hypothesis is to ask whether investment predicts future stock returns, but prior studies have not found a reliable effect in aggregate data (e.g., Cochrane, 1990; Lamont, 2000; Baker and Wurgler, 2000; Chen, Da, and Larrain, 2011).[1] One potential problem is that future realized returns are a very noisy measure of ex ante discount rates, reducing the power of the tests. A second concern is that it is not always clear whether studies really distinguish a predictive role for investment from a price response to news about investment, given the delay in the observability of aggregate expenditures. A third problem is that, if the stock market is inefficient, the predictive power of investment may reflect irrational variation in expected returns as well as rational variation in discount rates.

The impact of discount-rate shocks can also show up as an investment response to prior market returns, since stock prices move inversely with discount-rate news (e.g., Campbell, 1991). However, a response to stock returns does not distinguish between rational and sentiment-driven variation in expected returns or between the role of cashflow news and discount-rate news.

We explore the impact of discount-rate shocks using an alternative and more direct approach: we test whether

[1] Using survey data on planned investment, Lamont (2000) finds that planned investment at the start of the year is strongly negatively related to the year's market returns. However, the survey data are not collected until February or March each year, so the actual predictive power of planned investment is unclear. Results reported by Jones and Tuzel (2011, footnote 7) using monthly returns raise doubts about the predictive ability.

investment responds, concurrently or with a lag, to changes in observable discount-rate proxies including short-term interest rates, spreads between long-term and short-term interest rates, and spreads between low-grade and high-grade corporate-bond rates. These variables track business conditions and have been used in prior research to capture time-varying expected returns (e.g., Fama and French, 1989).

2.2. Profits and cashflow

A second common prediction is that investment should respond positively to profits and cashflow. These variables may capture information about the profitability of new investment, about the availability of cheap internal financing, or about managers' access to free cashflow. Empirically, there is much evidence that profits explain significant variation in both firm-level and aggregate investment (e.g., Fazzari, Hubbard, and Petersen, 1988; Barro, 1990; Morck, Shleifer, and Vishny, 1990; Blanchard, Rhee, and Summers, 1993; Hubbard, 1998; Lewellen and Lewellen, 2013).

A key feature of our tests is that we explore not only the link between investment and *prior* profits, but also the link between investment and *future* profits. We expect investment to be positively related to future profits if investment responds to a rationally anticipated change in expected profitability or if higher investment signals that the firm has taken more positive NPV projects. (Depending on the exact mechanism, investment might be positively related to profits but negatively related to profitability; our tests focus on changes in profits, not changes in profitability.) On the other hand, if managers waste internal funds or overreact to the signals in past profits, higher investment might predict lower subsequent profits, especially if higher aggregate investment leads to overcapacity.

2.3. Stock returns

Stock returns, like profits, are expected to lead investment: Stock returns might reflect positive news about future profitability, negative news about discount rates, or positive news about investor sentiment, all effects that could lead to an increase in subsequent investment.

However, the behavior of returns *following* investment depends on which factor is most important. If discount rates are stable and investment responds optimally to changes in expected profitability, stock prices should react positively to news about investment—assuming managers have private information about profits—but would not be predictable after investment is known.

In contrast, if investment responds to changes in discount rates or sentiment, high investment should predict low subsequent returns. We would expect this predictability to be fairly long-lasting since swings in discount rates or sentiment are likely to be persistent—and, indeed, should have a significant impact on investment only if they are persistent (though these effects may be too small to detect directly given the modest power of predictive regressions). The discount-rate and sentiment stories do not, however, make a clear prediction about the market's *reaction to* investment news. Discount rates would seem to be public knowledge, since they are determined in aggregate by investors, suggesting that no information should be revealed by investment. However, an unexpectly large increase in investment following a given drop in discount rates might convey good news to the market about the firm's investment opportunities. Similarly, if sentiment drives investment, it is not obvious why investment news would cause irrational investors to revise their beliefs. But, again, it seems possible that higher investment could induce a positive market response if managers cater to the sentiment-driven demands of shareholders.

The predictions all reverse if managerial waste or overreaction explains variation in investment: we would not expect any long-run return predictability but the market should react negatively to unexpectedly high investment. Thus, the behavior of stock returns after investment helps discriminate between the impact of fundamentals, sentiment, and overspending on investment.

2.4. Market volatility

The traditional view from the real options and irreversible-investment literature is that higher uncertainty raises the value of delaying investment, leading to lower investment in the short-run (e.g., Pindyck, 1991; Bloom, 2009). The predictions, however, are less clear cut if prices and interest rates are endogenous. For example, Kogan (2001) shows that higher uncertainty will not only affect the option-to-wait but can have an indirect and opposite impact on investment by lowering equilibrium interest rates. He shows that this indirect effect can, in principle, dominate the direct effect.

Our tests use stock market volatility as a proxy for aggregate uncertainty. The logic is that stock volatility should provide a timely and forward-looking measure of uncertainty and can be estimated well at a quarterly frequency. We consider both the simple relation between investment and volatility and the relation controlling for interest rates, stock returns, and profits.

3. Data and descriptive statistics

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

The Flow of Funds accounts track income, savings, and expenditures for broad sectors of the economy. Our tests focus on fixed investment and after-tax profits for nonfinancial corporations, available quarterly starting in 1952. We use seasonally adjusted data, converted into real terms using the consumer price index (CPI). Since the mid-1990s, the data have been released in the third month following each quarter. Thus, we generally interpret quarter t+1 as the 'announcement' quarter for investment and profits, though the information may not have been widely disseminated until quarter t+2 in early years of the sample.[2]

Table 1 reports summary statistics for the data and Figs. 2 and 3 plot the evolution of the variables during our sample, 1952–2010. We scale investment and profits by firms' lagged total assets valued at historical cost (also from the Flow of Funds accounts). It is important to note that, to calculate changes in the variables, we difference the raw series first and then divide by lagged assets (rather than calculate ratios and then difference). Thus, changes in the variables are similar to growth rates except that we scale all of the changes by total assets

[2] The Flow of Funds accounts are described on the Federal Reserve's website, with additional information available from the Bureau of Economic Analysis (much of the underlying data come from the BEA's National Income and Product Accounts). Quarterly investment data from the Flow of Funds are available much earlier than Compustat quarterly investment data, which does not begin until 1984.

