ACCRUAL PERSISTENCE AND ACCRUAL ANOMALY

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by
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The undersigned, appointed by the dean of the Graduate School, have examined the dissertation entitled

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and hereby certify that, in their opinion, it is worthy of acceptance.

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To my parents

Tongshun Xu and Cuilan Jia

Because I never tell them

How much I love them

To my husband

Sam Martin

Because he is always behind me providing strong support

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ABSTRACT

The first essay, "Inter-temporal accrual persistence and accrual anomaly" investigates whether accrual persistence and accrual anomaly vary with the state of economy. Prior accounting research argues that diminishing marginal returns on new investments drive lower persistence of accruals relative to cash flows. Macroeconomic research documents that marginal profitability is counter-cyclical, which implies that diminishing marginal returns on new investments are more pronounced during periods of expansions than recessions. Linking the cyclicality of diminishing returns on investments with the argument that diminishing returns to investments contribute to lower persistence of accruals relative to cash flows, this paper predicts that the differential persistence of accruals is greater during expansionary periods than recessionary periods. Using a U.S. sample from 1972 to 2003, I find that the differential persistence of accruals is greater during economic expansions than recessions. When I focus on the components of accruals, I find that depreciation, change in accounts receivable, change in raw materials, and change in finished goods are the main drivers of cyclical differential accrual persistence. These findings are robust to alternative conditioning sets, estimation procedures, and

measures of the business cycle. I also find that investors are unable to assess the cyclical differential persistence of accruals, leading to higher returns (both raw and abnormal returns) from an accrual-based trading strategy during expansionary periods.

The second essay "Can cyclical property of accrual persistence explain the accrual anomaly?" examines whether cyclical accrual persistence documented in the first essay can provide an explanation to accrual anomaly based on consumption based assets pricing theory. Specifically, I posit that accruals decrease in consumption risk because of cyclical property of accrual persistence (i.e., accruals are less persistent during economic expansions than during recessions). The implication is that the observed abnormal returns from accrual-trading strategy represent compensation for the underlying consumption risk. Using a U.S. sample from 1972 to 2003, I find that consumption risk decreases in the level of accruals. I also show that after controlling for other known risk factors, pricing kernel (a proxy for the state of economy) can explain about 11 percent of abnormal returns from accrual-based trading strategy. These findings are robust to alternative conditioning set and estimation procedures.

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Chapter 1

Introduction

1.1 Dissertation overview

This dissertation empirically examines whether accrual persistence and accrual anomaly vary with the state of economy, and if so, whether the cyclical property of accrual persistence can provide an explanation to the accrual anomaly.[1]

The first essay, “Inter-temporal accrual persistence and accrual anomaly,” provides empirical evidence that both differential persistence of accruals relative to cash flows and accrual anomaly are more pronounced during economic expansions relative to recessions. This study is important because it provides strong support to the growth explanation of the differential accrual persistence and accrual anomaly. It also highlights the importance of applying macro-economics theory to examine the property of accounting information.

The second essay “Can cyclical accrual persistence explain the accrual anomaly?” builds on the finding from the first essay that accrual persistence exhibits cyclical property, and consumption based asset pricing theory that consumption risk determines cross-sectional difference in expected returns. Specifically, I investigate whether the level of accruals is correlated with consumption risk. In other words, I examine whether high accruals firms have lower consumption risk, and low accruals firms have higher

[1] Accrual persistence is the ability of using the accrual component of current earnings to predict one year-ahead earnings and accrual anomaly is characterized by the phenomenon that high accruals firms earn lower subsequent abnormal returns than low accruals firms.

consumption risk, and cross sectional difference in returns between high and low accruals firms is compensation for consumption risk. This study contributes to the existing literature on accruals anomaly in three ways. First, based on the cyclical property of accrual persistence and consumption asset pricing theory, I provide a rational explanation for the accrual anomaly. Second, this study also complements the findings of Essay I that accrual anomaly is more pronounced during economic expansions. From consumption asset pricing point of view, the pro-cyclical payoff from accrual-based trading strategy is a compensation for investors for bearing additional consumption risk.

Third, this study sheds light on the conjecture of Fairfield et al. (2003b) that market accrual anomaly may be due to investors' inability to extrapolate growth rates or to consider the effects of diminishing marginal returns on new investments. In this paper, I show that investors consider the growth rate and diminishing marginal returns on investments and understand their implication on asset pricing. In other words, abnormal returns from accruals-based trading strategy reflect compensation for risk arising from the cyclical persistence of accruals, which results from variation in diminishing marginal returns across the business cycle.

1.2 Essay I: Inter-temporal accrual persistence and accrual anomaly

Sloan (1996) documents that the accrual component of earnings is less persistent than the cash flow component and attributes this difference to estimation errors in accruals. Fairfield et al. (2003a, 2003b) provide an alternative explanation for the differential persistence of accruals and cash flows. They argue that diminishing marginal returns on new investments create a negative relation between new investments (growth in net operating assets) and future profitability after controlling for the current level of profitability. Given that accruals are a component of growth in net operating assets, they show that accruals are also negatively associated with future profitability. Such a negative association indicates accruals are less persistent than cash flows due in part to growth effects on future earnings.

Essay I draws a natural link between Fairfield et al.'s argument about growth effects and prior macroeconomics research on counter-cyclical marginal profitability to examine the inter-temporal variation in the differential accrual persistence. The macroeconomics literature offers several explanations for variation in marginal profitability over the business cycle. These explanations include state varying costs of production, state varying income dispersion of consumers, and state varying investor sentiment. For example, Bils (1987), and Bils and Kahn (2000) show that while marginal cost of production related to employee training and labor utilization is higher in expansions, prices are not sensitive to the cyclical movement in marginal cost. As a result, marginal profitability declines in expansions. Edmond and Veldkamp (2005) argue that consumer income dispersion increases in recessions and decreases in expansions, as a result, firms respond to the variation in consumer income dispersion by pursuing high profit margin-low volume pricing strategy in recessions, and low profit margin-high volume pricing strategy in expansions, which leads to counter-cyclical marginal profitability. Aghion and Stein (2004) argue that investor sentiment varies with the business cycle. Investors prefer a high growth strategy during expansionary periods, and a high profit margin strategy during recessionary periods. Resource constraints force firms to trade off the pros and cons between growth and profit margin strategy. To cater to investor preferences, firms choose a high growth strategy at the expense of profit margins during expansions, and a high profit margin strategy at the expense of growth during recessions. The state-varying investor sentiment is another source of counter-cyclical marginal profitability.

To the extent that marginal profitability captures returns on new investments (whereby new investments lead to increased production and sales), the counter-cyclical variation in marginal profitability implies that diminishing marginal returns on new investments are more pronounced in expansions than recessions. Furthermore, if diminishing returns reduce accrual persistence and leads to the differential persistence of accruals, then inter-temporal variation in diminishing returns predicts that the differential accrual persistence is greater during expansions than recessions.

Using a U.S. sample covering the time period 1972-2003, I find that the differential accrual persistence is greater during periods of economic expansion than during periods of recession. Probing further into which components of accruals are responsible for the cyclical differential accrual persistence, I find that changes in accounts receivable, changes in inventory (both raw materials and finished goods), and negative depreciation exhibit a cyclical persistence property. These results suggest that the cyclical differential accrual persistence is mainly driven by the subcomponents of change in accounts receivable, change in inventory (both raw materials and finished goods), and negative depreciation. These results are robust to alternative econometric specifications and to alternative proxies of business cycle.

Next, I examine whether the accrual pricing anomaly varies with the state of the economy. Fairfield et al. (2003a) shows that investor overpricing of accruals arises from an inability to assess the implication of growth associated with diminishing returns on investments (hereafter growth effect) on future profitability. If the growth effect is more pronounced during periods of expansion, but investors are unable to assess it, then accruals mispricing is expected to be greater during economic expansions than during recessions. I empirically test this prediction and find that both raw and abnormal returns from an accrual-based trading strategy are higher during periods of economic expansion than during periods of recession. This finding holds even after controlling for arbitrage risk, which suggests arbitrage risk is an unlikely alternative explanation for the cyclical payoff of an accrual-based trading strategy.

1.3 Essay II: Can cyclical accrual persistence explain the accrual anomaly?

Accrual anomaly as documented by Sloan (1996) challenges existing asset pricing theory that views cross-sectional difference in expected returns as compensation for risk differences. Sloan (1996) shows that high (low) accruals firms earn negative (positive) abnormal returns and that such cross-sectional differences in returns to high and low accruals firms cannot be explained by the differences in risk as measured by a variety of variables used in prior research to capture risk. The implication is that investors naively fixate on earnings and they fail to understand the differential persistence of accruals vis-à-vis cash flows.

In this study I draw upon consumption-based asset pricing theory to explain the accrual anomaly. Lucas (1978) and Breeden (1979) argue that the risk premium on an asset is determined by ability of the asset to insure against consumption fluctuations. If investors care about consumption and are risk averse, they value an asset more (requiring lower expected returns) if such asset provides higher payoff during economic recessions. In contrast, they value an asset less (requiring higher expected returns) if such asset provides lower payoff during economic recessions. Therefore, the correlation between an asset's payoff and business cycle (economic expansions and recessions) is priced to reflect the asset's underlying consumption risk. Stated differently, the payoff pattern associated with the differential consumption risk determines cross-sectional expected returns.

In the context of accruals, given accrual persistence (the ability of using the accruals to predict one-year-ahead earnings) is lower during periods of economic expansion than recession, which is documented in Essay I, a firm's one-year-ahead earnings forecasted from the accruals should also vary with business cycle. In other words, high (low) accruals predict higher (lower) future earnings during recessions than expansions. Thus, firms with high (low) accruals provide investors with counter-cyclical (pro-cyclical) payoff and low (high) consumption risk. Based on consumption-based asset pricing theory, investors require lower (higher) expected returns for high (low) accruals firms as a result of differential consumption risk. If asset pricing models of expected returns used in prior research to study the accrual anomaly do not capture consumption risk, even though this risk is priced by investors, then measures of abnormal returns based on the existing models will, on average, be systematically associated with consumption risk. In other words, rational investor responses to consumption risk can potentially offer an explanation for the observed statistically significant abnormal returns to the accrual-trading strategy.

Given the empirical regularity of cyclical accrual persistence, this paper sheds light on two elements of the consumption-based explanation for accruals anomaly. First, I examine whether the correlation between stock returns and business cycle (proxied by pricing kernel) is positively associated with accruals. Given that under consumption-based asset pricing model, consumption risk is inversely related to the covariance between asset returns and pricing kernel, I find the assets' consumption risk is decreasing in accruals. Additional analysis indicates that 11 percent of the accrual-trading strategy returns in my sample is compensation for consumption risk controlling for other known risk factors.

Second, I test whether the hedge portfolio returns are correlated with business cycle (proxied by pricing kernel). I find a negative relation between pricing kernel and hedge portfolio returns. This result suggests that accrual-based trading strategy is not risk-free, and its positive returns are a compensation for consumption risk.

Chapter 2

Essay I: Inter-temporal accrual persistence and accrual anomaly

2.1 Introduction

This essay examines whether differential accrual persistence relative to cash flows and accrual anomaly vary with the state of the economy.[2] Sloan (1996) documents that the accrual component of earnings is less persistent than the cash flow component and attributes this difference to estimation errors in accruals. However, Fairfield et al. (2003a, 2003b) provide an alternative explanation for the differential persistence of accruals and cash flows. They argue that diminishing marginal returns on new investments create a negative relation between new investments (growth in net operating assets) and future profitability after controlling for the current level of profitability. Given that accruals are a component of growth in net operating assets, they show that accruals are also negatively associated with future profitability. Such a negative association indicates accruals are less persistent than cash flows due in part to growth effects on future earnings.

This paper draws a natural link between Fairfield et al.'s argument about growth effects and prior macroeconomics research on counter-cyclical marginal profitability to examine the inter-temporal variation in the differential accrual persistence. The macroeconomics literature offers several explanations for variation in marginal profitability over the business cycle. These explanations include state varying costs of

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[2] I use the phrase "differential accrual persistence" to denote the extent to which the persistence of accruals differs from that of cash flows in predicting one year-ahead earnings.

production, state varying income dispersion of consumers, and state varying investor sentiment. For example, Bils (1987) and Bils and Kahn (2000) show that while marginal cost of production related to employee training and labor utilization is higher in expansions, prices are not sensitive to the cyclical movement in marginal cost. As a result, marginal profitability declines in expansions. Edmond and Veldkamp (2005) argue that consumer income dispersion increases in recessions and decreases in expansions, as a result, firms respond to the variation in consumer income dispersion by pursuing high profit margin-low volume pricing strategy in recessions, and low profit margin-high volume pricing strategy in expansions, which leads to counter-cyclical marginal profitability. Aghion and Stein (2004) argue that investor sentiment varies with the business cycle. Investors prefer a high growth strategy during expansionary periods, and a high profit margin strategy during recessionary periods. Resource constraints force firms to trade off the pros and cons between growth and profit margin strategy. To cater to investor preferences, firms choose a high growth strategy at the expense of profit margins during expansions, and a high profit margin strategy at the expense of growth during recessions. The state-varying investor sentiment is another source of counter-cyclical marginal profitability.

To the extent that marginal profitability captures returns on new investments (whereby new investments lead to increased production and sales), the counter-cyclical variation in marginal profitability implies that diminishing marginal returns on new investments are more pronounced in expansions than recessions. Furthermore, if diminishing returns reduce accrual persistence and leads to the differential persistence of accruals, then inter-temporal variation in diminishing returns predicts that the differential accrual persistence is greater during expansions than recessions.

Using a U.S. sample covering the time period 1972-2003, I find that the differential accrual persistence is greater during periods of economic expansion than during periods of recession. Probing further into which components of accruals are responsible for the cyclical differential accrual persistence, I find that changes in accounts receivable, changes in inventory (both raw materials and finished goods), and negative depreciation exhibit a cyclical persistence property. These results suggest that the cyclical differential accrual persistence is mainly driven by the subcomponents of change in accounts receivable, change in inventory (both raw materials and finished goods), and negative depreciation. These results are robust to alternative econometric specifications and to alternative proxies of business cycle.

Next, I examine whether the accrual pricing anomaly varies with the state of the economy. Fairfield et al. (2003a) shows that investor overpricing of accruals arises from an inability to assess the implication of growth associated with diminishing returns on investments (hereafter growth effect) on future profitability. If the growth effect is more pronounced during periods of expansion, but investors are unable to assess it, then accruals mispricing is expected to be greater during economic expansions than during recessions. I empirically test this prediction and find that both raw and abnormal returns from an accrual-based trading strategy are higher during periods of economic expansions than during recessions. This finding holds even after controlling for arbitrage risk, which suggests arbitrage risk is an unlikely alternative explanation for the cyclical payoff of an accrual-based trading strategy.

This paper contributes in several important ways to the existing literature. First, it tests the implication of counter-cyclical marginal profitability on accrual persistence. It also corroborates and extends Fairfield et al. (2003a) with respect to growth effects on the differential accrual persistence and accruals mispricing. Fairfield et al. contend that firm growth contributes to the lower persistence and mispricing of accruals. However, they focus on documenting the average effect of accruals (growth in working capital) on future profitability and do not explore its inter-temporal variation. In this paper, I argue and show that the differential accrual persistence varies with the economic condition because diminishing returns (marginal profitability), one of the drivers of the differential accrual persistence, vary with the state of the economy.

Second, I show that profits from an accrual-based trading strategy are conditional on the state of the economy. Specifically, I find that the payoffs from an accrual-based trading strategy are higher during expansions than recessions, implying that accruals mispricing is more pronounced in expansions than in recessions. Third, this paper extends the literature (e.g., Lev and Thiagarajan, 1993; and Johnson, 1999) that emphasizes contextual analysis of financial statement information. This literature finds that earnings persistence, earnings response coefficient, and the returns-fundamentals relation vary with the business cycle. The current paper adds fresh evidence to this literature in terms of inter-temporal variation in the differential accrual persistence.

The organization of this paper is as follows. Next section summarizes prior literature on accrual persistence. Section 3 develops testable hypotheses. Section 4 discusses sample selection and research design. Section 5 presents the empirical results. Section 6 concludes the paper.

2.2 Prior Literature on Accrual Persistence and Accrual Anomaly

2.2.1 Prior Literature on Accrual Persistence

Sloan (1996) is the first study to document that the accrual component of earnings is less persistent than the cash flow component. Sloan (1996) inspired subsequent research on the lower persistence of accruals, which can be classified into three broad streams.

The first stream of research conjectures that the lower persistence of accruals arises from the estimation errors contained in the accruals. For example, Xie (2001) shows that the lower persistence of accruals is due to the discretionary component of accruals. He concludes that the lower persistence of accruals is primarily attributable to the opportunistic behavior of management. Dechow and Dichev (2002) and Richardson et al. (2005) show that the lower persistence of accruals is consistent with the existence of estimation error in accruals. Richardson et al. (2006) decompose accruals into a growth component and an efficiency component. They argue that the growth component captures growth-related factors that explain the lower persistence of accruals, and the efficiency component captures temporary accounting distortions or the efficiency of using existing capital. They find that both components contribute to the lower persistence of accruals. These papers conclude that the lower persistence of accruals is attributable to temporary accounting distortions arising from accrual estimation error.

The second stream of research argues that accounting rules affect accrual persistence. Dechow and Ge (2006) finds that high accruals firms have higher earning persistence than low accruals firms. They argue that high accruals tend to be an outcome of "matching" principle, and the matching principle enhances earning persistence;

whereas low accruals tend to be an outcome of "fair value" principle, and the fair value principle decreases earning persistence.

The third stream of research argues that accruals are correlated with economic characteristics, such as firm growth, and that these correlated economic characteristics are responsible for the lower persistence of accruals. For example, Fairfield et al. (2003a) show that the lower persistence of accruals relative to cash flows arises from the interaction of firm growth with the lower rates of economic profits associated with the diminishing marginal returns on new investments. Titman et al. (2004), Anderson and Garcia-Feijoo (2006), and Cooper et al. (2005) provide variants of this explanation.

2.2.2 Prior Research on Accrual Anomaly

Sloan (1996) is the first to document accrual anomaly. He finds that investors fixate on earnings and fail to understand the differential persistence of accruals and cash flows. That is, investors tend to overweight accruals when forming future earnings expectations and are subsequently surprised when accruals turn out to be less persistent than expected. As a result, high (low) accruals firms can earn negative (positive) abnormal returns, which is commonly called the accrual anomaly. The accrual anomaly has spurred considerable follow up research since Sloan (1996), which can be broadly categorized into four groups.

The first group of studies decompose accruals into their components (e.g. changes in inventories and changes in accounts receivable, and discretionary and non-discretionary components), and then relate these components to the returns from the accrual-based trading strategy. Thomas and Zhang (2002) find that change in inventory is the main driver of accruals mispricing. Xie (2001) finds that abnormal returns are earned only for portfolios sorted based on discretionary accruals but not non-discretionary accruals.

The second group of studies relates accrual properties to the behavior of more sophisticated financial statement users such as analysts, auditors, institutional investors, insiders, and arbitrageurs. For example, Bradshaw et al. (2001) find that analysts also overestimate the accrual persistence in that they find forecast errors to be negative for high accrual firms. Collins et al. (2003) investigate the role of institutional investors in the mispricing of accruals. They find that accruals mispricing is significantly reduced, though not completely eliminated, for firms with high institutional ownership. Lev and Nissim (2006) investigate why accruals anomaly is not arbitraged away over time. They find that transient institutional investors do trade on accrual information, however systematic structural factors of extreme accruals firms prevent investors, both institutions and individuals, from trading on accruals despite the apparent profitability of such a trading strategy. Mashruwala et al. (2006) find that accrual mispricing is more pronounced for firms with high arbitrage risk and high transaction costs because the characteristics of these firms make it difficult for arbitrageurs to exploit accrual trading strategy.

The third group of studies examines whether the accrual anomaly is distinct from other anomalies. Collins and Hribar (2001) show that the accrual anomaly is distinct from the post-earnings announcement drift, while Desai et al. (2004) show that there is an overlap between the accrual and the value/glamour anomaly. Fairfield et al. (2003a) suggest that the accrual anomaly comes from the investors' inability to assess the implications for future profitability of growth associated with diminishing returns on investments. Therefore, they attribute the accrual anomaly to a more general growth anomaly.

The fourth group of studies examines cross-sectional differences in the returns to the accrual-based trading strategy. Collins et al. (2003) investigate the role of institutional investors in the mispricing of accruals and find that accruals mispricing is significantly reduced, though not completely eliminated, for firms with high institutional ownership. Ali and Trombley (2000) examine whether the abnormal returns from accrual-based trading strategy are due to the presence of naïve investors. They find contrary evidence to Collins et al. (2003) in that abnormal returns increase in analyst coverage and institutional investors. Khan (2006) examines the accrual anomaly using a four-factor model. He finds the cross-sectional variation in average returns to high and low accruals firms is explained by differences in risk embedded in the four factors.

My paper builds on Fairfield et al. (2003a), which attributes the lower persistence of accruals to diminishing marginal returns, and the accrual anomaly to investors' inability to assess the implication of growth on future profitability, and extends it to a temporal setting. In the next section, I develop a testable hypothesis.

