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Understanding The Accrual Anomaly

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Abstract

Interpreting accruals as working capital investment, we hypothesize that firms optimally adjust their capital investment in response to discount rate changes. Consistent with the discount-rate hypothesis, we document that (i) the predictive power of accruals for future returns increases with the correlations of accruals with past and current stock returns; (ii) controlling for investment substantially reduces the magnitude of the accrual anomaly; (iii) the ex-ante expected returns of various accrual strategies have been stable at around 5% per annum over the past 35 years; (iv) the accounting reliability of various accrual components is inversely related to their cross-correlations with investment-to-assets; and finally (v) high accrual firms have similar corporate governance and entrenchment indexes as low accrual firms, suggesting that the accrual anomaly is unlikely to be driven by investor overreaction to over-investment.

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1 Introduction

In a path-breaking article, Sloan (1996) documents that firms with high accruals earn abnormally lower returns on average than firms with low accruals, and interprets the evidence as investors overestimating the persistence of the accrual component of earnings when forming earnings expectations. He argues that naive investors are systematically surprised later on when realized earnings of high accrual firms fall short of, and those of low accrual firms exceed, prior expectations. This explanation is rooted in the functional fixation hypothesis, which is consistent with irrational investor behavior (e.g., Watts and Zimmerman 1986). Sloan's work has spurred a large body of literature in empirical finance and capital markets research in accounting. One strand of the literature follows Sloan in linking accruals to earnings persistence and security mispricing (e.g., Xie 2001 and Richardson, Sloan, Soliman, and Tuna 2005). Another strand links accruals to growth attributes and argues that investors fail to account for the unsustainability of growth (e.g, Thomas and Zhang 2002, Fairfield, Whisenant, and Yohn 2003, and Hirshleifer, Hou, Teoh, and Zhang 2004).

Most, if not all, existing explanations for the accrual anomaly rely on some form of investor irrationality. In contrast, we propose and empirically test a discount-rate hypothesis that is potentially consistent with rationality. Interpreting accruals as working capital investment, we hypothesize that firms optimally adjust investment in response to discount rate changes, as predicted by the neoclassical q-theory of investment (e.g., Tobin 1969, Abel 1979, Hayashi 1982, and Cochrane 1991).

When the discount rate falls, more investment projects become profitable and accruals increase. At the same time, current returns should increase because stock prices increase from lower discount rates. But future returns should decrease because lower discount rates mean low 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, see, e.g., Kydland and Prescott 1982, Lamont 2000, and Lettau and Ludvigson 2002), accruals also should be positively correlated with 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 correlations between accruals and current and past returns.

Our empirical tests support the discount-rate hypothesis. 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 relation of accruals for future returns increases with the correlations between accruals and past and current returns and with the correlations between investment and past and current returns. We document these results using different accrual measures such as Sloan's (1996) total accruals, Xie's (2001) discretionary accruals, and Hirshleifer, Hou, Teoh, and Zhang's (2004) net operating assets.

The discount-rate hypothesis predicts that controlling for capital investment should go a long way in reducing the magnitude of the accrual anomaly. Using calendar-time factor regressions à la Fama and French (1993), we document that adding investment-based return factors into standard factor models such as the CAPM and the Fama-French three-factor model reduces the total accrual anomaly by 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 (1996), matching on investment-to-assets in addition to size reduces the total accrual anomaly by around 50% and 35% in the first and the second post-formation years, respectively. Doing so also reduces the magnitude of the discretionary accrual anomaly by 32% in the first post-formation year and by 41% in the second, and reduces the magnitude of the net operating assets anomaly by 59% in the first year and by 46% in the second.

Several researchers have argued that the average return can be a noisy or even biased estimate of the ex-ante expected return (e.g., Elton 1999, Fama and French 2002, and Pastor, Sinha, and Swaminathan 2007). Following Blanchard (1993) and Fama and French, we use dividend growth rates to measure expected rates of capital gain in constructing the ex-ante discount rates for accrual portfolios. Consistent with the discount-rate hypothesis, we find that high accrual firms have reliably lower ex-ante discount rates than low accrual firms. For example, the low total accrual quintile has a high discount rate of 8% per annum, whereas the high total accrual quintile has a low discount rate of 2.3%. The discount-rate spread of 5.8% is highly significant. The expected long-term dividend growth accounts for 75% of the discount-rate spread, and the expected dividend-to-price ratio accounts for the remaining 25%. Finally, the ex-ante profitability of various accrual strategies has been largely stable at around 5% per annum over the past 35 years.

Richardson, Sloan, Soliman, and Tuna (2005) develop a comprehensive balance sheet categorization of accruals and rank each category based on its accounting reliability. Their tests show that less reliable accruals lead to lower earnings persistence and more mispricing. This evidence can be accounted for by the discount-rate hypothesis. We show that what Richardson et al. categorize as less reliable accruals is more correlated with investment and what they categorize as more reliable accruals is less correlated with investment. Consistent with the discount-rate hypothesis, we show that accruals that are more correlated with investment-to-assets have more predictive power for future realized returns and covary more with ex-ante discount rates.

The over-investment hypothesis says that investors 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). To distinguish our hypothesis from this alternative, we examine the variation in the accrual anomaly across subsamples split on proxies for the vulnerability of firms to over-investment. We use 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. However, the magnitude of the accrual anomaly does not vary across governance indexes. The governance of firms in the high accrual decile also is indistinguishable from that of firms in the low accrual decile. The evidence suggests that the accrual anomaly is unlikely to be driven by investor overreaction to over-investment.

We add to the body of work that emphasizes the importance of capital investment in driving asset pricing anomalies. Cochrane (1991) establishes the inverse relation between investment and the discount rate in the neoclassical q-theory framework and documents such a relation in aggregate data. Anderson and Garcia-Feijóo (2006) document that investment growth classifies firms into size and book-to-market portfolios. Based on valuation theory, Fama and French (2006) argue that given book-to-market equity and expected profitability, high expected rates of investment imply lower expected returns. Fama and French (2007) use valuation theory to interpret a wide range of anomalies including the accrual anomaly. Cooper, Gulen, and Schill (2007) document that the annual asset growth rate is an important determinant in the cross section of returns. Xing (2007) shows that an investment growth factor helps explain the value effect.

Several recent papers propose alternative explanations for the accrual anomaly that are different from Sloan's (1996) earnings fixation hypothesis. Kothari, Loutskina, and Nikolaev (2005) argue that, under the agency theory of overvalued equity, managers of overvalued firms are likely to manage their accruals upwards to sustain the overvaluation. But overvaluation eventually reverts so as to generate lower average returns for high accrual firms. Kothari et al. also show that accruals are positively related to current and past returns. Kothari, Sabino, and Zach (2005) stress the danger of data trimming in market efficiency tests. Kraft, Leone, and Wasley (2006) find that accrual anomaly is driven by a small number of extreme observations (1% of the sample) and interpret the evidence as inconsistent with the naive fixation hypothesis of Sloan (1996). Khan (2007) uses a four-factor ICAPM-type model to explain the accrual anomaly. Our work complements these papers by offering an investment-based explanation for the accrual anomaly.

We emphasize that our contribution is to propose an economics-based story and to show that many results on the accrual anomaly can be consistent with this story. The explanation also generates new testable hypotheses (such as the cross-sectional variation in the magnitude of the accrual anomaly based on the covariation of accruals with current and past stock returns). In particular, our purpose is not to refute the existing behavioral explanations. Rather, we interpret our evidence as saying that there exists at least some room for fundamental forces in helping us understand the accrual anomaly. Thus, we reinforce the conclusion of Kothari (2001), Lewellen and Shanken (2002), and Fama and French (2006) that empirical tests in the anomalies literature cannot by themselves tell us whether the anomalies are driven by rational or irrational forces.

Our story proceeds as follows. Section 2 develops the discount-rate hypothesis. Section 3 describes our data. We test the discount-rate hypothesis in Section 4, and explore alternative explanations in Section 5. Section 6 concludes.

2 Hypothesis Development

Interpreting accruals as working capital investment, we argue that firms optimally adjust their investment in response to changes in the discount rate. When the discount rate falls, more investment projects become profitable, giving rise to higher investment and accruals. The discount rate can vary across firms due to, for example, 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 discount rates of the new projects, given their expected cash flows. High discount rates mean low NPVs, which in turn mean low investment, and low discount rates mean high NPVs, which in turn mean high investment. More important, the expected returns of firms that take many new projects are reduced by the low discount rates of the new projects.

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, 1996) is among the first to establish this relation in the neoclassical q-theory framework and explore its asset pricing implications. 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 discount rates give rise to high values of marginal q and high investment, and high discount rates give rise to low values of marginal q and low investment. Consistent with this prediction, Cochrane finds that aggregate investment-to-assets predicts future stock market returns with a negative sign. The negative relation between investment and average returns also arises in the real options models (e.g., Berk, Green, and Naik 1999 and Carlson, Fisher, and Giammarino 2004, 2006). In these models, growth options are riskier than assets in place, and investment transforms riskier growth options into less risky assets in place, thereby reducing risk and expected returns.

The accrual anomaly offers an ideal setting to test the discount-rate hypothesis. The reason is that accruals represent a direct form of investment in 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. 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 accounting literature also shows that accruals capture fundamental investment in working capital (e.g., Bushman, Smith, and Zhang 2006 and Zhang 2007). For example, Zhang documents that accruals covary with employee growth, external financing, and other growth aspects of corporate growth, and that the covariation between accruals and growth attributes helps explain the magnitude of the accrual anomaly. However, he does not explain why investment in working capital is negatively related to future stock returns. We fill this gap by applying the insights from investment-based asset pricing. Our tests also are different and more extensive.

