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The Accrual Anomaly: Exploring
The Optimal Investment Hypothesis

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Abstract

Interpreting accruals as working capital investment, we hypothesize that firms rationally adjust their investment to respond to discount rate changes. Consistent with the optimal investment hypothesis, we document that (i) the predictive power of accruals for future stock returns increases with the covariations of accruals with past and current stock returns, and (ii) adding investment-based factors into standard factor regressions substantially reduces the magnitude of the accrual anomaly. High accrual firms also have similar corporate governance and entrenchment indexes as low accrual firms. This evidence suggests that the accrual anomaly is more likely to be driven by optimal investment than by investor overreaction to excessive growth or over-investment.

1   Introduction

In a path-breaking work, Sloan (1996) documents that firms with high accruals earn abnormally lower returns on average than firms with low accruals. Sloan interprets the evidence as investors overestimating the persistence of the accrual component of earnings when forming earnings expectations. These investors are systematically surprised later on when realized earnings of high accrual firms fall short of prior expectations and those of low accrual firms exceed prior expectations.

Sloan's (1996) influential work has spurred the development of a large body of empirical literature in accounting and finance. One strand of the literature follows Sloan in linking accruals to earnings persistence and security mispricing. Xie (2001) shows that the relation between total accruals and average returns is largely due to discretionary accruals. Richardson, Sloan, Soliman, and Tuna (2005) develop a comprehensive balance sheet categorization of accruals and show that less reliable accruals lead to lower earnings persistence and abnormally lower average returns.[1] Another strand links accruals to growth attributes. Thomas and Zhang (2002) report that the accrual anomaly is related to inventory changes, and interpret this evidence as investors not recognizing the temporary nature of growth. Fairfield, Whisenant, and Yohn (2003) find that accruals and long-term net operating assets growth both predict stock returns negatively, and argue that the market equivalently overvalues these two components in net operating assets. Hirshleifer, Hou, Teoh, and Zhang (2004) document that net operating assets scaled by total assets predicts long-run returns negatively, and argue that investors fail to discount for the unsustainability of earnings growth.

A commonality across most, if not all, existing explanations for the accrual anomaly relies on some form of investor irrationality. In contrast, we propose and test an optimal investment hypothesis of the accrual anomaly, a hypothesis that is potentially consistent with rationality. Interpreting accruals as working capital investment, we hypothesize that firms optimally adjust capital investment in response to discount rate changes, as predicted by the neoclassical q-theory of investment

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[1]However, Francis and Smith (2005) show that accruals are reliably less persistent than cash flows for only about 15% of firms, a result that casts doubt on the persistence explanation of the accrual anomaly.

(e.g., Brainard and Tobin 1968, Tobin 1969, Hayashi 1982). When the discount rate falls, more investment projects become profitable and accruals increase accordingly. At the same time, current returns should increase because stock prices increase due to lower discount rates. But future average returns should decrease because lower discount rates mean lower expected returns going forward.

Thus, if capital investment optimally adjusts to discount rate changes, accruals should be positively related to current returns and negatively related to future returns. To the extent that investment adjusts with time lags (investment projects can take multiple periods to complete, e.g., Kydland and Prescott 1982), accruals also should be positively correlated to past returns. Because discount rate changes affect past, current, and future returns simultaneously, the magnitude of the accrual anomaly in the cross section should increase with the correlation between accruals and current and past returns (which reflects the changes in the discount rate).

Our empirical tests confirm these predictions. While replicating previous findings that accruals are negatively related to future returns, we show that accruals also are positively related to past and current returns. In cross-sectional regressions, the magnitude of the predictive relations of accruals for future returns increases with the correlation between accruals and past and current returns and with the correlation between investment and past and current returns. We document these results using Sloan's (1996) total accruals, Xie's (2001) discretionary accruals, and Hirshleifer, Hou, Teoh, and Zhang's (2004) net operating assets as different accrual measures.

More important, the optimal investment hypothesis suggests that controlling for capital investment should go a long way in reducing the magnitude of the accrual anomaly. We test this prediction using both the calendar-time factor regressions à la Fama and French (1993) and the characteristic-matching technique à la Sloan (1996). We find that adding investment-based common factors into standard factor models such as the CAPM and the Fama-French three-factor model reduces the total accrual anomaly by on average 46%, the discretionary accrual anomaly by 50%, and the net operating assets anomaly by 82%. Further, relative to the magnitude of abnormal performance measured as the average size-adjusted abnormal returns as in Sloan, matching on

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investment-to-assets in addition to size reduces on average the total accrual anomaly by around 50% and 35% in the first and the second post-formation years, respectively. Matching further on investment-to-assets reduces the magnitude of the discretionary accrual anomaly by 32% in the first post-formation year and by 41% in the second. Doing so also reduces the magnitude of the net operating assets anomaly by 59% in the first post-formation year and by 46% in the second.

Although our evidence is consistent with the optimal investment hypothesis, it is also possible to put forward a mispricing story. Investors can overreact to past good news reflected in strong past growth only to be systematically surprised later on, giving rise to subsequent reversals in stock prices (e.g., Fairfield, Whisenant, and Yohn 2003, Titman, Wei, and Xie 2004). To distinguish our optimal investment hypothesis from this over-investment story, we examine the variation in the accrual anomaly across subsamples split on proxies for firms' vulnerability to over-investment or excess growth. Our goal is not to refute the over-investment hypothesis, but to show that our rational story works differently from the behavioral over-investment story.

We use two such proxies including Gompers, Ishii, and Metrick's (2003) corporate governance index and Bebchuk, Cohen, and Ferrell's (2005) entrenchment index. Both indexes have been used extensively in the literature to quantify the degree of investor protection. Under the over-investment hypothesis, the negative relation between accruals and future returns should be more pronounced among firms with weaker corporate governance. Presumably, these firms are more vulnerable to over-investment by empire-building managers. We find that the accrual anomaly does not display much systematic variation across governance indexes. Further, the governance structure of firms in the highest accruals decile is indistinguishable from the governance structure of firms in the lowest accruals decile. Our evidence suggests that the accrual anomaly is more likely to be driven by optimal investment than by investor overreaction to over-investment.

Our work is related to several recent papers that also propose alternative economic explanations for the accrual anomaly that are different from Sloan's (1996) earnings fixation hypothesis. Zach (2004) reports that when book-to-market is added to size as a second control, average abnormal re-

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turns of the low-minus-high accrual strategy decrease by about 20%. Kothari, Loutskina, and Nikolaev (2005) argue that, under the agency theory of overvalued equity, managers of overvalued firms are likely to manage their firms' accruals upwards to sustain the overvaluation. But overvaluation eventually reverts, generating lower average returns for high accrual firms. Kothari et al. also show that accruals are positively related to current and past returns. Khan (2007a) uses a four-factor ICAPM-type model to explain the accrual anomaly. Using simulations in which true abnormal returns are zero by construction, Khan (2007b) shows that small measurement errors in risk can reproduce the magnitude of the accrual anomaly. Kraft, Leone, and Wasley (2007) show that the accrual anomaly vanishes when additional explanatory variables are incorporated into the Mishkin test. Our work complements these papers by offering an investment-based explanation of the accrual anomaly.

Several papers explore the explanatory power of investment in the context of other asset pricing anomalies. Anderson and Garcia-Feijóo (2006) document that investment growth classifies firms into size and book-to-market portfolios. Xing (2006) shows that an investment growth factor helps explain the value effect. Fama and French (2006) use valuation theory to interpret a wide range of anomalies including the accrual anomaly. Fama and French emphasize that, despite common claims to the contrary, common empirical tests cannot by themselves tell whether the anomalies are driven by rational or irrational forces. Cooper, Gulen, and Schill (2007) document that the annual asset growth rate is an important determinant in the cross-section of returns.

Our story proceeds as follows. Section 2 discusses theoretical motivation for the optimal investment hypothesis. Section 3 describes our data. We present our main empirical findings in Section 4. Section 5 presents some tests that aim to distinguish our optimal investment hypothesis from the over-investment hypothesis. Finally, Section 6 concludes.

2   Theoretical Motivation

We interpret accruals as investment in working capital. Doing so opens the door for a rational explanation for the accrual anomaly: Firms rationally adjust their investment levels in response

to changes in the discount rate. When the discount rate falls, more investment projects become profitable, giving rise to higher investment and thus accruals. The discount rate can vary across firms due to firm-specific loadings on macroeconomic risk factors.

Our explanation of the accrual anomaly is built on the negative relation between investment and the discount rate. In the language of Brealey, Myers, and Allen (2006), capital investment increases with the net present values, or NPVs, of new projects. These NPVs are inversely related to the costs of capital or expected returns of the new projects, given their expected cash flows. High costs of capital mean low NPVs, which in turn mean low investment. And low costs of capital mean high NPVs, which in turn mean high investment. More important, the average costs of capital for firms that take many new projects are reduced by the low costs of capital of the new projects. But the average costs of capital for firms that do not take many new projects remain relatively high.

This prediction on the negative expected return-investment relation is pervasive across diverse theoretical models in the emerging literature on investment-based asset pricing. Cochrane (1991) is the first to establish this relation in the neoclassical q-theory framework. In Cochrane's model, firms invest more when their marginal q (the net present value of future cash flows generated from one additional unit of capital) is high. Given expected cash flows, low costs of capital give rise to high values of marginal q and high investment, and high costs of capital give rise to low values of marginal q and low investment. Consistent with this prediction, Cochrane documents that the aggregate investment-to-assets ratio strongly predicts future stock market returns with a negative slope. Liu, Whited, and Zhang (2007) apply Cochrane's insights in the cross-section of returns. Their structural tests show that the q-theory model empirically captures the average-return variation across portfolios sorted on investment and on size and book-to-market.[2]

The negative relation between investment and average stock returns also arises in the real options models of Berk, Green, and Naik (1999) and Carlson, Fisher, and Giammarino (2004). In

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[2]Zhang (2005) embeds Cochrane's (1991, 1996) q-theory model into an industry equilibrium framework and uses it to study the value premium. Zhang emphasizes the importance of asymmetric adjustment costs and time-varying price of risk in explaining the magnitude of the value premium.

their models, growth options are riskier than assets in place. Capital investment transforms riskier growth options into less risky assets in place in firm value, thereby reducing risk and expected returns. Further, capital obtained from raising equity is likely to be invested. Based on this observation, Carlson, Fisher, and Giammarino (2006) argue that equity issuers must earn lower expected returns than nonissuers with similar characteristics (see also Li, Livdan, and Zhang 2007). Intuitively, firms' uses of funds must add up to the sources of funds, meaning that issuers are more likely to invest more and earn lower average returns than matching nonissuers.[3]

Perhaps more important, compared to the value, equity issuance, and other related anomalies, the accrual anomaly offers an arguably better setting to test the optimal investment hypothesis. The reason is that accruals represent a direct form of investment (on working capital). Similar to investment in fixed assets, changes in working capital represent one form of investment and are an integral part of a firm's business growth. In particular, it has long been recognized in the accounting literature that accruals vary systematically with a firm's life cycle (see, for example, the textbook treatment in Stickney, Brown, and Wahlen 2003, Chapter 3).

Recent evidence in the accounting literature also shows that it is important to recognize that accruals capture fundamental investment in working capital (e.g., Bushman, Smith, and Zhang 2006, Zhang 2007). Specifically, Zhang shows that accruals covary with employee growth, external financing, and other growth aspects of corporate growth, and that the covariation between accruals and other growth attributes helps explain the magnitude of the accrual anomaly in a cross-sectional setting. Thus, it is natural to apply the insights from the emerging literature on investment-based asset pricing in the context of the accrual anomaly. Our work takes the first step in this direction.

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[3]Motivated by the theoretical work of Carlson, Fisher, and Giammarino (2006) and Li, Livdan, and Zhang (2007), Lyandres, Sun, and Zhang (2007) document that controlling for investment in standard factor regressions substantially reduces the magnitude of the long-term underperformance following seasoned equity offerings, initial public offerings, and convertible debt issues.