2.3 Hypotheses Development

Sloan (1996) regresses one-year-ahead ROA on the accrual and cash flow components of current ROA and finds that accruals are less persistent than cash flows. Fairfield et al. (2003a) argue that growing firms tend to have lower profitability resulting from diminishing marginal returns on increased investments and they find a negative relation between growth in net operating assets (NOA) and one-year-ahead return on assets (ROA). More importantly, they argue accruals are not only a component of profitability but also a component of growth in NOA. They predict and find that accruals suppress one-year-ahead ROA in a manner similar to growth in NOA after controlling for the current level of profitability. Fairfield et al. (2003b) find that accruals are more strongly associated than cash flows with invested capital, which is the denominator of the one-year-ahead ROA. However, they find accruals and cash flows to have no differential relation to one-year-ahead operating income, which is the numerator of the one-year-ahead ROA. Taken together, Fairfield et al. (2003a, 2003b) suggest that diminishing marginal returns on investments associated with firm growth contribute to the lower persistence of accruals.

Prior macroeconomics research offers several explanations for variation in marginal profitability over the business cycle. These explanations include state varying costs of production, state varying income dispersion of consumers, and state varying investor sentiment. For example, Mitchell (1941) notes that as activity expands:

"equipment of less than standard efficiency is brought back into use; the price of labor rises while its efficiency falls; the cost of materials, supplies and wares for resale advances faster than selling prices; discount rates go up at especially high pace, and all the little wastes incidental to conduct of business enterprises grow steadily larger".

Bils (1987) examines cyclical behavior of marginal profitability and finds that marginal cost of production is higher in expansions than recessions because, during expansions, firms must incur additional employee training costs or over time salary. However, prices do not respond to the cyclical movement in marginal cost, therefore marginal profitability declines in expansions. In a similar vein, Bils and Kahn (2000) examine inventory behavior over the business cycle and find that marginal cost of production rises from using labor more intensively during economic expansions. As a result, marginal profitability decreases in expansions.

Edmond and Veldkamp (2005) argue that consumer income dispersion increases in recessions and decreases in expansions, as a result, firms respond to the variation in consumer income dispersion by pursuing high profit margin - low volume pricing strategy in recessions, and low profit margin - high volume pricing strategy in expansions.[3] In addition, Aghion and Stein (2004) argue that investor sentiment varies with the business cycle. Investors prefer a high sales growth strategy during economic expansions, and a high profit margin strategy during recessions. Resource constraints force firms to trade off the pros and cons between growth and profit margin strategy. To cater to investor preference, firms choose a high growth strategy at the expense of profit margin during expansions, and a high profit margin strategy at the expense of growth during recessions. The state-varying investor sentiment is another source of counter-cyclical marginal profitability.

[3] During recessions, consumer income dispersion rises resulting in firms' greater uncertainty about each customer's willingness to trade. As such, the gains from trade are lower, and firms are more willing to lose small gains on some trades to make higher margins on others. However, in expansions, income dispersion decreases resulting in lower uncertainty about a customer's willingness to trade. As such, the gains from trade are high and firms are eager to ensure that trade occurs.

To the extent that marginal profitability captures returns on investments (whereby new investments lead to increases in production and sales), the counter-cyclical marginal profitability implies that diminishing returns on new investments is greater in expansions than in recessions. Linking the cyclicality of diminishing returns on investments with Fairfield et al.'s argument that diminishing returns on investments drive the lower persistence of accruals, I state the following hypothesis:

H1: The differential persistence of accruals relative to cash flows is greater during economic expansions than recessions after controlling for current profitability.

Fairfield et al. (2003a) shows that investor overpricing of accruals arises from the inability to assess correctly the growth effect on future profitability. If during periods of expansion, the growth effect is more pronounced, and investors are unable to assess it, then the accrual mispricing is therefore expected to be greater during economic expansions than recessions. Stated formally, the second hypothesis is as follows:

H2: The mispricing of accruals is greater during economic expansions than recessions.

2.4 Sample and Research Design

2.4.1 Sample

Firm financial statement data are obtained from the annual COMPUSTAT file and stock returns data are obtained from the monthly CRSP files for the period 1972-2003.[4] Firm-year observations from the financial sector (SIC 6000-6999) are excluded because the financial statement data required to compute operating accruals are not available for these companies. Closed-end funds, investment trusts, units, and foreign

[4] Similar to Desai et al. (2004), the empirical analysis begins in 1972 because prior to 1971, fewer than 500 firms with the required data are available. The data in 1971 are dropped because accruals are computed using two years data.

companies are also excluded from the sample. Firm-year observations are eliminated due to insufficient data on Compustat necessary to compute the primary financial statement variables and on CRSP for returns used in the empirical tests.[5] Furthermore, financial variables (e.g., *ROA, Accruals, GRLTNOA*) are truncated at 1% in each tail of the distribution for each year.[6] All financial variables are ranked into deciles across all sample years and the ranked variables take a value from 1 to 10.[7] The final sample has 105,493 firm-year observations covering 65 two-digit industry groups over a 32 year period from 1972 to 2003.

2.4.2 Test of hypothesis 1

2.4.2.1 Regression model

To assess whether the differential accrual persistence varies with the business cycle, I expand the basic model used in Fairfield et al. (2003a), which examines the incremental effect of the growth in net operating assets on one-year-ahead ROA after controlling for current profitability. Specifically, I introduce business cycle and the interaction term between the business cycle and growth in net operating assets into the basic model used in Fairfield et al. (2003a):

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[5] Specifically, Compustat items 1, 4, 5, 6, 12, and 181 are required to be available in both the current and previous year and data item 178 in the current year in order to keep a firm-year observation in the sample. If data items 9, 32 or 34 are missing, then they are set equal to zero rather than eliminating the observation. These data items represent balance sheet items that may not be relevant for some companies (e.g., investments and advances), so they are set to zero rather than needlessly discarded. All results are qualitatively similar if instead each regression is estimated using only observations with all data available for that particular regression.

[6] Inferences regarding the cyclical accrual persistence are qualitatively similar without truncation.

[7] Ranking financial variables into deciles across all sample years rather than ranking them annually will make the value of ranked variables comparable across different years, and facilitate empirical tests because measuring business cycle and testing its impact on the accrual persistence involve a time-series comparison. Using raw values of financial variables yields qualitatively similar inferences. The ranked results, however, have lower standard error.

$$ROA_{t+1} = \lambda_0 + \lambda_1 GRNOA_t + \lambda_2 ROA_t + \lambda_3 BUSCYC_{t+1} + \lambda_4 GRNOA_t * BUSCYC_{t+1}$$
$$\quad\quad (-) \quad\quad (+) \quad\quad (+) \quad\quad\quad\quad (-)$$

$$+ v_{t+1} \quad (1)$$

where *ROA* is the income from continuing operations (Compustat Item #178) divided by average total assets (Compustat Item #6); *GRNOA* is growth in net operating assets computed as annual change in net operating assets divided by average total assets; and *BUSCYC* denotes business cycle, which is empirically measured such that higher values represent periods of expansion. [8] Measures of business cycle are defined in section 4.2.2. As the dependent variable, ROA, is measured at time t+1, I also measure business at t+1 because the investments (e.g., *GRNOA*) are measured at the end of t, and I allow one year for these investments to be put into production, and yield sales and profit.

Following Fairfield et al. (2003a), the coefficient on *ROA* captures the effect of cash component on future *ROA*, this coefficient is expected to be positive. The coefficient on *GRNOA* is expected to be negative as growth in net operating assets suppresses one-year-ahead profitability (Fairfield et al. 2003a). Klein and Marquardt (2006) contend that firms make more investments and consumers spend more during periods of economic expansion. Conversely, firms and consumers cut expenditures during periods of recession resulting in higher frequencies of accounting losses and lower accounting profitability during recessions. Given that high values of *BUSCYC* represent periods of expansion, the coefficient on *BUSCYC* is expected to be positive. As noted previously, the growth effect

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[8] Net operating assets (NOA) are computed as :
$NOA_t = AR_t + INV_t + OTHERCA_t + PPE_t + INTANG_t + OTHERLTA_t – AP_t – OTHERCL_t - OTHERLTL_t$
where *AR* is accounts receivable (Compustat item #2); *INV* is inventories (Compustat item #3);*OTHERCA* is other current assets (Compustat item #68); *PPE* is net property, plant, and equipment (Compustat item #8); *INTANG* is intangibles (Compustat item #33);*OTHERLTA* is other long-term assets (Compustat item #69); *AP* is accounts payable (Compustat item #70); *OTHERCL* is other current liabilities (Compustat item #72); and *OTHERLTL* is other long-term liabilities (Compustat item #75).

associated with diminishing returns on new investments is more pronounced during expansions. As a result, the sensitivity of one-year-ahead *ROA* to *GRNOA* is expected to be greater during expansions, thus the coefficient on the interaction between *BUSCYC* and *GRNOA* is expected to be negative.

Next, similar to Fairfield et al. (2003a), growth in net operating assets (*GRNOA*) can be decomposed into two components: *Accruals* and growth in long-term net operating assets (*GRLTNOA*). Then the variable *GRNOA* in model (1) is replaced with the two components:

$$\begin{aligned} ROA_{t+1} = \lambda_0 + \underset{(-)}{\lambda_1 Accruals_t} + \underset{(-)}{\lambda_2 GRLTNOA_t} + \underset{(+)}{\lambda_3 ROA_t} + \underset{(+)}{\lambda_4 BUSCYC_{t+1}} \\ + \underset{(-)}{\lambda_5 Accruals_t * BUSCYC_{t+1}} \ \underset{(-)}{\lambda_6 GRLTNOA_t * BUSCYC_{t+1}} + v_{t+1} \end{aligned} \quad (2)$$

where $Accruals_t = \Delta CA_t - \Delta CL_t - DEP_t$, ΔCA = non-cash current assets (Compustat Item #4 - Compustat Item #1) divided by average total assets, ΔCL = the change in current liabilities other than taxes payable and the current portion of long-term debt (Compustat Item #5 - Compustat Item #34 - Compustat Item #71) divided by average total assets, *DEP* = depreciation expense (Compustat Item #14) divided by average total assets, and *GRLTNOA* = growth in net operating assets other than accruals, *computed as* $GRNOA_t - Accruals_t$.

As both *Accruals* and *GRLTNOA* are components of *GRNOA*, the two components and their interactions with BUSCYC are expected to have the same predicted negative sign as *GRNOA*, and the interaction of *GRNOA* with *BUSCYC* in equation (1). The predictions for other variables are the same as those in equation (1).

2.4.2.2 Measures of Business Cycle

I use three alternative measures to capture the concept of business cycle. The three measures are macro economic indicators used in Klein and Marquardt (2006), which are annual GDP growth rate, annual industrial production growth rate, and National Bureau of Economic Research's (NBER) definition of expansions and recessions, respectively. The first measure, annual GDP growth rate (*GDPgr*), is annual percentage change in real gross domestic product. GDP is compiled by the U.S. Department of Commerce and includes personal consumption, government expenditures, private investment, inventory growth, and the trade balance.[9] I obtain data for *GDPgr* from St. Louis Federal Reserve website.

The second measure, annual industry productivity growth rate (*IPgr*), is the annual growth in industrial production. Similar to GDP, industrial productivity measures total real output including total production in manufacturing, mining, gas, and electric utilities. [10] I obtain data for *IPgr* from St. Louis Federal Reserve website.

The third measure is an indicator variable (*EXPAN*) based on the NBER definition of expansions and recessions.[11] NBER divides the U.S. economy into periods of expansion and recession based on business growth measured in real GDP, real income, employment, industrial production, and wholesale-retail sales. Expansions are from the trough to the peak of business growth, and recessions are from the peak to the trough. Following Klein and Marquardt (2006), I define the variable *EXPAN* equal to 0 when any part of a recessionary period occurs within a calendar year, and 1 otherwise.

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[9] Hall (1990) and Cochrane (1991) use *GDPgr* as a macroeconomic measure of business productivity.

[10] Fama (1981) and Chordia and Shivakumar (2002) use *IPgr* as a measure of business productivity.

[11] Prior studies using the NBER definition to proxy for business cycle include Johnson (1999), Chordia and Shivakumar (2002), and Fama (1989).

2.4.3 Test of hypothesis 2

To empirically examine hypothesis 2, I conduct both firm level analysis based on buy-and-hold annual returns and portfolio level analysis based on monthly portfolio returns.

2.4.3.1 Firm level return analysis

The regression model used in firm level analysis is as follows:

$$
\begin{aligned}
CEx\mathrm{Re}t_{t+1} = {} & \delta_0 + \underset{(-)}{\delta_1 Accruals_t} + \underset{(-)}{\delta_2 GRLTNOA_t} + \underset{(+)}{\delta_3 ROA_t} + \underset{(-)}{\delta_4 GDPgr_{t+1}} + \underset{(-)}{\delta_5 Accruals_t * GDPgr_{t+1}} \\
& + \underset{(-)}{\delta_6 GRLTNOA_t * GDPgr_{t+1}} + \underset{(-)}{\delta_7 LOG\_MKT_{t+1}} + \underset{(+)}{\delta_8 BM_{t+1}} + \varepsilon_{t+1} \qquad (3)
\end{aligned}
$$

where *CExRet* is the firm's annual buy-and-holding returns in excess of the annual risk-free rate, measured starting four months after the fiscal year end. *LOG_MKT* is the logarithm of market value computed as (Compustat item #25 * Compustat item #199); *BM* is the book-to-market ratio computed as (Compustat item #60/market value); and all other variables are defined as before.

In equation (5), *LOG_MKT* and *BM* are two control variables picking up size and book-to-market effect, respectively. The coefficient on *LOG_MKT* is expected to be negative because prior studies find that small stocks outperform large stocks (e.g., Fama (1992, 1993, 1996) shows that small firms earn higher returns). The coefficient on *BM* is expected to be positive as finance literature shows that value firms (high *BM*) outperform glamour firms (Graham and Dodd 1934, Lakonishok 1994, and Fama 1992, 1993, 1996). According to Sloan (1996) and Fairfield et al. (2003a), accruals are negatively related with future returns, therefore the coefficient on *Accruals* is expected to be negative. Fairfield et al. (2003a) finds that firms with high growth in long-term net operating assets have lower subsequent returns than firms with low growth in long-term net operating assets, therefore the coefficient on *GRLTNOA* is predicted to be negative. Sloan (1996) finds that investors underestimate the persistence of cash flows, which suggests that firms with high cash flows should have higher subsequent returns than firms with lower cash flows. The coefficient on *ROA* in equation (5) captures the relation between cash flows and future returns, therefore the coefficient on *ROA* is expected to be positive. The coefficient on *GDPgr* is also expected to be negative because expected returns are found to be low when economic condition is strong and higher when conditions are weak (Fama and French, 1989).

My focus is the interaction of accruals with GDP growth rate. If during periods of expansion, the growth effect is more pronounced and leads to greater accrual mispricing, then the coefficient on the interaction of *Accruals* with *GDPgr* is expected to be negative. As suggested in Fairfield et al. (2003a), *GRLTNOA* behaves similarly as accruals because both are components of growth in net operating assets. The interaction between *GRLTNOA* and *GDPgr* is expected to be negative.

2.4.3.2 Portfolio Return analysis

Monthly portfolio returns are also used to test hypothesis 2. Following Fama and French (1993), I adopt standard portfolio approach using Fama-French three factor model including MKT, SMB, and HML, and my interest variable, GDP growth rate:

$$HedgeRet_{t+1} = \alpha + \delta_1\, GDPgr_{t+1} + \delta_2\, MKT_{t+1} + \delta_3\, SMB_{t+1} + \delta_4\, HML_{t+1} + \varepsilon_{t+1} \qquad (4)$$

where *HedgeRet* represents monthly hedge portfolio returns, which is equal to the equally weighted monthly returns to the highest accruals decile minus the equally weighted monthly returns to the lowest accruals decile. *MKT*, *SMB*, and *HML* are the monthly

Fama-French excess market, size, and book-to-market factors, respectively. *GDPgr* is quarterly GDP growth rate obtained from St. Louis Federal Reserve website.[12] The coefficient on *GDPgr* is expected to be positive due to greater accrual mispricing as predicted in hypothesis 2.

2.5 Empirical Results

2.5.1 Descriptive Statistics

Panel A of Table 2.1 reports the descriptive statistics for all the variables used in the empirical tests. The mean values of ROA_{t+1} and $Cash\ Flows_t$ are 0.049 and 0.081, respectively, both of which are lower than the median values, suggesting that the distributions of these variables are left-skewed. The mean and median value of $Accruals_t$ is -0.026 and -0.031, respectively, indicating on average accruals decrease earnings.[13] The mean and median value of growth in net operating assets ($GRNOA_t$) is 0.074 and 0.053, respectively, and the mean and median value of growth in long-term net operating assets ($GRLTNOA_t$) is 0.101 and 0.068, respectively, which suggests that on average sample firms experience 7% growth in net operating assets, and 10% growth in long-term net operating assets.

[Insert Table 2.1]

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[12] Quarterly GDP growth rate is used to capture business cycle effect more accurately and avoid repeated measure of using annual GDP growth rate in the monthly return test.

[13] Compared with Fairfield et al. (2003a), both mean and median values of ROA_{t+1}, ROA_t and $Accruals_t$ are lower in magnitude. This may be due to the fact that I cover a longer sample period. My sample covers 41-year period from 1963 to 2003, and Fairfield et al. (2003a) covers 30-year period from 1964 to 1993. They purposely select this sample period to ensure replication of Sloan (1996) whose sample period is from 1962 to 1991. According to Givoly and Hayn (2000), more companies report losses during my later sample period (1994-2003) which is not covered by Fairfiled et al. (2003a).

The mean value of annual GDP growth rate (*GDPgr*) is 3.1 percent and ranges from 2.5 percent for the first quartile to 4.2 percent for the third quartile. The mean annual industrial production growth rate (*IPgr*) is 2.8 percent and ranges from 0.8 percent for the first quartile to 5.3 percent for the third quartile. The mean value of *EXPAN* is 0.76 indicating that about 76 percent of firm-year observations in my sample belong to the expansion periods as defined by the NBER. The mean and median value of one-year-ahead buy-and-hold annual stock returns (*CRET*) is 0.183 and 0.053, respectively.

When accruals are disaggregated into change in non-cash current assets (ΔCA), change in current liabilities other than short term debt and tax payable (ΔCL), and depreciation (*DEP*), the mean and median value of ΔCA is 0.046 and 0.028, respectively; the mean and median value of ΔCL is 0.024 and 0.015, respectively; and the mean and median value of *DEP* is 0.047 and 0.041, respectively. Disaggregating change in non-cash current assets into change in accounts receivable (ΔAR), change in inventory (ΔINV), and change in other current assets (ΔOCA) suggests that change in accounts receivable and change in inventory contribute to the positive change in current assets.

Disaggregating inventory into raw materials, work-in-process, and finished goods suggests that the positive change in inventory is attributable to the change in all three components.

To the extent that some of the financial variables have skewed distributions, outliers are of concern in the empirical analyses. To mitigate this concern, all financial variables (ROA_{t+1}, ROA_t, $Accruals_t$, $GRNOA_t$, $GRLTNOA_t$, ΔCA_t, ΔCL_t, DEP_t, ΔAR_t,

ΔINV_t, ΔOCA_t, ΔRM_t, ΔWIP_t, ΔFG_t) are ranked into deciles over the sample period in the empirical analysis and each of the ranked variables takes value from 1 to 10. [14]

Panel B of Table 2.1 provides the Pearson/Spearman correlations among selected variables reported in Panel A. Pearson correlations are reported below the diagonal, and Spearman correlations are reported above the diagonal. The first-order autocorrelation for ROA is 0.804, suggesting that earnings tend to be persistent. As expected, one-year-ahead ROA is more positively correlated with cash flows than accruals. This is consistent with the findings in Sloan (1996) that cash flows have higher persistence than accruals. The spearman correlation of *GRNOA* with one-year-ahead *ROA* is similar in magnitude to that of accruals with one-year-ahead *ROA*, and that of *GRLTNOA* with one-year-ahead *ROA*. This is consistent with Fairfield et al. (2003a) observations that both *Accruals* and *GRLTNOA* are components of *GRNOA*. *Accruals* are negatively correlated with cash flows, which is consistent with Dechow's (1994) argument that accruals smooth temporary fluctuations in cash flows. Both *Accruals* and *GRLTNOA* are positively correlated with *GRNOA*, suggesting that both components of *GRNOA* capture growth.

Consistent with Klein and Marquardt (2006), the correlations of one-year-ahead *ROA* with annual GDP growth rate, and annual industrial production growth rate are positive. The correlations among the three business cycle proxies (*GDPgr, IPgr, and EXPAN*) range between 0.58 and 0.83, suggesting that they capture a similar concept. The buy and hold annual returns (*CRET*) are negatively correlated with *Accruals* and positively correlated with *Cash flows*, which is consistent with the finding in the accruals anomaly literature that low accruals and high cash flows firms earn higher subsequent

[14] I also redo all analyses based on raw values of all variables. The results are qualitatively similar.

returns. *CRET* is negatively correlated with *GDPgr*, *IPgr*, and *EXPAN*,suggesting during periods of expansion, firms' stock returns are lower which is consistent with the argument that the stock market leads economic growth.