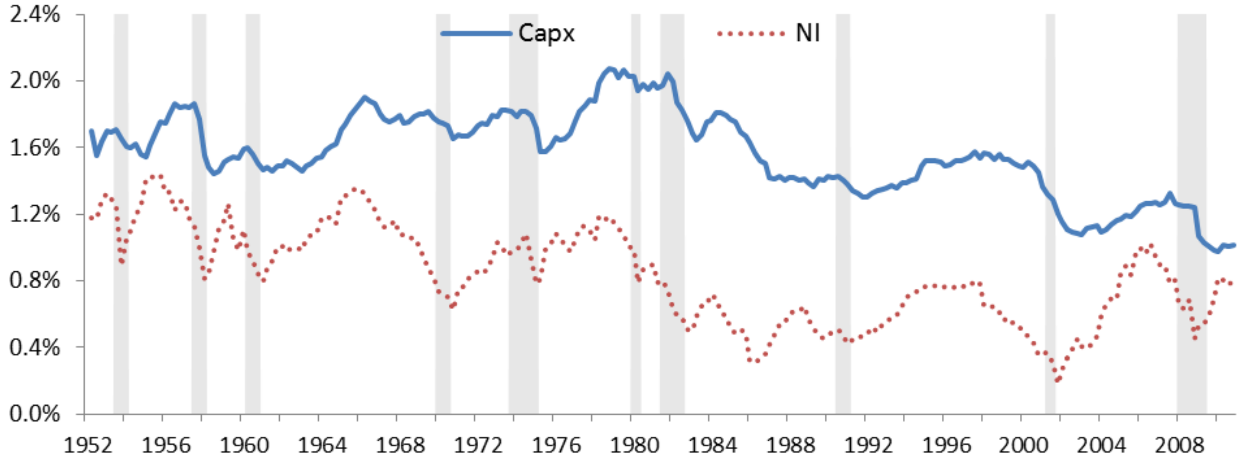


Fig. 2. Quarterly fixed investment (Capx) and after-tax profits (NI) scaled by lagged total assets for nonfinancial corporations from 1952–2010. Data come from the Federal Reserve's seasonally-adjusted Flow of Funds accounts. Shaded regions indicate NBER recessions.

in order to compare their magnitudes more easily. (Results using actual growth rates are similar and summarized in the text.)

Average quarterly investment equals 1.56% of assets, roughly double average quarterly profits of 0.83%. Both variables are highly persistent and tend to trend downward through time (see Fig. 2). 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 (the 21% decline in 2009 represents the largest annual percentage drop during our sample; see Fig. 1). More generally, investment shows a clear business-cycle pattern, growing in expansions (except during the mid-1980s) and dropping in recessions.

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 also show a clear business-cycle pattern and a clear correlation with investment.

The other variables in Table 1 include quarterly stock returns (the CRSP value-weighted index), GDP growth,

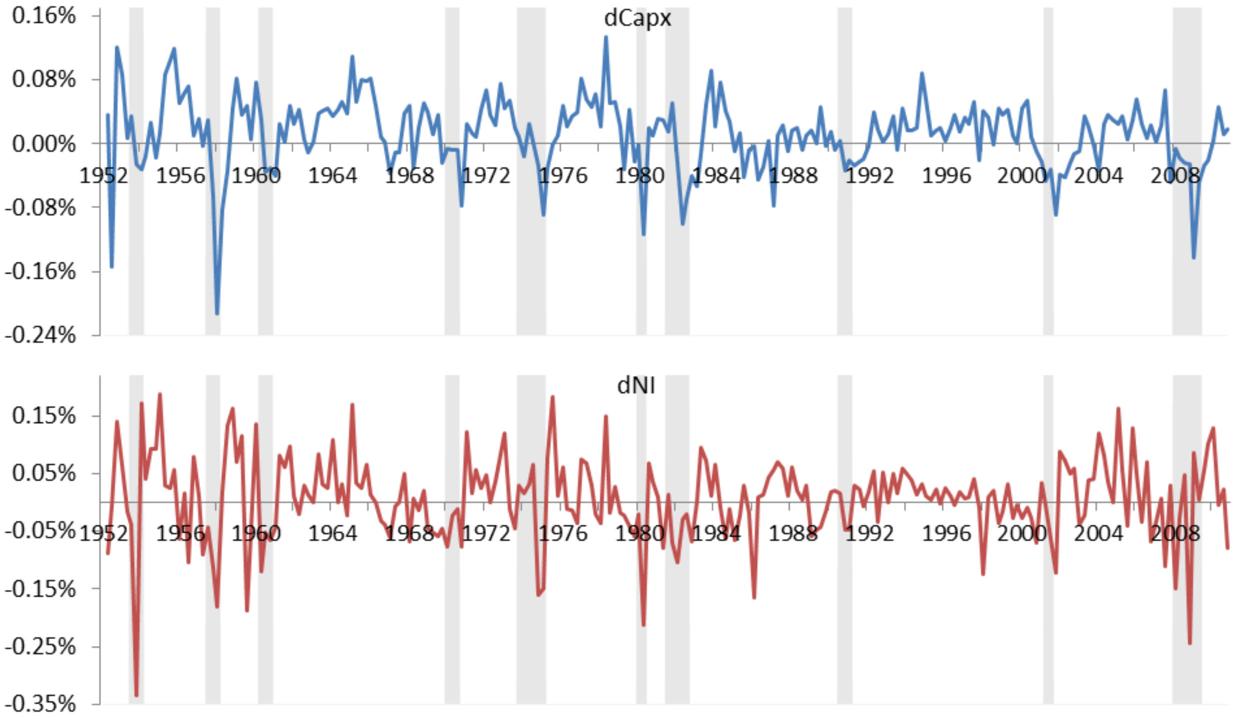


Fig. 3. Quarterly changes in fixed investment (dCapx) and after-tax profits (dNI), scaled by lagged total assets, for nonfinancial corporations from 1952–2010. Data come from the Federal Reserve's seasonally-adjusted Flow of Funds accounts. Shaded regions indicate NBER recessions.

inflation (measured by the CPI), 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 yield spread between 10-year and 1-year Treasury notes ('Term'), and the yield spread between Baa and Aaa corporate bonds ('Def'). The latter three variables serve as proxies for aggregate discount rates, based on the connection between the variables and expected stock and bond returns (see, e.g., Fama and French, 1989; Ferson and Harvey, 1999; Baker and Wurgler, 2012).