3 Data

We obtain accruals and other accounting data from the COMPUSTAT Annual Industrial, Full Coverage, and Research files. Stock return data are from CRSP monthly return files for NYSE, AMEX, and NASDAQ firms. Starting with the universe of publicly traded firms, we exclude utility (SIC codes between 4900 and 4999) and financial firms (SIC codes between 6000 and 6999). These two industries are highly regulated in our sample and thus have accruals that are significantly different from those in other industries. We also exclude firms with negative book values of equity. The final sample spans 36 years from 1970 to 2005 and includes 127,103 firm-year observations with non-missing accruals and future stock return data.

We consider three accrual measures. Following Sloan (1996), we measure total accruals (ACC) as changes in non-cash working capital minus depreciation expense scaled by average total assets (TA). The non-cash working capital is the change in non-cash current assets minus the change in current liabilities less short-term debt and taxes payable. Specifically:

$$ACC \equiv (\triangle CA - \triangle CASH) - (\triangle CL - \triangle STD - \triangle TP) - DEP \tag{1}$$

in which $\triangle CA$ is the change in current assets (COMPUSTAT annual item 4), $\triangle CASH$ is the change in cash or cash equivalents (item 1), $\triangle CL$ is the change in current liabilities (item 5), $\triangle STD$ is the change in debt included in current liabilities (item 34), $\triangle TP$ is the change in income taxes payable (item 71), and DEP is depreciation and amortization expense (item 14).

We also use discretionary accruals ($DACC$) motivated from Xie (2001), who finds that the accrual anomaly is largely due to discretionary accruals. We measure discretionary accruals using Dechow, Sloan, and Sweeney's (1995) modification of the Jones (1991) model as follows:

$$ACC_t/TA_{t-1} = \alpha_1 \, 1/TA_{t-1} + \alpha_2 \, (\triangle REV_t - \triangle REC_t)/TA_{t-1} + \alpha_3 \, PP\&E_t/TA_{t-1} + e_t \tag{2}$$

in which $\triangle REV_t$ is the change in sales in year t (COMPUSTAT annual item 12), $\triangle REC_t$ is the

net receivables in year t less net receivables in year $t-1$ and $PP\&E_t$ is the gross property, plant, and equipment in year t (item 7). We estimate the cross-sectional regression (2) for each two-digit SIC code and year combination, formed separately for NYSE/AMEX firms and for NASDAQ firms. The discretionary accrual (scaled by average total assets) is the residual from equation (2), e_t, whereas the non-discretionary accrual is the fitted component.

Our third accrual measure is net operating assets from Hirshleifer, Hou, Teoh, and Zhang (2004). Hirshleifer et al. find that net operating assets scaled by lagged total assets is a strong negative predictor of stock returns. Scaled net operating assets (NOA) are defined as:

$$NOA_t \equiv \frac{\text{Operating assets } (OA_t) - \text{Operating liabilities } (OL_t)}{\text{Lagged total assets } (TA_{t-1})}$$

in which OA_t is total assets (COMPUSTAT annual item 6) minus cash and short-term investment (item 1). OL_t is $TA_t - STD_t - LTD_t - MI_t - PS_t - CE_t$, in which STD_t is debt included in current liabilities (item 34), LTD_t is long-term debt (item 9), MI_t is minority interests (item 38), PS_t is preferred stocks (item 130), and CE_t is common equity (item 60).

We use NOA in our tests because it is basically the comprehensive measure of accruals from Richardson, Sloan, Soliman, and Tuna (2005). Richardson et al. develop a balance sheet categorization of accruals and rate each category based on the reliability of the underlying accruals. They argue that less reliable accruals lead to lower earnings persistence and that investors do not fully anticipate the lower earnings persistence, leading to significant mispricing.

Table 1 reports descriptive statistics. To alleviate the effects of outliers, we winsorize all variables at 1% and 99%. Panel A shows that, consistent with Sloan (1996), total accruals tend to be negative with a mean of -0.016. By construction, the mean of discretionary accruals is zero. The net operating assets have a mean of 0.748 and a standard deviation of 0.36. From Panel B, all three accrual measures are positively correlated. Total accruals have Spearman correlations of 0.66 and 0.28 with discretionary accruals and NOA, respectively. And the correlation is 0.27 between discretionary accruals and NOA. All these correlations are significantly different from zero.

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We measure investment-to-assets as the annual change in gross property, plant, and equipment (COMPUSTAT annual item 7) plus the annual change in inventories (item 3) divided by the lagged book value of assets (item 6). We use changes in property, plant, and equipment to capture investment in long-lived assets for operations over many years such as buildings, machinery, furniture, and other equipment. We use changes in inventories to capture investment in short-lived assets within a normal operating cycle such as merchandise, raw materials, supplies, and work in progress. This investment measure has been used by Lyandres, Sun, and Zhang (2007) in their investigation of the new issues puzzle (e.g., Ritter 1991, Loughran and Ritter 1995). Our goal is, simply, to use an investment measure from the existing literature to capture fundamental investment and to examine whether this investment measure helps explain the accrual anomaly.

As expected, Table 1 shows that all the accrual measures are positively correlated with investment-to-assets. Specifically, the Spearman correlations of investment-to-assets with ACC, $DACC$, and NOA are 0.23, 0.21, and 0.51, respectively. All these correlations are significantly different from zero. But more important, they are also far below one.

4   Empirical Results

We proceed in four steps in testing the optimal investment hypothesis. First, we explore the effects of past and current returns on the magnitude of the accrual anomaly in Section 4.1. Second, in Section 4.2, we use the standard calendar-time factor regression approach à la Fama and French (1993, 1996) to quantify the effects of investment in driving the accrual anomaly. Third, in Section 4.3, we calculate characteristic-adjusted abnormal returns using the event-time regression approach of Sloan (1996). Finally, in Section 4.4, we examine how investment and profitability vary across extreme accrual portfolios using the Fama and French (1995) event-study approach.

4.1   The Impact of Past and Current Returns on the Accrual Anomaly

Changes in the discount rate should affect the investment level, current stock returns, and expected stock returns simultaneously. Consequently, accruals should be positively related to current stock

returns and negatively related to future stock returns if investment adjusts instantly in response to changes in the discount rate. To the extent that investment adjusts with a lag, accruals also should be positively related to past stock returns. We study these testable implications in this subsection.

The Lead-Lag Relations Between Accruals and Stock Returns

We use the Fama and French (1993) portfolio approach. Specifically, we sort stocks in June of each year t into ten accrual portfolios and calculate average future stock returns from July of year t to June of year $t+1$ (RET_{t+1}), where the accruals are measured at the fiscal year-end of year $t-1$.

The last column in each panel of Table 2 reports the accrual anomaly. Most of the literature on the accrual anomaly reports equal-weighted portfolio returns. From Panel A, the average equal-weighted RET_{t+1} decreases from 18.7% per annum for the low-ACC decile to 9.8% for the high-ACC decile. The low-minus-high ACC portfolio earns an average return of 8.9% per annum ($t = 5.92$). Panel B reports a spread in average equal-weighted return of 9.0% per annum across the two extreme discretionary accrual deciles. Panel C shows that the corresponding average return spread is higher across the NOA deciles. The average equal-weighted return decreases from 20.6% per annum for the low-NOA decile to 5.9% for the high-NOA decile. The low-minus-high NOA portfolio earns an average return of 14.6% per annum ($t = 4.81$). This evidence is consistent with previous studies by Sloan (1996), Xie (2001), and Hirshleifer, Hou, Teoh, and Zhang (2004).

Using value-weighted returns does not materially affect the magnitude of the relations of average returns with total accruals and discretionary accruals. The low-minus-high ACC portfolio earns a value-weighted average return of 7.3% per annum ($t = 3.02$), and the low-minus-high $DACC$ portfolio earns a value-weighted average return of 7.6% per annum ($t = 3.98$). However, using value-weighted returns dramatically reduces the average return of the low-minus-high NOA portfolio to 6.9% per annum ($t = 1.91$). The reason is that the highest NOA decile has an equal-weighted average return of 5.9% per annum, which is dramatically lower than that of 13.4% for the ninth NOA-decile. But the big gap is largely absent when we use value-weighted returns. (Fama

and French [2007] make a similar point that the asset growth anomaly of Cooper, Gulen, and Schill [2007] is strong in microcaps and small stocks, but is absent for big stocks.)

More important, unlike the decreasing relation with future returns, accruals exhibit increasing relations with past and current stock returns. We associate accruals measured at the fiscal year-end of year $t-1$ (or equivalently, at the beginning of year t) to the annual stock returns from the beginning to the end of fiscal year $t-1$, which we call current stock returns (RET_t). To allow for investment lags, we also associate accruals at the fiscal year-end of year $t-1$ to the annual returns from the beginning to the end of fiscal year $t-2$, which we call past stock returns (RET_{t-1}). We again use both equal-weighted and value-weighted returns.

Panel A of Table 2 shows that, as total accruals increase from decile one to ten, the equal-weighted RET_t increases from 6.5% to 34.7% per annum, and the equal-weighted RET_{t-1} increases from 3.7% to 42.8%. The return spreads of -39% and -28% are highly significant ($t = -11.42$ and -10.65, respectively). Panel B shows that a somewhat weaker pattern is present across the $DACC$ deciles. The equal-weighted RET_t and RET_{t-1} spreads across the two extreme $DACC$ deciles are 7.4% and 24.3% per annum ($t = -1.98$ and -12.45), respectively. From Panel C, the average equal-weighted RET_t and RET_{t-1} spreads across the two extreme NOA deciles are -18% and -34.4% per annum ($t = -6.41$ and -11.11), respectively. Using value-weighted returns yields similar, but quantitatively weaker results. In all, the evidence on the positive relations of accruals with past and current returns lends support to our optimal investment hypothesis.

Conditional Analysis of the Accrual Anomaly

The optimal investment hypothesis suggests that the magnitude of the accrual anomaly should vary cross-sectionally with the correlation between accruals and current and past stock returns. In industries in which accruals exhibit strong positive relations with past and current stock returns, accruals are more likely to capture information about changes in the discount rate and thus should have stronger predictive power for future stock returns. In industries in which accruals are not

correlated with past and current stock returns, we should not expect to find such predictive power.

To test this implication, we first estimate the sensitivity of accruals to changes in the discount rate for each industry based on the most recent three years of data (years $t-2, t-1$, and t). Specifically, we estimate the three-year rolling panel regression:

$$ACC_{j\tau}[DACC_{j\tau}, NOA_{j\tau}] = \alpha_{0t} + \alpha_{1t}\,RET_{j\tau} + \alpha_{2t}\,RET_{j\tau-1} + \epsilon_{jt} \tag{3}$$

where $\tau = t-2, t-1$, and t and $ACC_{j\tau}[DACC_{j\tau}, NOA_{j\tau}]$ denotes total accruals, discretionary accruals, or net operating assets at year τ for firm j in a given industry. We use the categorization of 48 industries from Fama and French (1997). The sensitivity of accruals to changes in the discount rate is defined as $S_t \equiv \alpha_{1t} + \alpha_{2t}$. A higher S_t indicates that accruals are more positively correlated to past and current stock returns, meaning that accruals contain more information on discount rate changes.

In untabulated results, we find that manufacturing (SIC codes between 2000 and 3999) and wholesales and retail (SIC codes between 5000 and 5999) industries have high accrual-discount-rate sensitivities. Agriculture and mining (SIC codes between 0100 and 1999) and service (SIC codes between 7000 and 8999) industries have low sensitivities. The evidence suggests that the information content of accruals depends on a firm's business model (e.g., Zhang 2007).

After estimating the accrual-discount-rate sensitivities for all the industries each year, we assign the sensitivity of a given industry to all the firms within that industry. We estimate the sensitivities at the industry portfolio level because firm-level estimates tend to be much less precise. The idea is basically that of Fama and French (1992), who estimate firm-level market betas as betas of corresponding portfolios sorted on pre-ranking betas and market equity.