In our empirical analysis, we measure investment-to-assets as the annual change in gross property, plant, and equipment plus the annual change in inventories scaled by the lagged book value of assets. We use the change 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. Although Richardson, Sloan, Soliman, and Tuna (2005) have recently categorized the change in property, plant, and equipment as long-term accruals, we emphasize that this variable has long been used to measure firm-level investment in the empirical investment literature (e.g., Abel and

Blanchard 1986, Whited 1992, and Barnett and Sakellaris 1998).

We use the change in inventories to capture investment in short-lived assets within a normal operating cycle such as merchandise, raw materials, supplies, and work in progress. Inventory investment has been treated somewhat differently from fixed-capital investment in macroeconomics (e.g., Ramey and West 1999), and has been overlooked so far in investment-based asset pricing. In Appendix A, we extend Cochrane's (1991) model by incorporating inventories in the production function. The central insight is that, similar to fixed-capital investment, inventory investment also is negatively related to the discount rate. Its economic mechanism also is similar to the mechanism underlying the negative relation between fixed-capital investment and the discount rate. The crux is that, similar to adjusting fixed-capital, adjusting inventories is costly. Costs in adjusting inventories arise from costs of production and of changing production, hiring and firing costs, and inventory holding and stock-out costs. Stock-out costs arise when sales exceed the stock on hand, entailing lost sales and delayed payment if orders are backlogged.

3 Data and Descriptive Statistics

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 code between 4900 and 4999) and financial firms (SIC code between 6000 and 6999). These two industries are highly regulated and have accruals that are significantly different from those in other industries. We also exclude firms with negative book values of equity. Also, only firms with ordinary common equity are included in the tests, meaning that we exclude ADRs, REITs, and units of beneficial interest. 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 use three accrual measures in our tests. Following Sloan (1996), we measure total accruals (ACC) as changes in non-cash working capital minus depreciation expense scaled by average total assets. 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 driven by discretionary accruals. We measure $DACC$ using Dechow, Sloan, and Sweeney's (1995) modification of the Jones (1991) model:

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

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 $t-1$, TA_{t-1} is total assets (item 6) at the end of year $t-1$, and $PP\&E_t$ is the gross property, plant, and equipment (item 7) at the end of year t. Following Dechow et al., 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.

The 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. They define the scaled net operating assets (NOA) 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 closely related to 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. This expectational error gives rise to mispricing.

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

Motivated from the discussion in Section 2, 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). This measure of investment has been used before by Lyandres, Sun, and Zhang (2007). Our goal is to use a simple measure from the existing literature to capture fundamental investment and to examine whether investment helps explain the accrual anomaly. We have not experimented with different measures to maximize the explanatory power of investment for the accrual anomaly.

As expected, Table 1 shows that all the accrual measures are positively correlated with investment-to-assets. The Spearman correlations of investment-to-assets with ACC, $DACC$, and NOA are 0.23, 0.21, and 0.51, respectively, all of which are significantly different from zero. However, investment and accruals are far from being perfectly correlated.

4 Testing the Discount-Rate Hypothesis

We test the discount-rate hypothesis using three different proxies for the discount rate. The first proxy is the covariation of accruals (and investment) with current and past stock returns. Section 4.1 examines its relation with the magnitude of the accrual anomaly. The second proxy is simply investment-to-assets. Section 4.2 studies the impact of controlling for investment-to-assets on the magnitude of the accrual anomaly. Finally, Section 4.3 constructs the ex-ante discount rate à la Fama and French (2002) and examines its cross-sectional variation across the accrual portfolios.

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

Changes in the discount rate should affect investment, 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 should also be positively related to past stock returns. We study these testable implications in this subsection.

4.1.1 The Lead-Lag Relations between Accruals and Stock Returns

We use the Fama and French (1993) portfolio approach. 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 $t+1$ (R_{t+1}), where the accruals are measured at the fiscal year-end of year $t-1$.

From Panel A of Table 2, the average equal-weighted R_{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 $DACC$ deciles. From Panel C, 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 ($t = 4.81$). Overall, the evidence is consistent with Sloan (1996), Xie (2001), and Hirshleifer, Hou, Teoh, and Zhang (2004).

Using value-weighted returns does not materially affect the magnitude of the correlations of average returns with ACC and $DACC$. 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 greatly reduces the average return of the low-minus-high NOA portfolio to 6.9% per annum ($t = 1.91$). The high-NOA decile has an equal-weighted average return of 5.9% per annum, which is much lower than that of 13.4% for the ninth-NOA decile. The big gap is absent in 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 micro-caps and small stocks, but is largely absent for big stocks.

Accruals increase 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 fiscal year t) to the annual stock returns from the beginning to the end of fiscal year $t-1$, which we call current stock returns (R_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 (R_{t-1}). We again report both equal-weighted and value-weighted results.

Panel A of Table 2 shows that, as ACC increases from decile one to ten, the equal-weighted R_t increases from 6.5% to 34.7% per annum, and the equal-weighted R_{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 R_t and R_{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 R_t and R_{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 somewhat weaker results.

4.1.2 Conditional Analysis of the Accrual Anomaly

The discount-rate hypothesis suggests that the magnitude of the accrual anomaly should vary cross-sectionally with the correlation between accruals and current and past stock returns. The reason is that changes in the discount rate affect past, current, and future returns simultaneously. 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 should have stronger predictive power for future returns. In industries in which accruals do not vary with past and current stock returns, we do not expect accruals to be negatively correlated with future returns.

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). Implicitly, we assume that the information content of accruals depends on industry-specific business model. Specifically, we estimate the following three-year rolling panel regressions:

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

in which $\tau = t-2, t-1$, and t and $ACC_{j\tau}[DACC_{j\tau}, NOA_{j\tau}]$ denotes ACC, $DACC$, or NOA at year τ for firm j in a given industry. We use the categorization of 48 industries from Fama and French (1997). We define the sensitivity of accruals to discount rate changes 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 are likely to 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.

After estimating the sensitivities for all the industries each year, we assign the sensitivity of an industry to all the firms in that industry. We estimate industry sensitivities because firm-level estimates are less precise. The idea follows 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 S_t, we perform the following annual Fama-MacBeth (1973) cross-sectional regressions:

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

The discount-rate 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, the hypothesis predicts a negative slope for the interaction term, $S_t \times R_{t+1}$.

Panel A of Table 3 shows that, when we use ACC as the dependent variable, the interaction term has a negative coefficient of -0.120 ($t = -2.52$). Using $DACC$ yields a negative coefficient to -0.063 ($t = -1.10$). When we use NOA as the dependent variable, the interaction term has a negative coefficient of -0.107 ($t = -3.37$). The evidence suggests that, consistent with the discount-rate hypothesis, the predictive power of accruals for future returns increases with the sensitivity of accruals to changes in the discount rate.

We also explore an alternative measure of accrual-discount-rate sensitivity by replacing accruals with investment-to-assets as the dependent variable in equation (3) and rerunning the cross-sectional regressions in equation (4). This alternative test design is informative because the discount-rate hypothesis of the accrual anomaly works through the relation between investment and the discount rate. From Panel B of Table 3, using this alternative measure yields similar results for ACC and $DACC$ as those in Panel A. When we use ACC as the dependent variable, the interaction term ($S_t \times R_{t+1}$) has a negative coefficient of -0.035 ($t = -2.37$). However, when we use NOA as the dependent variable, the interaction term has an insignificant coefficient of -0.052 ($t = -1.30$), albeit still negative. On balance, our evidence suggests that the magnitude of the accrual anomaly increases with the accruals (and investment) sensitivity to discount rate changes.

4.2 The Impact of Capital Investment on the Accrual Anomaly

We now use investment-to-assets as the discount-rate proxy to test the discount-rate hypothesis. Section 4.2.1 uses the Fama and French (1993, 1996) factor regression approach, and Section 4.2.2 calculates characteristics-adjusted abnormal returns to quantify the effect of investment in driving the accrual anomaly. In Section 4.2.3, we examine how investment and profitability vary across extreme accrual deciles using the Fama and French (1995) event-study approach.

4.2.1 Calendar-Time Factor Regressions

The discount-rate 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. To test this implication, we regress zero-cost low-minus-high accrual portfolio returns on the market factor and on the Fama and French (1993) three factors and 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 the 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 additional factor.

4.2.1.1 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, 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 accruals 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. Because of the large number of testing portfolios, we only report the results for zero-cost low-minus-high accrual portfolios to save space.

4.2.1.2 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 30-40-30% cutoff points. We also independently sort all stocks into two groups using 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 returns on the six portfolios are calculated from July of year t to June of $t+1$. The investment 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. 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 INV_{vw} and 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 investment factor returns. (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 positive alphas unexplained. For example, 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 also are relatively low (the highest is 33%). In all, the evidence suggests that the investment factors capture average return variations not subsumed by other factors commonly used in empirical finance.

4.2.1.3 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). To preview the results, we find that adding the investment factors can explain on average 46% of the ACC anomaly, 50% of the $DACC$ anomaly, and 82% of the NOA anomaly. (For example, the 46% is the average of the four numbers reported in the column denoted $\triangle\alpha/\alpha$ in Panel A of Table 5.)