Fig. 4 plots the discount-rate variables through time. Short-term interest rates typically fall in or around recessions, while the term and default spreads exhibit the opposite behavior. The default spread probably shows the clearest business-cycle behavior, spiking rapidly in recessions and then declining fairly steadily in expansions. The term spread tends to increase and remain high for many quarters after the official end of a recession and tends to decline only in the second half of an expansion. Thus, the three variables seem to pick up different aspects of the business cycle.

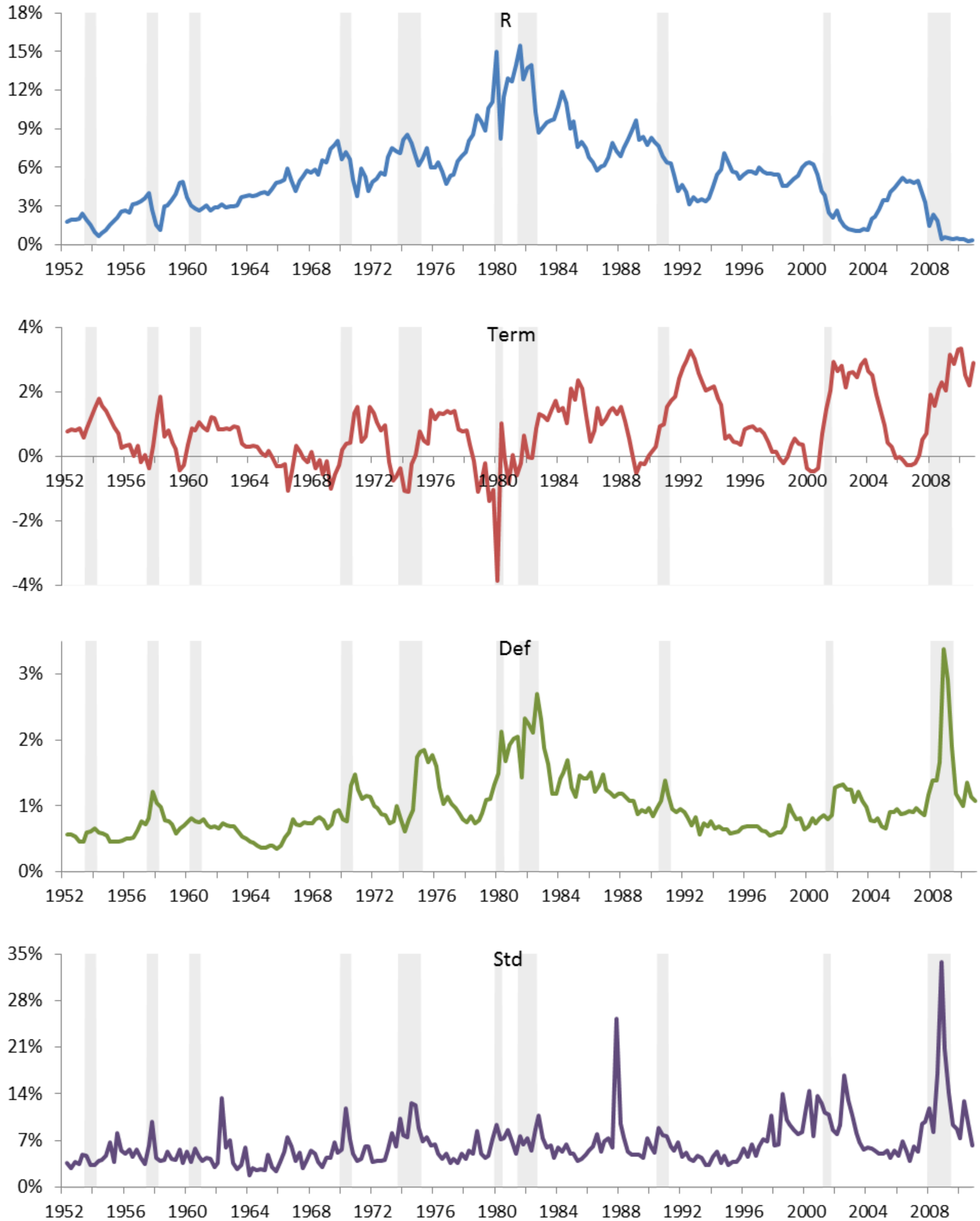


Fig. 4. Quarterly 1-year Tnote rate (R), term premium (Term; the yield spread between 10-year and 1-year Tnotes), default spread (Def; the yield spread between Baa- and Aaa-rated corporate bonds), and stock volatility (Std; the square root of the sum of squared daily market returns) from 1952–2010. Interest 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. 4, trends upward through time. Volatility spikes up following 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 their high persistence, 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 the term and default spreads (which are negatively correlated with GDP and, hence, countercyclical). Investment and profits are also positively correlated with each other but weakly negatively correlated with contemporaneous stock returns.

4. Predicting investment

We split the empirical analysis into two parts. This section studies the link between investment and prior profits, stock returns, volatility, and discount rates; the next section, in contrast, studies the link between investment and subsequent profits and stock returns. While our regressions focus on correlations, not causation, the overall pattern of the results provide a rich picture of the factors that drive investment and the strength and speed of the investment response.

4.1. Univariate relations

Table 3 explores how quarterly investment (dCapx) responds following changes in profits (dNI), stock returns (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 unexpected shocks to the variables given their high persistence in levels (see Table 1).

