Changes in the Profitability-Growth Relation and the Implications for the Accrual Anomaly

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Abstract

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Valuation research establishes growth in net operating assets (ΔNOA) as a primary predictor of future profitability. The negative relation between ΔNOA and future profitability, after controlling for current profitability, is researched extensively in the context of earnings quality, capital investment, accounting conservatism, earnings management, and the accrual anomaly. However, this study shows that while ΔNOA is negatively related to future profitability from 1967 to 1995, it is positively related to future profitability from 1996 to 2010. The negative effects of ΔNOA on future profitability (e.g., diminishing returns on investment, accruals overstatement, and excess capitalization) continue to exist, although they are now dominated by the positive implications of ΔNOA for future profitability. The positive relation between ΔNOA and future profitability grows stronger over time for reasons including increasing intangible intensity, increased volatility of economic activities, increased accounting conservatism, accounting principles shifting toward a balance sheet/fair value approach, changing characteristics of public firms, and the increasing importance of real options.

The change in the future profitability-ΔNOA relation has important implications, particularly for the accrual anomaly. The prevailing explanation for the anomaly is that an increase (decrease) in NOA predicts a decrease (increase) in profitability and investors fail to fully appreciate this negative relation. However, if this hypothesis is true, the anomaly should no longer exist. I examine the anomaly over an extended time period, including more recent years,

and provide evidence that the anomaly is still present. To explain the persistence of the anomaly over time, I conjecture and show that the market reaction to ΔNOA and the future profitability implications of ΔNOA diverge throughout the sample period. Specifically, investors are always over optimistic about the future profitability implications of the growth, i.e., in the first half of the sample (1967-1988), investors do not fully react to the negative effects of growth on profitability, and in the second half (1989-2010), they appear to over-emphasize the positive implications of ΔNOA for future profitability. The anomaly weakens during periods when investors' reaction to ΔNOA aligns with the profitability implications of ΔNOA.

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Dedication

I dedicate this dissertation to my family for their love, support, and encouragement over the many years, especially my late grandfather, my grandmother, my parents, and my uncle.

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1. Introduction

The negative relation between growth in net operating assets (ΔNOA) and future profitability, after controlling for current profitability, is researched extensively in the context of earnings quality, capital investment, accounting conservatism, earnings management, and the accrual anomaly. However, ΔNOA also has positive implications for future profitability attributable to the information of balance sheet about future performance and the increased profitability generated by the growth. The positive relation is expected to grow stronger over time given the accounting and economic changes in the last twenty years. As accounting principles shift towards a balance sheet/fair value approach, the informativeness of book value has increased over time. At the same time, the balance sheet accounts which capture the existing resources that the firm may adopt for alternative uses provide more information about the firm's future performance when the business environment is more volatile and the overall profit level of public firms is lower. As the economy shifts from being fixed assets oriented to being intangible oriented, a given growth in net operating assets is associated with higher profitability than in the past because of the profits contributed by the intangible investment.

I examine the relation between ΔNOA and future profitability, conditional on current profitability, from 1967 to 2010. Consistent with prior literature, I find that the overall relation between ΔNOA and future profitability is negative from 1967 to 1995. However, I show that ΔNOA positively predicts future profitability from 1996 onwards. The ability of current profitability to predict future profitability declines monotonically during the 1980s and 1990s, but it increases substantially during the 2000s.

The changes in the relation between ΔNOA and future profitability can be explained by accounting changes, the increased volatility of economic activities, changes in the characteristics of public firms, the increased importance of real option effects, and the increased intangible intensity. Specifically, these factors result in a decrease in earnings persistence and an increase in earnings volatility, stock return volatility, and the ability of book value to explain firm value. Various measures of volatility—including stock return volatility, earnings volatility, and the frequency of negative earnings, special items, and large special items (greater than 5% of sales)—all increase substantially over time. I show that the ability of ΔNOA (current profitability) to predict future profitability is positively (negatively) related to volatility levels. Although the relation between ΔNOA and future profitability changes from negative to positive for firms with all levels of intangible assets, the change is more pronounced for firms with higher intangible intensity.