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 INV_{ew} into the factor regression reduces the alpha by 34% to 0.49%, albeit still significant ($t = 3.25$). The value-weighted CAPM alpha of the zero-cost ACC portfolio equals 0.78% per month ($t = 3.39$). Adding INV_{vw} 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 $DACC$ portfolios are similar. From Panel B, the equal-weighted alpha of the zero-cost $DACC$ portfolio is 0.64% per month ($t = 5.80$), and adding INV_{ew} reduces the alpha by 34% to 0.42% ($t = 3.46$). The value-weighted alpha of the zero-cost $DACC$ portfolio is 0.63% per month ($t = 3.05$), and adding INV_{vw} reduces the alpha by 71% to 0.18% ($t = 0.86$). Again, 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, the equal-weighted CAPM alpha of the zero-cost NOA portfolio is 1.34% per month ($t = 7.21$), adding INV_{ew} 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 ($t = 3.79$), and adding INV_{vw} reduces the alpha by 88% to 0.10% ($t = 0.47$). The investment-factor loadings of the zero-cost NOA portfolio are all significant positive.

Table 6 reports the factor regressions using two-way sorted testing portfolios. We only report the results from using the low-minus-high accrual portfolios in the extreme market-cap quintiles. The results from three intermediate market-cap groups are similar (not reported). Consistent with Fama and French (2007), the accrual anomaly is pervasive across different size groups. For example, 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% ($t = 2.70$). Also, the explanatory power of investment 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 INV_{ew} 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 INV_{ew} only reduces this alpha by 22% to 0.43% per month ($t = 2.38$).

4.2.2 Characteristic-Adjusted Abnormal Returns

The accrual anomaly literature has traditionally used the characteristics-matching technique to measure the magnitude of abnormal returns (e.g., Sloan 1996, Table 6). For example, Zach (2003) reports that when book-to-market is added to size as a second control, average abnormal returns of the low-minus-high accrual strategy decrease by about 20%. Thus, we also quantify the explanatory power of investment in driving the accrual anomaly using the characteristics-matching technique. The basic results are 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 $t+3$ goes 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 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. Following Sloan, we base the market equity deciles of NYSE, AMEX, and NASDAQ firms with breakpoints of NYSE and AMEX firms.

We compute the size-and-investment-adjusted abnormal returns 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-investment portfolios are based on a sequential sort on size and investment-to-assets (independent sorts generate several portfolios with too few firms). Starting from the ten size deciles used for size-adjusted returns, we further split each size decile into ten groups on investment-to-assets using breakpoints on NYSE, AMEX, and NASDAQ firms. The relative magnitudes of average abnormal returns with and without matching further on investment-to-assets provide a quantitative measure of the explanatory power of investment for the accrual anomaly.

Table 7 presents the details. In the top half of the table, we equal-weight a given accrual portfolio and the corresponding matching portfolios for all the firms in the accrual portfolio. From Panel A, the zero-cost low-minus-high ACC portfolio earns an 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. The average abnormal return after adjusting for investment is significant at the 5% level in the first and third years, but is insignificant in the second year.

In the bottom half of Table 7, we value-weight a given accrual portfolio and the corresponding matching portfolios for all the firms in the accrual portfolio. Panel A shows that the average value-weighted size-adjusted abnormal return for the low-minus-high ACC portfolio is 7.30% per annum (t = 4.22) in the first post-formation year, and 5.37% (t = 3.03) in the second 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 reports largely similar results for the $DACC$ portfolios. 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 is more important for 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). 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). 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.

4.2.3 Why Can Investment Help Explain the Accrual Anomaly?

To understand the role of investment in driving the accrual anomaly, we study the investment and earnings behavior for extreme accrual deciles. We find that the investment-to-assets spread between the high and low accrual deciles is much larger than the return-on-assets spread, meaning that the accrual anomaly is mainly driven by investment rather than by earnings.

We use the event study framework à la Fama and French (1995). We examine event-time evolution of median investment-to-assets and 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 and 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. We measure return-on-assets as earnings (income before extraordinary items, item 18) divided by the lagged total assets (item 6). The denominator is the same as in investment-to-assets to facilitate comparison in magnitude.

Panel A of Figure 1 shows that the high-ACC decile has higher investment-to-assets for one year before and one year after the portfolio formation. At year zero (portfolio formation), the high-ACC decile has an investment-to-assets of 0.27 per annum, whereas the low-ACC decile has an investment-to-assets of 0.10. From Panel B, the two extreme $DACC$ deciles 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 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.

An interesting pattern of asymmetry appears in Figure 1: Firms with high accruals all display upward spikes in investment-to-assets at the portfolio formation, but firms with low accruals do not display symmetric downward spikes in investment-to-assets. We interpret this evidence as costly reversibility: It is more costly for firms to downsize than to expand the scale of productive assets.[1]

Figure 1 also examines the return-on-assets of extreme accrual portfolios for seven years around the portfolio formation. This step is important because 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). The investment spread between high and low accrual portfolios goes in the right direction in explaining the accrual anomaly, but the profitability spread goes in the wrong direction.

From Panels D to F of Figure 1, the return-on-assets spread between the two extreme ACC deciles is 0.09 per annum, which is about one half of the corresponding investment-to-assets spread (0.17). The return-on-assets spread between the two extreme $DACC$ deciles is even smaller at 0.05 per annum, which amounts to 36% of the corresponding investment-to-assets spread (0.14). 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). Because the return-on-assets spread is much smaller than their corresponding investment-to-assets spread, the investment spread plays a quantitatively more important role in driving the accrual anomaly.

4.3 Ex-Ante Discount Rates and Accruals

Our tests so far are based on ex-post realized returns. A common critique to this approach is that realized returns are noisy and probably even biased. We now construct the ex-ante discount rate à la Fama and French (2002) and examine its variation across the accrual portfolios. We find that accruals are inversely related to ex-ante discount rates. The expected profitability of various accrual strategies also has been largely stable at around 5% per annum during the 1970–2005 period.

We follow Fama and French (2002) and Chen, Petkova, and Zhang (2008) in constructing ex-ante discount rates. The basic idea is to use dividend growth rates to measure expected rates of

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[1] 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) explore the effect of costly reversibility on asset pricing dynamics.

capital gain. The ex-ante discount rate (expected return) is the expected dividend-to-price ratio plus the expected rate of capital gain. Suppose the dividend-to-price ratio is stationary. Then the compounded rate of dividend growth approaches the compounded rate of capital gain if the sample period is long. Thus, we can measure the ex-ante discount rate as:

$$E[R_{t+1}] = E\left[\frac{D_{t+1}}{P_t}\right] + E[Ag_{t+1}] \tag{5}$$

in which D_{t+1}/P_t is the dividend-to-price ratio and Ag_{t+1} is the long-term dividend growth rate. Appendix B provides estimation details of equation (5) at the portfolio level.

Table 8 reports the discount-rate estimates for quintiles based on one-way sorts on accruals. We use quintiles instead of deciles because some accrual deciles generate excessively volatile dividend growth rates. Using more aggregated quintiles helps alleviate the influence of outliers. Table 8 shows that the low-minus-high accrual quintiles earn significant positive realized returns on average. For example, the low-minus-high ACC quintile earns an average realized return of 6.7% per annum ($t = 5.75$). And the low-minus-high $DACC$ quintile earns an average return of 8.5% per annum ($t = 6.28$). The evidence is in line with the results on deciles (Table 2).

High accrual firms have reliably lower ex-ante discount rates than low accrual firms. For example, the low-ACC quintile has a discount rate of 8% per annum, whereas the high-ACC quintile has a discount rate of 2.3%. The spread of 5.8% per annum is highly significant ($t = 27.75$). (The t-statistics in Table 8 are adjusted for autocorrelations of up to 12 lags.) A reliable discount-rate spread also appears across the $DACC$ and NOA quintiles: 5% and 4.1% per annum, respectively. An important source of the discount-rate spread is the expected long-term dividend growth rate, $E[Ag_{t+1}]$. The difference in $E[Ag_{t+1}]$ between the extreme ACC quintiles is 4.4% per annum, which is about 75% of the discount-rate spread. The difference in $E[Ag_{t+1}]$ constitutes almost all of the discount-rate spread across the $DACC$ and NOA quintiles.

Fama and French (2002) report that the expected market return is lower than the average realized market return and argue that average returns are a lot higher than expected. Chen, Petkova, and Zhang (2008) document a similar pattern for the book-to-market portfolios. Table 8 finds the same pattern across the accrual portfolios: In most cases, expected returns are less than one half of corresponding average returns. However, the expected returns for the various low-minus-high accrual portfolios are closer to their average realized returns. This evidence suggests that the difference between expected and average returns is similar in magnitude across extreme accrual portfolios.

Armed with the time series of the estimated ex-ante discount rates for the low-minus-high accrual strategies, we can study the ex-ante profitability of these strategies. Figure 2 plots the expected returns of the zero-cost $ACC, DACC$, and NOA quintiles. For comparison, we also plot their corresponding five-year moving averages of ex-post returns. The most important finding from the figure is that the expected returns of the three accrual strategies have been largely stable at around 5% per annum during the 1970–2005 period. In contrast, even after averaged over past five years, the realized returns are much more volatile and often deviate a lot from their expected values.

In untabulated results, we also find that the high investment-to-assets quintile has a lower ex-ante discount rate than the low investment-to-assets quintile: 4.0% vs. 7.8% per annum during the 1980–2005 period. The spread of 3.8% is significant ($t = 9.68$). For comparison, the low-minus-high investment-to-assets quintile earns an average realized return of 5.7% per annum ($t = 3.19$).

5 Alternative Explanations and Discussions

This section explores alternative explanations for the accrual anomaly and discusses related issues.