To examine how the magnitude of the accrual anomaly varies with the accrual-discount-rate sensitivity, we perform the following annual Fama-MacBeth (1973) cross-sectional regression:

$$ACC_t[DACC_t, NOA_t] = \beta_0 + \beta_1\,RET_{t+1} + \beta_2\,S_t + \beta_3\,(S_t \times RET_{t+1}) + e_t \tag{4}$$

The optimal-investment hypothesis predicts a stronger correlation between accruals and future

returns when accruals covary more with past and current returns. Because accruals and future returns are negatively correlated, our hypothesis predicts a negative slope on the interaction term.

Panel A of Table 3 shows that, when we use total accruals as the dependent variable, the interaction term has a negative coefficient of -0.120 ($t = -2.52$). Using discretionary accruals decreases the magnitude of the negative coefficient to -0.063 ($t = -1.10$). And when we use net operating assets as the dependent variable, the interaction term has a negative coefficient of -0.107 ($t = -3.37$). The evidence suggests that, consistent with our optimal investment hypothesis, the predictive power of accruals for future returns increases with the sensitivity of accruals to changes in the discount rate.

We use an alternative measure of investment sensitivity to discount rate changes. Specifically, we replace accruals with investment-to-assets as the dependent variable in equation (3) and redo the cross-sectional regression tests in (4). This alternative test design is interesting because our explanation of the accrual anomaly works through the relation between investment and discount rates.

From Panel B of Table 3, using investment sensitivity to discount rate changes yields similar results for total accruals and discretionary accruals as in Panel A. But the results for net operating assets are somewhat weaker. Specifically, when we use total accruals as the dependent variable, the interaction term of $S_t \times RET_{t+1}$ has a negative coefficient of -0.035 ($t = -2.37$). But when we use net operating assets as the dependent variable, the interaction term has an insignificant coefficient of -0.052 ($t = -1.30$), albeit still negative. On balance, however, our evidence suggests that the magnitude of the accrual anomaly tends to increase with investment sensitivity to discount rate changes.

4.2 Calendar-Time Factor Regressions

Our optimal investment hypothesis says that the accrual anomaly reflects the negative relation between investment and the discount rate. Thus, controlling for investment should reduce the magnitude of the accrual anomaly. In this subsection, we test this implication using the standard factor regression approach à la Fama and French (1993, 1996).

Specifically, we regress zero-investment low-minus-high accrual portfolio returns on the market

factor and on the Fama and French (1993) three factors to measure abnormal returns as the intercepts (alphas) from these factor regressions. To evaluate the explanatory power of investment in driving the accrual anomaly, we augment these standard factor models with an investment-based common factor. We quantify the explanatory power of investment using the percentage reduction in the magnitude of the alphas induced by the investment factor.

Testing Portfolios

We use both one-way and two-way sorted testing portfolios. For one-way sorted portfolios, in June of each year t, we sort stocks into ten deciles based on the accruals at the fiscal year-end of year $t-1$. For the two-way sorted portfolios, in June of each year t, we assign stocks into five quintiles based on the accruals at the fiscal year-end of year $t-1$. We also independently sort stocks in June of each year t into five quintiles based on their June market equity (stock price times shares outstanding). We form 25 portfolios from the intersections of these size and accrual quintiles. Both equal-weighted and value-weighted monthly returns on the subsequent portfolios are calculated from July of year t to June of year $t+1$. We repeat this procedure for all three accrual measures (total accruals, discretionary accruals, and net operating assets).

Because of the large number of resultant testing portfolios, to save space, our empirical tests only focus on zero-investment low-minus-high accrual portfolios. For the one-way sort, we form the zero-investment low-minus-high accrual portfolios. For the two-way sort, we form the zero-investment low-minus-high accrual portfolios in each size quintile.

Investment-Based Common Factors

Following the Fama and French (1993) portfolio approach, we do a double (two by three) sort on size and investment-to-assets. In June of each year t from 1970 to 2005, we sort all stocks into three investment-to-assets groups using the 30-40-30 cutoff points. We also independently sort all stocks into two groups using the 50-50 cutoff points based on their June market equity. Six portfolios are formed from the intersections of the two size and the three investment-to-assets groups. Monthly

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returns on the six portfolios are calculated from July of year t to June of $t+1$.

The investment-based factors are designed to mimic the common variations in returns related to capital investment. Corresponding to the weighting scheme in the dependent low-minus-high accrual portfolio returns, we both equal-weight and value-weight the six portfolio returns. INV_{vw} is the difference between the simple average of the value-weighted returns on the two low investment-to-assets portfolios and the simple average of the value-weighted returns on the two high investment-to-assets portfolios. And INV_{ew} is the difference between the simple average of the equal-weighted returns on the two low investment-to-assets portfolios and the simple average of the equal-weighted returns on the two high investment-to-assets portfolios.

Table 4 reports descriptive statistics for the value-weighted investment factor, INV_{vw}, and the equal-weighted investment factor, INV_{ew}. The average INV_{vw} return is 0.60% per month ($t = 5.89$), and the average INV_{ew} return is 0.77% ($t = 8.04$). Other common factors such as the market factor MKT, the size factor SMB, the value factor HML, and the momentum factor WML cannot explain the average returns of the investment factors. (The data for the Fama-French [1993] factors and the momentum factor are from Kenneth French's Web site.) Regressing the investment factors on these common factors leaves significant and positive alphas unexplained. The Fama-French alpha of INV_{vw} is 0.66% per month ($t = 7.05$), and that of INV_{ew} is 0.81% ($t = 9.25$). The R^2s from these factor regressions are also relatively low with the highest being 33%. And INV_{vw} and INV_{ew} are negatively correlated with MKT and SMB, but are positively correlated with HML and WML. In all, the evidence suggests that the investment-based common factors capture average return variations that are not subsumed by other well-known factors commonly used in empirical finance.

Factor Regression Results

Table 5 reports the factor regressions for one-way sorted accrual portfolios. The regressions are estimated with ordinary least squares. Using weighted least squares regressions yields quantitative similar results (not reported). We find that adding the investment factors can explain on average

46% of the total accrual anomaly, 50% of the discretionary accrual anomaly, and 82% of the net operating assets anomaly. (For example, 46% is the average of the four numbers reported in the column denoted $\triangle\alpha/\alpha$ in Panel A of Table 5.)

Specifically, from Panel A of Table 5, the equal-weighted CAPM alpha of the low-minus-high ACC portfolio is 0.74% per month ($t = 5.42$). Adding the equal-weighted investment factor into the factor regression reduces the alpha by 34% to 0.49%, albeit still significant ($t = 3.25$). Further, the value-weighted CAPM alpha of the zero-cost ACC portfolio equals 0.78% per month ($t = 3.39$). Adding the value-weighted investment factor into the regression reduces the alpha by 69% to an insignificant level of 0.24% ($t = 1.04$). Using the Fama-French (1993) three-factor model as the benchmark to measure the alphas yields quantitatively similar results. But the percentage reductions in the alphas are somewhat lower. Most important, the zero-cost accrual portfolio has significant positive loadings on the investment factors in all specifications.

The results for the discretionary accrual portfolios are largely similar to those for the total accrual portfolios. For example, from Panel B of Table 5, the equal-weighted CAPM alpha of the zero-cost $DACC$ portfolio is 0.64% per month ($t = 5.80$). Adding the equal-weighted investment factor reduces the alpha by 34% to 0.42% ($t = 3.46$). The value-weighted CAPM alpha of the zero-cost $DACC$ portfolio is 0.63% per month ($t = 3.05$). Adding the value-weighted investment factor reduces the alpha by 71% to 0.18% ($t = 0.86$). More important, the zero-cost $DACC$ portfolio has significant positive loadings on the investment factors in all specifications.

Investment is more important in driving the NOA anomaly. From Panel C of Table 5, the equal-weighted CAPM alpha of the zero-cost NOA portfolio is 1.34% per month ($t = 7.21$). Adding the equal-weighted investment factor reduces the alpha by 91% to 0.13% per month ($t = 0.78$). The value-weighted CAPM alpha for the portfolio is 0.84% per month ($t = 3.79$). Adding the value-weighted investment factor reduces the alpha by 88% to 0.10% ($t = 0.47$). The zero-cost NOA portfolio has positive and highly significant loadings on the investment factors in all specifications.

Table 6 reports the factor regressions using two-way sorted testing portfolios. To save space, we

only report the results from using the low-minus-high accrual portfolios in the smallest market-cap quintile and in the biggest market-cap quintile. The results from three intermediate market-cap quintiles are largely similar (not reported). Table 6 provides new insights not captured by Table 5. First, consistent with Fama and French (2007), the accrual anomaly is pervasive across different size groups. The value-weighted low-minus-high ACC alpha in big firms is 0.62% per month ($t = 3.25$), and the corresponding alpha in small firms is 0.50% ($t = 3.26$). The value-weighted low-minus-high $DACC$ alpha in big firms is 0.63% per month ($t = 3.46$), and that in small firms is 0.40% ($t = 2.70$).

More important, the explanatory power of investment in driving the accrual anomaly seems more important in the big firms than that in the small firms. For example, the equal-weighted low-minus-high ACC alpha is 0.47% per month ($t = 3.18$) in big firms. Adding the equal-weighted investment factor reduces the CAPM alpha by 62% to 0.18% per month ($t = 1.10$). In contrast, the equal-weighted low-minus-high ACC alpha in small firms is 0.56% per month ($t = 3.51$). Adding the equal-weighted investment factor only reduces this alpha by 22% to 0.43% per month ($t = 2.38$).

4.3   Characteristic-Adjusted Abnormal Returns

Other than the Fama-French (1993) portfolio approach, the accrual anomaly literature has traditionally used the characteristics matching technique to measure the magnitude of abnormal returns (see, for example, Sloan [1996, Table 6]). In this subsection, we quantify the explanatory power of investment in driving the accrual anomaly using the matching technique. The basic results are quantitatively similar to those from the factor regressions.

We follow Sloan's (1996) empirical procedure. In June of each year t, we assign firms into ten deciles based on the magnitude of accruals at the fiscal year-end of year $t-1$. The return cumulation for years $t+1, t+2$, and $t+3$ begins from July of year t to June of year $t+1$, July of year $t+1$ to June of year $t+2$, and July of year $t+2$ to June of year $t+3$, respectively. We compute the size-adjusted abnormal returns by calculating the buy-and-hold returns for each firm and then subtracting the return on a size matched portfolio of firms. Again following Sloan, we base the market equity

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deciles of NYSE, AMEX, and NASDAQ firms with breakpoints of NYSE and AMEX firms.

The size-and-investment-adjusted abnormal returns are computed by calculating the buy-and-hold returns for each firm and then subtracting the return on a size-and-investment-matched portfolio of firms. The size and investment portfolios are based on a sequential sort on size and investment-to-assets (independent sorts lead to some portfolios with too few firms). Starting from the ten size deciles used for size-adjusted returns, we further split each size decile on investment-to-assets using breakpoints on NYSE, AMEX, and NASDAQ firms. The relative magnitudes of the average abnormal returns with and without matching further on investment-to-assets provide a quantitative measure of the explanatory power of investment as a driver of the accrual anomaly.

Table 7 presents the detailed results. In the top half of the table, we equal-weight a given accrual portfolio and its corresponding matching portfolios for all the firms in that portfolio. From Panel A, the zero-cost low-minus-high total accrual portfolio earns average equal-weighted size-adjusted abnormal returns of 7.31%, 4.50%, and 4.11% per annum in the first, second, and third post-formation years, respectively. All of them are significantly different from zero at the 1% significance level. Matching on investment-to-assets in addition to size reduces these average abnormal returns to 3.70%, 2.58%, and 3.10% per annum, which represent reductions of 49%, 43%, and 25% from their respective size-adjusted levels. And the average abnormal return after adjusting for investment is significant at the 5% level in the first and third years, and is insignificant in the second year.