Panel A reports slopes from simple regressions that consider each factor separately. The general form of the regression is:

$$dCapx_{t+k} = a_k + b_k X_t + e_{t+k}, \quad (1)$$

where $dCapx_{t+k}$ is the quarterly change in investment (scaled by beginning-of-quarter total 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 single-quarter change, the cumulative impact of X_t can be inferred from the sum of the slopes in a given row. We report Newey-West t-statistics below the slopes, allowing for two lags of autocorrelation (doubling the number of lags produces very similar results).

Panel A shows that profits, stock returns, and the default spread are strongly related to investment. Higher profits are associated with a contemporaneous increase in investment (t-statistic of 3.30) and 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, where a $1 increase in profits implies a $0.25 increase in quarterly investment (investment and profits are scaled by the same variable, so the slopes can be interpreted as the impact of a $1 change in profits). Summing the slopes for k = 0 to 5, an extra dollar of profits is associated with just under $1.00 of additional investment in quarter t+5. (In untabulated results, the slopes for quarters t+6 and t+7 are also positive, but insignificant.) Thus, investment reacts strongly either to the information captured by lagged profits or to the additional supply of internal financing brought by higher profits. Our later tests suggest that the investment response might, at least partially, reflect managerial overreaction.

Stock returns are also a strong predictor of investment. Returns lead investment by up to six quarters, consistent with a lag between a shock to investment opportunities or sentiment and changes in actual expenditures (the slope for quarter t+6 is not reported in the table but is similar to that for t+5). The investment response to 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 leads to 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. We discuss the magnitudes further below.

Short-term interest rates (dR) are positively correlated with investment growth in quarters t and t+2, while changes in the default spread (dDef) are negatively correlated 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. 4). 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 impact of both variables is weaker than the impact 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 factors.[3]

4.2. Multiple regressions

Panel B of Table 3 studies the joint explanatory power of profits, stock returns, volatility, and interest rates. The format is similar to Panel A, with $dCapx_{t+k}$ regressed on the factors, except that each column now reports a single regression using all of the variables together. Lagged dCapx is included in the regressions to control for persistence in investment growth.

The regressions in Panel B confirm many of the univariate results discussed above: Profits, stock returns, and lagged dCapx are strong predictors of subsequent investment growth for up to six quarters, while short-term

[3] Fig. 4 shows that stock 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 -0.08 and the maximum value of dStd to 0.10 (roughly equivalent to winsorizing dStd at the 1% level). 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).

interest rates, the default spread, and market volatility have a small amount of predictive power.

There are only three notable differences between Panels A and B. First, investment now seems to react more strongly and more quickly to stock returns, responding 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 quick response to stock returns is somewhat surprising and suggests that corporations have substantial flexibility to react to changes in investment opportunities or sentiment. An alternative possibility, of course, is that managers have private information about investment opportunities and make the decision to adjust investment before the market learns about the shock to, say, profitability, thereby decreasing the time lag between returns and the actual change in expenditures.

A second notable difference is that discount-rate shocks are less significant in Panel B than in Panel A. Changes in short-term interest rates continue to be significantly positively related to investment in quarters t and t+1, but changes in the default spread lose much of their predictive power (the slopes drop roughly in half and only the slope for quarter t+1 remains above two). The results suggest that much of the explanatory power of dR and dDef in Panel A can be attributed 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] The results suggest that discount-rate changes that are uncorrelated with profits have little impact on investment.

The third notable difference is that investment actually becomes positively related to changes in market volatility once we control for profits, stock returns, and the other variables. The predictive slope on dStd is

[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.

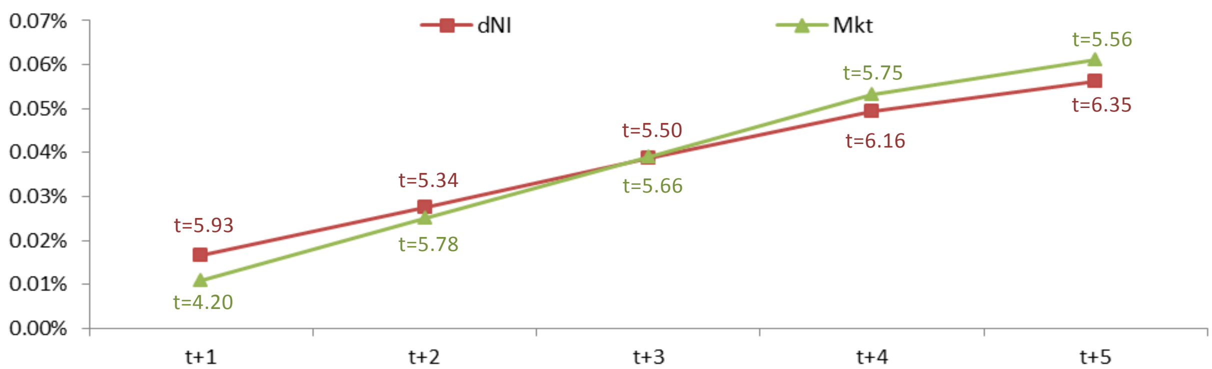
positive at all horizons and significant for quarters t+1, t+3, and t+4. Thus, the negative slopes in Panel A are largely attributable to the correlation between volatility and stock returns (-0.50) rather than a direct impact of volatility on investment. The results provide no evidence that corporations cut investment in response to an increase in aggregate uncertainty, contrary to the predictions of many theoretical papers (see, e.g., Pindyck, 1991; Caballero, 1999; Bloom, 2009).

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. To illustrate the relative importance of profits and stock returns, Fig. 5 plots the impact of one-standard-deviation increase in each variable on future investment, starting with the predicted impact in quarter t+1 and cumulating the changes out to quarter t+5. The top graph looks at investment changes scaled by lagged total assets (the dependent variable used in Table 3), while the bottom panel looks at investment growth rates (scaling by lagged investment). The effects come from multiple regressions like those in Table 3 and the t-statistics adjust for correlation between slopes at different horizons.