5.1 Accrual Reliability

Extending the earlier work by Sloan (1996), Richardson, Sloan, Soliman, and Tuna (2005) develop a comprehensive balance sheet categorization of accruals and rank each category according to the reliability of the underlying accruals. They show that less reliable accruals lead to lower earnings persistence, and interpret this evidence as suggesting that investors do not fully anticipate the lower earnings persistence, giving rise to significant security mispricing.

We argue that the discount-rate hypothesis can explain why the magnitude of the accrual anomaly is higher for less reliable accruals and lower for more reliable accruals. The crux is that what Richardson, Sloan, Soliman, and Tuna (2005) categorize as less reliable accruals is more correlated with capital investment and what they categorize as more reliable accruals is less correlated with capital investment. As a result, the inverse relation between investment and the discount rate is likely to be underlying the relation between the reliability of accruals and the magnitude of the accrual anomaly. Our tests below confirm this hypothesis.

5.1.1 Categorization of Accruals

We follow Richardson, Sloan, Soliman, and Tuna (2005) in grouping business activities into three broad categories including current operating activities, non-current operating activities, and financing activities. The corresponding accrual categories are referred to as the change in non-cash working capital ($\triangle WC$), the change in net non-current operating assets ($\triangle NCO$), and the change in net financial assets ($\triangle FIN$), respectively:

$$\text{Accruals} = \triangle WC + \triangle NCO + \triangle FIN \tag{6}$$

Specifically, $\triangle WC$ is the change in current operating assets, net of cash and short-term investments, less the change in current operating liabilities, net of short-term debt. $\triangle WC$ is closest to the traditional accrual measure used by Sloan (1996). $\triangle NCO$ is the non-current operating accruals measured as the change in non-current assets, net of long-term non-equity investments and advances, less the change in non-current liabilities, net of long-term debt. Major components of $\triangle NCO$ are intangibles and the change in property, plant, and equipment. Finally, $\triangle FIN$ is the change in net financial assets measured as the change in short-term investments and long-term investments less the change in short-term debt, long-term debt, and preferred stock. Appendix C contains detailed definitions of the three accrual components.

Richardson, Sloan, Soliman, and Tuna (2005) assign a reliability rating of medium to $\triangle WC$, a low-to-medium reliability rating to $\triangle NCO$, and a high reliability rating to $\triangle FIN$.

5.1.2 Empirical Results

From Panel A of Table 9, the reliability rankings of the three accrual components reflect the magnitude of their average cross-sectional correlations with investment-to-assets. $\triangle NCO$ has the highest Pearson correlation of 0.64 with investment-to-assets, followed by $\triangle WC$ with a correlation of 0.24 and then by $\triangle FIN$ with a correlation of -0.19.

Panel B of Table 9 asks whether the magnitude of the accrual anomaly varies in the cross section, depending on the correlations of different accrual components with investment-to-assets. The testing framework is similar to the design in Section 4.1 that explores the effect of the sensitivity of accruals to discount rate changes on the magnitude of the accrual anomaly. The design has two stages. We first estimate the correlations of the accrual components with investment-to-assets for each industry based on the three most recent years of data (years $t-2, t-1$, and t):

$$\triangle WC_{j\tau}[\triangle NCO_{j\tau}, \triangle FIN_{j\tau}] = \alpha_{0t} + \alpha_{1t}\, I/A_{j\tau} + \epsilon_{j\tau} \tag{7}$$

in which $\tau = t-2, t-1$, and t. $\triangle WC_{j\tau}[\triangle NCO_{j\tau}, \triangle FIN_{j\tau}]$ is $\triangle WC, \triangle NCO$, or $\triangle FIN$ and I/A is investment-to-assets at year τ for firm j in a given industry. We use Fama and French's (1997) categorization of 48 industries. α_{1t} measures the conditional correlation between one of the accrual components and investment-to-assets at year t. After we estimate the conditional correlations for all the industries each year, we assign the conditional correlation of a given industry in a given year to all the firms in the industry in that year.

In the second stage, we perform the annual Fama-MacBeth (1973) cross-sectional regressions:

$$\triangle WC_t[\triangle NCO_t, \triangle FIN_t] = \beta_0 + \beta_1 R_{t+1} + \beta_2 \alpha_{1t} + \beta_3 (\alpha_{1t} \times R_{t+1}) + e_t \tag{8}$$

According to the discount-rate hypothesis, the predictive power of the various accrual components for future returns derives from their respective correlations with investment-to-assets (as opposed to their accounting reliability). Because accruals predict returns with a negative sign, the discount-rate hypothesis says that the slope on the interaction term should be negative.

Panel B of Table 9 confirms this prediction. When we use the accrual components with low to median reliability ($\triangle NCO$ and $\triangle WC$), the interaction term has significant negative coefficients of -0.039 and -0.038 ($t = -1.99$ and -4.36), respectively. When we use $\triangle FIN$ with high reliability, the interaction term has an insignificant negative coefficient, -0.019 ($t = -1.03$). The evidence is largely consistent with the discount-rate hypothesis in that the predictive power of accruals for future returns increases with their correlations with investment-to-assets.

Table 10 reports ex-ante discount rate estimates for one-way quintiles formed on $\triangle WC$, $\triangle NCO$, and $\triangle FIN$. The empirical procedure is the same as used in Section 4.3 (see Appendix B). The table shows that the low-minus-high $\triangle WC$ quintile earns a significant positive average realized return of 8.2% per annum ($t = 6.41$), and the low-minus-high $\triangle NCO$ quintile earns an average return of 8.9% per annum ($t = 3.33$). However, the low-minus-high $\triangle FIN$ quintile earns a negative average return of -4.2% ($t = -2.18$).

The ex-post profitability of the $\triangle WC$ and the $\triangle NCO$ strategies is at least in part expected ex-ante. From Panel A of Table 10, the low-$\triangle WC$ quintile has a high discount rate of 6.1% per annum, whereas the high-$\triangle WC$ quintile has a low discount rate of 1.9%. The discount-rate spread of 4.1% per annum ($t = 8.96$) accounts for 50% of the average-return spread. Panel B reports that the low-$\triangle NCO$ quintile has a high discount rate of 7.0% per annum, whereas the high-$\triangle NCO$ quintile has a low discount rate of 2.0%. The discount-rate spread of 5.0% ($t = 6.22$) accounts for about 55% of the average-return spread. From Panel C, the low-$\triangle FIN$ quintile has a higher discount rate than the high-$\triangle FIN$ quintile, 4.5% vs. 3.4% per annum. Interestingly, the discount-rate spread has a different sign from the average-return spread. We also note that the relative ordering of the ex-ante profitability of the zero-cost $\triangle WC$, $\triangle NCO$, and $\triangle FIN$ strategies follows the same ordering as the cross-correlations of these variables with investment-to-assets. This evidence is again consistent with the discount-rate hypothesis.

5.2 The Over-Investment Hypothesis

Although our results so far support the discount-rate hypothesis, they also can be consistent with the over-investment hypothesis (e.g., Titman, Wei, and Xie 2004 and Cooper, Gulen, and Schill 2007). The difference is that while we argue that optimal investment drives the negative relation between investment and the discount rate, Titman et al. and Cooper et al. argue that investor underreaction to over-investment of 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) explanation for the accrual anomaly 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. We present tests to distinguish our discount-rate hypothesis from the over-investment hypothesis.

5.2.1 Empirical Design

Our idea is simple. Under the over-investment hypothesis, the negative investment-return relation should be stronger among firms that are more vulnerable to over-investment of empire-building managers. We split the sample into two based on ex-ante measures of vulnerability to empire-building. On each subsample, we perform Fama-MacBeth (1973) cross-sectional regressions of future stock returns on accrual measures and compare the magnitudes of the slopes across the two subsamples. We also directly compare measures of vulnerability to empire-building across extreme accrual portfolios.

Motivated by recent corporate governance literature, we measure a firm's vulnerability to 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 investment 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. But Core, Guay, and Rusticus (2005) show that the correlation between the governance index and future returns exhibit a reversal from 2000 to 2003 following Gompers et al.'s sample period from 1990 to 1999.

The entrenchment index also 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. This intersection has between 748 and 1,523 firms each year with an average of 1,071 firms. We define the democratic sample with the governance index less than 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.

5.2.2 Empirical Results

Table 11 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 does not support this hypothesis. We do observe a negative slope for ACC with a higher magnitude in the weak-governance sample than that in the strong-governance sample, -0.49 versus -0.30 in univariate regressions. But when we use the

E-index to split the sample, the result is reversed, -0.26 versus -0.44 (Panel A). Using *DACC* and *NOA* generates negative slopes for accruals with largely similar magnitudes across the subsamples. From Panel B, the magnitude of the slope for *DACC* in the high-entrenchment sample is even smaller than that in the low-entrenchment sample, -0.10 ($t = -1.28$) versus -0.34 ($t = -4.81$). Controlling for size and book-to-market in the regressions does not materially affect the results.

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 have weaker shareholder rights (higher *G*-index) and more entrenchment (higher *E*-index) than low accrual firms. The evidence again fails to support the over-investment hypothesis. If anything, high accrual firms have similar governance as or even more democratic governance than low accrual firms.

From Panel A of Table 12, 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 the *DACC* portfolios. From Panel C, high-*NOA* firms indeed have higher *G*- and *E*-index than low-*NOA* 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 variation in governance index across extreme accrual portfolios fails to support the over-investment hypothesis.