In the bottom half of Table 7, we value-weight a given accrual portfolio and its corresponding matching portfolios for all the firms in that portfolio. Panel A shows that the average value-weighted size-adjusted abnormal return for the low-minus-high total accrual portfolio is 7.30% per annum (t = 4.22) in the first post-formation year, and 5.37% (t = 3.03) in the second post-formation year. The abnormal performance is insignificant in year $t+3$. Matching further on investment-to-assets reduces the abnormal performance to 3.34% per annum (t = 1.83) in year $t+1$ and to 3.85% (t = 2.34) in year $t+2$. The reductions amount to 54% and 28% of the size-adjusted levels.

Panel B of Table 7 reports largely similar results for portfolios sorted on discretionary ac-

cruals. The percentage reductions in the abnormal performance induced by matching further on investment-to-assets are somewhat lower in the first post-formation year, but are higher in the following year. For example, the average equal-weighted size-adjusted abnormal return is 8.43% per annum ($t = 7.43$) and 4.23% ($t = 4.20$) in years $t+1$ and $t+2$. Additional matching on investment-to-assets reduces these abnormal returns by 40% and 46% to 5.31% and 2.30% per annum, albeit still significant ($t = 4.22$ and 2.39, respectively).

Investment seems more important in driving the NOA anomaly. From Panel C of Table 7, the average equal-weighted size-adjusted abnormal return for the low-minus-high NOA portfolio is 14.36%, 8.21%, and 4.74% per annum ($t = 4.23$, 2.56, and 1.87) in years $t+1, t+2$, and $t+3$, respectively. Additional matching on investment-to-assets reduces these average abnormal returns by 62%, 63%, and 65% to 5.53%, 3.04%, and 1.66% per annum ($t = 2.53$, 1.36, and 0.92), respectively. The value-weighted size-adjusted abnormal performance only shows up in the first two post-formation years, 9.15% and 6.51% per annum ($t = 2.64$ and 2.20), respectively. Matching further on investment-to-assets reduces these average abnormal returns to 4.05% per annum ($t = 1.34$) in year $t+1$ and 4.60% ($t = 1.85$) in year $t+2$.

4.4 Why Can Capital Investment Help Explain the Accrual Anomaly?

To understand the sources of the explanatory power of investment in driving the accrual anomaly, we study the investment and profitability behavior for high and low accrual firms. Table 1 shows that the correlations of accruals with earnings and investment are similar in magnitude. We now show that the investment-to-assets spread between the high and low accrual firms is much larger than the corresponding profitability spread. This evidence means that the accrual anomaly is primarily driven by investment-to-assets rather than by profitability.

Empirical Methodology

We use the standard event study framework à la Fama and French (1995). Specifically, we examine event-time evolution of median investment-to-assets and median return-on-assets for extreme

accrual deciles. In June of each year t, we assign stocks into ten accrual deciles based on the magnitude of the accruals at the fiscal year-end in year $t-1$. The median investment-to-assets or return-on-assets ratios for the two extreme accrual deciles are calculated for $t+i, i = -3, \ldots 3$. We then average the median investment-to-assets and the median return-on-assets of each accrual portfolio for event-year $t+i$ across portfolio formation year t.

As noted, we measure investment-to-assets as the sum of the annual change in gross property, plant, and equipment and the annual change in inventories divided by the lagged total assets. We measure return-on-assets as earnings (income before extraordinary items, item 18) divided by the lagged total assets (item 6). We use the same denominator in calculating investment-to-assets and return-on-assets to facilitate the interpretation of their relative magnitude.

Investment-to-Assets

Panel A of Figure 1 shows that the decile with the highest total accruals has higher investment-to-assets for one year before and one year after the portfolio formation. In particular, at year zero (portfolio formation), the high total accrual decile has an investment-to-assets of 0.27 per annum, whereas the low total accrual decile has an investment-to-assets of 0.10. From Panel B, the two extreme deciles based on discretionary accruals display a similar investment pattern. Panel C shows that the extreme NOA deciles display a more dramatic pattern in investment. At year zero, the high NOA decile has an investment-to-assets of 0.49, whereas the low NOA decile has an investment-to-assets of 0.05. Although a large portion of the investment-to-assets spread converges for one year before and one year after the year zero, the spread remains positive for all the seven years around the portfolio formation. Because the low-minus-high investment factors earn significant positive average returns, the investment pattern across extreme accrual portfolios helps explain the accrual anomaly.

Panels A to C of Figure 1 document an interesting pattern of asymmetry: Firms with high total accruals, discretionary accruals, and net operating assets all display upward spikes in investment-to-assets at the portfolio formation. But firms with low total accruals, discretionary accruals, and net

operating assets do not display symmetric downward spikes in investment-to-assets. We interpret this evidence as suggesting the empirical relevance of costly reversibility, meaning that it is more costly for firms to downsize than to expand the scale of productive assets.[4] Specifically, firms in the lowest deciles of total accruals and discretionary accruals have a median rate of capital depreciation around 10% per annum, and firms in the lowest NOA decile have a median rate of depreciation around 5%. Firms pay lower costs of adjustment when their rates of investment are higher than their rates of depreciation. And firms pay higher costs of adjustment when their rates of investment are lower than their rates of depreciation (or when their scale of production is decreasing).

Return-on-Assets

Figure 1 also examines the return-on-assets of extreme accrual portfolios for seven years around the portfolio formation. This step is important. As noted in Section 2, the negative relation between investment-to-assets and average returns is conditional on profitability. High investment can be induced by not only low costs of capital but also high profitability. Further, more profitable firms earn higher average returns than less profitable firms (e.g., Fama and French 2006, Chen and Zhang 2007). The investment spreads between high and low accrual portfolios go in the right direction in explaining the accrual anomaly, but the profitability spreads can potentially go in the wrong direction. Indeed, we find that high accrual firms are more profitable than low accrual firms. But more important, we document that the return-on-assets spreads are much smaller than their corresponding investment-to-assets spreads. This evidence suggests that the investment spreads play a quantitatively dominant role in driving the accrual anomaly.

Panels D to F of Figure 1 report the details. The spread in return-on-assets between the two extreme total accrual deciles is 0.09 per annum, which is about one half of the corresponding spread in investment-to-assets (0.17). The return-on-assets spread between the two extreme discretionary accrual deciles is even smaller at 0.05 per annum, which amounts to 36% of the corresponding

[4]Costly reversibility has received much attention in the investment literature, see, for example, Nickell (1978), Abel and Eberly (1994), and Veracierto (2002). Zhang (2005), Cooper (2006), and Gala (2006), among others, have explored the effects of costly reversibility on asset pricing dynamics.

investment-to-assets spread (0.14). And the return-on-assets spread between the two extreme NOA deciles is slightly less than 0.09 per annum, which is less than 20% of the corresponding investment-to-assets spread (0.44).

5 Optimal Investment Or Over-investment? The Effect of Corporate Governance

Although our results so far support the optimal investment hypothesis, the results also can be consistent with an over-investment hypothesis (e.g., Titman, Wei, and Xie 2004, Cooper, Gulen, and Schill 2007). The difference is that while we argue that optimal investment drives the negative relation between investment and expected returns, Titman et al. and Cooper et al. argue that investor underreaction to over-investment by empire-building managers drives the negative relation between investment and average abnormal returns. The over-investment hypothesis is also related to Fairfield, Whisenant, and Yohn's (2003) hypothesis for the accrual anomaly. Fairfield et al. argue that investors do not understand the implications of growth in net operating assets for future profitability, thereby overpricing firms with high accruals and underpricing firms with low accruals.

In this section, we present some tests to distinguish our optimal investment hypothesis from the over-investment hypothesis. Our goal is not to refute the over-investment hypothesis, but to illustrate that ours works through a different economic mechanism from the over-investment hypothesis.

Our tests are built on the following simple idea. Under the over-investment hypothesis, the negative investment-return relation should be stronger among firms that are more vulnerable to over-investment by empire-building managers. To operationalize this idea, we split the sample into two based on ex-ante measures of vulnerability to empire-building. We then perform Fama-MacBeth (1973) cross-sectional regressions of future stock returns on accrual measures and compare the magnitudes of the coefficients across the two subsamples. As an alternative, we also directly compare measures of vulnerability to empire-building across low and high accrual firms.

Motivated by recent corporate governance literature, we measure a firm's vulnerability to

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empire-building using the corporate governance index of Gompers, Ishii, and Metrick (2003). Democratic firms with strong shareholder rights (low values of the governance index) should be less vulnerable to over-investment than dictatorial firms with weak shareholder rights (high values of the governance index). Indeed, Gompers et al. show that firms with stronger shareholder rights have lower capital expenditures and make fewer corporate acquisitions than firms with weaker shareholder rights. Under the over-investment hypothesis, firms with strong shareholder rights should display weaker investment-return relation than firms with weak shareholder rights.

Several papers have recently cast doubt on the governance index of Gompers, Ishii, and Metrick (2003). Bebchuk, Cohen, and Ferrell (2005) show that an entrenchment index based on six out of 24 IRRC provisions fully drives the negative relation between the governance index and stock returns (see also Bebchuk and Cohen 2005). The relation between the entrenchment index and future stock returns is robust during the 1990–2003 period. In contrast, Core, Guay, and Rusticus (2005) show that the correlation between the governance index and future returns exhibits a reversal from 2000 to 2003 following Gompers et al.'s sample period from 1990 to 1999.

More important, the entrenchment index seems a more precise measure of vulnerability to empire-building than the governance index. Among the six provisions included in the entrenchment index are four provisions that directly limit the power of a majority of shareholders, provisions including staggered boards, limits to shareholder bylaw amendments, supermajority requirements for mergers, and supermajority requirements for charter amendments. The other two provisions reduce the likelihood of a hostile takeover (poison pills and golden parachutes). Accordingly, we also use the entrenchment index to measure a firm's vulnerability to empire-building.

We take the intersection of our sample with the sample of Gompers, Ishii, and Metrick (2003) from Andrew Metrick's Web site. Because of data restrictions, the sample is from 1990 to 2005. The intersection has between 748 and 1,523 firms each year with an average of 1,071 firms. (The governance index is available for 1990 and 1993, but not for 1991 and 1992. We use the data in 1990 for the two missing years.) We define the democratic sample with the governance index less than

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or equal to nine (the median) and the dictatorial sample with the governance index greater than or equal to ten. We also take the intersection of our sample with the sample of Bebchuk, Cohen, and Ferrell (2005) from Lucian Bebchuk's Web site. This intersection has between 660 and 1,312 firms each year from 1990 to 2004 with an average of 932 firms. We define the low-entrenchment sample with the entrenchment index less than or equal to two (the median) and the high-entrenchment sample with the index greater than or equal to three.

Table 8 reports Fama-MacBeth (1973) cross-sectional regressions of future returns on accruals using the samples partitioned by Gompers, Ishii, and Metrick's (2003) corporate governance index (G-index) and by Bebchuk, Cohen, and Ferrell's (2005) entrenchment index (E-index). Under the over-investment hypothesis, we expect to see a stronger negative relation between accruals and future returns in the weak-governance sample. The evidence is not supportive. Only when we use total accruals and G-index, do we observe a negative coefficient of accruals with a higher magnitude in the weak-governance sample than that in the strong-governance sample, -0.49 versus -0.30 in univariate regressions. However, when we use the E-index to split the sample, the result is reversed, -0.26 versus -0.44 (Panel A). Using discretionary accruals and net operating assets generate negative coefficients of accruals with largely similar magnitudes across the subsamples partitioned by corporate governance. The exception is that, from Panel B, the magnitude of the slope for discretionary accruals in the high-entrenchment sample is smaller than that in the low-entrenchment sample, -0.095 ($t = -1.28$) versus -0.342 ($t = -4.81$). Adding size and book-to-market in the regressions does not affect the basic results. In all, the evidence casts doubt on the over-investment hypothesis.

As an alternative test, we also directly examine the variation of corporate governance across the accrual portfolios. Under the over-investment hypothesis, we should expect to see that high accrual firms should be more vulnerable to empire-building, and should thus have weaker shareholder rights (higher G-index) and higher degrees of entrenchment (higher E-index) than low accrual firms. The evidence again fails to support the over-investment hypothesis. If anything, firms with high accruals have similar governance as or even more democratic governance than firms with low accruals.