The changes in the overall relation between ΔNOA and future profitability do not necessarily imply that the negative implications of growth for future profitability are no longer relevant. The literature provides extensive evidence to explain the negative relation between ΔNOA and future profitability, conditional on current profitability.[1] I show that the negative effects of ΔNOA on future profitability continue to exist, although they are now dominated by the positive implications resulting from the economic and accounting changes. The evidence includes the following: (1) one- and two-year lagged ΔNOA are both negatively related to future profitability in the second sub-period (1989-2010), even after controlling for current profitability and current ΔNOA; and (2) decomposing ΔNOA, I find that the relation of working capital accruals, depreciation, and the change in PP&E except depreciation to future profitability is

[1] The explanations include earnings quality (Sloan 1996, Xie 2001, Richardson et al. 2005), the realization principle and accounting conservatism (Givoly and Hayn 2000, Fairfield et al 2003, Penman and Zhang 2002), diminishing returns on investment (Fairfield et al. 2003, Zhang 2007, Wu et al. 2010), and the excess capitalization of expenditures (Barton and Simko 2002, Hirshleifer et al. 2004).

significantly negative for both sub-periods, while the relation of intangible growth and other ΔNOA to future profitability changes from negative to positive.

The changes in the relation between ΔNOA and future profitability have important implications for the accrual anomaly. Sloan (1996) is the first to document the accrual anomaly. He measures accruals as the change in non-cash working capital minus depreciation expense, and he finds a negative relation between accruals and future stock returns. Fairfield et al. (2003) extends Sloan (1996) by broadening the definition of accruals to include investments in long-term net operating assets (long-term ΔNOA) and showing that both components of ΔNOA, working capital accruals and long-term ΔNOA, are negatively related to future stock returns. Following Fairfield et al. (2003), I refer to this broad measure of accruals in discussing the accrual anomaly, i.e., the negative relation between ΔNOA and future stock returns.

The prevailing explanation for the accrual anomaly in the literature is that ΔNOA implies a reduction in future profitability (e.g., Fairfield et al. 2003, Fama and French 2006), and investors fail to fully appreciate this negative relation. The mispricing is corrected when future earnings are announced. However, the finding of this study that the relation between ΔNOA and future profitability is positive from 1996 onwards suggests that the anomaly should no longer exist.

Indeed, a few recent studies (e.g., Richardson et al. 2010, Wu et al. 2010, Green et al. 2011) document that the accrual anomaly is insignificant during the mid 2000s. Given the relatively short duration of their tested period, it is unclear whether the anomaly indeed disappears.[2] I examine the accrual anomaly from 1967 to 2010 (employing stock return data through April 2012). The empirical evidence suggests that the anomaly is still present.

[2] Studies show that other anomalies, such as the post earnings announcement drift, also do not perform well during the mid 2000s (e.g., Richardson et al. 2010, Ayers et al. 2011).

Specifically, I find that (1) in the most recent several years, the anomaly resumes; (2) in the 1970s, there was a short period during which the accrual anomaly was insignificant and exhibited a similar pattern to that found in the mid 2000s; (3) when the entire sample period is divided into two equal length sub-periods, the change in the magnitude of the anomaly between the two sub-periods is insignificant; and (4) all components of ΔNOA are significantly negatively related to future stock returns and the strength of these relations does not change during the sample period.

Considering that ΔNOA does not predict a reduction in future profitability in the second sub-period, what could explain the persistence of the accrual anomaly throughout the sample period? My empirical results suggest that risk contributes to the documented negative relation between ΔNOA and future stock returns, but it is unlikely to fully explain it. I conjecture and show that throughout the sample period the anomaly is related to the divergence between the market reaction to ΔNOA and the future profitability implications of ΔNOA. Investors are always over optimistic about the profitability implications of the growth. Specifically, in the first half of the sample (1967-1988), investors do not fully react to the negative effects of growth on profitability, and in the second half (1989-2010), they appear to over-extrapolate the positive implications of ΔNOA for future profitability. Investors may over-emphasize the information content of the book value of assets and liabilities. Consistent with this argument, Dichev et al. (2012) reports that CFOs express concerns that "over-emphasis of the fair value approach is misguided".