5.3 Earnings Announcement Returns

The prior literature (e.g. Sloan 1996) shows that the predictable stock returns are concentrated around subsequent earnings announcements, a fact widely cited to support the investor mispricing argument. We acknowledge that the concentration of predictable stock returns is a hurdle for any risk-based story, but also caution against overstating the importance of this evidence. The concentration of future returns is not entirely inconsistent with the discount-rate hypothesis. This hypothesis predicts the ex-ante profitability of the accrual strategies, but it does not rule out the concentration of its ex-post realization around subsequent earnings announcements.

From the information perspective, earnings announcements are likely to convey more new information to the market than other periods. Ball and Kothari (1991) and Shin (2003, 2006) argue that disclosures resolve uncertainty, but the increased information flow also raises the risk during the disclosure period. If earnings information is correlated across firms, the covariance with the market portfolio would increase around earnings announcements. Thus, investors should expect higher incidence of positive returns to compensate for the possibility of loss during earnings announcements. Alternatively, if returns are related to fundamental volatility, such as the volatility of earnings or cash flows, and information about fundamental volatility is more likely to be revealed via earnings announcements. Thus, it is perhaps not surprising for predictable stock returns to concentrate around earnings announcements.

6 Conclusion

Capital investment is an important driver of the accrual anomaly. Treating accruals as working capital investment, we hypothesize that firms optimally adjust their investment in response to discount rate changes. We motivate this hypothesis from the neoclassical q-theory of investment.

Consistent with the discount-rate hypothesis, we report five main results. First, the predictive power of accruals for future stock returns increases with the correlations of accruals (and investment) with current and past stock returns. Second, adding investment-based return factors into standard factor regressions and using investment-to-assets as an extra matching characteristic in calculating abnormal returns substantially reduce the magnitude of the accrual anomaly. Third, the ex-ante expected returns of various accrual strategies have been stable at around 5% per annum over the past 35 years. Fourth, less reliable accruals are more correlated, and more reliable accruals are less correlated, with investment-to-assets. Thus, the evidence that has been interpreted as supporting the accounting reliability argument by Richardson, Sloan, Soliman, and Tuna (2005) can be accounted for by the discount-rate hypothesis. Finally, 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 two behavioral hypotheses are informative, we recognize that distinguishing rational from behavioral explanations of the accrual anomaly is virtually impossible. As such, our goal is not to refute the mispricing hypothesis advocated by Sloan (1996). Rather, we interpret our evidence as saying that there exists at least some room for rational, fundamental forces in helping us understand the accrual anomaly.

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A A q-Theory Model with Inventories

We incorporate inventory investment into Cochrane's (1991) investment-based asset pricing framework. Let K_t denote fixed-capital (long-term capital) and Y_t denote inventory stock (short-term capital) at the beginning of time t. Fixed-capital and inventory evolve according to, respectively,

$$\begin{aligned} K_{t+1} &= I_t^K + (1-\delta_K)K_t && \text{(A1)} \\ Y_{t+1} &= I_t^Y + (1-\delta_Y)Y_t && \text{(A2)} \end{aligned}$$

where δ_K and δ_Y are the depreciation rates for fixed-capital and inventory, respectively.

Following Kydland and Prescott (1982) and Ramey (1989), we model inventories as an input in the production function. Assume the operating-profits function is given by $\Pi(K_t, Y_t, X_t)$, in which X_t is a vector of shocks and the production function is linear homogeneous in K_t and Y_t:

$$\Pi(K_t, Y_t, X_t) = \Pi_1(K_t, Y_t, X_t)K_t + \Pi_2(K_t, Y_t, X_t)Y_t \tag{A3}$$

in which we use the numerical subscript i to denote the first-order partial derivative with respect to the i^{th} argument. The joint capital-inventory adjustment-cost function also is linear homogenous:

$$\Phi(I_t^K, K_t, I_t^Y, Y_t) = \Phi_{1t}I_t^K + \Phi_{2t}K_t + \Phi_{3t}I_t^Y + \Phi_{4t}Y_t \tag{A4}$$

in which I_t^K and I_t^Y denote fixed-capital investment and inventory investment, respectively.

Let q_t^K and q_t^Y be the present-value multipliers associated with fixed-capital and inventory accumulation equations (A1) and (A2), respectively. The value-maximization problem of the firm can be formulated as:

$$\begin{aligned} V(K_t, Y_t, X_t) = & \max_{\{I_{t+j}^K, K_{t+1+j}, I_{t+j}^Y, Y_{t+1+j}\}_{j=0}^{\infty}} \mathrm{E}_t \sum_{j=0}^{\infty} M_{t+j}(\Pi(K_{t+j}, Y_{t+j}, X_{t+j}) - \Phi(I_{t+j}^K, K_{t+j}, I_{t+j}^Y, Y_{t+j}) \\ & - q_{t+j}^K[K_{t+j+1} - (1-\delta_K)K_{t+j} - I_{t+j}^K] - q_{t+j}^Y[Y_{t+j+1} - (1-\delta_Y)Y_{t+j} - I_{t+j}^Y]) \end{aligned} \tag{A5}$$

in which M_{t+j} is the stochastic discount factor from time 0 to j. The first-order conditions with respect to I_t^K, K_{t+1}, I_t^Y, and Y_{t+1} are, respectively,

$$q_t^K = \Phi_1(I_t^K, K_t, I_t^Y, Y_t) \tag{A6}$$

$$q_t^K = \mathrm{E}_t[M_{t+1}(\Pi_1(K_{t+1}, Y_{t+1}, X_{t+1}) - \Phi_2(I_{t+1}^K, K_{t+1}, I_{t+1}^Y, Y_{t+1}) + (1-\delta_K)q_{t+1}^K)] \tag{A7}$$

$$q_t^Y = \Phi_3(I_t^K, K_t, I_t^Y, Y_t) \tag{A8}$$

$$q_t^Y = \mathrm{E}_t[M_{t+1}(\Pi_2(K_{t+1}, Y_{t+1}, X_{t+1}) - \Phi_4(I_{t+1}^K, K_{t+1}, I_{t+1}^Y, Y_{t+1}) + (1-\delta_Y)q_{t+1}^Y)] \tag{A9}$$

The interpretation of the optimality conditions (A6) and (A8) is exactly the same as that in the baseline model. Intuitively, firms will adjust fixed-capital and inventories until the marginal costs of their respective investments equal their respective marginal q.

Combining equations (A6)–(A9) yields:

$$\begin{aligned} \mathrm{E}_t[M_{t+1}r_{Kt+1}^I] &= 1 \\ \mathrm{E}_t[M_{t+1}r_{Yt+1}^I] &= 1 \end{aligned}$$

with the capital-investment return and the inventory-investment return given by, respectively,

$$r_{Kt+1}^I \equiv \frac{\Pi_1(K_{t+1}, Y_{t+1}, X_{t+1}) - \Phi_2(I_{t+1}^K, K_{t+1}, I_{t+1}^Y, Y_{t+1}) + (1-\delta_K)\Phi_1(I_{t+1}^K, K_{t+1}, I_{t+1}^Y, Y_{t+1})}{\Phi_1(I_t^K, K_t, I_t^Y, Y_t)} \tag{A10}$$

$$r_{Yt+1}^I \equiv \frac{\Pi_2(K_{t+1}, Y_{t+1}, X_{t+1}) - \Phi_4(I_{t+1}^K, K_{t+1}, I_{t+1}^Y, Y_{t+1}) + (1-\delta_Y)\Phi_3(I_{t+1}^K, K_{t+1}, I_{t+1}^Y, Y_{t+1})}{\Phi_3(I_t^K, K_t, I_t^Y, Y_t)} \tag{A11}$$

The following proposition says that the stock return equals the value-weighted average of the capital-investment and inventory-investment returns.

Proposition 1 *Define the ex-dividend firm value as:*

$$P_t = V(K_t, Y_t, X_t) - \Pi(K_t, Y_t, X_t) + \Phi(I_t^K, K_t, I_t^Y, Y_t) \tag{A12}$$

Then with linear homogeneity of Π *and* Φ*,* $P_t = q_t^K K_{t+1} + q_t^Y Y_{t+1}$ *and*

$$r_{t+1}^S = \frac{q_t^K K_{t+1}}{P_t} r_{Kt+1}^I + \frac{q_t^Y Y_{t+1}}{P_t} r_{Yt+1}^I \tag{A13}$$

Proof. We first expand the value function (A5):

$$\begin{aligned} P_t + \Pi(K_t, Y_t, X_t) - \Phi(I_t^K, K_t, I_t^Y, Y_t) &= \Pi(K_t, Y_t, X_t) - \Phi(I_t^K, K_t, I_t^Y, Y_t) - q_t^K(K_{t+1} - (1-\delta_K)K_t - I_t^K) \\ &- q_t^Y(Y_{t+1} - (1-\delta_Y)Y_t - I_t^Y) + \mathrm{E}_t[M_{t+1}(\Pi(K_{t+1}, Y_{t+1}, X_{t+1}) - \Phi(I_{t+1}^K, K_{t+1}, I_{t+1}^Y, Y_{t+1}) \\ &- q_{t+1}^K(K_{t+2} - (1-\delta_K)K_{t+1} - I_{t+1}^K) - q_{t+1}^Y(Y_{t+2} - (1-\delta_Y)Y_{t+1} - I_{t+1}^Y)) + \ldots] \end{aligned}$$

Recursive substitution using equations (A4), (A6), (A7), (A8), and (A9) implies that:

$$P_t + \Pi_t - \Phi_t = \Pi_t + q_t^K(1-\delta_K)K_t - \Phi_{2t}K_t + q_t^Y(1-\delta_Y)Y_t - \Phi_{4t}Y_t$$