2.5.2 Results of Testing Hypothesis 1

2.5.2.1 Replicating Fairfield et al. (2003a)

Table 2.2 reports results of a regression model used by Fairfield et al. (2003a) to test the incremental effect of growth in net operating assets on one-year-ahead *ROA* and the incremental effect of accruals and growth in long-term net operating assets on one-year-ahead *ROA*. All variables are ranked into deciles. Columns (1) and (2) report mean parameter estimates of cross-sectional annual regressions. Columns (3) and (4) report estimates based on pooled OLS regresions, and Columns (5) and (6) report mean parameter estimates of industry regressions (industry group is defined based on the two-digit SIC code). The coefficients on *GRNOA_R* are negative and statistically significant at the .01 level, suggesting that the incremental effect of growth in net operating assets on one-year-ahead *ROA* is negative. The coefficients on both *Accruals_R* and *GRLTNOA_R* are negative and statistically significant at the .01 level, suggesting the incremental effect of both accruals and growth in long-term operating assets on one-year-ahead *ROA* is also negative. Overall, these results are consistent with Fairfield et al. (2003a).

[Insert Table 2.2]

2.5.2.2 Testing hypothesis 1

Panel A of Table 2.3 reports pooled OLS regression results for estimating equations (1) and (2) using three alternative measures of business cycle: *GDPgr, IPgr,* *and EXPAN*.[15] In columns (1), (3), and (5), the coefficients on the interaction term between business cycle (*BUSCYC*) and growth in net operating assets (*GRNOA*) is of primary interest. As expected, the coefficient on the interaction term is negative and statistically significant at the .05 level across all the three measures of business cycle. This is consistent with the notion that growth effect associated with diminishing marginal returns on new investments become more pronounced during expansions, thereby lowering one-year-ahead *ROA* more in expansions.

When growth in net operating assets is further decomposed into accruals and growth in long-term net operating assets (*GRLTNOA*) in columns (2), (4) and (6), the coefficients on the interaction term between business cycle and accruals are negative and statistically significant at the .01 level, which is consistent with the notion that during periods of economic expansion, firm growth contributes to the more negative relation between *Accruals* and one-year-ahead *ROA* after controlling for current *ROA*. The coefficient on the interaction term between the business cycle and growth in long-term net operating assets is also negative and statistically significant at the .10 level when GDP growth is used as a proxy for the business cycle. These findings suggest that the business cycle may have more impact on growth in working capital captured by accruals than growth in long term assets captured by growth in long-term net operating assets. [16,17]

[15] Robust standard errors clustered by industry-year are computed using the procedure in Rogers (1983, 1993) method.

[16] I also re-estimate equations (1) and (2) by including the interaction of ROA_t with $BUSCYC_{t+1.}$ The results show that the coefficients on the interaction of ROA_t with $BUSCYC_{t+1}$ are positive and statistically significant at the .05 level, which is consistent with Johnson (1999) who shows that earnings are more persistent during expansionary periods. More importantly, the coefficients on the interaction of $GRNOA_t$ with $BUSCYC_{t+1}$ in equation (1), and $Accruals_t$ with $BUSCYC_{t+1}$ in equation (2) are still negative and statistically significant, and the absolute value of the coefficients is greater than that of the interaction of ROA_t with $BUSCYC_{t+1.}$ Their differences are statistically significant at the .01 level, which suggests, the growth effect that contributes to lower persistence of accruals outweighs the greater earnings persistence

[Insert Table 2.3]

Panel B of Table 2.3 reports results of equation (1) and (2) estimated at the industry level. These results yield inferences qualitatively similar to that reported in Panel A of Table 2.3, which suggests that the results shown in Panel A of Table 2.3 are not driven by any specific industry.

Panels C and D of Table 2.3 report parameter estimates for equations (1) and (2) estimated for each two-digit SIC industry group, and categorized into nine broad industry categories, which is defined by U.S. Department of Labor.[18] For brevity, only the results of equation (1) and (2) based on GDP growth rate as a measure of business cycle are reported. Results based on industry production growth rate and NBER definition of business cycle are qualitatively similar. In Panel C the coefficients on the interaction of GRNOA with GDPGR are negative for all industry categories except for the agriculture and construction industries. In addition, the coefficients are more negative for the manufacturing, retail, and services industries, which account for a significant part of U.S. economy. In Panel D the coefficients on the interaction of Accruals with GDPGR are negative for all industry categories except for the agriculture, construction, and public administration industries. In addition, the coefficients are more negative for manufacturing, mining, transportation retail, and services industries.

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during expansionary periods, and as a whole the persistence of accruals are lower during expansionary periods relative to recessionary periods.

[17] Many sample firms have non-December fiscal year end, however, all three business cycle proxies are measured based on calendar year, there is miss-matching between business cycle and these firms' financial information. To the extent that the miss-matching could add noise to the estimation, I re-estimate equations (1) and (2) with all December fiscal year end firms. The results are quantitatively similar to those reported in Table 2.3.

[18] The website is http://www.osha.gov/pls/imis/sic_manual.html.

Overall, the results reported in Table 2.3 provide strong evidence that firm growth suppresses one-year-ahead profitability more during periods of economic expansion than recession. This is consistent with the notion that during periods of expansion diminishing marginal returns on new investments is more significant, which leads to lower future profitability. In addition, as a component of growth in net operating assets, accruals are the main contributor of the increased negative relation between one-year-ahead *ROA* and growth in net operating assets during economic expansions. In short, the differential accrual persistence is greater during economic expansions than recessions due to growth effects.[19]

2.5.2.3 Sensitivity test of using forecasted GDP growth rate as a measure of business cycle

As previously discussed, more pronounced diminishing marginal returns to new investments during expansionary periods increases differential accrual persistence relative to cash flows in the periods of expansion. However, as equations (1) and (2) show, investment decision is made at the end of year t (e.g., *GRNOA, Accruals, and GRLTNOA*, which captures investments are measured at the end of year t), and to the extent, such decision is made based on forecasted future macroeconomic condition available at the end of year t, using ex post measure of business cycle (e.g, $GDPGR_{t+1}$)

[19] I also conduct sensitivity test to determine whether the cyclical differential persistence of accruals found in Table 2.3 is due to growth in assets, which is the denominator of the dependent variable, ROA_{t+1}, using alternative model specification adopted in Fairfield et al. (2003b). In the alternative model specification, dependent variable, ROA_{t+1}, in equation (2) is replaced with $OPINC_{t+1}$, which is equal to operating income scaled by NOA_{t-1}, and the deflator of the independent variables including $accruals_t$, $GRLTNOA_t$ and ROA_t in equation (2) are also replaced with NOA_{t-1}. The untabulated results show that the interaction of accruals with GDP growth rate is not statistically significant at the .10 level using both pooled OLS estimation and industry level analysis. The results are also robust to the two alternative business cycle measures, industry production growth rate and NBER definition of business cycle. Compared results in Table 2.3, it confirms that the effect of growth in assets on future profitability drives the cyclical differential accrual persistence.

may not capture such forward looking decision process rather than the consequence of forecast errors in GDP growth rate. Therefore I conduct sensitivity test to examine this possibility by replacing business cycle measure in equations (1) and (2) with forecasted GDP growth rate.[20] Untabulated results show that the coefficients on the interaction of GRNOA with forecasted GDP growth rate are negative and statistically significant at the .01 level. The coefficients on the interaction of Accruals with the forecasted GDP growth rate are also negative and statistically significant at the .05 level. Taken together, it suggest that previous findings based on ex post GDP growth measure reflect management investment decision process rather than forecast errors in GDP growth rate.

2.5.3 Investigation of the persistence of the accrual components

The results in subsection 3.5.2 suggest that the differential persistence of accruals increases in periods of economic expansions. This subsection attempts to identify the specific components of accruals that drive the cyclical differential accrual persistence.

2.5.3.1 Investigation of the persistence of the changes in non-cash current assets, the changes in current liabilities, and depreciation

Table 2.4 reports results of pooled OLS regressions based on equation (3) replacing the accruals with the three components separately (univariate test) and jointly (multivariate test). Accruals can be partitioned as changes in non-cash current assets (ΔCA), changes in current liabilities other than taxes payable and the current portion of

[20] I obtain two-year average GDP growth rate forecast series from Congressional Budget Office (CBO) website. This time series cover 1976-2004. The majority of the forecasts were issued in the first quarter of the initial year of the forecast period or in December of the preceding year. For the years before 1992, CBO provides two-year average forecast growth rate for real GNP, and for years after 1992 including 1992, CBO provides two-year average forecast growth rate for real GDP. I match the first year of the two year forecast period with ROAt+1 because such matching procedure is more appropriate to reflect how economists feel about the economic growth in the near future.

long-term debt (-ΔCL), and depreciation (-DEP).[21] However, as noted in Richardson et al. (2005, p464) that "several of accrual components are highly correlated, care must be taken in interpreting the persistence coefficients in the multivariate specification."[22] The focus here is the interaction of accrual components with the business cycle.[23]

The univariate regression results in Table 2.4 show that the coefficients on the interaction of both change in non-cash current assets and depreciation with GDP growth are negative and statistically significant at the .01 level, suggesting that the two components drive the cyclical differential accrual persistence. The multivariate regression basically shows the same findings as the univariate regressions for the change in current assets and depreciation. However, for the change in current liabilities, its interaction with GDP growth is not statistically significant.

The result for the main effect of depreciation is noteworthy and can be explained by intuition. First, when a firm grows, the working capital (e.g. inventory) expands faster than fixed costs in the short term (e.g., depreciation), resulting in higher growth in total assets. Therefore depreciation scaled by total assets decreases in firm growth. Second, a firm's future profitability decreases in firm growth due to diminishing marginal returns on investments. Hence firm growth leads to a negative relation between depreciation and one-year-ahead ROA.

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[21] Components that appear with a negative sign in the accrual measure is multiplied by -1 to align the sign of the interactions between business cycle and accruals components across the components.

[22] All variables are ranked into deciles. Robust standard errors clustered by industry-year are computed using the procedure in Rogers (1983, 1993).

[23] For brevity, only the results using GDP growth as a proxy for business cycle are presented. Results based on industry production growth and NBER definition as proxy for business cycle are qualitatively similar.

Overall, results in Table 2.4 suggest that both change in current assets and depreciation show a similar cyclical property of persistence as accruals, with somewhat higher depreciation effect. This finding suggests that change in current assets and depreciation drives the cyclical differential accrual persistence.

[Insert Table 2.4]

2.5.3.2 Investigating the persistence of the components for change in non-cash current assets

In this section, I further decompose change in non-cash current assets into change in accounts receivable (ΔAR), change in inventory (ΔINV), and change in other current assets (ΔOCA), and examine whether the persistence of each component varies with the business cycle.

Table 2.5 presents results of estimating equation (3) by replacing accruals with the three components of change in current assets. Due to the missing data for specific variables, the sample size varies slightly across tests. Reviewing columns (1), (2), and (3) shows that the coefficient on the interaction of both change in accounts receivable and change in inventory with GDP growth are negative and statistically significant at the .10 level. However, the coefficient on the interaction of change in other current assets with GDP growth is not statistically significant at the .10 level. These results suggest that both change in accounts receivable and change in inventory are responsible for the cyclical differential persistence of accruals.

[Insert Table 2.5]

The results for the change in accounts receivable and change in inventory are consistent with the growth argument that during periods of economic expansion, sale increases, accounts receivable increases accordingly, and firm build up inventory anticipating increase in sales.[24] However, marginal cost goes up faster than price, which leads to lower marginal profitability (Bils, 1987; Bils and Kahn, 2000). Therefore we observe that both change in accounts receivable and change in inventory are less persistent during periods of economic expansion as a result of growth effect.

Columns (4) and (5) report multivariate regression results by including the three components of change in current assets at the same time, together with the other two components of accruals (-ΔCL and –DEP), respectively. Consistent with univariate regression analysis, both column (4) and column (5) show that the persistence of change in accounts receivable is lower during economic expansions. However, multivariate regression results suggest that the persistence of inventory change does not vary with the business cycle. [25]

2.5.3.3 Investigating the persistence of components of change in inventory

The results of univariate tests in the previous subsection suggest that the persistence of change in inventory is lower during economic expansions than recessions. In this subsection I investigate the persistence of the components of change in inventory. Table 2.6 presents results for both univariate and multivariate regressions for inventory components. Due to missing data for the inventory components, the sample size decreases.

[Insert Table 2.6]

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[24] To some degree, during periods of expansion, companies' credit policy may loosen up relative to recession. This may cause accounts receivable to increase more than sales volume proportionally.

[25] As noted in Richardson et al. (2005), several of the accrual components are highly correlated and care needs to be taken in interpreting the results based on multivariate regression when accrual components are included in the regression at the same time.

Reviewing columns (1), (2), and (3) in Table 2.6 shows that the interactions of change in raw material and change in finished goods with GDP growth are both negative and statistically significant at the .01 level, suggesting that the persistence of change in raw material and change in finished goods decreases in periods of expansion . However, the coefficient on the interaction of change in work-in-process with GDP growth is not statistically significant at the .10 level.

Results in Table 2.6 for raw materials and finished goods could be explained by intuition. First, during periods of economic expansion, firms build up inventory anticipating increased sales (Bils, 1987), which leads to an increase in both raw material and finished goods. Second, during expansions, due to more pronounced diminishing marginal returns on investments, a firm's future profitability decreases in sales. Hence the more pronounced growth effect during expansions leads to lower persistence of both change in raw material and change in finished goods during expansions.

However, the impact of expansion on work-in-process subjects to two forces that offset each other. On the one hand, firms temporarily boost labor utilization (Bils and Kahn, 2000) during expansions, which may shorten the length of production and cause a decrease in work-in-process. On the other hand, increases in production will lead to an increase in work-in-process. Under the two offsetting forces, results in Table 2.6 suggest that work-in-process does not vary with the business cycle. Therefore the persistence of work-in-process does not show cyclical pattern.

Overall, by analyzing the components of accruals at different levels, I find that the change in current assets and depreciation show a similar cyclical persistence property as accruals. When change in current assets is further decomposed into change in accounts receivable, change in inventory, and change in other current assets, I find that change in accounts receivable and change in inventory are less persistent during expansions than recessions. When change in inventory is decomposed into change in raw material, change in work-in-process, and change in finished goods, it turns out that change in raw material and change in finished goods are less persistent during expansions than recessions. In summary, the subcomponents of accruals, consisting of change in accounts receivable, change in inventory (both change in raw material and change in finished goods), and depreciation, are responsible for the cyclical differential persistence of accruals.

2.5.4 Alternative explanations for the cyclical differential persistence of accruals

The empirical evidence is consistent with the argument that economic growth is responsible for the cyclical differential persistence of accruals. However, one could argue that accounting distortions may vary with the business cycle. For example, Teoh, Welch, and Wong (1998a, 1998b) and Teoh, Wong and Rao (1998) find that both IPO and SEO firms reported higher earnings through earnings management before equity issuance. Hickman (1953) and Moore (1980) document that the frequency of equity issuances increases during expansionary periods. If so, the temporal variation in accounting distortions could be an alternative explanation for the observed cyclical persistence of accruals.

To examine the alternative explanation, I follow Richardson et al. (2006) methodology to assess the impact of business cycle on the two components of the accruals, namely, the sales growth component and the efficiency component. They argue that the growth component captures the effect of diminishing returns on new investments, and the efficiency component captures the effect of accounting distortions and/or the efficiency of using invested capital. Following Richardson et al. (2006), I decompose total accruals, defined as the change in net operating assets scaled by lagged net operating assets, into sales growth (growth component), change in asset turnover (efficiency component), and their interaction. Then I introduce the interaction between business cycle and accruals, and the three accruals components (sales growth, efficiency, and their interaction) into their model. A negative coefficient on the interaction of business cycle with sales growth would suggest that the growth effect is responsible for the cyclical differential persistence of accruals even after controlling for the possible state varying accounting distortions. Therefore the interaction between business cycle and sales growth is of primary interest.

Table 2.7 reports results for all the three business cycle measures. Results in Columns (1), (3), and (5) show that the coefficient on the interaction of total accruals with the business cycle is negative, which is consistent with results reported in Table 2.3, suggesting that accruals are less persistent during expansions than recessions. Results in Columns (2), (4), and (6) show that the coefficient on the interaction between the business cycle and sales growth component (SG) is negative and statistically significant for all three business cycle measures. This finding suggests that the growth effect is the driver of cyclical differential accrual persistence even after controlling for state varying accounting distortions. The coefficient on the interaction between the business cycle and the efficiency component ($-\Delta AT$) is also negative and statistically significant for two measures of the business cycle. This finding suggests that accounting distortions may also drive the cyclical differential persistence of accruals. Moreover, this finding suggests that accounting distortions are more pronounced during economic expansions than recessions. Overall, results in Table 2.7 suggest that the growth effect prevails in explaining the cyclical differential persistence of accruals even after controlling for accounting distortions.

[Insert Table 2.7]

2.5.5 Results of Testing Hypothesis 2

2.5.5.1 Firm level return analysis

Results for estimating equation (5) at firm level are presented in Panel A of Table 2.8. Pooled OLS regression is used for estimation. Robust standard errors clustered by industry-year are employed using the procedure in Rogers (1983, 1993). Column (1) reports results where all explanatory variables are measured at raw value, and column (2) reports results where financial variables are measured using decile rankings ranging from 1 to 10. The two control variables, *LOG_MKT* and *BM*, are both loaded with expected signs and statistically significant at the .01 level. As in prior research (Fairfield et al. 2003a), *Accruals* and growth in long term net operating assets (*GRLTNOA*) have negative signs, which is consistent with the naïve investor hypothesis. The interaction of *Accruals* with *GDPgr* is of primary interest. The coefficient on this interaction term is negative and statistically significant at the .10 level for both column (1) and (2), suggesting that investors fail to understand that accruals suppress future profitability more during economic expansions than recessions.[26]

[Insert Table 2.8]

The results in Table 2.8 can be used to evaluate the economic significance of business effect on accrual anomaly. Panel A of Table 2.1 shows the standard deviation of

[26] I also replace ex post GDP growth rate in t+1 with forecasted GDP growth rate, and the results are quantitatively similar.

GDP growth is 0.02. For one standard deviation increase in GDP growth rate, the spread in returns between the high and low accrual decile increase by 3.2 percent, which accounts for nearly 29% of the average monthly hedge portfolio returns.[27]

2.5.5.2 Portfolio Return Analysis

In this subsection, monthly portfolio returns are used to test hypothesis 2. Panel A of Table 2.9 reports the average of 395 equally weighted monthly returns of ten portfolios. Portfolios are formed annually by assigning firms into deciles based on the magnitude of accruals at fiscal year end t.[28] Returns are calculated for the 12 months starting four months after the fiscal year end t. The mean of portfolio returns are nearly monotonically decreasing from the lowest accrual decile, 212 basis point (bp), to the highest accrual decile, 89 bp. The median of portfolio returns shows a similar pattern. The hedge portfolio earns about 122 bp profit on a monthly basis which is significantly greater than zero at the .01 level. These findings are consistent with Sloan (1996).

[Insert Table 2.9]

To test hypothesis 2, I use the NBER definition to divide the sample into expansionary and recessionary periods. I then compare the hedge portfolio returns to the accrual trading strategy in each of these environments.[29] Next, the Fama-French three factor model with the GDP growth rate is used to examine the impact of business cycle

[27] The 3.2 percent change in annual returns is computed as: σ (GDPgr)*coefficient on the interaction between GDPgr and decile ranked accruals * the distance in ranks from high accruals decile to low accruals decile = 0.02*0.1816*9. The 3.2 percent change in returns accounts for 29% (= 3.2/11.2) of annual abnormal returns of the hedge portfolio.

[28] 395 series of monthly returns start from October 1972 and end in August 2005.

[29] See www.nber.org/cycles.html.

on the abnormal returns from the accrual trading strategy. In the regression analysis, quarterly GDP growth rate is used as a proxy for the business cycle.

Panel B of Table 2.9 documents the average monthly holding period returns to the accrual trading strategy over the two economic environments - expansionary and recessionary periods. Low accrual firms have lower profits during recessions than expansions. However, high accrual firms have higher profits during recessions than expansions (though it only holds for the mean value of portfolio returns). Overall, the accrual trading strategy has lower average return of 28 bp during recessionary periods, compared to an average return of 137 bp during expansionary periods.

Panel C of Table 2.9 presents the payoffs to the accrual trading strategy during the two economic environments according to NBER definition. Figure 2.1 plots the hedge portfolio returns across the six expansionary periods and five recessionary periods. The pattern revealed in figure 2.1 is pretty clear. The hedge portfolio returns from the accrual trading strategy are all positive only during the expansionary periods and five of these are statistically significant. In contrast, out of the five recessionary periods, only one of these hedge portfolio returns is positive and significant, and the hedge portfolio returns for one of the recessionary periods are negative.[30] In short, the accrual-trading strategy earns higher returns during expansions than recessions, and the difference between the two economic environments is both statistically and economically significant at 109 bp (t-statistic = 2.83) per month. This suggests that the sources of profitability associated with accrual-trading strategy are related to the business cycle. It provides consistent evidence to support the argument that during expansions, accruals suppress future profitability

[30] Note that recessionary periods have shorter durations than expansionary periods. This maybe the reason behind for the lack of significance of accrual trading strategy profits during recessions.

more due to the more pronounced growth effect, but investors are unable to assess it, therefore they are more surprised by the subsequent performance of high and low accruals firms, thus the trading profit from an accrual trading strategy is higher during expansions than recessions.