Table 9 shows that high accrual firms and low accrual firms have on average similar median governance and entrenchment indexes. From Panel A, the median G-index of the top ACC decile is 8.50, which is even lower than that of the bottom ACC decile of 8.67. The Z-statistic of -3.07 for the Wilcoxon matched-pairs test means that the distribution of the high-ACC firms is more skewed to the left than the distribution of the low-ACC firms. Using E-index yields similar results, but the difference in distribution is insignificant. (In untabulated results, we also find that the mean governance and entrenchment indexes are similar across the extreme accrual deciles.) Panel B shows that the evidence is largely similar across portfolios sorted on discretionary accruals. For net operating assets (Panel C), high investment firms indeed have higher G- and E-index than low investment firms. The difference in the E-index is significant, but the difference in the G-index is not. On balance, we judge that the evidence on the cross-sectional variation in governance index across extreme accrual portfolios fails to support the over-investment hypothesis.

6 Conclusion

Capital investment is an important driver of the accrual anomaly. Treating accruals as working capital investment, we hypothesize that firms rationally adjust their investment in response to discount rate changes. Consistent with this optimal investment hypothesis, we report three main findings. First, the predictive power of accruals for future stock returns increases with the covariations of accruals (and investment) with current and past stock returns. Second, adding investment-based common factors into standard factor regressions and using investment-to-assets as an extra matching characteristic in calculating abnormal returns substantially reduce the accrual anomaly. Third, high accrual firms have similar governance and entrenchment indexes as low accrual firms, meaning that the accrual anomaly is unlikely to be driven by investor overreaction to over-investment.

Although our tests on the mispricing argument are informative, we recognize that mispricing could take a variety of forms and definitively distinguishing rational from irrational explanations of the accrual anomaly is virtually impossible. While Fama and French (1993, 1996) interpret their

similarly constructed SMB and HML factors as risk factors motivated from ICAPM or APT, we only interpret our investment factors as common factors of stock returns. However, we wish to point out that, unlike size and book-to-market, investment-to-assets does not involve the market value of equity, and is thus less likely to be affected by mispricing (at least directly).

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Table 1 : Descriptive Statistics (January 1970–December 2005)

This table presents the summary statistics of total accruals (Sloan 1996), discretionary accruals (Dechow, Sloan, and Sweeney 1995), net operating assets (Hirshleifer, Hou, Teoh, and Zhang 2004), earnings, cash flows, market equity (ME), book-to-market equity (BE/ME), and investment-to-assets (I/A). Panel A reports the mean, standard deviation (Std), min, 25% percentile, median, 75% percentile, and max for these variables. Panel B reports their cross correlations. Total accruals, denoted ACC, are measured as the change in non-cash current assets (COMPUSTAT annual item 4 minus item 1), less the change in current liabilities (exclusive of short-term debt and taxes payable) (item 5 minus items 34 and 71), less depreciation expense (item 14), all divided by average total assets (the sum of item 6 and lagged item 6 divided by two). Discretionary accruals, denoted $DACC$, are measured as the residuals from the estimation of Dechow et al.'s modification of the original Jones (1991) model cross-sectionally for each SIC code and year combination. Following Hirshleifer et al., we measure net operating assets, denoted NOA, as operating assets minus operating liabilities, both divided by lagged total assets. Operating assets are total assets minus cash and short-term investment (item 1), and operating liabilities are total assets less debt included in current liabilities (item 34), less long term debt (item 9), less minority interests (item 38), less preferred stocks (item 130), less common equity (item 60). Cash flows are measured as the difference between earnings, defined as income before extraordinary items (item 18), and total accruals. Both earnings and cash flows are scaled by average total assets (item 6). ME (in millions of dollars) is the share price at the end of June in year t times the number of share outstanding. The book value (BE) is defined as the stockholders' equity (item 216), minus preferred stock, plus balance sheet deferred taxes and investment tax credit (item 35) if available, minus post-retirement benefit asset (item 330) if available. If stockholder's equity value if missing, we use common equity (item 60) plus preferred stock par value (item 130). We measure preferred stock as preferred stock liquidating value (item 10) or preferred stock redemption value (item 56) or preferred stock par value (item 130) in that order of availability. If these variable are missing, we use book assets (item 6) minus liabilities (item 181). BE/ME is calculated by using the book value and market value at the end of the fiscal year. Investment-to-assets is defined as the annual change in gross property, plant, and equipment (item 7) plus the annual change in inventories (item 3) divided by the lagged book value of assets (item 6).

Panel A: Descriptive statistics							
	Mean	Std	Min	25%	Median	75%	Max
ACC	−0.016	0.10	−0.50	−0.07	−0.02	0.03	0.50
$DACC$	0.008	0.14	−1.62	−0.04	0.00	0.05	2.32
NOA	0.748	0.36	−0.45	0.60	0.74	0.87	8.61
Cash flows	0.093	0.18	−1.42	0.04	0.12	0.19	0.53
Earnings	0.077	0.17	−1.62	0.04	0.10	0.16	0.47
ME	1247.8	8536.3	0.01	21.3	86.6	421.6	463699.8
BE/ME	1.399	5.43	0.00	0.36	0.66	1.17	154.14
I/A	0.145	0.20	0.00	0.04	0.09	0.17	3.55

Panel B: Cross correlations (Pearson/Spearman correlations above/below the diagonal)							
	ACC	$DACC$	NOA	Cash flows	Earnings	ME	BE/ME	I/A
ACC	1	0.58	0.27	−0.34	0.21	−0.04	−0.04	0.21
$DACC$	0.66	1	0.19	−0.34	0.09	0.00	−0.01	0.15
NOA	0.28	0.27	1	−0.05	0.16	−0.02	−0.01	0.63
Cash flows	−0.42	−0.23	0.01	1	0.84	0.09	0.00	−0.09
Earnings	0.23	0.09	0.17	0.71	1	0.07	−0.02	0.03
ME	−0.10	−0.02	−0.05	0.32	0.27	1	−0.03	−0.02
BE/ME	−0.03	0.02	0.09	−0.12	−0.20	−0.40	1	−0.02
I/A	0.23	0.21	0.51	−0.00	0.19	0.01	−0.10	1

Table 2 : The Lead-Lag Relations between Accruals and Stock Returns (January 1970–December 2005)

This table reports the portfolio averages of accruals, the annual returns from July of year t to June of year $t+1$ (RET_{t+1}), the annual returns for fiscal year t (RET_t), and the annual returns for fiscal year $t-1$ (RET_{t-1}). Panel A reports these averages for ten portfolios sorted on Sloan's (1996) total accrual measure, Panel B does the same for ten portfolios sorted on Dechow, Sloan, and Sweeney's (1995) discretionary accrual measure, and Panel C for ten portfolios sorted on Hirshleifer, Hou, Teoh, and Zhang's (2004) net operating assets measure. Following Fama and French (1993), we form portfolios in June of year t based on the accrual measures at the fiscal year-end of $t-1$. The portfolio sorts are effective from July of year t to June of year $t+1$. Total accruals, denoted ACC, are measured as the change in non-cash current assets (COMPUSTAT annual item 4 minus item 1), less the change in current liabilities (exclusive of short-term debt and taxes payable) (item 5 minus items 34 and 71), less depreciation expense (item 14), all divided by average total assets (the sum of item 6 and lagged item 6 divided by two). Discretionary accruals, denoted $DACC$, are measured as the residuals from the estimation of Dechow, Sloan, and Sweeney's modification of the original Jones (1991) model cross-sectionally for each SIC code and year combination. Following Hirshleifer et al., we measure net operating assets, denoted NOA, as operating assets minus operating liabilities, both divided by lagged total assets. Operating assets are total assets minus cash and short-term investment (item 1), and operating liabilities are total assets less debt included in current liabilities (item 34), less long term debt (item 9), less minority interests (item 38), less preferred stocks (item 130), less common equity (item 60). We use both equal-weighted and value-weighted returns.

	Panel A: Total accruals				Panel B: Discretionary accruals				Panel C: Net operating assets			
Decile	ACC_t	RET_{t-1}	RET_t	RET_{t+1}	$DACC_t$	RET_{t-1}	RET_t	RET_{t+1}	NOA_t	RET_{t-1}	RET_t	RET_{t+1}
	Equal-weighted returns				Equal-weighted returns				Equal-weighted returns			
Low	−0.207	0.037	0.065	0.187	−0.230	0.135	0.206	0.176	0.231	0.139	0.173	0.206
2	−0.108	0.077	0.115	0.189	−0.098	0.111	0.160	0.189	0.456	0.117	0.126	0.203
3	−0.076	0.121	0.137	0.200	−0.058	0.118	0.161	0.205	0.562	0.119	0.133	0.197
4	−0.054	0.130	0.149	0.200	−0.032	0.126	0.151	0.192	0.635	0.128	0.131	0.198
5	−0.036	0.150	0.144	0.172	−0.013	0.145	0.129	0.190	0.692	0.124	0.138	0.187
6	−0.018	0.161	0.164	0.186	0.004	0.138	0.140	0.181	0.744	0.127	0.150	0.186
7	0.001	0.194	0.167	0.168	0.023	0.180	0.148	0.171	0.797	0.145	0.148	0.179
8	0.027	0.218	0.190	0.164	0.047	0.208	0.152	0.158	0.862	0.193	0.173	0.152
9	0.069	0.305	0.243	0.151	0.090	0.253	0.193	0.156	0.969	0.276	0.213	0.134
High	0.191	0.428	0.347	0.098	0.255	0.378	0.280	0.086	1.509	0.483	0.353	0.059
L-H	−0.399	−0.391	−0.282	0.089	−0.485	−0.243	−0.074	0.090	−1.278	−0.344	−0.180	0.146
	(−25.39)	(−11.42)	(−10.65)	(5.92)	(−10.27)	(−12.45)	(−1.98)	(8.80)	(−10.00)	(−11.11)	(−6.41)	(4.81)
	Value-weighted returns				Value-weighted returns				Value-weighted returns			
Low		0.021	0.116	0.143		0.146	0.234	0.120		0.135	0.245	0.150
2		0.098	0.114	0.151		0.106	0.149	0.148		0.149	0.133	0.153
3		0.110	0.123	0.144		0.129	0.131	0.163		0.116	0.130	0.155
4		0.122	0.123	0.138		0.130	0.156	0.154		0.111	0.108	0.131
5		0.141	0.140	0.148		0.118	0.133	0.156		0.119	0.137	0.140
6		0.138	0.151	0.139		0.126	0.120	0.137		0.122	0.136	0.139
7		0.152	0.154	0.116		0.160	0.119	0.124		0.134	0.118	0.099
8		0.202	0.133	0.131		0.167	0.117	0.125		0.135	0.136	0.132
9		0.262	0.168	0.105		0.175	0.135	0.065		0.219	0.149	0.114
High		0.361	0.253	0.070		0.255	0.255	0.044		0.293	0.236	0.081
L-H		−0.340	−0.137	0.073		−0.109	−0.021	0.076		−0.157	0.010	0.069
		(−11.02)	(−3.23)	(3.02)		(−3.61)	(−0.39)	(3.98)		(−4.94)	(0.16)	(1.91)

Table 3 : Cross-Sectional Variations in the Accrual Anomaly (January 1970–December 2005)

Panel A of this table reports the regressions of accruals on the sensitivity of accruals to the change in the discount rate (S_t), future stock returns (RET_{t+1}), and their interaction with S_t $(S_t \times RET_{t+1})$. Panel B reports the results using the sensitivity of investment-to-assets to the discount rate changes. The annual returns RET_{t+1} are from July of year t to June of year $t+1$. In Panel A, we estimate S_t for each Fama and French (1997) industry each year based on the most recent three years of data based on the following model: $ACC_t[DACC_t, NOA_t] = \alpha_0 + \alpha_1 \times RET_t + \alpha_2 \times RET_{t-1} + \epsilon_t$, in which $ACC_t[DACC_t, NOA_t]$ is total accruals, discretionary accruals, or net operating assets at year t. RET_t and RET_{t-1} are the annual returns over the fiscal years t and $t-1$, respectively. S_t is estimated as $\alpha_1 + \alpha_2$. In Panel B, we estimate S_t from $I/A_t = \alpha_0 + \alpha_1 \times RET_t + \alpha_2 \times RET_{t-1} + \epsilon_t$, in which I/A_t is investment-to-assets at year t. Total accruals are measured as the change in non-cash current assets (COMPUSTAT annual item 4 minus item 1), less the change in current liabilities (exclusive of short-term debt and taxes payable) (item 5 minus items 34 and 71), less depreciation expense (item 14), all divided by average total assets (the sum of item 6 and lagged item 6 divided by two). Discretionary accruals are measured as the residuals from the estimation of Dechow, Sloan, and Sweeney's modification of the original Jones (1991) model cross-sectionally for each SIC code and year combination. We measure net operating assets as operating assets minus operating liabilities, both divided by lagged total assets. Operating assets are total assets minus cash and short-term investment (item 1), and operating liabilities are total assets less debt included in current liabilities (item 34), less long term debt (item 9), less minority interests (item 38), less preferred stocks (item 130), less common equity (item 60). The t-statistics (in parentheses) are adjusted for heteroscedasticity and autocorrelations.