Therefore, $P_t = q_t^K(1-\delta_K)K_t + \Phi_{1t}I_t^K + q_t^Y(1-\delta_Y)Y_t + \Phi_{1t}I_t^Y = q_t^K K_{t+1} + q_t^Y Y_{t+1}$. Next, using equations (A3)–(A2), (A10), and (A11) to rewrite the right-hand side of equation (A13) as

$$\begin{aligned} &\frac{\Phi_{1t}K_{t+1}}{P_t} \frac{\Pi_{1t+1} - \Phi_{2t+1} + (1-\delta_K)\Phi_{1t+1}}{\Phi_{1t}} + \frac{\Phi_{3t}Y_{t+1}}{P_t} \frac{\Pi_{2t+1} - \Phi_{4t+1} + (1-\delta_Y)\Phi_{3t+1}}{\Phi_{3t}} \\ &= \frac{\Pi_{t+1} - \Phi_{t+1} + \Phi_{1t+1}I_{t+1}^K + \Phi_{3t+1}I_{t+1}^Y + (1-\delta_K)\Phi_{1t+1} + (1-\delta_Y)\Phi_{3t+1}}{P_t} \\ &= \frac{\Pi_{t+1} - \Phi_{t+1} + q_{t+1}^K K_{t+2} + q_{t+1}^Y Y_{t+2}}{P_t} = \frac{P_{t+1} + \Pi_{t+1} - \Phi_{t+1}}{P_t} = r_{t+1}^S \end{aligned}$$

where the third equality follows from $P_t = q_t^K K_{t+1} + q_t^Y Y_{t+1}$. ■

Equations (A10), (A11), and (A13) are useful to glean some intuition on the relation between inventory investment and future stock returns. In a two-period world, equations (A10) and (A11) imply, respectively,

$$E_t[r_{Kt+1}^I] = \frac{E_t[\Pi_1(K_{t+1}, Y_{t+1}, X_{t+1})] + 1 - \delta_K}{\Phi_1(I_t^K, K_t, I_t^Y, Y_t)} \tag{A14}$$

$$E_t[r_{Yt+1}^I] = \frac{E_t[\Pi_2(K_{t+1}, Y_{t+1}, X_{t+1})] + 1 - \delta_Y}{\Phi_3(I_t^K, K_t, I_t^Y, Y_t)} \tag{A15}$$

Equation (A14) shows that, consistent with Cochrane (1991), fixed-capital investment (I_t^K) increases with marginal cost of capital investment (Φ_1), which decreases with the expected capital-investment return, $E_t[r_{Kt+1}^I]$, which in turn increases with the ex-ante discount rate, $E_t[r_{Kt+1}^S]$, from equation (A13). Similarly, inventory investment and the discount rate are inversely related. High I_t^Y means high marginal cost of inventory investment (Φ_3), which means low expected inventory-investment return, which means low ex-ante discount rate.

B Estimating Ex-Ante Discount Rates

We follow Fama and French (2002) and Chen, Petkova, and Zhang (2008) in estimating portfolio-level expected returns. These estimates provide an ex-ante measure of discount rates, as opposed to average realized returns. Start with the conditional version of equation (5) in the main text, $E_t[R_{t+1}] = E_t[D_{t+1}/P_t] + E_t[Ag_{t+1}]$, in which the long-term dividend growth rate, Ag_{t+1}, is defined as the annuity of future dividend growth:

$$Ag_{t+1} = \left[\frac{\overline{r} - \overline{g}}{1 + \overline{r}}\right] \sum_{i=0}^{\infty} \left[\frac{1 + \overline{g}}{1 + \overline{r}}\right]^{i} g_{t+i+1} \tag{B1}$$

In equation (B1), $\overline{g}$ and $\overline{r}$ are the average real growth rate of dividends and the average real stock return, respectively, and g_{t+i+1} denotes the realized real growth rate of dividends from $t+i$ to $t+i+1$.

Let P_t = market value at time t of the securities allocated to the portfolio when it is formed at time t, $P_{t,t+1}$ = market value at time $t+1$ of the securities allocated to the portfolio at time t, $D_{t,t+1}$ = dividends paid between t and $t+1$ on the securities allocated to the portfolio at time t, $R_{t,t+1}$ = return (with dividends) observed at time $t+1$ on a portfolio formed at time t, and $R^X_{t,t+1}$ = return (without dividends) observed at time $t+1$ on a portfolio formed at time t.

For each portfolio, we construct the real dividend-to-price ratio from the value-weighted realized stock returns with and without dividends and the Consumer Price Index (CPI) from the U.S. Bureau of Labor Statistics:

$$\frac{D_{t,t+1}}{P_t} = (R_{t,t+1} - R^X_{t,t+1}) \left(\frac{CPI_t}{CPI_{t+1}}\right) \tag{B2}$$

We measure portfolio real dividend growth rates as:

$$g_{t+1} = \left(\frac{D_{t,t+1}/P_t}{D_{t-1,t}/P_{t-1}}\right) (R^X_{t-1,t} + 1) \left(\frac{CPI_{t-1}}{CPI_t}\right) - 1 = \left(\frac{D_{t,t+1}/P_t}{D_{t-1,t}/P_{t-1}}\right) \left(\frac{P_{t-1,t}}{P_{t-1}}\right) - 1 \tag{B3}$$

We construct Ag_{t+1} based on equation (B1). Following Blanchard (1993), we estimate $\overline{r}$ as the sample average of the realized real equity returns and $\overline{g}$ as the sample average of the real dividend growth rates. Ag_{t+1} is an infinite sum of future real dividend growth rates. In practice, we use a finite sum of 100 years of future growth, and assume that future real dividend growth rates beyond 2005 equal the average dividend growth rate in the 1970–2005 period.

Following Blanchard (1993), we perform annual predictive regressions of Ag_{t+1} and D_{t+1}/P_t on a set of conditioning variables. The fitted values from these regressions provide the time series of Ag_{t+1} and D_{t+1}/P_t. The sum of these two components provides the time series of the ex-ante discount rate. Our choice of the set of conditioning variables is standard from the time-series literature. These variables include: (i) the aggregate dividend yield, computed as the sum of dividend payments accruing to the CRSP value-weighted market portfolio over the previous 12 months divided by the contemporaneous level of the index; (ii) the default premium, defined as the yield spread between Moody's Baa and Aaa corporate bonds from the monthly database of the Federal Reserve Bank of St. Louis; (iii) the term premium, defined as the yield spread between long-term and one-year Treasury bonds from Ibbotson Associates; and (iv) the one-month Treasury bill rate from CRSP.

C Measurement of Accrual Categories

Following Richardson, Sloan, Soliman, and Tuna (2005), we decompose accruals as follows and deflate each of these components of earnings by average total assets:

$$\text{Accruals} = \triangle WC + \triangle NCO + \triangle FIN \tag{C1}$$

in which $\triangle WC$ is the change in net working capital defined as $WC_t - WC_{t-1}$. WC is calculated as Current Operating Asset (COA) − Current Operating Liabilities (COL), in which COA = Current Assets (Compustat annual item 4) − Cash and Short Term Investments (STI) (item 1), and COL = Current Liabilities (item 5) − Debt in Current Liabilities (item 34).

$\triangle NCO$ is the change in net non-current operating assets defined as $NCO_t - NCO_{t-1}$. NCO = Non-Current Operating Assets ($NCOA$) − Non-Current Operating Liabilities ($NCOL$), where $NCOA$ = Total Assets (Compustat annual item 6) − Current Assets (item 4) − Investments and Advances (item 32), and $NCOL$ = Total Liabilities (item 181) − Current Liabilities (item 5) − Long-term debt (item 9).

$\triangle FIN$ is the change in net financial assets defined as $FIN_t - FIN_{t-1}$. FIN = Financial Assets ($FINA$) − Financial Liabilities ($FINL$), where $FINA$ = Short Term Investments (STI) (Compustat annual item 193) + Long Term Investments (LTI) (item 32), and $FINL$ = Long term debt (item 9) + Debt in Current Liabilities (item 34) + Preferred Stock (item 130).

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 $t+1$ (R_{t+1}), the annual returns for fiscal year t (R_t), and the annual returns for fiscal year $t-1$ (R_{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	R_{t-1}	R_t	R_{t+1}	$DACC_t$	R_{t-1}	R_t	R_{t+1}	NOA_t	R_{t-1}	R_t	R_{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 (R_{t+1}), and their interaction with S_t ($S_t \times R_{t+1}$). Panel B reports the results using the sensitivity of investment-to-assets to the discount rate changes. The annual returns R_{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: $ACC_t[DACC_t, NOA_t] = \alpha_0 + \alpha_1 \times R_t + \alpha_2 \times R_{t-1} + \epsilon_t$, in which $ACC_t[DACC_t, NOA_t]$ is total accruals, discretionary accruals, or net operating assets at year t. R_t and R_{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 $I/A_t = \alpha_0 + \alpha_1 \times R_t + \alpha_2 \times R_{t-1} + \epsilon_t$, 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 $ACC_t[DACC_t, NOA_t] = \beta_0 + \beta_1 R_{t+1} + \beta_2 S_t + \beta_3 (S_t \times R_{t+1}) + \epsilon_t$