It can be argued that risk factors could also vary with the business cycle. If so, the cyclical variation of the profit from the accrual trading strategy may just be the compensation for these risks. Panel A of Table 2.10 presents the regression results for equation (6) taking into consideration the Fama-French three risk factors. Several insights emerge from the table. First, column (1) shows that without including any explanatory variables, the intercept is 0.0122, which is consistent with the univariate statistic shown in Panel A of Table 2.9. Second, column (2) shows that GDP growth rate (*GDPgr*) is positively correlated with hedge portfolio returns, which is consistent with the prediction that accrual mispring is greater during expansionary periods, and corroborates the findings in Panel B of Table 2.9. Third, column (4) suggests that the business cycle affects accrual-trading strategy returns over and above other known risk factors. Four, comparing the results in column (3) with column (4), the Adjusted-R^2 has increased after including GPD growth rate in the regression. Moreover, after controlling for Fama-French three factors, the sensitivity of the hedge portfolio returns to GDP growth rate even goes up. Fifth, economic significance of business cycle effect on accrual anomaly can be assessed using the result in column (2). For one standard deviation increase in GDP growth rate, the monthly hedge portfolio returns increase by 36 bp, which accounts for nearly 30 percent of the monthly hedge portfolio returns.[31] Thus the regression

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[31] 30% is computed as: standard deviation of quarterly GDP growth rate *coefficient of GDPgr/ average monthly hedge portfolio returns = 0.0093*0.3922/0.0122.

analysis using portfolio approach is consistent with that using cross sectional approach at firm level. [32]

[Insert Table 2.10]

2.5.5.3 Sensitivity Test Controlling for Arbitrage Risk

Mashruwala et al. (2006) argue that arbitrage risk and transaction costs make it difficult for arbitrageurs to exploit the accrual-based trading strategy. They show that the accrual trading strategy profit increases in arbitrage cost proxied by idiosyncratic volatility and transaction costs. To the extent one can argue that arbitrage risk may be high in economic expansions, the cyclical profit from the accrual-based trading strategy shown in Table 2.8 may result from the inter-temporal variation in arbitrage risk rather than investors' inability to assess the cyclical persistence of accruals. Transaction costs is normally lower during expansions than recessions due to the high trading volume in expansionary periods. Therefore the inter-temporal variation in transaction costs is unlikely to be an alternative explanation for the findings in Table 2.8.

Following Mashruwala et al. (2006), I expand equation (5) by including idiosyncratic stock return volatility, its interaction with accruals and growth in long term net operating assets to explicitly control for the stock return volatility impact on the accrual anomaly, and its interaction with GDP growth rate to control for the inter-temporal variation in idiosyncratic stock return volatility. Within the inter-temporal context, idiosyncratic stock return volatility is computed as the residual variance from a standard market model regression of its returns on the returns of the CRSP equally weighted market index over the 12 months as accrual-trading strategy returns are

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[32] To the extent that ex post GDP growth rate at t+1 is not available at time t, I replace it with forecasted GDP growth rate at t for year t+1. The results are quantitatively similar to results reported in Table 2.11.

cumulated. Table 2.11 reports results with all the financial variables measured at both raw value and decile rankings, respectively. Columns (1) and (2) show that subsequent returns to accrual-based trading strategy are higher during expansionary periods even after controlling for inter-temporal variation in idiosyncratic stock return volatility. The negative sign of the interaction between idiosyncratic stock return volatility and accruals is consistent with Mashruwala et al. (2006), suggesting that subsequent returns to accrual-based trading strategy are higher in stocks with high idiosyncratic volatility.

[Insert Table 2.11]

2.6 Conclusion

In this essay I study whether the differential accrual persistence and accrual mispricing vary with the business cycle. Fairfield et al. (2003a) argue that firm growth in net operating assets together with diminishing marginal returns on new investments drives the lower persistence of accruals relative to cash flows because accruals are a component of the growth in net operating assets. Prior macroeconomics literature (e.g., Mitchell 1941; Bils and Kahn 2003; Edmond and Veldkamp 2005; and Aghion and Stein 2004) offers various explanations for counter-cyclical marginal profitability, which imply that diminishing marginal returns are more pronounced during periods of expansion than recession. Linking the two literatures, I predict the differential persistence of accruals are greater during expansions than recessions. I find evidence supporting this prediction, and the results are robust to the alternative measures of the business cycle such as GDP growth, industry production growth, NBER definition of expansions and recessions, and forecasted GDP growth rate.

Fairfield et al. (2003a) also show that investors' inability to assess growth effect on future profitability drives accrual mispricing. Given that the growth effect associated with diminishing marginal returns on new investment is more pronounced during economic expansions than recessions, I predict that accruals mispricing to be more pronounced during expansionary periods than recessionary periods. Based on both firm level and portfolio level analysis, I find that both raw and abnormal hedge portfolio returns from accrual-trading strategy are higher during expansions than recessions, and the results are robust to controlling for arbitrage risk.

In sum, my study adds to the growing literature that has begun to examine the factors affecting accrual persistence and contributing to accrual anomaly. Principally, I argue that more pronounced diminishing marginal returns on investments during periods of expansion contribute to the greater differential persistence of accruals in expansionary periods, and investors are unable to assess the temporal variation in accrual persistence. As a result, the abnormal returns from accrual trading strategy are higher during expansionary periods. In short, the state of the economy affects both accrual persistence and accrual anomaly. Overall, my study sheds light on the importance of contextual analysis of financial statement information.

Appendix 2A Variables Definition

ROA_t / ROA_{t+1}	=	income from continuing operations (Compustat Item #178) divided by average total assets (Compustat Item #6).
ΔCA	=	the change in non-cash current assets scaled by average total assets ((Compustat Item #4 – Compustat Item 1)/average total assets).
ΔCL	=	the change in current liabilities netting off short term debt and tax payable scaled by average total assets ((Compustat Item #5 – Compustat Item #34 – Compustat Item 71)/average total assets).
DEP	=	depreciation expense scaled by average total assets (Compustat Item #14/average total assets).
$Accruals_t$	=	$(\Delta CA_t - \Delta CL_t - DEP_t)$.
$Cah\ flows_t$	=	ROA_t - $Accruals_t$.
$GRNOA_t$	=	growth in net operating assets computed as annual change in net operating assets (ΔNOA_t / average total assets); Net operating assets (NOA) are computed as following: $NOA_t = AR_t + INV_t + OCA_t + PPE_t + INTANG_t + OTHERLTA_t - AP_t - OTHERCL_t - OTHERLTL_t$, where AR is accounts receivable (Compustat item #2); INV is inventories (Compustat item #3);OCA is other current assets (Compustat item #68); PPE is net property, plant, and equipment (Compustat item #8); $INTANG$ is intangibles (Compustat item #33);$OTHERLTA$ is other long-term assets (Compustat item #69); AP is accounts payable (Compustat item

#70); *OTHERCL* is other current liabilities (Compustat item #72); and *OTHERLTL* is other long-term liabilities (Compustat item #75).

$GRLTNOA_t$ = growth in long-term net operating assets computed as $GRLTNOA_t$ ($GRNOA_t$ - $Accruals_t$).

ΔAR = change in accounts receivable (Compustat Item #2).

ΔINV = change in inventory (Compustat Item # 3).

ΔOCA = change in other current assets (ΔCA - ΔAR - ΔINV).

ΔRM = change in raw material (Compustat Item # 76).

ΔWIP = change in work-in-process (Compustat Item # 77).

ΔFG = change in finished goods (Compustat Item # 78).

ACC = *growth in net operating assets divided by beginning net operating assets* (ΔNOA_t / NOA_{t-1}).

SG = $(Sale_t / Salte_{t-1})$ -1, where *Sale* is Compustat Item #12.

ΔAT = $$\left\{\left[\left(\frac{Sales_t}{NOA_t}\right)-\frac{Sales_{t-1}}{NOA_{t-1}}\right]\Big/\frac{Sales_t}{NOA_t}\right\}.$$

GDPgr = annual GDP growth rate equal to the percentage change in real gross domestic product. GDP is compiled by the U.S. Department of Commerce and includes personal consumption, government expenditures, private investment, inventory growth, and the trade balance.

IPgr = annual industry productivity growth. Similar to GDP, industrial productivity measures total real output, and compiled by the

Federal Reserve and includes total production in manufacturing, mining, gas, and electric utilities.

RECESS	=	an indicator variable based on the National Bureau of Economic Research (NBER) definition of expansions and recessions. NBER divides U.S. economy into periods of expansion and recession. Expansions are from the trough to the peak of business growth, normally business growth is visible and measured in real GDP, real income, employment, industrial production, and wholesale-retail sales, and recessions are measured from the peak to the trough. The variable takes value of 1 when any part of a recessionary period occurs within a calendar year, and 0 otherwise.
CRET	=	annual buy-and-hold returns starting to cumulate from four month after the fiscal year end.
CExRET	=	$CRET_{t+1}$ - annual risk free rate;
LOG_MKT	=	logarithm of market value at fiscal year end t. It is computed as (Compustat item #25 * Compustat item #199).
BM_t	=	book to market ratio at fiscal year end t, computed as (Compustat item #60 / (Compustat item #25 * Compustat item #199).
HedgeRet	=	return to the lowest accrual decile portfolio minus the return to the highest accrual decile portfolio for 12 months *starting four month* after the fiscal year end.
MKT	=	Fama-French excess market factor.
SMB	=	Fama-French excess size factor.

HML	=	Fama-French excess book-to-market factor.
ARBRISK	=	the residual variance from a regression of its returns on the returns of the CRSP equally weighted market index over the 12 months beginning four months after the firm's fiscal year end.

Table 2.1 Descriptive Statistics and Correlation

Panel A: Summary Statistics

Variable	N	Mean	Std. Dev.	First Quartile	Median	Third Quartile
ROA_{t+1}	105493	0.049	0.175	0.013	0.083	0.141
ROA_t	105493	0.055	0.181	0.021	0.087	0.146
$Accruals_t$	105493	-0.026	0.101	-0.077	-0.031	0.021
Cash $Flows_t$	105493	0.081	0.184	0.028	0.112	0.181
$GRNOA_t$	105493	0.074	0.174	-0.017	0.053	0.145
$GRLTNOA_t$	105493	0.101	0.141	0.027	0.068	0.136
$GDPgr_{t+1}$	105493	0.031	0.019	0.025	0.035	0.042
$IPgr_{t+1}$	105493	0.028	0.038	0.008	0.041	0.053
$EXPAN_{t+1}$	105493	0.759	0.431	1.000	1.000	1.000
$CRET_{t+1}$	105493	0.183	0.829	-0.229	0.053	0.386
ΔCA_t	105493	0.046	0.121	-0.007	0.028	0.092
ΔCL_t	105493	0.024	0.078	-0.006	0.015	0.048
DEP_t	105493	0.047	0.032	0.027	0.041	0.059
ΔAR_t	105228	0.023	0.077	-0.006	0.013	0.048
ΔINV_t	104966	0.018	0.066	-0.003	0.003	0.036
ΔOCA_t	104587	-0.008	0.051	-0.021	-0.004	0.007
ΔRM_t	64594	0.006	0.033	-0.002	0.000	0.013
ΔWIP_t	59880	0.004	0.031	-0.001	0.000	0.006
ΔFG_t	62706	0.007	0.038	-0.001	0.000	0.014

Panel B: Correlation (N = 105493)

Variable	ROA_{t+1}	ROA_t	$Accruals_t$	Cash $Flows_t$	$GRNOA_t$	$GRLTNOA_t$	$GDPgr_{t+1}$	$Ipgr_{t+1}$	$EXPAN_{t+1}$	$CRET_{t+1}$
ROA_{t+1}	1.000	0.779	0.150	0.604	0.150	0.103	0.050	0.062	-0.066	0.306
ROA_t	0.804	1.000	0.268	0.692	0.295	0.196	0.007	0.019	-0.101	0.104
$Accruals_t$	0.129	0.241	1.000	-0.399	0.623	0.041	-0.007	0.011	-0.068	-0.047
Cash $Flows_t$	0.718	0.848	-0.307	1.000	-0.166	0.129	0.014	0.011	-0.045	0.143
$GRNOA_t$	0.073	0.171	0.591	-0.153	1.000	0.727	-0.011	0.018	-0.055	-0.088
$GRLTNOA_t$	-0.001	0.040	0.018	0.029	0.817	1.000	-0.001	0.019	-0.014	-0.062
$GDPgr_{t+1}$	0.004	-0.019	-0.011	-0.013	-0.005	0.001	1.000	0.832	0.589	-0.049
$Ipgr_{t+1}$	0.008	-0.014	-0.006	-0.011	0.011	0.018	0.872	1.000	0.557	-0.096
$EXPAN_{t+1}$	-0.075	-0.094	-0.054	-0.062	-0.028	0.003	0.694	0.644	1.000	-0.031
$CRET_{t+1}$	0.127	-0.004	-0.049	0.022	-0.080	-0.064	-0.076	-0.094	-0.019	1.000

Correlations of 0.004, 0.005, 0.007 (in absolute value) are significant at the .10, .05, and .01 levels, respectively.
Variables are defined in the Appendix 2A.

Table 2.2 Replicating Farifield et al. (2003a)

$$ROA_{t+1} = \lambda_0 + \lambda_1 \, GRNOA_t + \lambda_2 \, ROA_t + v_{t+1}$$
$$\qquad\qquad (-) \qquad\qquad (+)$$

$$ROA_{t+1} = \lambda_0 + \lambda_1 \, Accruals_t + \lambda_2 \, GRLTNOA_t + \lambda_3 \, ROA_t + v_{t+1}$$
$$\qquad\qquad (-) \qquad\qquad (-) \qquad\qquad (+)$$

Variable	Predicated Sign	Parameter Estimates (t-statistics)					
		Annual Regression[a]		Pooled regression[b]		Industry-level Regression[c]	
		(1)	(2)	(3)	(4)	(5)	(6)
Intercept	?	1.4311	1.5431	1.3032	1.4189	1.3483	1.3257
		(21.59)***	(22.60)***	(44.83)***	(35.21)***	(9.27)***	(19.70)***
$GRNOA\_R_t$	-	-0.0772		-0.0837		-0.0767	
		(-16.18)***		(-25.48)***		(-4.63)***	
$Accruals\_R_t$	-		-0.0627		-0.0606		-0.0523
			(-15.38)***		(-16.52)***		(-7.05)***
$GRLNOA\_R_t$	-		-0.0398		-0.0501		-0.0331
			(-9.93)***		(-12.81)***		(-5.14)***
ROA_R_t	+	0.7689	0.7697	0.7941	0.7954	0.7543	0.7551
		(121.17)***	(120.80)***	(181.44)***	(181.50)***	(30.59)***	(35.39)***
N		3295	3295	3295	3295	1623	1623
R^2		0.57	0.57	0.57	0.57	0.61	0.61

***, **, and * Denotes significance at the 1, 5, and 10 percent levels (one-tailed test for variable with predictions), respectively.

[a] Mean parameter estimate is computed as the average of the coefficients obtained from the 32 annual regressions from 1972 and 2003. The t-statistics are based on the averages and standard deviations of the 32 parameter estimates obtained in the annual regression.

[b] t-statistic is computed using Roger's robust standard error correcting for year and industry clustering.

[c] Mean parameter estimate is computed as the average of the coefficients obtained from the 65 industry regressions based on two-digit SIC code. The t-statistics are based on the averages and standard deviations of the 65 parameter estimates obtained in the industry regression.

Variables are defined in the Appendix 2A.

Table 2.3 Regression Analysis of Cyclical Property of Accrual Persistence

Panel A: Pooled OLS regression

$$ROA_{t+1} = \lambda_0 + \lambda_1 GRNOA_t + \lambda_2 ROA_t + \lambda_3 BUSCY_{t+1} + \lambda_4 GRNOA_t * BUSCY_{t+1} + v_{t+1} \quad (1)$$
$$\qquad (-) \qquad (+) \qquad (+) \qquad (-)$$

$$ROA_{t+1} = \lambda_0 + \lambda_1 Accruals_t + \lambda_2 GRLTNOA_t + \lambda_3 ROA_t + \lambda_4 BUSCYC_{t+1} + \lambda_5 Accruals_t * BUSCYC_{t+1} \; \lambda_6 GRLTNOA_t * BUSCYC_{t+1} + v_{t+1} \quad (2)$$
$$\qquad (-) \qquad (-) \qquad (+) \qquad (-) \qquad (-) \qquad (-)$$

Variable	Predicted Sign	Parameter Estimate (t-statistic)[a]					
		BUSCYC = GDPgr		BUSCYC = IPgr		BUSCYC = EXPAN	
		(1)	(2)	(3)	(4)	(5)	(6)
Intercept		0.9968	1.0698	1.1558	1.2561	1.3331	1.4589
		(23.00)***	(21.83)***	(38.01)***	(37.90)***	(41.99)***	(41.90)***
$GRNOA\_R_t$	-	-0.0597		-0.0723		-0.0877	
		(8.06)***		(-15.14)***		(-23.61)***	
$Accruals\_R_t$	-		-0.0394		-0.0488		-0.0676
			(-5.28)***		(10.35)***		(-15.69)***
$GRLTNOA\_R_t$	-		-0.0383		-0.0473		-0.0492
			(-4.80)***		(-9.25)***		(-11.11)***
ROA_R_t	+	0.7945	0.7957	0.7942	0.7954	0.7949	0.7959
		(185.76)***	(185.86)***	(185.61)***	(185.72)***	(183.25)***	(183.92)***
$BUSCYC_{t+1}$	+	9.5165	10.8499	5.0601	5.6009	0.1552	0.2035
		(7.99)***	(7.82)***	(8.13)***	(7.82)***	(3.05)***	(3.53)***
$GRNOA\_R_t * BUSCYC_{t+1}$	-	**-0.7316**		**-0.3827**		**-0.0192**	
		(-3.56)* **		**(-3.60)*** **		**(-2.26)** **	
$Accruals\_R_t * BUSCYC_{t+1}$	-		**-0.6464**		**-0.3872**		**-0.0313**
			(-3.01)* **		**(-3.61)*** **		**(-3.70)*** **
$GRLTNOA\_R_t * BUSCYC_{t+1}$	-		-0.3609		-0.1038		0.0019
			(-1.73)*		(-0.97)		(0.21)
N		105493	105493	105493	105493	105493	105493
Adj-R^2		0.61	0.61	0.61	0.61	0.61	0.61

***, **, and * Denotes significance at the 1, 5, and 10 percent levels (one-tailed test for variable with predictions), respectively.
[a] t-statistic is computed using Roger's robust standard error clustered by industry-year. Variables are defined in the Appendix 2A.

Table 2.3 (Continued)

Panel B: Industry Regression

$$ROA_{t+1} = \lambda_0 + \lambda_1 \, GRNOA_t + \lambda_2 \, ROA_t + \lambda_3 BUSCY_{t+1} + \lambda_4 \, GRNOA_t * BUSCY_{t+1} + v_{t+1} \quad (1)$$

$$(\lambda_1: -)\quad (\lambda_2: +)\quad (\lambda_3: +)\quad (\lambda_4: -)$$

$$ROA_{t+1} = \lambda_0 + \lambda_1 \, Accruals_t + \lambda_2 \, GRLTNOA_t + \lambda_3 \, ROA_t + \lambda_4 \, BUSCYC_{t+1} + \lambda_5 Accruals_t * BUSCYC_{t+1} \; \lambda_6 GRLTNOA_t * BUSCYC_{t+1} + v_{t+1} \quad (2)$$

$$(\lambda_1: -)\quad (\lambda_2: -)\quad (\lambda_3: +)\quad (\lambda_4: -)\quad (\lambda_5: -)\quad (\lambda_6: -)$$

Variable	Predicted Sign	Mean Parameter Estimate [a] (t-statistic)					
		BUSCYC = GDPgr		BUSCYC = IPgr		BUSCYC = EXPAN	
		(1)	(2)	(3)	(4)	(5)	(6)
Intercept		1.0395	1.1001	1.1521	1.2444	1.2402	1.4737
		(18.74)***	(15.41)***	(28.26)***	(28.26)***	(28.02)***	(29.36)***
$GRNOA\_R_t$	-	-0.0547		-0.0609		-0.0795	
		(-5.52)***		(-10.20)***		(-14.33)***	
$Accruals\_R_t$	-		-0.0276		-0.0429		-0.0684
			(-2.27)**		(-7.55)***		(-11.75)***
$GRLNOA\_R_t$	-		-0.0433		-0.0402		-0.0392
			(-4.17)***		(-6.90)***		(-8.28)***
ROA_R_t	+	0.7874	0.7852	0.7868	0.7846	0.7853	0.7827
		(98.71)***	(98.77)***	(98.82)***	(98.77)***	(96.84)***	(97.07)***
$BUSCYC_{t+1}$	+	7.2874	8.8667	4.1131	4.8629	0.2703	0.3602
		(4.07)***	(3.71)***	(5.94)***	(5.77)***	(3.51)***	(3.68)***
$GRNOA\_R_t * BUSCYC_{t+1}$	-	**-0.5208**		**-0.3449**		**-0.0386**	
		(-1.80)**		**(-3.19)*****		**(-3.00)*****	
$Accruals\_R_t * BUSCYC_{t+1}$	-		**-0.9224**		**-0.4879**		**-0.0482**
			(-2.47)***		**(-3.82)*****		**(-3.41)*****
$GRLTNOA\_R_t * BUSCYC_{t+1}$	-		**0.1594**		**0.0641**		**-0.0068**
			(0.53)		**(0.51)**		**(-0.60)**
N		1757	1757	1757	1757	1757	1757
Adj-R^2		0.59	0.59	0.59	0.59	0.59	0.59

[a] Mean parameter estimate is computed as the average of the coefficients obtained from the 65 industry regressions based on two-digit SIC code. The t-statistics are based on the averages and standard deviations of the 65 parameter estimates obtained in the industry regression.
Variables are defined in the Appendix 2A.