Focusing on investment growth in the bottom panel of Fig. 5, a one-standard-deviation increase in profits leads to 1.06% of additional investment in quarter t+1 and 3.58% of additional investment in quarter t+5 (with a t-statistic of 6.64). The impact of stock returns is similar, starting at 0.72% in quarter t+1 and growing to 3.99% of additional investment in quarter t+5 (with a t-statistic of 5.67). Thus, profits and stock returns both have a statistically and economically strong impact on investment. (The effects are large compared, for example, with average investment growth of 0.76% quarterly from 1952–2010.)

The relative importance of profits and stock returns updates the results of Barro (1990), Morck, Shleifer, and Vishny (1990) and Blanchard, Rhee, and Summers (1993). Barro shows that returns have stronger predictive power than profits but the latter two papers find that stock prices are unimportant after controlling for profits. Our results, using quarterly investment and an updated dataset, show that profits and stock returns are both significant, with almost the same predictive power for investment.

Panel A: Investment changes scaled by total assets



Panel B: Investment growth

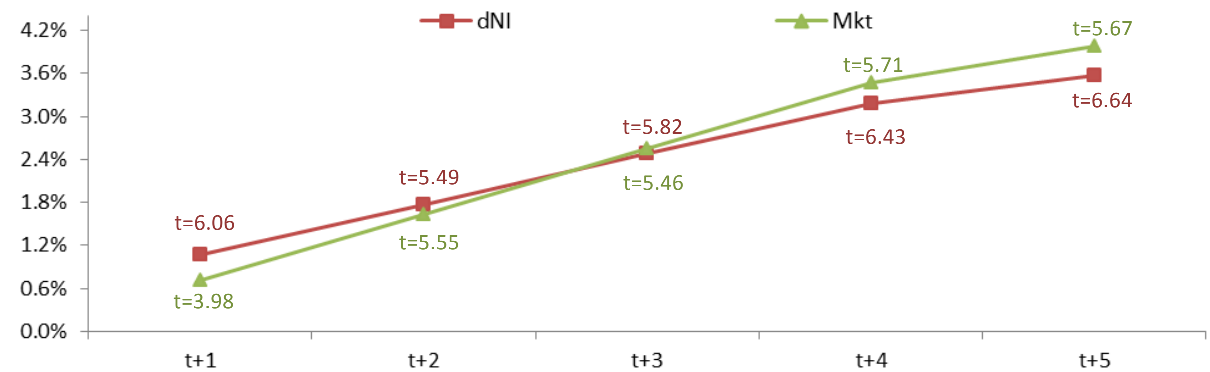


Fig. 5. Cumulative quarterly response of corporate fixed investment ($dCapx_{t+k}$, in percent) to a one-standard-deviation increase in corporate profits (dNI_t) or stock returns (Mkt_t), controlling for the other predictors in Table 3. Investment and profits come from the seasonally adjusted Flow of Funds accounts for nonfinancial corporations. Investment changes are scaled by lagged total assets in Panel A and lagged investment in Panel B. Stock returns come from CRSP. d(·) indicates a quarterly change. Newey-West t-statistics are reported next to each point.

The other predictors in Table 3 have a smaller impact on investment, but the cumulative effects of dDef and dStd are statistically significant (not shown in the graph). A one-standard-deviation increase in dDef implies 1.61% less investment in quarter t+5 (t-statistic of -3.01), while a one-standard-deviation increase in dStd leads to 1.34% more investment (t-statistic of 3.48).

4.3. Summary

Overall, Table 3 suggests four main conclusions. First, profits and stock returns both have strong predictive power for investment growth, persisting many quarters into the future. Second, interest rates and the default spread—our proxies for discount rates—are at best weakly correlated with current and future investment growth after controlling for profits and stock returns, with no evidence that an increase in short-term interest rates dampens investment. Third, the lag between market returns and investment growth is remarkably short, suggesting that firms adjust rapidly to the changing economy. Fourth, an increase in aggregate uncertainty, controlling for the other effects, does not appear to negatively impact investment—indeed, the predictive slope on market volatility is somewhat positive. In short, changes in profitability and stock prices appear to be much more important for investment than changes in interest rates and volatility.[5]

5. Investment and future performance

In this section, we reverse the tests, focusing on the link between investment and future profits and returns. The main questions we ask are: (1) Does investment anticipate, not just respond to, profit growth? (2) How do stock prices react when investment expenditures become 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?

5.1. Investment and future profits

Table 4 looks at the connection between investment and subsequent profit growth, using investment by itself or in combination with lagged profits, stock returns, stock volatility, and our discount-rate variables. The table is organized along the lines of Table 3, with simple regressions of dNI_{t+k} on each of the variables in Panel A and multiple regression using all of the predictors together in Panel B. Again, we study how profits evolve for up to five quarters in the future and measure all variables as changes or growth rates.

The two panels largely tell the same story: Profit growth is negatively related to prior investment, positively related to prior stock returns, and largely unrelated to prior changes in stock volatility, interest rates, or the default spread.

For our purposes, the key result in Table 4 is the strong negative relation between investment and future profit

[5] For robustness, we note that the conclusions here and throughout the paper continue to hold if we drop the financial crisis (2008–2010) from the sample. Those results, as well as those for other subperiods, are available on request.

growth. An increase in quarterly investment is associated with lower profit growth in every quarter t+1 to t+4, highly 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, economically and statistically, in quarters t+2 and t+3, where an extra dollar of investment is associated with a combined drop in profits of roughly $0.70 (recall that changes in profits and investment are scaled by the same variable—lagged assets—so the point estimates can be interpreted as the impact of a $1 increase in investment). The slopes are also negative in quarters t+5 and t+6, but the estimates are not statistical significant in either simple or multiple regressions (the estimate for quarter t+6, not reported in the table, falls between the estimates for t+4 and t+5).

The strength and speed of the effects suggest that the relation between investment and future profits is not causal. An increase in investment could, in principle, be associated with lower profit growth if firms face diminishing marginal returns from investment. However, 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.[6] A more plausible story, in our view, is that large changes in investment are simply poorly timed: Managers increase investment in response to the prior changes in profits and stock returns, perhaps extrapolating performance into the future, but by the time investment growth peaks profit growth going forward turns out to be low. This interpretation—that high investment growth is poorly timed and, hence, wasteful—is consistent with the negative stock market reaction that we document in the next subsection.