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 ($ACC_t[DACC_t, NOA_t] = \alpha_0 + \alpha_1 \times R_t + \alpha_2 \times R_{t-1} + \epsilon_t$)											
−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 ($I/A_t = \alpha_0 + \alpha_1 \times R_t + \alpha_2 \times R_{t-1} + \epsilon_t$)											
−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}
Mean	0.603	0.768
(t)	(5.89)	(8.04)
α_{CAPM}	0.714	0.872
(t)	(7.69)	(10.07)
$\{R^2\}$	{0.19}	{0.19}
α_{FF}	0.659	0.808
(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}

Cross correlations (Pearson/Spearman above/below the diagonal)						
	INV_{vw}	INV_{ew}	MKT	SMB	HML	WML
INV_{vw}	1	0.85	−0.44	−0.24	0.33	0.32
INV_{ew}	0.83	1	−0.44	−0.20	0.34	0.35
MKT	−0.39	−0.42	1	0.27	−0.44	−0.09
SMB	−0.27	−0.24	0.25	1	−0.29	−0.02
HML	0.36	0.37	−0.43	−0.20	1	−0.10
WML	0.25	0.25	−0.09	−0.06	−0.10	1

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. $\alpha^{L-H}_{S,ew}$ ($\alpha^{L-H}_{S,vw}$) is the equal-weighted (value-weighted) alpha for the low-minus-high accrual quintile in the small market-cap quintile, and $\alpha^{L-H}_{B,ew}$ ($\alpha^{L-H}_{B,vw}$) 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					
$\alpha^{L-H}_{S,ew}$	INV_{ew}	$\lvert\triangle\alpha\rvert/\alpha$	$\alpha^{L-H}_{B,ew}$	INV_{ew}	$\lvert\triangle\alpha\rvert/\alpha$	$\alpha^{L-H}_{S,ew}$	INV_{ew}	$\lvert\triangle\alpha\rvert/\alpha$	$\alpha^{L-H}_{B,ew}$	INV_{ew}	$\lvert\triangle\alpha\rvert/\alpha$	$\alpha^{L-H}_{S,ew}$	INV_{ew}	$\lvert\triangle\alpha\rvert/\alpha$	$\alpha^{L-H}_{B,ew}$	INV_{ew}	$\lvert\triangle\alpha\rvert/\alpha$
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)	
$\alpha^{L-H}_{S,vw}$	INV_{vw}	$\lvert\triangle\alpha\rvert/\alpha$	$\alpha^{L-H}_{B,vw}$	INV_{vw}	$\lvert\triangle\alpha\rvert/\alpha$	$\alpha^{L-H}_{S,vw}$	INV_{vw}	$\lvert\triangle\alpha\rvert/\alpha$	$\alpha^{L-H}_{B,vw}$	INV_{vw}	$\lvert\triangle\alpha\rvert/\alpha$	$\alpha^{L-H}_{S,vw}$	INV_{vw}	$\lvert\triangle\alpha\rvert/\alpha$	$\alpha^{L-H}_{B,vw}$	INV_{vw}	$\lvert\triangle\alpha\rvert/\alpha$
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 : Descriptive Statistics for Realized Returns, Expected Dividend-to-Price Ratio, Expected Long-Run Dividend Growth, and Ex-Ante Discount Rates for Total Accrual, Discretionary Accrual, and Net Operating Assets Quintiles, All in Real Terms (1970–2005)

This table reports the annualized sample averages of the realized future stock return, $\overline{R_{t+1}}$, the expected dividend-to-price ratio, $\overline{E_t[D_{t+1}/P_t]}$, the expected long-run dividend growth, $\overline{E_t[Ag_{t+1}]}$, and the ex-ante discount rate, $\overline{E_t[R_{t+1}]}$ for the one-way sorted total accruals, discretionary accruals, net operating assets quintiles. (Appendix B provides estimation details for $E_t[D_{t+1}/P_t]$, $E_t[Ag_{t+1}]$, and $E_t[R_{t+1}]$.) All the series are adjusted for inflation. The t-statistics adjusted for heteroscedasticity and autocorrelations are reported in parentheses.

	Panel A: Total accruals				Panel B: Discretionary accruals				Panel C: Net operating assets			
	$\overline{R_{t+1}}$	$\overline{E_t[D_{t+1}/P_t]}$	$\overline{E_t[Ag_{t+1}]}$	$\overline{E_t[R_{t+1}]}$	$\overline{R_{t+1}}$	$\overline{E_t[D_{t+1}/P_t]}$	$\overline{E_t[Ag_{t+1}]}$	$\overline{E_t[R_{t+1}]}$	$\overline{R_{t+1}}$	$\overline{E_t[D_{t+1}/P_t]}$	$\overline{E_t[Ag_{t+1}]}$	$\overline{E_t[R_{t+1}]}$
Low	0.139	0.027	0.053	0.080	0.130	0.021	0.049	0.070	0.148	0.027	0.042	0.069
2	0.133	0.033	0.014	0.047	0.147	0.027	0.037	0.064	0.131	0.031	0.028	0.059
3	0.131	0.028	0.038	0.066	0.139	0.033	0.045	0.078	0.130	0.029	0.029	0.058
4	0.107	0.023	0.018	0.041	0.108	0.029	0.017	0.046	0.108	0.027	0.019	0.046
High	0.073	0.014	0.008	0.023	0.045	0.020	0.000	0.020	0.085	0.020	0.008	0.028
$L-H$	0.066	0.013	0.044	0.058	0.085	0.001	0.049	0.050	0.063	0.007	0.034	0.041
	(5.75)	(8.40)	(72.37)	(27.75)	(6.28)	(0.77)	(22.00)	(47.89)	(2.96)	(3.55)	(14.96)	(30.27)

Table 9 : Average Cross-Sectional Correlations of the Change in Non-Cash Working Capital ($\triangle WC$), the Change in Net Non-Current Operating Assets ($\triangle NCO$), and the Change in Net Financial Assets ($\triangle FIN$) with Investment-to-Assets (I/A) As Well as Cross-Sectional Variations in the Accrual Anomaly Conditional on the Cross-Correlations (1970–2005)

Panel A of this table reports the average cross-sectional correlations of the three components of accruals ($\triangle WC, \triangle NCO$, and $\triangle FIN$) with I/A. Each year we take the cross-correlations of these variables in the sample and Panel A reports the time series averages of these correlations. Panel B asks whether there exists cross-sectional variations in the magnitude of the accrual anomaly, depending on the correlations of different accrual components with I/A. We first estimate the correlations of the accrual components with I/A for each industry based on the three most recent years of data (years $t-2, t-1$, and t): $\triangle WC_{j\tau}[\triangle NCO_{j\tau}, \triangle FIN_{j\tau}] = \alpha_{0t} + \alpha_{1t}\, I/A_{j\tau} + \epsilon_{j\tau}$, in which $\tau = t-2, t-1$, and t. $\triangle WC_{j\tau}[\triangle NCO_{j\tau}, \triangle FIN_{j\tau}]$ is $\triangle WC, \triangle NCO$, or $\triangle FIN$ and $I/A_{j\tau}$ is investment-to-assets at year τ for firm j in a given industry. α_{1t} measures the conditional correlation between one of the accrual components and investment-to-assets at year t. After we estimate the conditional correlations for all the industries each year, we assign the conditional correlation of a given industry in a given year to all the firms in the industry in that year. Panel B reports the results from the annual Fama-MacBeth (1973) cross-sectional regressions: $\triangle WC_t[\triangle NCO_t, \triangle FIN_t] = \beta_0 + \beta_1\, R_{t+1} + \beta_2 \alpha_{1t} + \beta_3\, (\alpha_{1t} \times R_{t+1}) + e_t$. We report the point estimates and their Fama-MacBeth t-statistics (in parentheses).

Panel A: Average cross-correlations

	I/A	$\triangle WC$	$\triangle NCO$	$\triangle FIN$
I/A	1	0.24	0.64	−0.19
$\triangle WC$	0.31	1	0.02	−0.16
$\triangle NCO$	0.63	0.05	1	−0.32
$\triangle FIN$	−0.30	−0.25	−0.37	1

Panel B: Regression results for $\triangle WC_t[\triangle NCO_t, \triangle FIN_t] = \beta_0 + \beta_1\, R_{t+1} + \beta_2 \alpha_{1t} + \beta_3\, (\alpha_{1t} \times R_{t+1}) + e_t$

$\triangle WC$				$\triangle NCO$				$\triangle FIN$			
β_0	β_1	β_2	β_3	β_0	β_1	β_2	β_3	β_0	β_1	β_2	β_3
0.016	0.156	−0.038	−0.001	0.034	0.115	−0.039	−0.006	−0.023	0.055	−0.019	0.011
(7.05)	(10.64)	(−4.36)	(−1.20)	(3.85)	(4.90)	(−1.99)	(−0.93)	(−1.78)	(1.54)	(−1.03)	1.36

Table 10 : Descriptive Statistics for Realized Returns, Expected Dividend-to-Price Ratio, Expected Long-Run Dividend Growth, and Ex-Ante Discount Rates for Quintiles Based on One-Way Sorts on the Change in Non-Cash Working Capital ($\triangle WC$), the Change in Net Non-Current Operating Assets ($\triangle NCO$), and the Change in Net Financial Assets ($\triangle FIN$), All in Real Terms (1970–2005)

This table reports the annualized sample averages of the realized future stock return, $\overline{R_{t+1}}$, the expected dividend-to-price ratio, $\overline{E_t[D_{t+1}/P_t]}$, the expected long-run dividend growth, $\overline{E_t[Ag_{t+1}]}$, and the ex-ante discount rate, $\overline{E_t[R_{t+1}]}$ for quintiles formed on $\triangle WC$, $\triangle NCO$, and $\triangle FIN$ quintiles. Appendix C contains detailed definitions of these variables. Appendix B provides estimation details for $E_t[D_{t+1}/P_t]$, $E_t[Ag_{t+1}]$, and $E_t[R_{t+1}]$. All the series are adjusted for inflation. The t-statistics adjusted for heteroscedasticity and autocorrelations are reported in parentheses.