Table 2.3 (Continued)

Panel C: Summary of Industry Level Regression Parameter Estimates Based on Model (1)[a]

INDUSTRY	INTERCEPT	ROA_R_t	$GRNOA\_R_t$	$GDPGR_{t+1}$	$GRNOA\_R_t * GDPGR_{t+1}$	N	$Adj\text{-}R^2$
AGRICULTURE	1.068	0.870	-0.095	-13.956	2.569	129	0.74
CONSTRUCTION	1.371	0.712	-0.107	-1.257	1.320	334	0.49
MANUFACTURING	1.119	0.772	-0.059	13.263	-0.932	2879	0.56
MINING	0.957	0.772	-0.027	3.842	-0.781	1354	0.57
PUBLIC	0.595	0.742	-0.069	9.552	-0.580	594	0.55
RETAIL	0.854	0.846	-0.060	9.100	-0.920	1098	0.65
SERVICES	0.972	0.792	-0.026	4.445	-0.969	1472	0.63
TRANSPORTATION	1.060	0.772	-0.054	7.316	-0.288	1299	0.58
WHOLESALE	1.121	0.780	-0.062	6.245	-0.120	2561	0.58

[a] Parameter estimate is computed as the average of two-digit SIC industry groups that fall in each industry category that is defined by U.S. Department of Labor.

Variables are defined in the Appendix 2A.

Table 2.3 (Continued)

Panel D: Summary of Industry Level Regression Parameter Estimates Based on Model (2)[a]

INDUSTRY	INTERCEPT	ROA_R_t	$Accrulas\_R_t$	$GRLTNOA_t$	$GDPGR_{t+1}$	$Accruals\_R_t$ * $GDPGR_{t+1}$	$GRLTNOA_t$ * $GDPGR_{t+1}$	N	Adj-R^2
AGRICULTURE	1.479	0.850	-0.162	0.005	-25.267	4.577	0.076	129	0.75
CONSTRUCTION	1.499	0.703	-0.046	-0.086	-2.894	0.118	1.824	334	0.49
MANUFACTURING	1.127	0.772	-0.015	-0.050	16.018	-1.395	0.151	2879	0.56
MINING	1.013	0.764	0.012	-0.043	4.160	-1.433	0.423	1354	0.57
PUBLIC	0.759	0.742	-0.080	-0.020	8.743	0.539	-1.045	594	0.55
RETAIL	0.986	0.846	-0.065	-0.030	10.253	-0.396	-0.559	1098	0.65
SERVICES	0.962	0.790	-0.005	-0.017	8.260	-1.703	-0.362	1472	0.64
TRANSPORTATION	1.125	0.776	-0.018	-0.071	10.155	-1.578	0.893	1299	0.58
WHOLESALE	1.130	0.775	0.004	-0.087	8.311	-0.906	0.753	2561	0.58

[a] Parameter estimate is computed as the average of two-digit SIC industry groups that fall in each industry category that is defined by U.S. Department of Labor.

Variables are defined in the Appendix 2A.

Table 2.4 Regression Analysis of Persistence of Accrual Components

Variable	Predicted Sign	Parameter Estimate (t-statistic)[a]			
		(1)	(2)	(3)	(4)
Intercept		0.9769	0.8787	0.8687	0.8207
		(21.34)***	(20.33)***	(16.78)***	(13.91)***
$GDPgr_{t+1}$	+	9.8649	8.6631	6.3116	0.0185
		(7.80)***	(7.25)***	(4.77)***	(2.13)**
ROA_R_t	+	0.7889	0.7781	0.7837	0.7927
		(177.20)***	(166.89)***	(178.43)***	(180.50)***
$GRLTNOA\_R_t$	-	-0.0321	-0.0443	-0.0421	-0.0462
		(-3.99)***	(-5.59)***	(-5.65)***	(-6.18)***
$GRLTNOA\_R_t *GDPgr_{t+1}$	-	-0.2445	-0.3461	-0.6204	-0.4748
		(-1.16)	(-1.65)*	(-3..09)***	(-2.37)***
ΔCA_R_t	-	-0.0182			-0.0409
		(-2.44)***			(-5.35)***
$\Delta CA\_R_t*GDPgr_{t+1}$	**-**	**-0.5416**			**-0.5389**
		(-2.63)***			**(-2.49)*****
-ΔCL_Rt	-		-0.0269		-0.0486
			(-4.35)***		(-8.10)***
$-\Delta CL\_R_t * GDPgr_{t+1}$	**-**		**0.1769**		**-0.2052**
			(1.06)		**(-1.24)**
$-DEP\_R_t$	-			-0.0201	-0.0185
				(-2.35)**	(-2.13)**
$-DEP\_R_t * GDPgr_{t+1}$	**-**			**-0.6546**	**-0.5892**
				(-2.66)***	**(-2.39)*****
N		105493	105493	105493	105493
Adj-R^2		0.61	0.61	0.61	0.61

***, **, and * Denotes significance at the 1, 5, and 10 percent levels (one-tailed test for variable with predictions), respectively.
[a] t-statistic is computed using Roger's robust standard error clustered by industry-year.
Variables are defined in the Appendix 2A.

Table 2.5 Analysis of Persistence of the Components of Change in Current Assets

Variable	Predicted Sign	Parameter Estimate (t-statistic)[a] (1)	(2)	(3)	(4)	(5)
Intercept		0.9152	1.0191	1.1368	1.1813	1.0111
		(20.32)***	(22.56)***	(20.43)***	(19.06)***	(13.42)***
$GDPgr_{t+1}$	+	9.6567	8.9707	8.8268	11.4851	9.2613
		(7.72)***	(7.33)***	(6.41)***	(6.93)***	(4.74)***
ROA_R_t	+	0.7801	0.7875	0.7776	0.7862	0.7885
		(169.86)***	(179.73)***	(167.51)***	(173.19)***	(178.31)***
$GRLTNOA\_R_t$	-	-0.0391	-0.0324	-0.0411	-0.0381	-0.0471
		(-4.69)***	(-3.94)***	(-5.25)***	(-4.66)***	(-6.11)***
$GRLTNOA\_R_t$ *$GDPgr_{t+1}$	-	-0.3062	-0.3184	-0.4301	-0.2869	-0.5129
		(-1.48)*	(-1.49)*	(-2.10)**	(-1.34)*	(-2.49)***
ΔAR_R_t	-	0.0115			0.0108	0.0058
		(1.58)*			(1.51)	(0.83)
ΔAR_R_t*$GDPgr_{t+1}$	**-**	**-0.4294**			**-0.4189**	**-0.3744**
		(-2.21)**			**(-2.20)****	**(-1.99)****
ΔINV_Rt	-		-0.0247		-0.0314	-0.0329
			(-3.47)***		(-4.81)***	(-4.82)***
ΔINV_R_t * $GDPgr_{t+1}$	**-**		**-0.3184**		**-0.2052**	**-0.1481**
			(-1.73)**		**(-1.26)**	**(-0.78)**
ΔOCA_R_t	-			-0.0329	-0.0331	-0.0236
				(-5.91)***	(-6.13)***	(-4.22)***
ΔOCA_R_t * $GDPgr_{t+1}$	**-**			**0.0211**	**0.0176**	**0.0406**
				(0.12)	**(0.10)**	**(0.24)**
–ΔCL_Rt	-					-0.0224
						(-3.49)***
$-\Delta CL\_R_t$ * $GDPgr_{t+1}$	**-**					**-0.0139**
						(-0.08)
$-DEP\_R_t$	-					-0.0182
						(-2.12)**
$-DEP\_R_t$ * $GDPgr_{t+1}$	**-**					**-0.6114**
						(-2.50)***
N		105228	104966	104704	104704	104704
Adj-R^2		0.61	0.61	0.61	0.61	0.61

***, **, and * Denotes significance at the 1, 5, and 10 percent levels (one-tailed test for variable with predictions), respectively.
[a] t-statistic is computed using Roger's robust standard error clustered by industry-year. Variables are defined in the Appendix 2A.

Table 2.6 Analysis of Persistence of Inventory Components

Variable	Predicted Sign	Parameter Estimate (t-statistic)				
		(1)	(2)	(3)	(4)	(5)
Intercept		0.9523	0.9569	1.0088	1.0231	1.0291
		(18.04)***	(17.76)***	(19.51)***	(15.82)***	(10.58)***
$GDPgr_{t+1}$	+	11.1086	7.4601	10.3971	10.6246	9.4304
		(8.00)***	(5.22)***	(7.56)***	(6.21)***	(3.79)***
ROA_R_t	+	0.7827	0.7762	0.7831	0.7832	0.7836
		(142.86)***	(136.10)***	(140.67)***	(139.60)***	(136.60)***
$GRLTNOA\_R_t$	-	-0.0483	-0.0458	-0.0428	-0.0447	-0.0618
		(-5.40)***	(-4.66)***	(-4.59)***	(-4.50)***	(-7.00)***
$GRLTNOA\_R_t *GDPgr_{t+1}$	-	-0.0575	-0.2689	-0.1968	-0.0051	-0.2529
		(-0.24)	(-1.03)	(-0.80)	(-0.02)	(-1.03)
ΔRM_R_t	-	-0.0066			-0.0043	-0.0101
		(-0.78)			(-0.53)	(-1.23)
$\Delta RM\_R_t*GDPgr_{t+1}$	**-**	**-0.7719**			**-0.7582**	**-0.6481**
		(-3.53)* **			**(-3.58)*** **	**(-3.01)*** **
ΔWIP_Rt	-		-0.0029		-0.0008	-0.0076
			(-0.42)***		(-0.14)	(-1.13)
$\Delta WIP\_R_t * GDPgr_{t+1}$	**-**		**0.0785**		**0.3487**	**0.4105**
			(0.39)		**(1.83)**	**(2.08)**
ΔFG_R_t	-			-0.0222	-0.0196	-0.0217
				(-3.45)***	(-2.95)***	(-3.16)***
$\Delta FG\_R_t * GDPgr_{t+1}$	**-**			**-0.6039**	**-0.4778**	**-0.3891**
				(-3.50)* **	**(-2.67)*** **	**(-2.10)** **
ΔAR_R_t	-					0.0184
						(2.14)**
$\Delta AR\_R_t * GDPgr_{t+1}$	-					**-0.5438**
						(-2.29) **
ΔOCA_R_t	-					-0.0286
						(-3.74)***
$\Delta OCA\_R_t * GDPgr_{t+1}$	-					**-0.1455**
						(-0.72)
–ΔCL_Rt	-					-0.0166
						(-1.73)*
$-\Delta CL\_R_t * GDPgr_{t+1}$	**-**					**-0.2091**
						(-0.80)
$-DEPR\_R_t$	-					-0.7984
						(-2.75)***
$-DEPR\_R_t * GDPgr_{t+1}$	**-**					**-0.7984**
						(-2.75)* **
N		64594	59880	62706	59127	58981
R^2		0.62	0.61	0.61	0.61	0.61

***, **, and * Denotes significance at the 1, 5, and 10 percent levels (one-tailed test for variable with predictions), respectively.

[a] t-statistic is computed using Roger's robust standard error clustered by industry-year.
Variables are defined in the Appendix 2A.

Table 2.7 Sensitivity Test on Alternative Explanation

Variable	Predicted Sign	Parameter Estimate (t-statistic)					
		BUSCYC = GDPgr		BUSCYC = IPgr		BUSCYC = EXPAN	
		(1)	(2)	(3)	(4)	(5)	(6)
Intercept		1.5513	1.8896	1.6836	2.0875	1.8678	2.3087
		(32.99)***	(30.99)***	(50.54)***	(48.34)***	(62.57)***	(62.78)***
$BUSCYC_{t+1}$	+	8.8388	11.8409	5.2625	6.4015	0.1724	0.2205
		(6.78)***	(6.89)***	(8.07)***	(7.19)***	(3.29)***	(3.12)***
$RNOA\_R_t$	+	0.7616	0.7537	0.7613	0.7536	0.7624	0.7549
		(162.77)***	(165.82)***	(161.79)***	(164.38)***	(165.49)***	(167.49)***
ACC_R_t	-	-0.1472		-0.1542		-0.1669	
		(-16.04)***		(-25.32)***		(-37.02)***	
$ACC\_R_t * BUSCYC_{t+1}$	-	-0.5235		-0.3478		-0.0131	
		(-2.10)**		(-2.58)***		(-1.14)	
SG_R_t	-		-0.0621		-0.0803		-0.0961
			(-6.73)***		(-13.51)***		(-22.97)***
$SG\_R_t * BUSCYC_{t+1}$	**-**		**-0.8928**		**-0.3715**		**-0.0259**
			(-3.63)* **		**(-2.93)*** **		**(-2.31)** **
$-\Delta AT\_R_t$	-		-0.1605		-0.1695		-0.1797
			(-20.77)***		(-32.79)***		(-42.43)***
$-\Delta AT\_R_t * BUSCYC_{t+1}$	**-**		**-0.6044**		**-0.3569**		**-0.0072**
			(-2.91)* **		**(-3.71)*** **		**(-0.74)**
$SG\_R_t * (-\Delta AT\_R_t)$	**-**		0.0047		0.0131		0.0208
			(0.73)		(3.16)***		(5.08)***
$SG\_R_t * (-\Delta AT\_R_t) * BUSCYC$	?		0.4412		0.1821		0.0158
			(2.32)**		(1.98)**		(1.92)*
N		102241	102241	102241	102241	102241	102241
Adj-R^2		0.51	0.51	0.51	0.51	0.51	0.51

***, **, and * Denotes significance at the 1, 5, and 10 percent levels (one-tailed test for variable with predictions), respectively.
[a] t-statistic is computed using Roger's robust standard error clustered by industry-year.
Variables are defined in the Appendix 2A.

Table 2.8 The Impact of Business Cycle on Stock Returns-Firm Level Analysis

$$CExRet_{t+1} = \delta_0 + \underset{(-)}{\delta_1 Accruals_t} + \underset{(-)}{\delta_2 GRLTNOA_t} + \underset{(+)}{\delta_3 ROA_t} + \underset{(-)}{\delta_4 GDPgr_{t+1}} + \underset{(-)}{\delta_5 Accruals_t * GDPgr_{t+1}}$$

$$+ \underset{(-)}{\delta_6 GRLTNOA_t * GDPgr_{t+1}} + \underset{(-)}{\delta_7 LOG\_MKT_{t+1}} + \underset{(+)}{\delta_8 BM_{t+1}} + \varepsilon_{t+1} \quad (3)$$

Variable	Predicted Value	Parameter Estimates (t-statistic)[a] Raw value	Decile Ranked
Intercept	?	0.2596	0.3276
		(28.29)***	(6.42)***
$Accruals_t$	-	-0.2305	-0.0467
		(-1.78)*	(-2.56)***
$GRLTNOA_t$	-	-0.5343	-0.0264
		(-5.76)***	(-5.24)***
ROA_t	+	0.0382	0.0072
		(0.37)	(1.51)
$GDPgr_{t+1}$	-	-3.6651	-3.2311
		(-6.46)***	(-3.26)***
$Accruals_t$ * $GDPgr_{t+1}$	-	-6.6426	-0.1816
		(-1.91)*	(-1.69)*
GRLTNOAt* $GDPgr_{t+1}$	-	7.5928	0.2855
		(2.97)***	(2.68)***
LOG_MKT_t	-	-0.0085	-0.0144
		(-4.17)***	(-4.78)***
BM_t	+	0.0677	0.0711
		(7.29)***	(6.24)***
N		102179	102179
Adj-R^2		0.02	0.02

***, **, and * Denotes significance at the 1, 5, and 10 percent levels (one-tailed test for variable with predictions), respectively.

[a] t-statistic is computed using Roger's robust standard error clustered by industry-year.

Variables are defined in the Appendix 2A.

Table 2.9 Analysis of the Impact of Business Cycle on Hedge Portfolio Returns

Panel A: Summary Statistics of Monthly Portfolio Returns

Accrual Decile	N	Equally Weighted Monthly Return Mean	Median
Low	395	0.0212	0.0244
2	395	0.0173	0.0175
3	395	0.0162	0.0167
4	395	0.0156	0.0178
5	395	0.0146	0.0155
6	395	0.0139	0.0154
7	395	0.0134	0.0137
8	395	0.0137	0.0163
9	395	0.0108	0.0130
High	395	0.0089	0.0113
Low - High	395	**0.0122**	
		(9.16)* **	

Panel B: Hedge Portfolio Returns Classified based on NEBR definition of Business Cycle

		Low	High	Low- High	% >0
RECESSION	Mean	0.0159	0.0131	0.0028	0.59
	Median	-0.0049	0.0023	0.0019	(0.00)
EXPANSION	Mean	0.0221	0.0083	0.0137	0.73
	Median	0.0254	0.0113	0.0129	(0.00)

Panel C: Hedge Portfolio Returns over the Specific Periods during the Business Cycle

Expansion	Low	High	Low - High	Recession	Low	High	Low - High
12/70-11/73	-0.0136	-0.0473	0.0336	12/73-03/75	0.0204	0.0053	0.0151
			(2.38)**				(2.73)**
04/75-01/80	0.0337	0.0234	0.0103	02/80-07/80	0.0144	0.0138	0.0004
			(3.43)***				(0.03)
08/80-07/81	0.0367	0.0328	0.0039	08/81-11/82	0.0024	0.0091	-0.0067
			(0.42)				(-1.14)
12/82-07/90	0.0117	0.0018	0.0098	08/90-03/91	0.0207	0.0195	0.0012
			(4.18)***				(0.12)
4/91-03/01	0.0243	0.0054	0.0189	04/01-11/01	0.0303	0.0293	0.0009
			(8.69)***				(0.10)
12/01-12/05	0.0291	0.0202	0.0088				
			(2.21)**				

***, **, and * Denotes significance at the 1, 5, and 10 percent levels (one-tailed test for variable with predictions), respectively.
Recessions and expansions are determined by the NBER (www.nber.org/clcles.html).
Variables are defined in the Appendix 2A.

Table 2.10 Regression Analysis on Hedge Portfolio Returns

$$HedgeRet_{t+1} = \alpha + \delta_1 \, GDPgr_{t+1} + \delta_2 \, MKT_{t+1} + \delta_3 \, SMB_{t+1} + \delta_4 \, HML_{t+1} + \varepsilon_{t+1} \qquad (4)$$

Variables	Predicted Sign	Parameter Estimates (t-statistic)			
		(1)	(2)	(3)	(4)
Intercept	?	0.0122	0.0053	0.0115	0.0041
		(9.18)***	(1.88)*	(8.35)***	(1.46)
$GDPgr_{t+1}$	**-**		**0.3922**		**0.4092**
			(2.76)***		**(2.92)*****
MKT_{t+1}	+			-0.0166	-0.0093
				(-0.52)	(-0.29)
SMB_{t+1}	+			-0.0329	-0.0335
				(-0.79)	(-0.81)
HML_{t+1}	+			0.1401	0.1494
				(2.89)***	(3.11)***
N		395	395	395	395
Adj-R^2		0.000	0.016	0.029	0.049

***, **, and * Denotes significance at the 1, 5, and 10 percent levels (one-tailed test for variable with predictions), respectively.

Variables are defined in the Appendix 2A.