A couple of other results in Table 4 are noteworthy. First, stock returns have strong but short-lived predictive power for profit growth. The slope on Mkt_t is highly significant in quarters t+1 and t+2 but close to zero thereafter (both the point estimates and t-statistics). The results are consistent with prior evidence that aggregate returns contain little information about long-run profit or dividend growth (e.g., Cochrane, 2008). Second,

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[6] Additional support for this view comes from the fact that investment is also negatively related to future GDP growth. Specifically, while $dCapx_t$ is positively correlated with GDP growth in quarters t and t+1, it is negatively correlated with GDP growth in quarterts 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 -3.37 in multiple regressions like those in Table 4). We can think of no reason that higher investment would *cause* a drop in GDP growth.

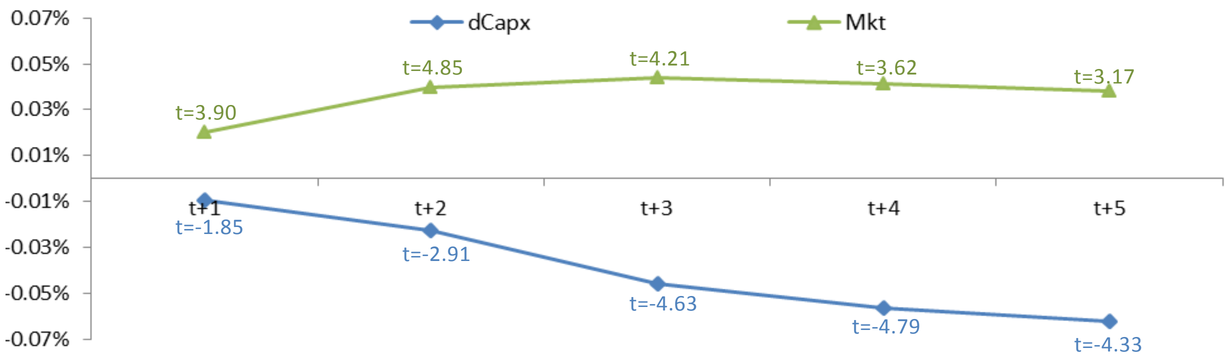
profits follow something close to a random walk, with little or no persistence in dNI, again consistent with prior evidence (e.g., Kothari, 2001). However, profit growth does becomes weakly positively autocorrelated once we control for the other variables—in particular, investment—in Panel B: The slope on dNI_{t-1} becomes positive at all horizons and marginally significant in quarters t+1 and t+2 (the sum of those two slopes is 21%, with a t-statistic of 2.18). This result suggests that the behavior of investment can partially explain the lack of persistence in profit growth.

Table 4 also provides little evidence that changes in stock volatility, interest rates, or the default spread predict subsequent profit growth. Contemporaneously, profit growth is positively correlated with changes in short-term interest rates and negatively correlated with changes in the default spread, but any evidence of a predictive relation in Panel A disappears once we control for investment and stock returns in the multiple regressions in Panel B. One way to interpret the results is that information about future profit growth does not have a measurable impact on current bond yields.

Fig. 6 provides additional perspective on the predictability of future profits. Specifically, the figure shows how profits evolve in quarters t+1 through t+5 following a one-standard-deviation increase in quarterly investment or stock returns, cumulating the predicted quarterly changes. The top panel shows results for dNI scaled by lagged total assets, while the bottom panel shows results for dNI scaled by lagged profits (i.e., actual profit growth). The estimates come from multiple regressions like those in Table 4.

Focusing on the bottom panel, a one-standard-deviation increase in $dCapx_t$ is associated with a 1.71% drop in profits in the subsequent quarter (t-statistic of -2.27) and a nearly 10% drop in profits in quarter t+5 (-9.91%, with a t-statistic of -5.06). The cumulative impact of a one-standard-deviation increase in stock returns is also significant but substantially smaller, peaking at a 5.59% increase in quarter t+3 (t-statistic of 4.08) before falling back slightly to 4.47% by quarter t+5 (t-statistic of 2.59). Thus, changes in investment have roughly twice the predictive ability as stock returns for longer-term profit growth. Again, the strong negative link between investment and future profits seems most consistent with poor investment timing by managers, not a direct impact of diminishing marginal returns.

Panel A: Profit changes scaled by total assets



Panel B: Profit growth

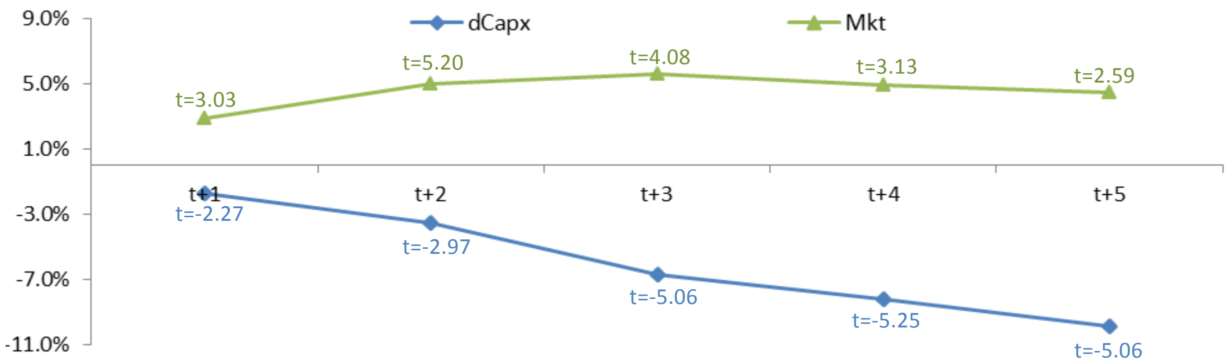


Fig. 6. Cumulative quarterly response of corporate profits (dNI_{t+k}, in percent) to a one-standard-deviation increase in corporate investment ($dCapx_t$) or stock returns (Mkt_t), controlling for the other predictors in Table 4. Investment and profits come from the seasonally adjusted Flow of Funds accounts for nonfinancial corporations. Profit changes are scaled by lagged total assets in Panel A and lagged profits in Panel B. Stock returns come from CRSP. d(·) indicates a quarterly change. Newey-West t-statistics are reported next to each point.