	Panel A: $\triangle WC$				Panel B: $\triangle NCO$				Panel C: $\triangle FIN$			
	$\overline{R_{t+1}}$	$\overline{E_t[D_{t+1}/P_t]}$	$\overline{E_t[Ag_{t+1}]}$	$\overline{E_t[R_{t+1}]}$	$\overline{R_{t+1}}$	$\overline{E_t[D_{t+1}/P_t]}$	$\overline{E_t[Ag_{t+1}]}$	$\overline{E_t[R_{t+1}]}$	$\overline{R_{t+1}}$	$\overline{E_t[D_{t+1}/P_t]}$	$\overline{E_t[Ag_{t+1}]}$	$\overline{E_t[R_{t+1}]}$
Low	0.158	0.027	0.034	0.061	0.166	0.029	0.041	0.070	0.099	0.019	0.026	0.045
2	0.145	0.031	0.031	0.062	0.142	0.033	0.049	0.083	0.148	0.027	0.041	0.067
3	0.119	0.028	0.016	0.044	0.149	0.029	0.012	0.041	0.139	0.030	0.024	0.055
4	0.141	0.022	0.007	0.029	0.123	0.022	0.027	0.049	0.143	0.029	0.046	0.075
High	0.076	0.012	0.008	0.019	0.077	0.018	0.002	0.020	0.141	0.020	0.014	0.034
$L-H$	0.082	0.015	0.026	0.041	0.089	0.010	0.040	0.050	−0.042	−0.000	0.012	0.012
	(6.41)	(5.94)	(10.21)	(8.96)	(3.33)	(9.44)	(5.47)	(6.22)	(−2.18)	(−0.29)	(4.00)	(5.56)

Table 11 : The Effect of Corporate Governance on the Accrual Anomaly (January 1990–December 2005)

This table reports annual Fama-MacBeth (1973) cross-sectional regression results using samples partitioned by Gompers, Ishii, and Metrick's (2003) corporate governance index and Bebchuk, Cohen, and Ferrell's (2005) management entrenchment 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 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 each firm has 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 R_{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 reported 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)

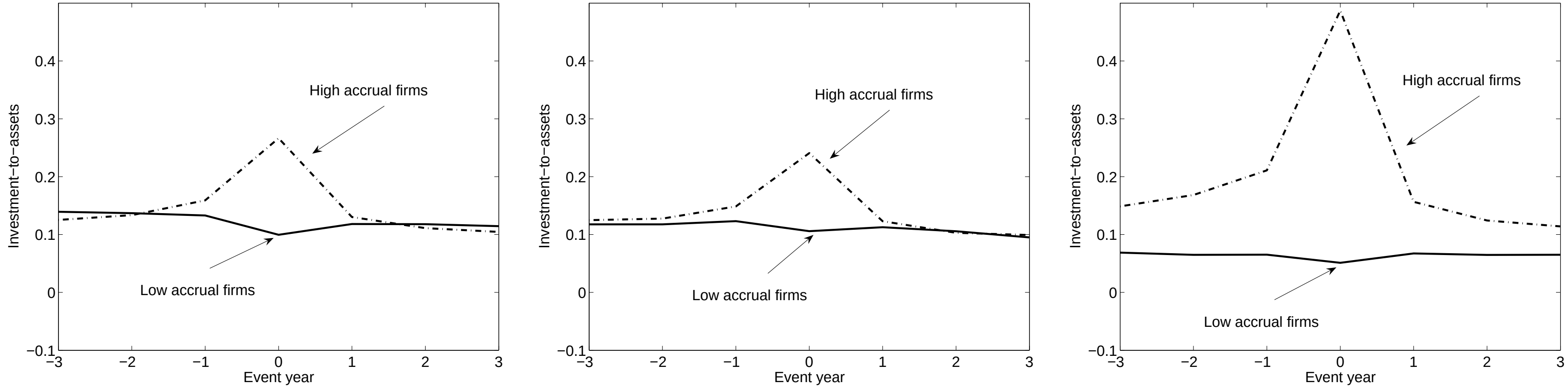
Table 12 : Median Corporate Governance Index (G-Index) and Median Entrenchment Index (E-Index) for Extreme Accrual Portfolios (1990–2004)

For extreme total accrual 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 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 each firm has 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 high accrual decile, whereas the broken line represents the median investment-to-assets or return-on-assets ratio for the low accrual 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).



Panel A: *ACC* (investment-to-assets)

Panel B: *DACC* (investment-to-assets)

Panel C: *NOA* (investment-to-assets)

Panel D: *ACC* (return-on-assets)

Panel E: *DACC* (return-to-assets)

Panel F: *NOA* (return-to-assets)

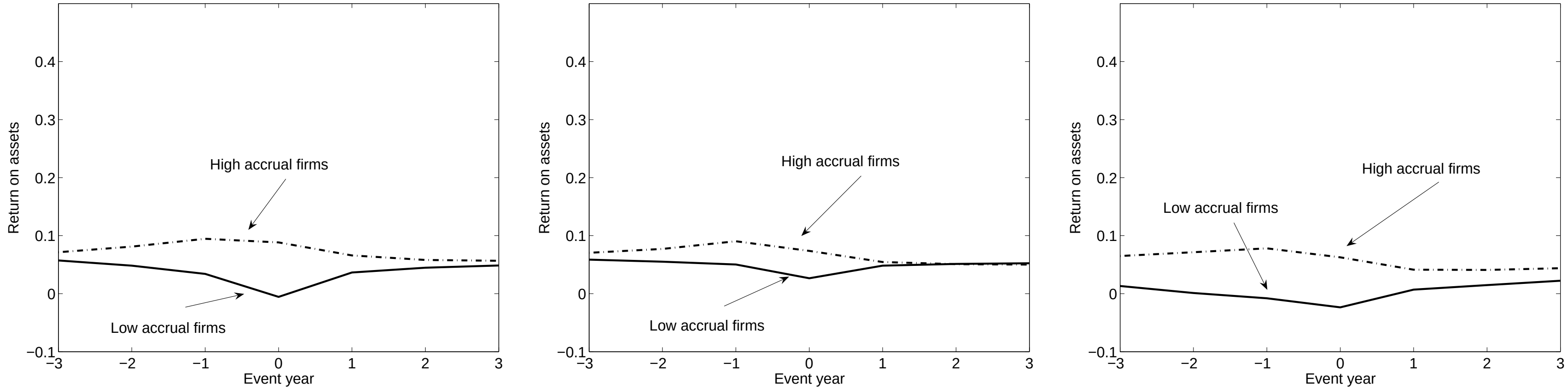
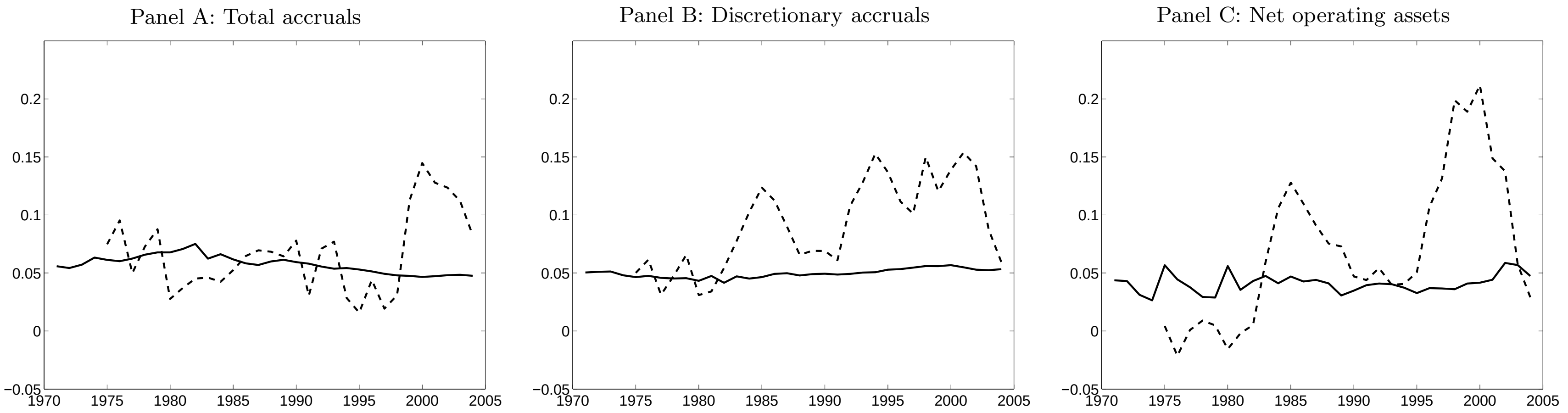


Figure 2 : Time Series Plots of the Ex-Ante Discount Rates and Five-Year Moving Averages of Realized Returns for the Low-Minus-High Total Accrual, Discretionary Accrual, and Net Operating Assets Quintiles (1970–2005)

We plot the time series of the ex-ante discount rate (the solid line) and its corresponding five-year moving average of realized returns (the broken line) for the low-minus-high *ACC* quintile (Panel A), the low-minus-high *DACC* quintile (Panel B), and the low-minus-high *NOA* quintile (Panel C).



Panel A: Total accruals

Panel B: Discretionary accruals

Panel C: Net operating assets