Table 2.11 Sensitivity Test on Firm Level Analysis

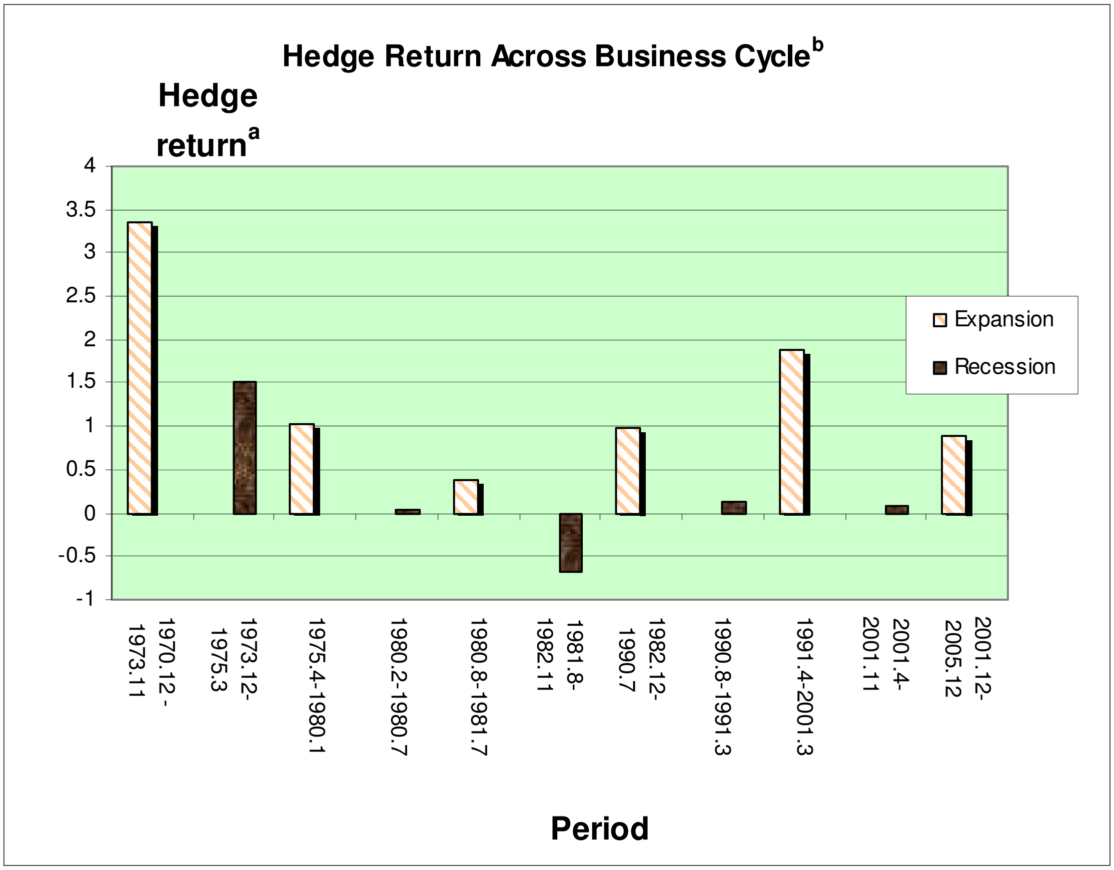
$$CEx\,\mathrm{Re}\,t_{t+1} = \delta_0 + \delta_1 Accruals_t + \delta_2 GRLTNOA_t + \delta_3 ROA_t + \delta_4 GDPgr_{t+1} + \delta_5 Accruals_t * GDPgr_{t+1}$$
$$(-) \quad (-) \quad (+) \quad (-) \quad (-)$$
$$+ \delta_6 GRLTNOA_t * GDPgr_{t+1} + \delta_7 ARBRISK_{t+1}^{dec} + \delta_8 ARBRISK_{t+1}^{dec} * Accruals_t$$
$$(-) \quad (?) \quad (-)$$
$$+ \delta_9 ARBRISK_{t+1}^{dec} * GRLTNOA_t + \delta_{10} ARBRISK_{t+1}^{dec} * GDPgr_{t+1} + \delta_{11} LOG\_MKT_{t+1} + \delta_{12} BM_{t+1} + \varepsilon_{t+1}$$
$$(-) \quad (?) \quad (-) \quad (+)$$

Variable	Predicted Value	Parameter Estimates (t-statistic)[a]	
		Raw value	Decile Ranked
Intercept	?	0.0608	-0.0026
		(5.80)***	(-0.08)
$Accruals_t$	-	0.0387	0.0003
		(0.50)	(0.07)
$GRLTNOA_t$	-	-0.0856	0.0012
		(-1.57)	(0.25)
ROA_t	+	0.1939	0.0151
		(7.54)***	(4.50)***
$GDPgr_{t+1}$	-	-1.8217	-0.8418
		(-8.82)***	(-1.16)
$Accruals_t$ * $GDPgr_{t+1}$	-	-8.1617	-0.2531
		(-4.74)***	(-2.24)**
$GRLTNOAt$* $GDPgr_{t+1}$	-	6.4577	0.1975
		(5.70)***	(1.76)*
$ARBRISK^{dec}$	?	0.0509	0.0737
		(20.30)***	(8.21)***
$Accruals_t$ * $ARBRISK^{dec}$	-	-0.0541	-0.0021
		(-4.26)***	(-2.82)***
$GRLTNOA_t$ * $ARBRISK^{dec}$	-	-0.0898	-0.0051
		(-10.97)***	(-5.77)***
$ARBRISK^{dec}$ * $GDPgr_{t+1}$	?	-0.4333	-0.4063
		(-7.13)***	(-1.75)*
LOG_MKT_t	-	-0.0097	-0.0111
		(-7.76)***	(-1.94)*
BM_t	+	0.0011	0.0011
		(3.15)***	(2.80)***
N		102179	102179
Adj-R^2		0.03	0.03

***, **, and * Denotes significance at the 1, 5, and 10 percent levels (one-tailed test for variable with predictions), respectively.

Variables are defined in the Appendix 2A.

Figure 2.1



[a] Hedge returns are calculated by forming the low and high decile portfolios as described in Panel A of Table 2.8.

[b] Business cycle are classified as expansionary and recessionary periods determined by the NBER (www.nber.org/cycles.html)

Chapter 3

Can cyclical property of accrual persistence explain the accrual anomaly?

3.1 Introduction

Accrual anomaly as documented by Sloan (1996) challenges existing asset pricing theory that views cross-sectional difference in expected returns as compensation for risk differences.[33] Sloan (1996) shows that high (low) accruals firms earn negative (positive) abnormal returns and that such cross-sectional differences in returns to high and low accruals firms cannot be explained by the differences in risk as measured by a variety of variables used in prior research to capture risk. The implication is that investors naively fixate on earnings and they fail to understand the differential persistence of accruals vis-à-vis cash flows.[34]

In this study I draw upon consumption-based asset pricing theory to explain the accrual anomaly. Lucas (1978) and Breeden (1979) argue that the risk premium on an asset is determined by ability of the asset to insure against consumption fluctuations. If investors care about consumption and are risk averse, they value an asset more (requiring lower expected returns) if such asset provides higher payoff during economic recessions. In contrast, they value an asset less (requiring higher expected returns) if such asset provides lower payoff during economic recessions. Therefore, the correlation between an

[33] Several other studies (e.g., Bradshaw et al. 2001; Collins and Hribar 2003; Fairfield et al. 2003; and Xie 2001) provide evidence consistent with stock market mispricing accruals.

[34] That is, investors tend to overweight (underweight) accruals (cash flows) when forming future earnings expectations and are subsequently surprised when accruals (cash flows) turn out, in the future, to be less (more) persistent than expected.

asset's payoff and business cycle (economic expansions and recessions) is priced to reflect the asset's underlying consumption risk.[35] Stated differently, the payoff pattern associated with the differential consumption risk determines cross-sectional expected returns.

In the context of accruals, given accrual persistence (the ability of using the accruals to predict one-year-ahead earnings) is lower during periods of economic expansion than recession, which is documented in the first essay, a firm's one-year-ahead earnings forecasted from the accruals should also vary with business cycle. In other words, high (low) accruals predict higher (lower) future earnings during recessions than expansions. Thus, firms with high (low) accruals provide investors with counter-cyclical (pro-cyclical) payoff and low (high) consumption risk. Based on consumption-based asset pricing theory, investors require lower (higher) expected returns for high (low) accruals firms as a result of differential consumption risk. If asset pricing models of expected returns used in prior research to study the accrual anomaly do not capture consumption risk, even though this risk is priced by investors, then measures of abnormal returns based on the existing models will, on average, be systematically associated with consumption risk. In other words, rational investor responses to consumption risk can potentially offer an explanation for the observed statistically significant abnormal returns to the accrual-trading strategy.

Given the empirical regularity of cyclical accrual persistence, this paper sheds light on two elements of the consumption-based explanation for accruals anomaly. First, I

[35] Specifically, an asset with counter-cyclical payoff is valued more because of low consumption risk. Therefore, investors require lower expected returns. In contrast, when an asset exhibits pro-cyclical payoff, it is valued less because of high consumption risk. Therefore, investors require higher expected returns for such an asset.

examine whether the correlation between stock returns and business cycle (proxied by pricing kernel) is positively associated with accruals.[36] Given that under consumption-based asset pricing model, consumption risk is inversely related to the covariance between asset returns and pricing kernel, I find the assets' consumption risk is decreasing in accruals. Additional analysis indicates that 11 percent of the accrual-trading strategy returns in my sample is compensation for consumption risk controlling for other known risk factors.

Second, I test whether the hedge portfolio returns are correlated with business cycle (proxied by pricing kernel). I find a negative relation between pricing kernel and hedge portfolio returns. This result suggests that accrual-based trading strategy is not risk-free, and its positive returns are a compensation for consumption risk.

This paper contributes to the existing literature on accruals anomaly in three ways. First, based on the cyclical property of accrual persistence and consumption asset pricing theory, I provide a rational explanation for the accrual anomaly. I find the abnormal returns from accrual-trading strategy are a compensation for the consumption risk arising from cyclical persistence of accruals. Empirically, I show that the cyclical property of accrual persistence can partially explain the abnormal returns from the accrual-based trading strategy.

Second, this study sheds light on the conjecture of Fairfield et al. (2003b) that market accrual anomaly may be due to investors' inability to extrapolate growth rates or to consider the effects of diminishing marginal returns on new investments. In this paper, I show that investors consider the growth rate and diminishing marginal returns on

[36] Pricing kernel is the rate at which an investor is willing to substitute consumption at time t+1 for consumption at time t, which captures investors sentiment about economy.

investments and understand their implication on asset pricing. In other words, abnormal returns from accruals-based trading strategy reflect compensation for risk arising from the cyclical persistence of accruals, which results from variation in diminishing marginal returns across the business cycle.

Third, this paper also complements the findings of Essay I that accrual anomaly is more pronounced during economic expansions. From consumption asset pricing point of view, the pro-cyclical payoff from accrual-based trading strategy is a compensation for investors for bearing additional consumption risk.

The organization of this paper is as follows. Next section develops testable hypotheses. Section 3 discusses sample selection and research designs. Section 4 presents the empirical results. Section 5 concludes the paper.

3.2 Hypotheses Development

3.2.1 Development of Hypothesis 1

Drawing on consumption-based asset pricing theory, I examine whether the state-varying feature of accrual persistence can explain accrual anomaly. As shown in equation (A10) of Appendix 3A, the expected return of an asset equals the risk free rate plus risk correction under consumption-based asset pricing theory.

$$E_t(R_{t+1}^i) = R_{t+1}^f - R_{t+1}^f \ \operatorname{cov}(m_{t+1}, R_{t+1}^i) \quad (1)$$

where R_{t+1}^i is the gross return for asset i during t+1; m_{t+1} is the pricing kernel (intertemporal marginal rate of substitution) at t+1; R_{t+1}^f is risk-free rate at time t+1; and $E_t(\cdot)$ denotes the expectation at time t. Equation (1) suggests that the covariance between pricing kernel and assets payoff determines the expected return of an asset.

In the context of accruals, Essay I documents that accruals are less persistent during periods of expansions than recessions. If accruals persistence is counter-cyclical, then a stock with high current accruals is expected to have higher future payoff during recessions (low consumption) than expansions (high consumption). Therefore the payoff of holding such asset covaries negatively with consumption and positively with pricing kernel (m), providing a good hedge to investors against the volatility of the state of the economy. As a result, investors require lower expected return on such stock. In contrast, investors require higher expected return for holding a stock with low current accruals, because it adds more risk to investors who care about consumption.[37]

Appendix 3B formally incorporates the cyclical property of accrual persistence into consumption-based asset pricing model and derives the accrual persistence model. Specifically, equation (B10) of Appendix 3B depicts the relation between accruals and the consumption risk factor as follows:

$$\text{cov}(m_{t+1}, R_{t+1}) = \phi \,\text{cov}(m_{t+1}, \gamma_{1,t+1}) Accruals_t + \Omega \qquad (2)$$

where $\gamma_{1,t+1}$ is the coefficient on accruals in the earnings forecasting model.[38] Ω is equal to

$$\phi \,\text{cov}(m_{t+1}, \gamma_{2,t+1}) GRLTNOA_t + \phi \,\text{cov}(m_{t+1}, \gamma_{3,t+1}) ROA_t + \phi \,\text{cov}(m_{t+1}, e_{t+1}) + \text{cov}(m_{t+1}, v_{t+1}),$$

$\gamma_{2,t+1}$ and $\gamma_{3,t+1}$ are the coefficients on growth in long term net operating assets

[37] A stock with low accruals tends to have lower future payoff during recessions than expansions, therefore the payoff of holding such asset covaries positively with consumption and negatively with the pricing kernel (m).

[38] Earnings forecasting model is $ROA_{t+1} = \gamma_0 + \gamma_{1,t+1} Accruals_t + \gamma_{2,t+1} GRLTNOA_t + \gamma_{3,t+1} ROA_t + e_{t+1}$, where GRLTNOA is growth in long-term net operating assets.

($GRLTNOA$), and ROA in the earnings forecasting model, and e_{t+1} is the error term in the earnings forecasting model, respectively.

Assuming the terms in Ω are not systematically related to the covariance between pricing kernel and returns, equation (2) suggests the covariance between pricing kernel and returns depends on $\text{cov}(m_{t+1}, \gamma_{1,t+1})$ and accruals.[39] Given the cyclical property of accrual persistence, the covariance between m_{t+1} and $\gamma_{1,t+1}$ should be positive. Therefore, the covariance of pricing kernel with returns should be positively correlated with accruals. Recall in equation (1), assets' expected return decreases in the covariance between pricing kernel and assets' return (covariance term). This is, the negative value of the covariance term represents consumption risk. The positive relation between the covariance term and accruals suggests that accruals are negatively associated with assets' consumption risk. This reasoning leads to hypothesis 1:

H1: The covariance between pricing kernel and returns is positively correlated with accruals.

3.2.2 Development of hypothesis 2

Equation (B11) of Appendix 3B shows:

$$\text{cov}(m_{t+1}, Hedge\text{Re}t_{t+1}) = \phi\,\text{cov}(m_{t+1}, \gamma_{1,t+1})(Accruals_t^- - Accruals_t^+) \quad (3)$$

where $Hedge\,\text{Re}t_{t+1}$ denotes returns from hedge portfolio formed based on accruals for period t+1, and $Accruals_t^+$ ($Accruals_t^-$) denotes the average accruals at the end of t for firms in the highest (lowest) accruals decile.

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[39] To the extent that this assumption may not hold as it can be argued that $\phi\,\text{cov}(m_{t+1}, \gamma_{2,t+1})GRLTNOA_t$ may be correlated with the covariance of pricing kernel with returns since Fairfield et al. (2003a) suggests that growth in long term net operating assets behave in a similar way as accruals, I control for this variable in the empirical tests.

Given the cyclical property of accrual persistence, the covariance between m_{t+1} and $\gamma_{1,t+1}$ should be positive, the difference in accruals between lower accrual portfolio and high accrual portfolio is negative, and earnings response coefficient, ϕ, is positive. Therefore Equation (3) suggests the covariance between pricing kernel and hedge portfolio returns is negative. Based on consumption asset pricing model in equation (1), this indicates that hedge portfolio formed based on accruals has a risk greater than the risk free rate. This reasoning leads to hypothesis 2:

H2: Pricing kernel (m) prices the accrual-trading strategy.

3.3 Sample and Research Design

3.3.1 Sample

Firm financial statement data are obtained from annual COMPUSTAT file and stock returns data are obtained from monthly CRSP files for the period 1972-2003 based on COMPUSTAT year.[40] Firm-year observations from the financial sector (SIC 6000-6999) are excluded because the financial statement data required to compute operating accruals are not available for these companies. Closed-end funds, investment trusts, units, and foreign companies are also excluded from the sample. Firm-year observations are eliminated with insufficient data on Compustat to compute the primary financial statement variables (ROA, accruals, growth in long-term net operating assets) and with missing returns from CRSP.[41] Furthermore, financial variables (e.g., ROA, accruals,

[40] Similar to Desai et al. (2004), the empirical analysis begins in 1972 because prior to 1971, fewer than 500 firms with the required data are available. The data in 1971 are dropped because accruals are computed using two years data.

[41] Specifically, Compustat items 1, 4, 5, 6, 12, and 181 in both the current and previous year and data item 178 in the current year in order to keep a firm-year observation in the sample. If data items 9, 32 or 34 are

growth in long-term net operating assets) are truncated at 1% in each tail of the distribution for each year. All financial variables are ranked into deciles across all sample years and the ranked variables take value from 1 to 10.[42] Final sample has 105,493 firm-year observations covering 65 two-digit industry groups over 32 year period from 1972 to 2003.

3.3.2 Test of Hypothesis 1 – Cross Sectional Analysis

To examine whether the covariance between pricing kernel and returns is positively correlated with accruals, the following equation is estimated using cross sectional analysis:

$$\begin{aligned} CEx\text{Re}t_{t+1} = \delta_0 &+ \underset{(-)}{\delta_1 Accruals_t} + \underset{(-)}{\delta_2 GRLTNOA_t} + \underset{(+)}{\delta_3 ROA_t} + \underset{(-)}{\delta_4 m_{t+1}} + \underset{(+)}{\delta_5 Accruals_t * m_{t+1}} \\ &+ \underset{(+)}{\delta_6 GRLTNOA_t * m_{t+1}} + \underset{(-)}{\delta_7 LOG\_MKT_t} + \underset{(+)}{\delta_8 BM_t} + \varepsilon_{t+1} \end{aligned} \quad (4)$$

where *CExRet* is the firm annual buy-and-holding returns in excess of annual risk-free rate, and annual buy-and-holding returns cumulate four month after the fiscal year end. Accruals are computed as:

$$Accruals_t = (\Delta CA_t - \Delta Cash_t) - (\Delta CL_t - \Delta STD_t - \Delta TP_t) - Dep_t \quad (5)$$

where ΔCA is the change in current assets (Compustat Item #4); $\Delta Cash$ is the change in cash/cash equivalent (Compustat Item #1); ΔCL is the change in current liabilities (Compustat Item #5); ΔSTD is the change in short term debt (Compustat Item #34), ΔTP is the change in tax payable (Compustat Item #71), and *Dep* is depreciation expense

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missing,, then they are set equal to zero rather than eliminating the observation. These data items represent balance sheet items that may not be relevant for some companies (e.g., investments and advances), so they are set to zero rather than needlessly discarded. All results are qualitatively similar if instead each regression is estimated using only observations with all data available for that particular regression.

[42] Ranking financial variables into deciles across all sample years rather than ranking them annually will make the value of ranked variables comparable across different years and facilitate empirical tests because measuring business cycle and testing its impact on the accrual persistence involve time-series comparison. Using raw values of financial variables yields qualitatively similar results. The ranked results, however, have lower standard error.

(Compustat Item #14). To standardize the accruals measure, the accruals are deflated by average total assets.

Growth in long-term net operating assets (*GRLTNOA*) is defined as growth in net operating assets other than accruals:

$$GRLTNOA_t = GRNOA_t - Accruals_t \tag{6}$$

where *GRNOA* is growth in net operating assets computed as annual change in net operating assets divided by average total assets. Net operating assets (*NOA*) are computed as follows:

$$NOA_t = AR_t + INV_t + OTHERCA_t + PPE_t + INTANG_t + OTHERLTA_t - AP_t - OTHERCL_t - OTHERLTL_t \tag{7}$$

where *AR* is accounts receivable (Compustat item #2); *INV* is inventories (Compustat item #3);*OTHERCA* is other current assets (Compustat item #68); *PPE* is net property, plant, and equipment (Compustat item #8); *INTANG* is intangibles (Compustat item #33);*OTHERLTA* is other long-term assets (Compustat item #69); *AP* is accounts payable (Compustat item #70); *OTHERCL* is other current liabilities (Compustat item #72); and *OTHERLTL* is other long-term liabilities (Compustat item #75).

LOG_MKT is logarithm of market value computed as (Compustat item #25 * Compustat item #199), and *BM* is book-to-market ratio computed as (Compustat item #60/market value). *m* is pricing kernel which is cumulated from monthly pricing kernel to firm-specific annual pricing kernel based on firm-specific fiscal period. Pricing kernel (m), captures intertemporal variation in consumption. As shown in equation (A6) in Appendix A, when consumption is high (low), investors' marginal utility obtained from consumption is low (high) because the utility function of consumption is increasing and concave, then one unit of saving today yields less (more) utility for consumption tomorrow, thus the inter-temporal marginal rate of substitution namely, pricing kernel, is low (high).