Regression results for $ACC_t[DACC_t, NOA_t] = \beta_0 + \beta_1\, RET_{t+1} + \beta_2\, S_t + \beta_3\, (S_t \times RET_{t+1}) + \epsilon_t$											
Total accruals				Discretionary accruals				Net operating assets			
β_0	β_1	β_2	β_3	β_0	β_1	β_2	β_3	β_0	β_1	β_2	β_3
Panel A: S_t estimated as the correlation between accruals and current/past returns $(ACC_t[DACC_t, NOA_t] = \alpha_0 + \alpha_1 \times RET_t + \alpha_2 \times RET_{t-1} + \epsilon_t)$											
−0.030	−0.004	0.258	−0.120	−0.003	−0.006	0.075	−0.063	0.732	−0.031	0.146	−0.107
(−6.24)	(−1.89)	(9.07)	(−2.52)	(−2.22)	(−5.57)	(1.27)	(−1.10)	(54.39)	(−5.40)	(2.87)	(−3.37)
Panel B: S_t estimated as the correlation between investment-to-assets and current/past returns $(I/A_t = \alpha_0 + \alpha_1 \times RET_t + \alpha_2 \times RET_{t-1} + \epsilon_t)$											
−0.023	−0.006	0.003	−0.035	−0.003	−0.007	0.016	−0.014	0.723	−0.037	0.350	−0.052
(−4.91)	(−3.10)	(0.13)	(−2.37)	(−0.99)	(−4.65)	(1.31)	(−1.16)	(43.37)	(−4.17)	(3.18)	(−1.30)

Table 4 : Descriptive Statistics of the Value-Weighted and the Equal-Weighted Investment Factors (January 1970–December 2005)

This table reports descriptive statistics for the value-weighted and the equal-weighted investment factors. We report the means, the CAPM alphas (α_{CAPM}), the alphas from the Fama-French (1993) three-factor regressions (α_{FF}), the alphas from the Carhart (1997) four-factor regressions (α_{4FAC}), and their corresponding t-statistics in parentheses and adjusted R^2s in curly brackets. We do a double sort on size and investment-to-assets. In June of each year t from 1970 to 2005, we sort all stocks on their June market equity into two groups using the 50-50 cutoff points. We also break all stocks into three investment-to-assets groups using the 30-40-30 cutoff points. We form six portfolios from taking intersections of the two size and three investment-to-assets portfolios. Monthly returns on the six portfolios are calculated from July of year t to June of year $t + 1$. INV_{vw} is the difference, each month, between the simple average of the value-weighted returns on the two low investment-to-assets portfolios and the simple average of the value-weighted returns on the two high investment-to-assets portfolios. INV_{ew} is the difference, each month, between the simple average of the equal-weighted returns on the two low investment-to-assets portfolios and the simple average of the equal-weighted returns on the two high investment-to-assets portfolios. Investment-to-assets is defined as the annual change in gross property, plant, and equipment (COMPUSTAT annual item 7) plus the annual change in inventories (item 3) divided by the lagged total assets (item 6). The returns for the market factor MKT, the size factor SMB, the value factor HML, and the momentum factor WML (all value-weighted) are obtained from Kenneth French's Web site. The t-statistics are adjusted for heteroscedasticity and autocorrelations. We also report the cross correlations of $INV_{vw}, INV_{ew}, MKT, SMB, HML$, and WML (Pearson correlations above the diagonal and Spearman correlations below the diagonal).

	INV_{vw}	INV_{ew}	Cross correlations (Pearson/Spearman above/below the diagonal)					
				INV_{vw}	INV_{ew}	MKT	SMB	HML	WML
Mean	0.603	0.768	INV_{vw}	1	0.85	-0.44	-0.24	0.33	0.32
(t)	(5.89)	(8.04)	INV_{ew}	0.83	1	-0.44	-0.20	0.34	0.35
α_{CAPM}	0.714	0.872	MKT	-0.39	-0.42	1	0.27	-0.44	-0.09
(t)	(7.69)	(10.07)	SMB	-0.27	-0.24	0.25	1	-0.29	-0.02
$\{R^2\}$	$\{0.19\}$	$\{0.19\}$	HML	0.36	0.37	-0.43	-0.20	1	-0.10
α_{FF}	0.659	0.808	WML	0.25	0.25	-0.09	-0.06	-0.10	1
(t)	(7.05)	(9.25)							
$\{R^2\}$	$\{0.22\}$	$\{0.22\}$							
α_{4FAC}	0.500	0.642							
(t)	(5.53)	(7.73)							
$\{R^2\}$	$\{0.31\}$	$\{0.33\}$							

Table 5 : Calendar-Time Factor Regressions of the Low-Minus-High Accrual Deciles, with and without the Investment Factor
(January 1970–December 2005)

The dependent variables in the calendar-time factor regressions are equal-weighted and value-weighted low-minus-high accrual decile returns. In June of each year t, we assign stocks into ten deciles based on total accruals, discretionary accruals, or net operating assets in Panels A, B, and C, respectively. The accruals are measured at the fiscal year-end of year $t-1$. The monthly portfolio returns are calculated from July of year t to June of year $t+1$. We use the market factor (as in the CAPM) and the Fama and French (1993) three factors as explanatory variables in factor regressions. To quantify the effects of investment in driving the accrual anomaly, we augment the CAPM and the Fama-French model with the equal-weighted or value-weighted investment factor, corresponding to the weighting scheme used in the dependent portfolio returns. We do a double sort on market equity (stock price times shares outstanding) and investment-to-assets. In June of each year t from 1970 to 2005, we sort all stocks on their June market equity into two groups using the 50-50 cutoff points. We also break all stocks into three investment-to-assets groups using the 30-40-30 cutoff points. We form six portfolios from taking intersections of the two size and three investment-to-assets portfolios. Monthly returns on the six portfolios are calculated from July of year t to June of year $t+1$. Corresponding to the weighting scheme in the dependent portfolio returns, we either equal-weight or value-weight the six portfolio returns. INV_{ew} (INV_{vw}) is the difference, each month, between the simple average of the equal-weighted (value-weighted) returns on the two low investment-to-assets portfolios and the simple average of the equal-weighted (value-weighted) returns on the two high investment-to-assets portfolios. We report the results from OLS regressions. The t-statistics reported in parentheses are adjusted for heteroscedasticity and autocorrelations. α_{ew}^{L-H} (α_{vw}^{L-H}) is the equal-weighted (value-weighted) alpha for the low-minus-high accrual deciles. $|\triangle\alpha|/\alpha$ is the percentage reductions in alphas from investment-augmented regressions relative to the corresponding alphas from the CAPM and the Fama-French model.

Panel A: Total accruals						Panel B: Discretionary accruals						Panel C: Net operating assets					
α_{ew}^{L-H}	MKT	SMB	HML	INV_{ew}	$|\triangle\alpha|/\alpha$	α_{ew}^{L-H}	MKT	SMB	HML	INV_{ew}	$|\triangle\alpha|/\alpha$	α_{ew}^{L-H}	MKT	SMB	HML	INV_{ew}	$|\triangle\alpha|/\alpha$
0.743	−0.077					0.635	0.000					1.344	−0.073				
(5.42)	(−2.58)					(5.80)	(−0.00)					(7.21)	(−1.80)				
0.489	−0.022			0.291	34.2%	0.417	0.047			0.249	34.2%	0.127	0.188			1.401	90.5%
(3.25)	(−0.67)			(3.82)		(3.46)	(1.79)			(4.00)		(0.78)	(5.31)			(16.43)	
0.801	−0.060	−0.186	−0.064			0.688	−0.029	0.015	−0.089			1.541	−0.204	0.144	−0.347		
(5.80)	(−1.81)	(−4.37)	(−1.30)			(6.15)	(−1.10)	(0.42)	(−2.23)			(8.43)	(−4.66)	(2.55)	(−5.32)		
0.568	−0.017	−0.176	−0.096	0.288	29.0%	0.456	0.014	0.021	−0.119	0.286	33.7%	0.264	0.033	0.187	−0.514	1.584	82.9%
(3.81)	(−0.49)	(−4.18)	(−1.94)	(3.77)		(3.78)	(0.52)	(0.61)	(−3.00)	(4.56)		(1.91)	(1.05)	(4.82)	(−11.35)	(21.78)	
α_{vw}^{L-H}	MKT	SMB	HML	INV_{vw}	$|\triangle\alpha|/\alpha$	α_{vw}^{L-H}	MKT	SMB	HML	INV_{vw}	$|\triangle\alpha|/\alpha$	α_{vw}^{L-H}	MKT	SMB	HML	INV_{vw}	$|\triangle\alpha|/\alpha$
0.777	−0.252					0.627	−0.143					0.840	−0.181				
(3.39)	(−5.05)					(3.05)	(−3.18)					(3.79)	(−3.75)				
0.244	−0.101			0.747	68.6%	0.183	−0.023			0.610	70.9%	0.103	0.015			0.993	87.7%
(1.04)	(−1.91)			(6.48)		(0.86)	(−0.48)			(5.69)		(0.47)	(0.30)			(8.98)	
0.800	−0.144	−0.489	0.043			0.690	−0.137	−0.150	−0.077			1.089	−0.236	−0.270	−0.364		
(3.61)	(−2.72)	(−7.13)	(0.54)			(3.27)	(−2.71)	(−2.30)	(−1.03)			(4.95)	(−4.49)	(−3.97)	(−4.63)		
0.376	−0.042	−0.446	−0.022	0.644	53.0%	0.270	−0.038	−0.114	−0.127	0.612	60.8%	0.355	−0.072	−0.198	−0.478	1.075	67.4%
(1.66)	(−0.78)	(−6.70)	(−0.29)	(5.74)		(1.25)	(−0.73)	(−1.81)	(−1.74)	(5.65)		(1.68)	(−1.45)	(−3.22)	(−6.68)	(10.00)	

Table 6 : Calendar-Time Factor Regressions of the Low-Minus-High Accrual Quintiles across the Small and the Big Quintiles, with and without the Investment Factor (January 1970–December 2005)