5.2. Investment and future stock returns

The results above suggest that a jump in investment is bad news. In this section, we study how stock prices respond to investment, both in the short run when investment expenditures are publicly released and in the long run after expenditures are known. Prior studies have looked at whether investment predicts market 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.

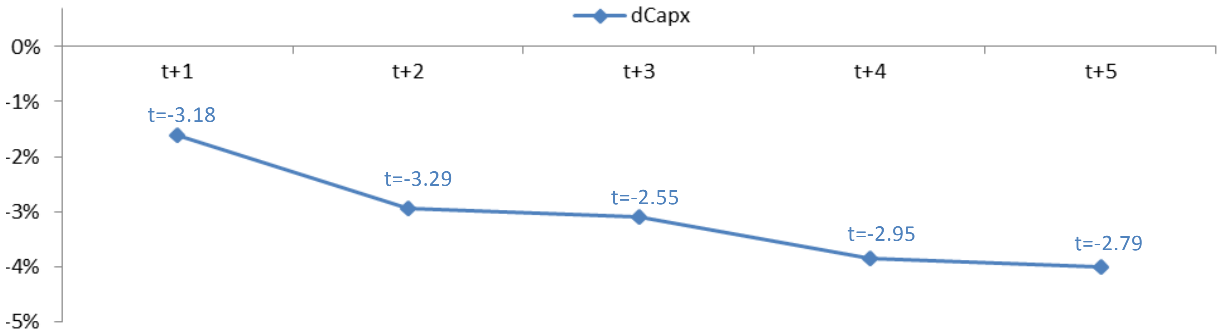
Because stock prices should react differently to expected and unexpected investment—in an efficient market, only the latter provides new information to investors—we explore the market's response to the total change in investment and to estimates of the expected and unexpected change. Our earlier analysis, in Section 4, 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 4 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 residual 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 investment growth is negatively related to stock returns, 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 weak. The results suggest that the market reacts negatively to investment but provide little evidence that investment predicts subsequent returns once expenditures become known.

Economically, the point estimates in Table 6 are large. As shown in Fig. 7, a one-standard-deviation increase in $dCapx_t$ is associated with a price drop of 1.61% in quarter t+1 and a combined drop of 2.93% in quarters t+1 and t+2 (t-statistic of -3.29). A one-standard-deviation increase in $U[dCapx_t]$ is associated with price drop of 1.35% in quarter t+1 and a combined drop of 2.76% in quarters t+1 and t+2 (t-statistic of -4.51). These effects

Panel A: Predictive power of investment



Panel B: Predictive power of expected and unexpected investment

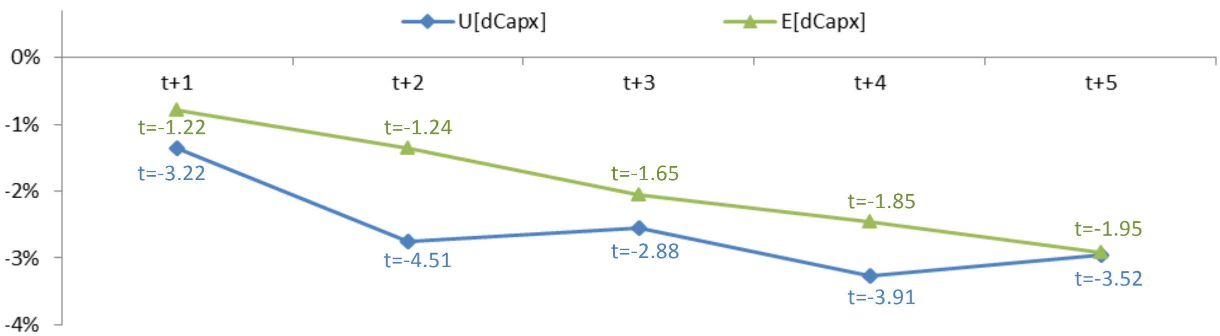


Fig. 7. Cumulative quarterly stock market reaction to a one-standard-deviation increase in either corporate investment (dCapx) or unexpected and expected investment (U[dCapx] and E[dCapx]). Investment comes from the Federal Reserve's seasonally adjusted Flow of Funds accounts for nonfinancial corporations; the quarterly change in investment, dCapx, is scaled by beginning-of-quarter lagged total assets. E[dCapx] and U[dCapx] are the fitted values and residuals, respectively, from the regression shown in Table 5. Value-weighted stock returns come from CRSP. Newey-West t-statistics are reported next to each point.

are consistent with the strong negative relation between investment and profit growth documented in Table 4.

5.3. Discussion

Tables 4 and 6 show that a large increase in investment signals bad news about future profits and that stock prices do, in fact, drop when investment news hits the market. The evidence is hard to reconcile with the idea that investment growth is driven solely by fundamentals. Models in which investment responds optimally to fundamentals suggest that high investment should be positively, not negatively, associated with realized stock returns (to the extent that investment growth is not fully anticipated).

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. The challenge for either fundamentals-based story is to explain why investment has an opposite relation to past and future profits.

The evidence seems more consistent with the view that large increases in investment are, on average, poorly timed and wasteful. Managers may overreact to prior profit growth and stock returns, expanding investment excessively in the late-stages of an expansion and cutting investment excessively at the end of a recession. Such behavior could reflect either managers' incentives to expand when funds are abundant or mistakes in how managers extrapolate from past performance. In either case, the market seems to react fairly quickly to the negative information in high investment growth.

6. 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 have suggested 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 response 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 relative importance of the two factors is essential for firms and policy makers.