LOG_MKT is expected to be negative because prior studies find that small stocks outperform large stocks (e.g., Fama (1992, 1993, 1996) shows that small firms earn higher returns). The coefficient on *BM* is expected to be positive as finance literature shows that value firms (high *BM*) outperform glamour firms (Graham and Dodd 1934, Lakonishok 1994, and Fama (1992, 1993, 1996)). According to Sloan (1996) and Fairfield et al. (2003a), accruals are negatively related with future returns, therefore the coefficient on *Accruals* is expected to be negative in equation (4). Fairfield et al. (2003a) finds that firms with high growth in long-term net operating assets have lower subsequent returns than firms with low growth in long-term net operating assets, therefore coefficient on *GRLTNOA* is predicted to be negative. Sloan (1996) finds that investors underestimate the persistence of cash flows, which suggests that firms with high cash flows should have higher subsequent returns than firms with low cash flows, and the coefficient on *ROA* in equation (4) captures the relation between cash flows and future returns, therefore the coefficient on *ROA* is expected to be positive. The coefficient on m is expected to be negative because on average, expected return of a stock should be higher than risk-free rate, which suggests that the correlation between assets' return and m is negative based on equation (1). Hypothesis 1 predicts a positive sign for the coefficient on the interaction between *Accruals* and *m,* which indicates that consumption risk decreases in accruals. As suggested in Fairfield et al. (2003a), *GRLTNOA* behaves in a similar way as accruals because both are components of growth in net operating assets, therefore the interaction between *GRLTNOA* and *m* is expected to be positive.

3.3.3 Test of Hypothesis 2- Portfolio Analysis

Next, two different approaches are used at the portfolio level to examine whether pricing kernel prices trading strategy:

Under the first approach, the standard Fama-French three factor model with pricing kernel is used to test the relation between hedge portfolio returns and pricing kernel:

$$HedgeRet_{t+1} = \alpha + \delta_1 m_{t+1} + \delta_2 MKT_{t+1} + \delta_3 SMB_{t+1} + \delta_4 HML_{t+1} + \varepsilon_{t+1} \quad (8)$$

where *HedgeRet* is monthly hedge portfolio returns, which is equal to the equally weighted monthly returns to the highest accruals decile minus the equally weighted monthly returns to the lowest accruals decile. *MKT*, *SMB*, and *HML* are the monthly Fama-French excess market, size, and book-to-market factors, respectively. *m* is monthly pricing kernel as defined before.

Hypothesis 2 predicts that pricing kernel can price accrual anomaly, which is equal to say that the covariance of hedge portfolio returns and pricing kernel is negative. Therefore the coefficient on m is expected to be negative. There are no predictions for the signs of the coefficients on the three risk factors.

Under the second approach, I follow Chen and Knez (1996) using a two step procedure to evaluate the performance of a trading strategy. The null hypothesis tested here is that the trading strategy does not expand the investment opportunity set (IOS), which indicates that the assets in trading strategy are correctly priced by the pricing kernel. The first step is to calculate performance value:

$$\lambda_{t+1} = E(x_{t+1} m_{t+1}) \qquad (9)$$

where x_{t+1} is the gross return to the hedge portfolio of the accrual-trading strategy, and m_{t+1} is the pricing kernel.

The second step is to construct a statistic, h_T, with one degree of freedom χ^2 distribution, and then use this statistic to test whether λ_{t+1} is significantly different from zero:

$$h_T = T\left[\frac{1}{T}\sum_{k=0}^{T-1}\hat{\lambda}_{t+1+k}\right]W_T\left[\frac{1}{T}\sum_{k=0}^{T-1}\hat{\lambda}_{t+1+k}\right] \qquad (10)$$

where $\hat{\lambda}_{t+1}$ is the estimate from equation (9), and W_T denotes the inverse of the variance of $\hat{\lambda}_{t+1}$. A value of h_T that is statistically greater than zero indicates that λ_{t+1} is different from zero, suggesting that accrual-trading strategy enhances investors' IOS and pricing kernel cannot fully price accrual-trading strategy.

3.3.4 Estimating pricing kernel

In section 3.2.1, pricing kernel is defined as the inter-temporal marginal rate of substitution. It is a macroeconomic condition dependent function that discounts payoffs using time and risk preferences (See equation (A6) in Appendix 3A). Monthly pricing kernel is empirically retrieved by using Hansen and Jagannathan (1991) approach which has been employed recently in Ahn et al. (2003). Ahn et al. (2003) uses twenty industry basic assets to retrieve pricing kernel. The detail retrieving procedure is described in Appendix 3C. At the firm level analysis, monthly pricing kernel is cumulated into firm-year specific pricing kernel. The pricing kernel is firm-year specific because firms have different return accumulation periods. The accumulation window for the firm-year –

specific pricing kernel is the same as firms' annual return accumulation window, one year period starting from four month after firms' fiscal year end.

3.4. Empirical Results

3.4.1 Descriptive Statistics

Panel A of Table 3.1 reports the descriptive statistics for all the variables used in the empirical tests.[43] The mean values of ROA_{t+1} and $Cash\ Flows_t$ are 0.049 and 0.083, respectively. The mean values are all lower than the median values, indicating the distributions of these variables are all left-skewed. The mean and median value of $Accruals_t$ is -0.026 and -0.031, respectively, indicating on average accruals decrease earnings.[44] The mean and median value of growth in net operating assets ($GRNOA_t$) is 0.074 and 0.053, respectively, and the mean and median of growth in long-term net operating assets ($GRLTNOA_t$) is 0.101 and 0.068, respectively. To the extent that some of the financial variables have skewed distributions, outliers are of concerns in the empirical analysis. To mitigate this concern, the financial variables (ROA_{t+1}, ROA_t, $Accruals_t$, and $GRLNOA_t$) are ranked into deciles over the sample period in the empirical analysis. Each of the ranked variables takes value from 1 to 10.

[Insert Table 3.1]

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[43] The descriptive statistics for pricing kernel (m) is presented in Panel A of Table 3.2.

[44] Compared with Fairfield et al. (2003a), both mean and median values of ROA_{t+1}, ROA_t and $Accruals_t$ are lower in magnitude. This may be due to the fact that I cover a longer sample period. My sample covers 41-year period from 1963 to 2003, and Fairfield et al. (2003a) covers 30-year period from 1964 to 1993. They purposely select this sample period to ensure replication of Sloan (1996) whose sample period is from 1962 to 1991. According to Givoly and Hayn (2000), more companies report losses during my later sample period (1994-2003) which is not covered by Fairfiled et al. (2003a).

Panel B of Table 3.1 provides the Pearson/Spearman correlations among the variables reported in Panel A. Pearson correlations are reported below the diagonal, and Spearman correlations are reported above the diagonal. The first-order autocorrelation for ROA is 0.804, suggesting that earnings tend to be persistent. As expected, one-year-ahead ROA is more positively correlated with cash flows than accruals. This is consistent with the findings in Sloan (1996) that cash flows have higher persistence than accruals. *GRNOA* and *GRLTNOA* are also positively correlated with one-year-ahead *ROA*. Spearman correlation of *GRNOA* with one-year-ahead *ROA* is similar in magnitude to that of both accruals and *GRLTNOA* with one-year-ahead *ROA*. This is consistent with Fairfield et al. (2003a) observation that both *Accruals* and *GRLTNOA* are components of *GRNOA*. *Accruals* are negatively correlated with cash flows, which is consistent with Dechow's (1994) argument that accruals smooth temporary fluctuations in cash flows. Both *Accruals* and *GRLTNOA* are positively correlated with *GRNOA*, suggesting that both components of *GRNOA* capture growth.

3.4.2 Replicating Cyclical Accrual Persistence Using Pricing Kernel as Proxy for Business Cycle

Essay I shows that accrual persistence is counter-cyclical by using three metrics to measure business cycle consisting of annual GDP growth rate, annual industry productivity growth rate, and NBER definition of expansion versus recession. As this finding is essential for the current study, and current study adopts pricing kernel as a state variable, it is necessary to conduct replication test to confirm the finding from first essay is robust to pricing kernel as a measure of business cycle.

Table 3.2 report results of the replication test. The primary interest is the interaction of accruals with pricing kernel. The coefficient on this interaction term is positive and statistically significant at the .01 level, suggesting that accruals are more persistent during economic recessions relative to expansions. Therefore pricing kernel, as another measure of business cycle, yields similar results as the three business cycle proxies used in the first essay, which confirms that the finding from first essay that accrual persistence has cyclical property is robust to pricing kernel. Moreover, it gives more confidence in the empirical validity of pricing kernel retrieving process.

[Insert Table 3.2]

3.4.3 Results of Testing Hypothesis 1

Panel A of Table 3.3 presents the summary statistics for pricing kernel. The mean and median values of pricing kernel for the monthly series are 0.995 and 0.994, respectively. The mean of 0.994 implies that monthly rate on risk-free asset is 0.6 percent or about 7.2 percent per year for the period 1972 – 2005. These summary statistics are similar to that reported in Nichols (2006). The firm-year cumulative pricing kernel has mean value of 1.004 and median value of 0.704. Recall that higher values of pricing kernel represent low consumption or periods of recession discussed in Appendix 3A.

[Insert Table 3]

Panel B of Table 3.3 reports firm-level regression analysis of testing whether the covariance between pricing kernel and return depends on accruals using equation (4). Column (1) report results of estimating equation (4) where all the variables enter into regression with raw value, and column (2) report results where all the variables enter into regression with decile rankings ranging from 1 to 10. Consistent with the prediction, *Accruals,* and growth in long term net operating assets (*GRLTNOA*), are loaded with negative signs. The negative sign of the coefficients on *Accruals* and *GRLTNOA* indicates that higher current accruals and growth in long-term net operating assets have lower subsequent returns. The coefficient on the main effect of pricing kernel is positive but statistically not significant. Return on assets (*ROA*), and the interaction between *Accruals* and *m*, are both loaded with expected positive signs. Particularly, the positive sign for the interaction between *Accruals* and *m* is consistent with the notion that the relation between pricing kernel and returns are conditional on accruals. The interaction of *GRLTNOA* and *m* is loaded with negative sign, which is inconsistent with prediction. However, this result is not surprising given that Essay I does not find consistently that growth in long-term net operating assets has cyclical persistence property as accruals (See Table 3 on page 38). The coefficient on firms' size (LOG_MKT) is negative and statistically significant at .01 level, and the coefficient on book-to-market ratio (BM) is positive and statistically significant at .01 level. These results are consistent with the notion that small firms and value firms, on average, earn higher returns.

The results in Panel B of Table 3.3 can be used to evaluate the economic significance of consumption risk adjustment. Panel A of Table 3.3 reports the standard deviation of firm- specific annual pricing kernel is 0.993. One standard deviation increase in pricing kernel leads to 5.5 percent decline in the difference of returns between high and low accrual decile, which accounts for about 39% drop in hedge portfolio returns.[45] This suggests that accrual-trading strategy delivers lower returns when consumption is scare

[45] The 5.5 percent change in annual returns is computed as: σ (pricing kernel)*coefficient on the interaction between pricing kernel and decile ranked accruals * the distance in ranks from high accruals decile to low accruals decile = 0.993*0.0061*9. The 5.5 percent change in returns accounts for 39% (= 5.5/14) of annual returns to hedge portfolio. 14 percent hedge portfolio return is computed as (0.0122*12) using monthly hedge portfolio return of 0.0122 reported in Panel A of Table 3.3.

(pricing kernel is high). Overall, Table 3.3 suggests that the risk reflected in the covariance between pricing kernel and returns depends on accruals.

3.4.5 Results of testing hypothesis 2 - pricing kernel prices hedge portfolio returns

As noted previously, two approaches are used to test hypothesis 2 at portfolio level. Under the first approach, I use Fama-French three factor model controlling for the three known risk factors: market risk (MKT), size risk (SMB), and book-to-market risk (HML) to evaluate the relation between pricing kernel and hedge portfolio returns.

Firms are sorted on the magnitude of the accruals and assigned in equal numbers to ten portfolios for each year. Equally weighted monthly returns are then computed for each portfolio for the subsequent one year, where return accumulation period begins four month after the fiscal year in which accruals are measured.

Panel A of Table 3.4 reports the average of 395 equally weighted monthly returns of ten portfolios. The mean of portfolio returns almost monotonically decreases from the lowest accrual decile, 0.0212, to the highest accrual decile, 0.0089. The median of portfolio returns shows similar pattern. The hedge portfolio earns about 1.22 percent profit on monthly basis which is significantly greater than zero at .001 level. These findings are consistent with Sloan (1996).

[Insert Table 3.4]

Panel B of Table 3.4 reports the results of testing hypothesis 2 under the first approach. Column (1) shows that without including any explanatory variables, the intercept is 0.0122 which is the mean value of monthly hedge portfolio returns. This result is consistent with the univariate statistic shown in Panel A. Column (2) shows that pricing kernel is negatively correlated with hedge portfolio returns which is consistent with the prediction. This result suggests that the hedge portfolio returns are compensation for risk arising from volatile consumption embedded in implementing accruals trading strategy. Column (3) present regression results by including Fama-French three factors only in the regression. Among the three known risk factors, only *HML* is significant, and in total the three factors explain about three percent of the variation in returns to hedge portfolio. Comparing the results of column (3) with column (4), we can see that the Adjusted-R^2 has increased by about two percent after introducing pricing kernel into regression. This result indicates that pricing kernel has significant incremental explanatory power over and above other known risk factors for the accruals trading strategy returns. The results in column (4) can be used to evaluate the economic significance of pricing kernel in explaining accrual-based trading strategy. The standard deviation of monthly pricing kernel is 0.291 as reported in Panel A of Table 3.2. One standard deviation change in pricing kernel can explain 37 percent of monthly hedge portfolio returns after controlling for other known risk factors.[46] The results from portfolio approach are similar to the results reported in Table 3.3 based on firm level analysis. Furthermore, this result indicates that about 11% of the average returns to the hedge portfolio are compensation for risk. [47]

Essay I finds that the profit from accrual-based trading strategy varies with business cycle and attributes this finding to investors' inability to assess growth rate and diminishing marginal return to new investments. The results reported in Panel B of Table 3.4 are consistent with that reported in Table 2.9. However, they suggest that accrual-

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[46] 37 percent is computed as: standard deviation in monthly pricing kernel * coefficient on pricing kernel/monthly hedge portfolio returns = 0.291 * 0.0158 /0.0122.

[47] 11% is computed as: variance of pricing kernel *coefficient of pricing kernel * monthly gross return to risk free asset/ average monthly hedge portfolio returns = 0.291^2*0.0158 * 1.007/0.0122.

based trading strategy is risky making investors' consumption volatile, therefore the positive returns to hedge portfolio are compensation for investors for bearing consumption risk.

Under the second approach, I follow Chen and Knez (1996) two-step procedure of using a chi-square distributed statistic to evaluate whether trading strategy enhance investors' investment opportunity set (IOS), which is described in section 3.3.4. The value of h_T statistic is 72.74, which is significant at .01 level rejecting the null hypothesis that trading strategy does not enhance IOS. Given 11% of hedge portfolio returns is compensation for risk, it is not surprising that the null hypothesis that accrual-trading strategy does not enhance IOS is rejected.

3.5 Conclusion

Using the consumption-based asset pricing theory and the cyclical property of accrual persistence documented in Essay I, this study derives two predictions. First, the covariance between the pricing kernel and asset return is positively associated with accruals. Second, the pricing kernel can price accruals trading strategy.

I examine the above two predictions using a sample over the time period 1972-2003. First, consistent with my prediction, I find that covariance between the pricing kernel and asset return is positively correlated with accruals, suggesting that accruals are associated with risk arising from volatile consumption. Additional analysis indicates that about 11 percent of trading strategy returns is compensation for risk. Second, I use a factor model to analyze the trading strategy returns at portfolio level, I find a negative relation between the pricing kernel and hedge portfolio returns. This result suggests that hedge portfolio is risky. The positive returns from hedge portfolio are a compensation for risk, although only about 11 percent of the hedge portfolio returns is attributable to the risk. When I use the methodology by Chen and Knez (1996), I find that the accruals-based trading strategy enhances the investment opportunity set available to investors. Given that 11 percent of hedge portfolio returns are attributable to consumption risk, it is not surprising the null hypothesis is rejected under Chen and Knez (1996) approach.

This study relies on consumption-based asset pricing theory and theoretically develops an accrual persistence model predicting that accruals decrease in consumption risk. Empirically it relies on basic-assets back-out pricing kernel to test the prediction. However, similar to using factor model testing market efficiency, using basic-assets back-out pricing kernel to test trading strategy is a joint test of both the appropriate specification of basic assets (or the validity of empirical methodology to back out pricing kernel) and market efficiency. A rejection of rational pricing could be due to either misspecification of basic assets or market inefficiency. Moreover, relatively weak economic significance of pricing kernel in explaining accrual-based trading strategy could also be attributable to the empirical implementation of retrieving pricing kernel. Future research could identify a better empirical procedure of deriving pricing kernel and re-examine the predictions in this paper.

Appendix 3A: Derivation of Consumption-based Asset Pricing Model

In this appendix, I describe the consumption-based asset pricing theory framework and the derivation of the first-order condition.

Consumption-based Asset Pricing Theory Framework

Following Cochrane (2001), the consumption and investment decision problem is as follows: suppose in a two period model, the investor can buy and sell as much assets as he wants in time t. In period t, the investor chooses to purchase ξ units of asset at price p, which yields the payoff x_{t+1} in period t+1.The investor's total saving in the assets satisfies the identity

$$c_t = e_t - p_t \xi \tag{A1}$$

where c is consumption, e is the original consumption level (if the investor bought none of the asset).

The investor's consumption in the second period t+1 is given by the intertemporal budget constraint assuming he consumes all his wealth at period end.

$$c_{t+1} = e_{t+1} + x_{t+1}\xi. \tag{A2}$$

Given the investor's current level of consumption e_t, the investor chooses consumption and savings in assets ξ to maximize his utility over period t and t+1 subject to the constraints (1) and (2):

$$\max_{\{\xi\}} u(c_t) + E_t[\beta u(c_{t+1})] \tag{A3}$$

where u(·) is utility function of consumption; c is consumption, $E_t(\cdot)$ denotes the expectation at time t, β is subjective discount factor which captures investor's impatience to consume.

First-order Condition

Substitute the constraints (A1) and (A2) into the objective (A3), and set the first derivative with respect to ξ equal to zero, the first-order condition for an optimal consumption and portfolio choice is obtained,

$$p_t u'(c_t) = E_t[\beta u'(c_{t+1}) x_{t+1}], \tag{A4}$$

or

$$p_t = E_t\left[\beta \frac{u'(c_{t+1})}{u'(c_t)} x_{t+1}\right] \tag{A5}$$

Intuitively $p_t u'(c_t)$ in equation (A4) represents the loss in utility at t if the investor buys one more unit of the asset at t; and $E_t[\beta u'(c_{t+1}) x_{t+1}]$ represents the increase in (discounted expected) utility at t+1he obtains from the extra payoff of buying another unit of asset at t. The investor continues to buy or sell the asset at t until the marginal loss equals the expected marginal gain. Equation (A5) is the basic asset pricing model. It shows what market price p_t should be, given the payoff x_{t+1} and the investor's consumption choices (c_t and c_{t+1}).

Define the intertemporal marginal rate of substitution, m_{t+1}, as

$$m_{t+1} = \beta \frac{u'(c_{t+1})}{u'(c_t)} \tag{A6}$$

where m_{t+1} represents the rate at which the investor is willing to substitute consumption at time t+1 for consumption at time t, which is often called the intertemporal marginal rate of substitution, or pricing kernel. If we are willing to assume a convenient power utility function, and it is increasing and concave reflecting the declining marginal value of additional consumption, then equation (6) suggests m is low when consumption is high, and vice versa.

Substituting equation (A6) in (A5)

$$p_t = E_t(m_{t+1} x_{t+1}) \tag{A7}$$

Scaling both sides of equation (A7) by p_t :

$$1 = E_t(m_{t+1} R^i_{t+1}), \tag{A8}$$

where R^i_{t+1} is the gross return for asset i during t+1.

Applying equation (A8) to risk free rate case

$$R^f_{t+1} = 1/E_t(m_{t+1}) \tag{A9}$$

Expanding equation (A8) first, then substitute $E_t(m_{t+1})$ for $1/R^f_{t+1}$ and rearrange terms:

$$E_t(R^i_{t+1}) = R^f_{t+1} - R^f_{t+1}\ \mathrm{cov}(m_{t+1}, R^i_{t+1}) \tag{A10}$$

Equation (A10) implies that the expected return of an asset equals the risk free rate plus risk correction. The risk correction depends on the covariance of the stochastic discount factor, m, and the assets return. This covariance term is often referred to as consumption risk. In other words, assets that deliver low returns when pricing kernel is high must have high expected returns to reward the investor for bearing risk. On the other hand, assets that deliver high returns when pricing kernel is high provide a good hedge against the consumption fluctuations and consequently must have low expected returns.

Appendix 3B: Derivation of Accrual Persistence Model and its Applications

In this appendix, I rely on consumption-based asset pricing model and three assumptions to derive accrual persistence model and four applications.

Accrual persistence model

The accrual persistence model relies on three assumptions. First, the accrual persistence is lower during periods of economic expansion than recession. Second, the law of one price holds. The second assumption is the basis to recover pricing kernel, m. The existence of m is a necessary and sufficient condition for equilibrium in stock market. Under this condition, if m prices the accruals strategy, then the risk imbedded in the covariance between stock returns and pricing kernel should explain the hedge portfolio returns. Third, the unexpected returns correspond to the information of unexpected earnings. The efficient market hypothesis implies that abnormal returns are zero in expectation:

$$E_t(R_{t+1} - E_t(R_{t+1}) \mid \theta_t) = 0 \qquad \text{(B1)}$$

where $E(\ldots|\theta_t)$ is the objective expectation conditional on information set θ_t .