The dependent variables in the calendar-time factor regressions are equal-weighted and value-weighted low-minus-high accrual quintile returns in the small market-cap quintile and in the big market-cap quintile. In June of each year t, we assign stocks into five quintiles based on total accruals in Panel A (discretionary accruals in Panel B, net operating assets in Panel C). The accruals are measured at the fiscal year-end of year $t-1$. Independently, we sort stocks in June of each year t into five quintiles based on their June market equity (stock price times shares outstanding). We form 25 portfolios from the intersections of the five size and the five total accruals in Panel A. The monthly portfolio returns are calculated from July of year t to June of year $t+1$. The testing portfolios in Panels B and C are formed in a similar way. We use the market factor (as in the CAPM) and the Fama and French (1993) three factors as explanatory variables in factor regressions. To quantify the effects of investment in driving the accrual anomaly, we augment the CAPM and the Fama-French model with the equal-weighted or value-weighted investment factor, corresponding to the weighting scheme used in the dependent portfolio returns. To construct the investment factors, we do a double (two by three) sort on market equity and investment-to-assets. In June of each year t from 1970 to 2005, we sort all stocks on their June market equity into two groups using the 50-50 cutoff points. We also break all stocks into three investment-to-assets groups using the 30-40-30 cutoff points. We form six portfolios from taking intersections of the two size and three investment-to-assets portfolios. Monthly returns on the six portfolios are calculated from July of year t to June of year $t+1$. Corresponding to the weighting scheme in the dependent portfolio returns, we either equal-weight or value-weight the six portfolio returns. INV_{ew} (INV_{vw}) is the difference, each month, between the simple average of the equal-weighted (value-weighted) returns on the two low investment-to-assets portfolios and the simple average of the equal-weighted (value-weighted) returns on the two high investment-to-assets portfolios. The factor returns MKT, SMB and HML (all value-weighted) are from Kenneth French's Web site. We report the results from OLS regressions. The t-statistics reported in parentheses are adjusted for heteroscedasticity and autocorrelations. $\alpha_{S,ew}^{L-H}$ ($\alpha_{S,vw}^{L-H}$) is the equal-weighted (value-weighted) alpha for the low-minus-high accrual quintile in the small market-cap quintile, and $\alpha_{B,ew}^{L-H}$ ($\alpha_{B,vw}^{L-H}$) is the equal-weighted (value-weighted) alpha for the low-minus-high accrual quintile in the big market-cap quintile. $|\triangle\alpha|/\alpha$ is the percentage reductions in alphas from investment-augmented regressions relative to the corresponding alphas from the CAPM and the Fama-French model. In each subpanel (for example, the first half of Panel A), the first two regressions are the CAPM regressions with and without the investment factor. The third and the fourth regressions are the Fama-French regressions with and without the investment factor.

Panel A: Total accruals						Panel B: Discretionary accruals						Panel C: Net operating assets					
$\alpha_{S,ew}^{L-H}$	INV_{ew}	$|\triangle\alpha|/\alpha$	$\alpha_{B,ew}^{L-H}$	INV_{ew}	$|\triangle\alpha|/\alpha$	$\alpha_{S,ew}^{L-H}$	INV_{ew}	$|\triangle\alpha|/\alpha$	$\alpha_{B,ew}^{L-H}$	INV_{ew}	$|\triangle\alpha|/\alpha$	$\alpha_{S,ew}^{L-H}$	INV_{ew}	$|\triangle\alpha|/\alpha$	$\alpha_{B,ew}^{L-H}$	INV_{ew}	$|\triangle\alpha|/\alpha$
0.556			0.472			0.404			0.515			1.369			0.725		
(3.51)			(3.18)			(2.76)			(4.02)			(6.81)			(5.28)		
0.432	0.142	22.3%	0.181	0.334	61.7%	0.250	0.176	38.1%	0.232	0.325	55.0%	0.680	0.794	50.4%	0.103	0.716	85.8%
(2.38)	(1.16)		(1.10)	(3.43)		(1.50)	(1.72)		(1.38)	(2.71)		(2.34)	(3.22)		(0.60)	(5.31)	
0.582			0.383			0.393			0.535			1.600			0.823		
(3.50)			(2.64)			(2.57)			(4.11)			(7.68)			(5.37)		
0.460	0.152	21.0%	0.172	0.261	55.1%	0.244	0.184	37.8%	0.244	0.360	54.4%	0.818	0.969	48.8%	0.180	0.797	78.2%
(2.51)	(1.21)		(1.04)	(2.58)		(1.45)	(1.75)		(1.48)	(3.13)		(2.92)	(4.76)		(1.08)	(6.48)	

$\alpha_{S,vw}^{L-H}$	INV_{vw}	$|\triangle\alpha|/\alpha$	$\alpha_{B,vw}^{L-H}$	INV_{vw}	$|\triangle\alpha|/\alpha$	$\alpha_{S,vw}^{L-H}$	INV_{vw}	$|\triangle\alpha|/\alpha$	$\alpha_{B,vw}^{L-H}$	INV_{vw}	$|\triangle\alpha|/\alpha$	$\alpha_{S,vw}^{L-H}$	INV_{vw}	$|\triangle\alpha|/\alpha$	$\alpha_{B,vw}^{L-H}$	INV_{vw}	$|\triangle\alpha|/\alpha$
0.497			0.622			0.395			0.628			1.269			0.577		
(3.26)			(3.25)			(2.70)			(3.46)			(5.94)			(3.54)		
0.430	0.093	13.4%	0.097	0.736	84.5%	0.309	0.118	21.7%	0.365	0.361	41.9%	0.878	0.527	30.8%	0.127	0.607	78.0%
(2.49)	(0.84)		(0.49)	(6.99)		(1.85)	(1.31)		(1.77)	(2.65)		(3.28)	(2.41)		(0.73)	(5.30)	
0.539			0.549			0.397			0.642			1.519			0.737		
(3.36)			(2.82)			(2.56)			(3.33)			(6.64)			(4.36)		
0.474	0.099	12.1%	0.108	0.668	80.3%	0.311	0.125	21.6%	0.381	0.381	40.7%	1.026	0.722	32.5%	0.264	0.692	64.2%
(2.69)	(0.88)		(0.56)	(5.94)		(1.82)	(1.33)		(1.81)	(2.74)		(3.82)	(4.08)		(1.57)	(6.53)	

Table 7 : Time-Series Means of Size-Adjusted and Size-And-Investment-Adjusted Abnormal Returns (in Percentage) for Accrual Portfolios (January 1970–December 2005)

In June of each year t, we assign firms into deciles based on accruals at the fiscal year-end of year $t-1$. The returns for years $t+1, t+2$, and $t+3$ are from July of year t to June of year $t+1$, July of year $t+1$ to June of year $t+2$, and July of year $t+2$ to June of year $t+3$, respectively. We compute the size-adjusted abnormal returns by subtracting the return on a size matched portfolio from the buy-and-hold returns for each firm in an accrual portfolio. The size portfolios are market equity deciles of NYSE, AMEX, and NASDAQ firms with NYSE/AMEX breakpoints. We compute the size-and-investment-adjusted abnormal returns by subtracting the return on a size-and-investment-matched portfolio from the buy-and-hold returns for each firm in an accrual portfolio. The size and investment portfolios are based on a sequential sort on size and investment-to-assets. Starting from the size deciles used for size-adjusted returns, we further split each size decile on investment-to-assets using the NYSE/AMEX/NASDAQ breakpoints. In the top (bottom) half of the table, we equal-weight (value-weight) the abnormal returns for a given accrual portfolio and its corresponding matching portfolios for all the firms in the portfolio. Size is the share price times the number of share outstanding. The definition of investment-to-assets is in the caption of Table 1. The t-statistics (in parentheses) are adjusted for heteroscedasticity and autocorrelations. * and ** denote significance at the 0.05 and 0.01 levels using a two-tailed t-test, respectively. $\triangle$ denotes the percentage reduction of abnormal performance induced by matching on investment-to-assets in addition to size.

	Panel A: Total accruals						Panel B: Discretionary accruals						Panel C: Net operating assets					
	Size-adjusted			Size/INV-adjusted			Size-adjusted			Size/INV-adjusted			Size-adjusted			Size/INV-adjusted		
Year	$t+1$	$t+2$	$t+3$	$t+1$	$t+2$	$t+3$	$t+1$	$t+2$	$t+3$	$t+1$	$t+2$	$t+3$	$t+1$	$t+2$	$t+3$	$t+1$	$t+2$	$t+3$
	Equal-weighted returns						Equal-weighted returns						Equal-weighted returns					
Low	−0.26	−0.67	0.24	−0.03	−0.35	0.77	−0.23	−0.89	0.14	0.54	−0.52	0.40	*3.43	2.26	0.01	1.65	1.36	0.38
2	*1.63	**2.48	0.91	*1.08	**1.91	0.23	*1.54	1.00	*2.05	0.77	0.57	1.88	**2.84	0.80	1.12	1.22	−0.13	0.51
3	**3.48	1.04	0.59	**2.91	0.69	0.16	**2.88	**2.31	0.68	**1.87	**1.87	0.62	**2.94	**3.37	1.50	**1.20	**2.34	0.92
4	**2.46	*1.62	1.06	*1.60	0.60	0.67	**3.33	1.00	0.39	*2.12	0.33	0.16	**2.32	**2.38	1.28	*0.94	**1.61	*0.95
5	0.92	*1.10	1.18	0.13	0.59	0.73	**2.67	*1.63	−0.07	**1.89	*1.12	−0.31	**2.46	0.37	0.09	*1.15	−0.56	−0.31
6	**2.15	1.20	*1.55	**1.27	0.61	*1.46	0.09	0.90	0.22	−0.86	0.29	−0.08	**2.57	0.89	0.91	*1.38	0.22	0.50
7	*1.57	−0.30	−0.93	0.77	−0.73	−1.04	1.12	*1.04	0.26	0.49	0.38	−0.23	−0.30	−0.25	0.27	−1.21	−0.72	−0.15
8	*−1.75	0.44	0.51	**−2.04	0.59	0.50	*−0.90	−0.65	−0.50	**−1.05	−0.61	−0.64	−1.58	−0.98	0.48	−1.39	−1.02	0.10
9	**−2.65	**−1.76	−1.34	*−1.97	**−1.00	−1.21	*−1.85	*−1.26	0.07	−1.00	−0.62	0.12	**−3.77	**−3.03	**−2.65	−1.06	**−1.46	**−1.84
High	**−7.57	**−5.17	**−3.87	**−3.73	**−2.93	**−2.34	**−8.66	**−5.12	**−3.15	**−4.77	**−2.83	**−1.86	**−10.93	**−5.95	*−4.05	**−3.88	−1.68	−1.29
L-H	**7.31	**4.50	**4.11	*3.70	2.58	*3.10	**8.43	**4.23	3.29	**5.31	*2.30	2.25	**14.36	*8.21	4.74	*5.53	3.04	1.66
	(4.38)	(2.89)	(3.52)	(1.98)	(1.74)	(2.42)	(7.43)	(4.20)	(1.89)	(4.22)	(2.39)	(1.34)	(4.23)	(2.56)	(1.87)	(2.53)	(1.36)	(0.92)
$\triangle$				49.4%	42.6%	24.5%				36.9%	45.5%	31.6%				61.5%	62.9%	64.9%
	Value-weighted returns						Value-weighted returns						Value-weighted returns					
Low	0.83	−0.10	−2.32	0.19	0.75	−1.67	−0.85	0.28	1.52	−0.70	0.24	1.47	2.32	0.59	−1.25	0.94	0.70	−0.99
2	0.65	*2.18	1.48	0.65	*1.61	0.48	1.20	**4.71	1.54	1.01	**4.05	1.94	*2.12	0.64	0.35	*1.95	0.22	0.26
3	1.45	−0.02	0.96	*1.36	0.46	0.81	**3.83	*1.91	0.86	**3.30	*1.78	0.63	0.68	**2.15	−0.49	0.21	**1.87	−0.25
4	1.53	1.62	−0.58	1.16	0.50	−0.34	1.25	0.80	1.15	1.13	−0.03	0.97	−0.08	0.88	*1.86	−0.56	0.48	*1.81
5	−0.63	**1.83	0.62	−0.64	**1.47	0.60	**3.60	**2.17	0.17	**2.94	**1.83	−0.17	*1.59	−1.20	−1.10	1.19	−0.90	−0.38
6	1.42	−0.37	1.33	1.37	−0.26	1.47	−0.89	−1.15	0.22	−1.22	−1.27	−0.11	−0.94	−1.17	−0.17	−0.88	*−1.58	−0.52
7	−1.84	−0.85	−0.52	−1.63	−0.44	−0.73	−0.17	−0.16	−1.08	0.20	0.16	−1.35	**−3.06	−0.82	0.59	*−2.26	−0.37	0.03
8	−0.67	0.90	0.19	−0.00	1.17	−0.03	−1.77	−0.85	−0.63	−1.26	−0.60	−0.79	1.13	−1.31	0.51	1.30	−1.33	−0.35
9	**−4.37	**−4.17	−1.97	**−3.49	*−3.25	−0.84	**−6.54	**−5.07	0.13	**−5.58	**−4.01	1.12	−2.75	−0.88	−1.08	−0.85	−0.35	−1.50
High	**−6.47	**−5.47	*−2.87	**−3.15	*−3.10	*−2.64	**−8.08	**−5.67	−1.63	**−6.00	**−3.56	−0.81	**−6.83	**−5.91	−0.34	*−3.12	**−3.90	−0.24
L-H	**7.30	**5.37	0.55	3.34	*3.85	0.97	**7.23	*5.95	3.15	**5.32	3.79	2.28	**9.15	*6.51	−0.91	4.05	4.60	−0.75
	(4.22)	(3.03)	(0.38)	(1.83)	(2.34)	(0.69)	(4.21)	(2.47)	(1.39)	(3.25)	(1.88)	(1.15)	(2.64)	(2.20)	(−0.37)	(1.34)	(1.85)	(−0.34)
$\triangle$				54.3%	28.3%	−				26.4%	36.2%	27.7%				55.7%	29.2%	−