Of course, unambiguously isolating the two causes of the investment decline 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 appealing to anything special going on in the credit markets. The question is: How much would investment have declined in response to the change in profits, GDP, and stock prices at the end of 2008 if it simply maintained its historical link to those variables? Interpreted differently, if managers update investment plans based solely 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 includes GDP_t as an additional predictor; and Model 3 adds stock returns (Mkt_t) as a fourth predictor. 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

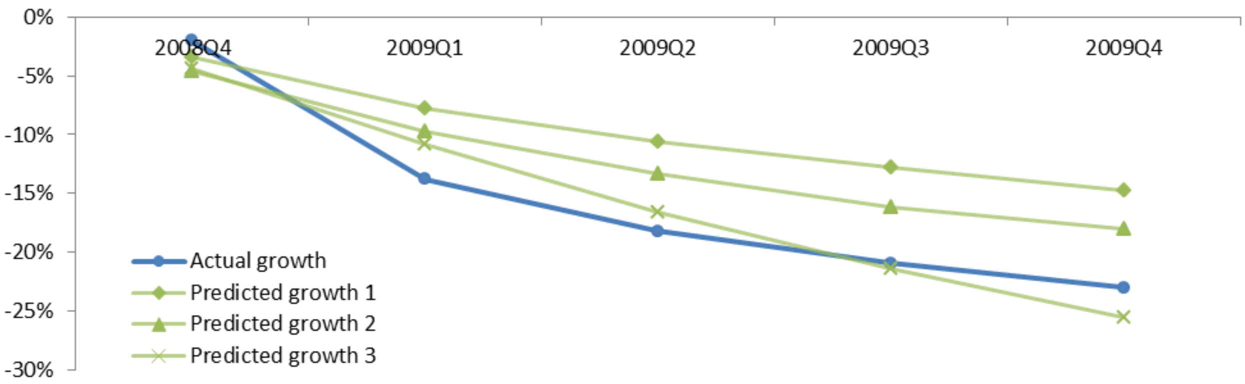


Fig. 8. Predicted vs. actual cumulative investment growth from 2008Q4 through 2009Q4. The predicted growth rate is the fitted value (given the predictors in 2008Q4) from a regression of $dCapx_t + dCapx_{t+1} + \ldots + dCapx_{t+k}$ on various predictors known in quarter t, where k equals zero for predicted 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.

behavior of profits, GDP, and stock returns at the end of 2008.[7]

The graph shows that, based simply on the behavior of macroeconomic factors at the end of 2008, investment would have been predicted to decline substantially 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 a normal response to 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

[7] The predictions simply equal the fitted values from the regressions, estimated in the full sample using investment growth as the dependent variable. The results are similar if we omit the financial crisis itself from the regressions (the predictions in Fig. 8 change by less than 1.4 percentage points).

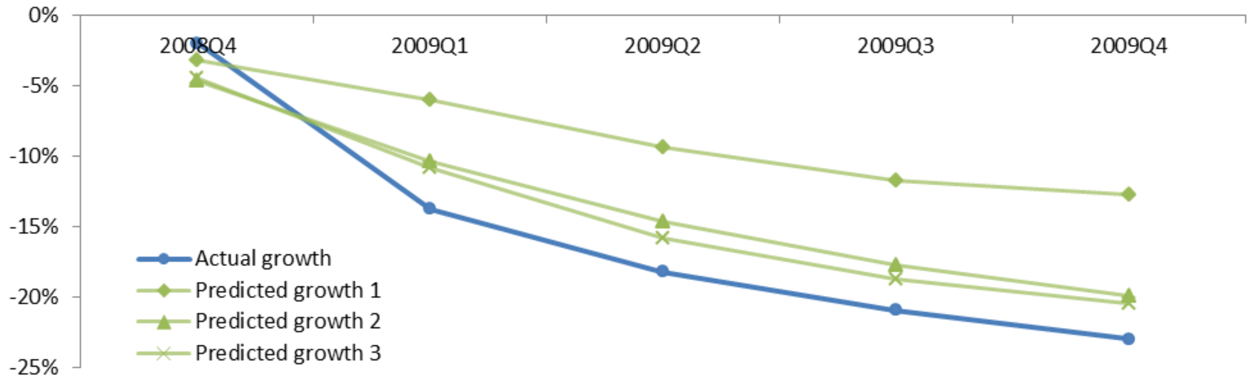


Fig. 9. Predicted vs. actual cumulative investment growth from 2008Q4 through 2009Q4. The predicted growth rate each quarter is the fitted value from a regression of $dCapx_t$ on various predictors known in quarter t. Three sets of predictors are used. Predicted growth 1 is based on the current change 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.

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 the 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. 9 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 have been predicted to decline 12.8% from 2008Q4–2009Q4 in response to changes in profits, 20.0% in response to changes in profits and GDP, and 20.5% in response to 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. In short, a reduction in the availability of external financing may well have played only a small role relative to changes in investment opportunities.

7. Conclusions

Our paper provides new evidence on the factors that drive aggregate corporate investment from 1952–2010. The behavior of aggregate investment is important both for understanding how firms make investment decisions and for its macroeconomic implications.

Our tests show that investment responds strongly to changes in profits and stock prices but weakly to changes in interest rates, stock volatility, and the default spread. We find no evidence that aggregate uncertainty has a negative impact on investment growth—if anything, the slopes are positive once we control for stock returns—contrary to the predictions of many models with irreversible investment. We also find no evidence that short-term interest rates are negatively related to investment growth, contrary to the idea that Federal-Reserve-driven movements in interest rates have a first-order impact on investment.

The investment response to prior profits and stock returns almost certainly reflects the impact of fundamentals on investment. However, the behavior of profits and stock returns after investment suggests that fundamentals are unlikely to be the whole story: investment growth is negatively related to future profits and to quarterly stock returns when investment expenditures become publicly known. Thus, high investment growth appears to be bad news, suggesting that it is poorly timed and wasteful. The investment response to prior profits may reflect, in part, an overreaction to good performance that does not persist.

Our final tests show that the decline in investment following the 2008 financial crisis, while unprecedented in our sample, can be explained largely by the behavior of profits and GDP in 2008 and 2009, without needing to ascribe a special role to the decline in the banking sector and short-term debt markets. More specifically, our estimates suggest that at least three-quarters of the investment decline can be thought of as historically typical response to the drop in profits, GDP, and stock returns at the end of 2008. Problems in the credit markets may have played a role, but the impact is arguably small relative to the lack of 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