Given Ball and Brown's (1968) finding that accounting earnings is value relevant in pricing securities, the unexpected changes in earnings during t+1 should be correlated with the innovation of stock returns resulting in abnormal returns. Therefore, equation (C1) could be expressed as:

$$R_{t+1} - E_t(R_{t+1}) = \phi UE_{t+1} + v_{t+1} \qquad \text{or}$$

$$R_{t+1} = E_t(R_{t+1}) + \phi UE_{t+1} + v_{t+1} \qquad \text{(B2)}$$

where ϕ denotes the earnings response coefficient, UE_{t+1} denotes the unexpected earnings during t+1, and v_{t+1} represents the unexpected returns during t+1 corresponding to all other unexpected information (assuming it is orthogonal to the UE_{t+1}).

Based on the above three assumptions and consumption-based asset pricing model, I derive accrual persistence model.

Define UE_{t+1} in equation (B2) as the following:

$$UE_{t+1} = ROA_{t+1} - E_t(ROA_{t+1}) \quad \text{(B3)}$$

According to Fairfield et al. (2003a), one-year-ahead ROA can be predicted from current accruals (Accruals), growth in long term net operating assets (GRLTNOA), and ROA:

$$ROA_{t+1} = \gamma_0 + \gamma_{1,t+1} Accruals_t + \gamma_{2,t+1} GRLTNOA_t + \gamma_{3,t+1} ROA_t + e_{t+1} \quad \text{(B4)}$$

where $\gamma_{1,t+1}$, $\gamma_{2,t+1}$ and $\gamma_{3,t+1}$ are the coefficients of the accruals, growth in long term net operating assets, and ROA, e_{t+1} is the error term, $\gamma_{1,t+1} \sim N(E(\gamma_1),\sigma_1^2)$, $\gamma_{2,t+1} \sim N(E(\gamma_2,\sigma_2^2)$, and $\gamma_{3,t+1} \sim N(E(\gamma_3,\sigma_3^2)$. [48]

Given equation (B4), the unexpected earnings (UE) can be expressed as the following:

$$UE_{t+1} = [\gamma_{1,t+1} - E_t(\gamma_1)]Accruals_t + [\gamma_{2,t+1} - E_t(\gamma_2)]GRLTNOA_t + [\gamma_{3,t+1} - E_t(\gamma_3)]ROA_t + e_{t+1} \quad \text{(B5)}$$

Substituting (B5) to (B2):

[48] The reason I index γ_1, $\gamma_{2,}$ and $\gamma_{3,}$ with the subscript t+1 is that the implication of $Accruals_t$ and $GRLTNOA_t$, and ROA_t for ROA_{t+1} is not known with certainty at the time of t.

$$R_{t+1} = E_t(R_{t+1}) + \phi\{[\gamma_{1,t+1} - E(\gamma_1)]Accruals_t + [\gamma_{2,t+1} - E(\gamma_2)]GRLTNOA_t + [\gamma_{3,t+1} - E(\gamma_3)]ROA_t + e_{t+1}\} + v_{t+1}$$

(B6)

Consumption-based asset pricing model stated in Equation (A10) in Appendix A is as follows:

$$E_t(R^i_{t+1}) = R^f_{t+1} - R^f_{t+1}\ \text{cov}(m_{t+1}, R^i_{t+1}) \tag{B7}$$

where R^i_{t+1} is the gross return for asset i during t+1. R^f_{t+1} is risk-free rate during t+1. m_{t+1} is pricing kernel at t+1, and $\text{cov}(\cdot)$ denotes covariance.

Substituting (B6) to (B7) and rearrange terms:

$$E(R_{t+1}) = R^f_{t+1}[1 - \phi\,\text{cov}(m_{t+1}, \gamma_{1,t+1})Accruals_t - \phi\,\text{cov}(m_{t+1}, \gamma_{2,t+1})GRLTNOA_t - \phi\,\text{cov}(m_{t+1}, \gamma_{3,t+1})ROA_t - \phi\,\text{cov}(m_{t+1}, e_{t+1}) - \text{cov}(m_{t+1}, v_{t+1})] \tag{B8}$$

Equation (B8) suggests that the expected return of an asset depends accruals and the cyclical property of accruals persistence ($\text{cov}(m_{t+1}, \gamma_{1,t+1})$). Given that $\text{cov}(m_{t+1}, \gamma_{1,t+1})$ is positive, the expected return should be negatively associated with accruals assuming other terms in equation (B8) are not systematically related with the expected return.

Separately, I substitute (B5) and (B8) to (B2), then I have the following equation depicting realized returns:

$$R_{t+1} = R^f_{t+1} + \phi\{ROA_{t+1} - [E(\gamma_1) + R^f_{t+1}\,\text{cov}(m_{t+1}, \gamma_{1,t+1})]Accruals_t + \Phi_{t+1}\} \tag{B9}$$

where

$$\Phi_{t+1} = v_{t+1} - R^f_{t+1}\,\text{cov}(m_{t+1}, v_{t+1}) - \phi[(E(\gamma_2) + R^f_{t+1}\,\text{cov}(m_{t+1}, \gamma_{2,t+1})]GRLTNOA_t - \phi[(E(\gamma_3) + R^f_{t+1}\,\text{cov}(m_{t+1}, \gamma_{3,t+1})]ROA_t - R^f_{t+1}\phi\,\text{cov}(m_{t+1}, e_{t+1}) - \phi E(\gamma_0)$$

Application 1: The relation between accruals and consumption risk factor:

Subtracting equation (B8) from (B7):

$$\text{cov}(m_{t+1}, R_{t+1}) = \phi\,\text{cov}(m_{t+1}, \gamma_{1,t+1})Accruals_t + \Omega \tag{B10}$$

where

$$\Omega = \phi \operatorname{cov}(m_{t+1}, \gamma_{2,t+1}) GRLTNOA_t + \phi \operatorname{cov}(m_{t+1}, \gamma_{3,t+1}) ROA_t + \phi \operatorname{cov}(m_{t+1}, e_{t+1}) + \operatorname{cov}(m_{t+1}, v_{t+1})$$

All other variables are as defined before.

Equation (B10) depicts the relation between accruals and consumption risk, which is the negative value of the covariance between pricing kernel and assets' return.

Application 2: The Consumption Risk of Hedge Portfolio:

Applying equation (B10) to low accrual portfolio and high accrual portfolio separately:

$$\operatorname{cov}(m_{t+1}, R^{-}_{t+1}) = \phi \operatorname{cov}(m_{t+1}, \gamma_{1,t+1}) Accruals^{-}_{t} + \Omega \qquad \text{(B10a)}$$

$$\operatorname{cov}(m_{t+1}, R^{+}_{t+1}) = \phi \operatorname{cov}(m_{t+1}, \gamma_{1,t+1}) Accruals^{+}_{t} + \Omega \qquad \text{(B10b)}$$

Subtracting (B10b) from (B10a):

$$\operatorname{cov}(m_{t+1}, Hedge\operatorname{Re}t_{t+1}) = \phi \operatorname{cov}(m_{t+1}, \gamma_{1,t+1})(Accruals^{-}_{t} - Accruals^{+}_{t}) \qquad \text{(B11)}$$

Application 3: Expected Return of Hedge Portfolio

In a similar vein as deriving equation (B11), the expected returns of hedge portfolio from accruals-trading strategy can be derived from equation (B8):

$$E_t(Hedge\operatorname{Re}t_{t+1}) = -R^{f}_{t+1}(\phi \operatorname{cov}(m_{t+1}, \gamma_{1,t+1})(Accruals^{-}_{t} - Accruals^{+}_{t}) \qquad \text{(B12)}$$

where $E_t(Hedge\operatorname{Re}t_{t+1})$ denotes the expected returns of hedge portfolio for period t+1 at t, and $Accruals^{+}_{t}(Accruals^{-}_{t})$ denotes the average accruals at the end of t for firms in the highest (lowest) accrual decile.

Given cyclical property of accrual persistence, the covariance between pricing kernel and accrual persistence is positive, and the difference in accruals between low accrual portfolio and high accrual portfolio is negative, therefore hedge portfolio returns in expectation is positive, suggesting that profit from accrual-based trading strategy is compensation for consumption risk.

Equation (B12) yields prediction consistent with one regularity in the accrual anomaly literature that the returns from accrual-trading strategy are positive. Moreover equation (B12) suggests that hedge portfolio returns are positive in expectation which is the required compensation for consumption risk. Such risk arises from the cyclical property of accrual persistence.

Appendix 3C: Retrieve Pricing Kernel

In this appendix I introduce the procedure of retrieving pricing kernel used by Ahn, Conrad and Dittmar (2003).

To empirically estimate pricing kernel is challenging. The problem is to decide the functional form of utility, and the variables to determine marginal utility functions. Jensen and Jagannathan (1991) investigate how to retrieve the pricing kernel from a given set of tradable, or basic assets. The key assumption is that there is no pricing inconsistency among the basic assets. They suggest the law of one price discount factor as a solution for the pricing kernel, which is:

$$m = x'\delta \tag{C1}$$

where m is pricing kernel, x is the assets payoff, and δ is the weight of the portfolio taking in the assets.

Consider the set of basic assets from which the trading strategy is to be implemented. Under the law of one price assumption, there must be a stochastic discount factor that correctly prices assets payoff and all linear combination of. Ahn, Conrad and Dittmar (2003) uses 20 industry basic assets to retrieve pricing kernel. Such approach shifts the focus from specifying the functional form of utility and determinants of marginal utility to specifying an appropriate set of basic assets which attempt to span investment opportunity set (IOS) available to investors in equilibrium. Then the research question is turned to examine whether trading strategy significantly expand investors' IOS using the backed-out pricing kernel from basic assets, which forms the basis for testing whether a trading strategy is rationally priced in equilibrium. If the trading strategy does not expand the IOS, then the assets in trading strategy are correctly priced by the pricing kernel. Conversely, if the trading strategy does expand the IOS, then it implies the assets in trading strategy are not rationally priced in equilibrium.

I retrieve the pricing kernel by: First, sorting all monthly returns from CRSP for the period from 1962 to 2005 into twenty industry portfolios.[49] The twenty industry portfolios serve as the basic assets to back out pricing kernel and test accrual-trading strategy; Second, computing the equally weighted monthly gross returns for each industry portfolio resulting in totally 10320 monthly portfolio returns. These portfolio returns are the monthly payoff of the twenty basic assets. Third, combining equation (1) in section 3 and equation (C1):

$$1 = E_t(R_{t+1}^{i}{}'\delta R_{t+1}^{i}), \qquad \text{(C2)}$$

where R_{t+1}^{i} is the gross return for asset i during t+1, and δ are as defined before.

Fourth, following Hansen and Jagannathan (1991), using General Method of Moments (GMM) based on equation (C2) estimating the weight of each industry portfolio, δ, assuming it is constant across time. Last, computing monthly pricing kernel from equation (C1), which is the sum of the product of estimated δ and the monthly twenty basic assets returns. To facilitate empirical tests, I also cumulate monthly pricing kernel to firm-specific annual pricing kernel based on firm-specific fiscal period.

[49] The twenty industry portfolios have been used in Moskowitz et al. (1999) examining industries momentum, Ahn, Conrad and Dittmar (2003) studying whether pricing kernel can price momentum trading strategy, and Nichols (2005) studying whether autocorrelation risk in seasonal differenced earnings can explain post-earnings announcement drift.

Appendix 3D:Variables Definition

ROA_t / ROA_{t+1}	=	income from continuing operations (Compustat Item #178) divided by average total assets (Compustat Item #6).
$Accruals_t$	=	$[(\Delta CA_t - \Delta Cash_t) - (\Delta CL_t - \Delta STD_t - \Delta TP_t) - Dep_t]/average\ total\ assets$; ΔCA is the change in non-cash current assets (Compustat Item #4); $\Delta Cash$ is the change in cash/cash equivalent (Compustat Item #1); ΔCL is the change in current liabilities (Compustat Item #5); ΔSTD is the change in short term debt (Compustat Item #34), ΔTP is the change in tax payable (Compustat Item #71), and *Dep* is depreciation expense (Compustat Item #14).
$Cah\ flows_t$	=	$ROA_t - Accruals_t$.
$GRNOA_t$	=	growth in net operating assets computed as annual change in net operating assets (ΔNOA_t / average total assets); Net operating assets (*NOA*) are computed as following: $NOA_t = AR_t + INV_t + OTHERCA_t + PPE_t + INTANG_t + OTHERLTA_t - AP_t - OTHERCL_t - OTHERLTL_t$, where *AR* is accounts receivable (Compustat item #2); *INV* is inventories (Compustat item #3);*OTHERCA* is other current assets (Compustat item #68); *PPE* is net property, plant, and equipment (Compustat item #8); *INTANG* is intangibles (Compustat item #33);*OTHERLTA* is other long-term assets (Compustat item #69); *AP* is accounts payable (Compustat item #70); *OTHERCL* is other current liabilities

(Compustat item #72); and *OTHERLTL* is other long-term liabilities (Compustat item #75).

$GRLTNOA_t$	=	growth in long-term net operating assets computed as $GRNOA_t$ - $Accruals_t$.
$CRET_{t+1}$	=	annual buy-and-hold returns starting to cumulate from four month after the fiscal year end.
$CExRET_{t+1}$	=	$CRET_{t+1}$ - annual risk free rate.
m_{t+1}	=	pricing kernel, extracted from monthly returns to 20 industry sorted portfolios assuming the law of one price.
LOG_MKT_t	=	logarithm of market value at fiscal year end t. It is computed as (Compustat item #25 * Compustat item #199).
BM_t	=	book to market ratio at fiscal year end t, computed as (Compustat item #60 / (Compustat item #25 * Compustat item #199).

Table 3.1 Descriptive Statistics and Correlation

Panel A: Summary Statistics (N = 105493)

Variable	Mean	Std. Dev.	First Quartile	Median	Third Quartile
ROA_{t+1}	0.049	0.175	0.013	0.083	0.141
ROA_t	0.055	0.181	0.021	0.087	0.146
$Accruals_t$	-0.026	0.101	-0.077	-0.031	0.021
Cash $Flows_t$	0.081	0.184	0.028	0.112	0.181
$GRNOA_t$	0.074	0.174	-0.017	0.053	0.145
$GRLTNOA_t$	0.101	0.141	0.027	0.068	0.136

Panel B: Correlation (N = 105493)

Variable	ROA_{t+1}	ROA_t	$Accruals_t$	Cash $Flows_t$	$GRNOA_t$	$GRLTNOA_t$	$CRET_{t+1}$
ROA_{t+1}	1.000	0.779	0.150	0.604	0.150	0.103	0.306
ROA_t	0.804	1.000	0.268	0.692	0.295	0.196	0.104
$Accruals_t$	0.129	0.241	1.000	-0.399	0.623	0.041	-0.047
Cash $Flows_t$	0.718	0.848	-0.307	1.000	-0.166	0.129	0.143
$GRNOA_t$	0.073	0.171	0.591	-0.153	1.000	0.727	-0.088
$GRLTNOA_t$	-0.001	0.040	0.018	0.029	0.817	1.000	-0.062
$CRET_{t+1}$	0.127	-0.004	-0.049	0.022	-0.080	-0.064	1.000

Correlations of 0.004, 0.005, 0.007 (in absolute value) are significant at the .10, .05, and .01 levels, respectively.
Variables are defined in Appendix 3D.

Table 3.2 Replicating Cyclical Accrual Persistence Using Pricing Kernel as Proxy for Business Cycle

$$ROA_{t+1} = \lambda_0 + \lambda_1 GRNOA_t + \lambda_2 ROA_t + \lambda_3 m_{t+1} + \lambda_4 GRNOA_t * m_{t+1} + v_{t+1}$$

(-) (+) (+) (-)

$$ROA_{t+1} = \lambda_0 + \lambda_1 Accruals_t + \lambda_2 GRLTNOA_t + \lambda_3 ROA_t + \lambda_4 m_{t+1}$$

(-) (-) (+) (-)

$$+ \lambda_5 Accruals_t * m_{t+1} + \lambda_6 GRLTNOA_t * m_{t+1} + v_{t+1}$$

(+) (+)

Variable	Predicted Sign	Parameter Estimate (t-statistic) (1)	(2)
Intercept		1.4253 (82.98)***	1.5542 (38.48)***
$GRNOA\_R_t$	-	-0.0883 (-28.93)***	
$Accruals\_R_t$	-		-0.0664 (-13.06)***
$GRLNOA\_R_t$	-		-0.0517 (-10.00)***
ROA_R_t	+	0.7938 (182.59)***	0.7951 (182.46)***
m_{t+1}	-	-0.1198 (-6.03)***	-0.1325 (-5.71)***
$GRNOA\_R_t * m_{t+1}$	+	**0.0044 (1.97)****	
$Accruals\_R_t * m_{t+1}$	+		**0.0061 (2.71)*****
$GRLNOA\_R_t * m_{t+1}$	+		0.0011 (0.51)
N		105493	105493
R^2		0.61	0.61

***, **, and * Denotes significance at the 1, 5, and 10 percent levels (one-tailed test for variable with predictions), respectively.

Variables are defined in Appendix 3D.

Table 3.3 Pricing Kernel

Panel A: Summary Statistic of Pricing Kernel (m)

	N	Mean	STD	Q1	Median	Q3
Monthly time-series	395	0.995	0.291	0.844	0.994	1.163
Firm-year cumulative	105493	1.004	0.993	0.265	0.704	1.426

Panel B: Analysis of Risk Conditional on Accruals

$$\begin{aligned} CExRet_{t+1} = {} & \delta_0 + \underset{(-)}{\delta_1 Accruals_t} + \underset{(-)}{\delta_2 GRLTNOA_t} + \underset{(+)}{\delta_3 ROA_t} + \underset{(-)}{\delta_4 m_{t+1}} + \underset{(+)}{\delta_5 Accruals_t * m_{t+1}} \\ & + \underset{(+)}{\delta_6 GRLTNOA_t * m_{t+1}} + \underset{(-)}{\delta_7 LOG\_MKT_t} + \underset{(+)}{\delta_8 BM_t} + \underset{(+)}{\varepsilon_{t+1}} \end{aligned} \quad (4)$$

Variable	Predicted Value	Parameter Estimates (t-statistic)	
		Raw value	Decile Ranked
Intercept	?	0.1049	0.2046
		(3.83)***	(4.57)***
$Accruals_t$	-	-0.6191	-0.0217
		(-7.70)***	(-9.01)***
$GRLTNOA_t$	-	-0.1981	-0.0085
		(-2.77)***	(-2.85)***
ROA_t	+	0.0414	0.0078
		(0.41)	(1.64)
m_{t+1}	-	0.0267	0.0032
		(2.57)***	(0.19)
$Accruals_t * m_{t+1}$	**+**	**0.1817**	**0.0061**
		(3.24)* **	**(3.43)*** **
GRLTNOAt* m_{t+1}	+	-0.0896	-0.0038
		(-2.32)**	(-2.36)**
LOG_MKT_t	-	-0.0131	-0.0139
		(-3.99)***	(-4.64)***
BM_t	+	0.0783	0.0821
		(8.73)***	(7.54)***
N		105493	105493
R^2		0.02	0.02

***, **, and * Denotes significance at the 1, 5, and 10 percent levels (one-tailed test for variable with predictions), respectively.
Variables are defined in Appendix 3D.

Table 3.4 Analysis of Hedge Portfolio Returns

Panel A: Summary Statistics of Monthly Portfolio Returns

Accrual Decile	N	Equally Weighted Monthly Return Mean	Median
Low	395	0.0212	0.0244
2	395	0.0173	0.0175
3	395	0.0162	0.0167
4	395	0.0156	0.0178
5	395	0.0146	0.0155
6	395	0.0139	0.0154
7	395	0.0134	0.0137
8	395	0.0137	0.0163
9	395	0.0108	0.0130
High	395	0.0089	0.0113
Low - High	395	**0.0122**	
		(9.16)***	

Panel B: Factor Analysis of Hedge Portfolio Returns

$$HedgeRet_{t+1} = \alpha + \delta_1\, m_{t+1} + \delta_2\, MKT_{t+1} + \delta_3\, SMB_{t+1} + \delta_4\, HML_{t+1} + \varepsilon_{t+1} \qquad (8)$$

Variables	Predicted Sign	Parameter Estimates (t-statistic) (1)	(2)	(3)	(4)
Intercept	?	0.0122	0.0248	0.0114	0.0271
		(9.36)***	(4.75)***	(8.51)***	(5.06)***
m_{t+1}	**-**		**-0.0125**		**-0.0158**
			(-2.48)***		**(-3.01)*****
MKT_{t+1}	+			-0.0142	-0.0184
				(-0.45)	(-0.59)
SMB_{t+1}	+			-0.0297	0.0078
				(-0.73)	(0.09)
HML_{t+1}	+			0.1447	0.1714
				(3.05)***	(3.59)***
N		395	395	395	395
Adj-R^2		0.000	0.013	0.032	0.052

***, **, and * Denotes significance at the 1, 5, and 10 percent levels (one-tailed test for variable with predictions), respectively.

Variables are defined in Appendix 3D.

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