Table 8 : The Effect of Corporate Governance on the Accrual Anomaly (January 1990–December 2005)

This table reports annual Fama-MacBeth (1973) cross-sectional regressions using samples partitioned by Gompers, Ishii, and Metrick's (2003) corporate governance index (G-index) and Bebchuk, Cohen, and Ferrell's (2005) management entrenchment index (E-index). Gompers et al. obtain firm-level corporate governance provisions from the Investor Responsibility Research Center (IRRC). The index counts the number of unique provisions for each firm, and it ranges from 1 to 24. We intersect the sample used by Gompers et al. with our sample. Bebchuk et al. construct their index based on six out of 24 provisions from the IRRC. The six provisions include staggered boards, limits to shareholder bylaw amendments, supermajority requirements for mergers, supermajority requirements for charter amendments, poison pills, and golden parachutes. The entrenchment index counts the number of unique provisions for each firm in the sample, and it ranges from 0 to 6. We intersect the sample used by Bebchuk et al. with our sample. The dependent variable in the cross-sectional regressions is future annual stock returns RET_{t+1} from July of year t to June of year $t + 1$. ACC is Sloan's (1996) measure of total accruals, $DACC$ is Dechow, Sloan, and Sweeney's (1995) measure of discretionary accruals, and NOA is Hirshleifer, Hou, Teoh, and Zhang's (2004) measure of net operating assets. ME is the market value of equity; and BM is the book-to-market ratio. See Table 1 for detailed variable definitions. The t-statistics in parentheses are adjusted for heteroscedasticity and autocorrelations.

	Panel A: Total accruals							
	Strong governance (G-index ≤ 9)		Weak governance (G-index > 9)		Strong governance (E-index ≤ 2)		Weak governance (E-index > 2)	
Intercept	0.146	0.255	0.127	0.274	0.143	0.276	0.135	0.250
	(7.80)	(3.50)	(6.71)	(5.55)	(7.36)	(4.65)	(6.41)	(3.42)
ACC_t	−0.296	−0.273	−0.449	−0.401	−0.444	−0.400	−0.264	−0.220
	(−4.03)	(−3.75)	(−4.94)	(−5.45)	(−5.71)	(−5.78)	(−2.52)	(−2.39)
$\log(BM_t)$		0.004		−0.002		−0.001		0.011
		(0.26)		(−0.14)		(−0.07)		(0.77)
$\log(ME_t)$		−0.016		−0.021		−0.019		−0.016
		(−1.26)		(−3.43)		(−1.89)		(−1.68)
	Panel B: Discretionary accruals							
	Strong governance (G-index ≤ 9)		Weak governance (G-index > 9)		Strong governance (E-index ≤ 2)		Weak governance (E-index > 2)	
Intercept	0.160	0.276	0.148	0.295	0.164	0.305	0.149	0.260
	(9.76)	(3.54)	(7.86)	(5.93)	(9.35)	(4.55)	(7.91)	(3.70)
$DACC_t$	−0.240	−0.229	−0.261	−0.238	−0.342	−0.309	−0.095	−0.082
	(−3.43)	(−3.56)	(−3.36)	(−3.42)	(−4.81)	(−4.48)	(−1.28)	(−1.18)
$\log(BM_t)$		0.002		0.001		−0.001		0.013
		(0.14)		(0.10)		(−0.04)		(0.87)
$\log(ME_t)$		−0.017		−0.021		−0.021		−0.015
		(−1.32)		(−3.29)		(−1.87)		(−1.64)
	Panel C: Net operating assets							
	Strong governance (G-index ≤ 9)		Weak governance (G-index > 9)		Strong governance (E-index ≤ 2)		Weak governance (E-index > 2)	
Intercept	0.213	0.311	0.212	0.333	0.213	0.337	0.202	0.303
	(5.39)	(4.03)	(7.89)	(7.48)	(5.08)	(4.99)	(6.90)	(4.56)
NOA_t	−0.069	−0.055	−0.094	−0.078	−0.066	−0.055	−0.076	−0.062
	(−1.39)	(−1.17)	(−4.83)	(−3.86)	(−1.22)	(−1.02)	(−2.79)	(−2.22)
$\log(BM_t)$		0.013		0.008		0.013		0.016
		(1.05)		(0.65)		(0.96)		(1.33)
$\log(ME_t)$		−0.015		−0.018		−0.018		−0.015
		(−1.30)		(−2.88)		(−1.78)		(−1.68)

Table 9 : Median Corporate Governance Index (*G*-Index) and Median Entrenchment Index (*E*-Index) for Extreme Accrual Portfolios (1990–2004)

For extreme total accruals portfolios (Panel A), discretionary accruals portfolios (Panel B), and net operating assets portfolios (Panel C), we report the median corporate governance index and the median entrenchment index. In all panels, we also report *Z*-statistics from the Wilcoxon matched-pairs signed-rank test for differences in distributions. The null hypothesis is that the indexes for high and low accrual portfolios are both drawn from the same distribution. *Z*-statistics larger than two and smaller than −2 reject the null hypothesis. Gompers, Ishii, and Metrick (2003) obtain firm-level corporate governance provisions from the Investor Responsibility Research Center (IRRC). The index counts the number of unique provisions for each firm, and it ranges from 1 to 24. We intersect the sample used by Gompers et al. from Andrew Metrick's Web site with our sample. Bebchuk, Cohen, and Ferrell (2005) construct their index based on six out of 24 provisions from the IRRC. The six provisions include staggered boards, limits to shareholder bylaw amendments, supermajority requirements for mergers, supermajority requirements for charter amendments, poison pills, and golden parachutes. The entrenchment index counts the number of unique provisions for each firm in the sample, and it ranges from 0 to 6. We intersect the sample used by Bebchuk et al. from Lucian Bebchuk's Web site with our sample.

| | Panel A: Total accruals | | | | | | Panel B: Discretionary accruals | | | | | | Panel C: Net operating assets | | | | | |
| | Median *G*-index | | | Median *E*-index | | | Median *G*-index | | | Median *E*-index | | | Median *G*-index | | | Median *E*-index | | |
Year	High	Low	*Z*	High	Low	*Z*	High	Low	*Z*	High	Low	*Z*	High	Low	*Z*	High	Low	*Z*
1990	8.89	9.25	−1.10	1.89	2.00	1.61	8.98	8.50	−0.10	2.27	1.71	0.97	7.96	8.57	−0.86	2.25	1.73	−1.58
1991	8.46	8.33	−1.90	2.33	2.00	−0.72	7.88	8.10	−1.53	1.88	2.00	1.40	9.00	8.33	0.74	2.60	1.75	1.74
1992	7.29	8.45	−0.22	1.75	2.00	0.14	9.20	8.20	0.44	2.42	2.00	0.21	8.71	8.83	0.02	2.00	1.88	0.93
1993	8.00	9.18	−1.24	2.00	2.14	0.02	8.23	9.00	−1.13	2.00	2.00	−0.42	9.10	8.09	0.86	2.50	1.75	1.15
1994	8.00	9.17	−1.41	2.00	2.31	−0.45	8.67	9.00	−0.34	2.00	2.00	0.00	9.50	8.50	0.30	2.50	2.00	0.89
1995	9.00	8.27	−0.10	2.20	2.00	−0.20	8.88	8.86	1.06	1.92	1.86	0.39	9.00	8.75	0.95	2.10	1.70	1.67
1996	9.00	10.00	−2.02	2.29	2.39	−0.81	9.60	9.00	0.20	2.25	2.00	0.40	9.00	8.75	−0.42	2.17	2.00	0.00
1997	8.69	9.25	−1.92	2.06	2.29	−2.35	9.33	8.80	−0.52	2.50	2.75	0.30	8.67	9.50	0.02	2.56	2.00	0.40
1998	8.67	8.00	−1.07	2.40	2.00	−0.13	8.58	8.13	−0.51	2.29	2.00	−0.88	8.00	7.86	−0.03	2.20	2.00	0.70
1999	8.00	8.55	0.87	1.94	2.08	0.84	8.00	8.25	0.41	1.75	1.67	0.95	7.71	7.96	0.94	2.32	1.85	1.48
2000	9.00	8.60	−0.98	2.17	2.42	−1.12	8.58	8.46	−0.30	1.63	2.50	−3.14	8.55	8.00	1.84	2.00	2.00	0.61
2001	8.92	8.52	0.77	2.52	2.00	1.24	8.65	8.42	0.20	2.20	2.14	−0.42	8.86	8.20	0.70	2.00	1.83	1.98
2002	8.00	8.25	−0.04	2.00	2.33	−1.24	8.50	8.33	0.49	2.20	2.33	−0.62	8.67	8.13	0.58	2.54	1.83	0.83
2003	8.80	8.40	−0.04	2.50	2.00	−1.16	8.80	8.20	−1.57	2.38	2.17	−2.29	8.33	8.17	1.32	2.10	1.75	2.02
2004	8.57	8.67	0.41	2.50	2.40	−0.22	9.00	8.67	−0.73	2.40	2.33	0.23	8.81	8.33	1.24	2.14	2.00	1.79
All	8.50	8.67	−3.07	2.11	2.20	−1.26	8.67	8.50	0.44	2.17	2.04	0.22	8.67	8.29	1.82	2.20	1.86	4.77

Figure 1 : The Event-Time Evolution of Investment-to-Assets and Return-on-Assets for the Low and High Accrual Portfolios During Three Years Before and Three Years After the Portfolio Formation (January 1970–December 2005)

This figure presents event-time evolution of investment-to-assets and return-on-assets for extreme accrual deciles formed in each June. We consider three set of portfolios sorted on Sloan's (1996) total accruals (Panels A and D), Dechow, Sloan, and Sweeney's (1995) discretionary accruals (Panels B and E), and Hirshleifer, Hou, Teoh, and Zhang's (2004) net operating assets (Panels C and F). See Table 1 for detailed variable definitions. Panels A to C plot investment-to-assets, and Panels D to F plot return-on-assets. In each panel, the solid line represents the median investment-to-assets or return-on-assets ratio for the low accruals decile, whereas the broken line represents the median investment-to-assets or return-on-assets ratio for the high accruals decile. In June of each year t, we assign stocks into ten accruals deciles based on the magnitude of the accruals at the fiscal year-end in year $t-1$. The median investment-to-assets or return-on-assets ratios for the two extreme accrual deciles are calculated for $t+i, i = -3, \ldots 3$. The median investment-to-assets or return-on-assets ratios of each accrual portfolio for event-year $t+i$ are then averaged across portfolio formation years t. We measure investment-to-assets as the sum of the annual change in gross property, plant, and equipment (COMPUSTAT annual item 7) and the annual change in inventories (item 3) divided by the lagged total assets (item 6). We measure return-on-assets as earnings (income before extraordinary items, item 18) divided by the lagged total assets (item 6).