The decline of the anomaly in the mid 2000s occurs during a period in which investors' reaction to ΔNOA and the profitability implications of ΔNOA converge. The resumption of the anomaly in the late 2000s can be explained by a divergence of market expectations and profitability realizations, i.e., investors continue to react positively to ΔNOA while ΔNOA does not positively predict future profitability. Considering that market pricing of ΔNOA has been stable over the past twenty years, it is the profitability implications of ΔNOA that have been shifting over time and cause the divergence. Future work exploring the accrual anomaly should consider the movement of the profitability implications of ΔNOA.

By documenting changes in the relation between growth and future profitability and linking them to economic and accounting factors, this study makes important contributions to several strands of accounting and finance research. The profitability-growth relation has been studied in the context of earnings quality, valuation, capital investment, accounting conservatism, earnings management, and market efficiency. My findings suggest that growth now provides different information regarding future profitability, and prior research inferences that rely on the negative relation between growth and profitability should be reexamined. In the context of the accrual anomaly, the prevailing explanation in the literature is that it reflects investors' failure to fully price the negative implications of growth for future profitability. I show that while the anomaly is still related to the divergence between the market pricing of growth and its profitability implications, in recent years it is driven by investors' over-emphasis on the positive implications of growth for future profitability.

The study continues as follows. Section 2 describes the sample data. Section 3 investigates the relation between ΔNOA and future profitability and explains the changes. Section 4 examines the implications for the accrual anomaly. Section 5 conducts additional analysis as robustness checks. Section 6 concludes.

2. Data Description

The sample used in this study consists of all firm-year observations that satisfy the following criteria: (1) accounting data is available from COMPUSTAT, (2) the company fiscal year end is in December, (3) total assets are at least 10 million USD in December 2011 prices, (4) stock return data is available from the CRSP monthly return files, and (5) the firm is not a financial institution or a utility company (GIC sector 40 or 55, respectively). I restrict the sample to December fiscal year end firms to improve the comparability of the financial information in the cross-section. Very small firms are excluded because their financial ratios often have problematic distributions. Financial and utility firms are excluded from the sample because the impact of regulation in both industries may constrain profitability, and the distinction between operating and financing activities is not well-defined for financial firms. The sample spans 44 years, from 1967 to 2010, with stock return data employed through April 2012. The number of annual observations ranges from 920 (for 1967) to 3,787 (for 1997). It increases monotonically through 1997, and declines slightly afterwards. The total number of firm-year observations is 99,137.

The variables are measured as follows. Net operating assets are measured as total assets minus operating liabilities.[3] Operating liabilities are measured by subtracting debt in current liabilities and long term debt from total liabilities. Growth in net operating assets (ΔNOA) is measured relative to average total assets, as in Fairfield et al. (2003). Working capital accruals (ΔWC) are estimated as the change in working capital minus depreciation, divided by average

[3] An alternative approach is to exclude cash and marketable securities from total assets. I elected not to do so in the primary analysis for several reasons: (a) at least a portion of the liquid funds is required for operations, and estimating that portion is difficult; (b) risky operations require a greater "buffer" (e.g., to secure the availability of cash to fund required investments in case financial markets dry up); (c) cash is often quite "sticky", so the lost return is recurring and should be accounted for; (d) related to the previous point, significant portions of the cash balances of large corporations are held outside the U.S., and repatriating these funds would trigger significant tax payments. In any case, as a robustness check, I verify that my results are not driven by this choice, as reported in Table 14.

total assets.[4] Return on net operating assets (RNOA) is the ratio of net operating profit after tax (NOPAT) to the net operating assets at the beginning of the period. NOPAT is calculated as net income before extraordinary items and after minority interest, minus after-tax special items, plus after-tax interest expense, plus minority interest in income. The tax adjustment is calculated by multiplying pretax items by one minus the marginal tax rate. The marginal tax rate estimated is as the top federal statutory tax rate in that year plus 2% (an estimate of the average incremental effect of state taxes). Annual stock returns (RET) are measured from May through April of the following year. Size-adjusted stock returns are calculated by deducting the average return of firms in the same size-matched decile.

Beta is estimated using the 60 most recent monthly stock returns through April of the following year (a minimum of 30 observations is required), and the total return on the S&P 500. Idiosyncratic stock return volatility (Idio_Volat) is the residual volatility from the beta regression. Size is measured as the log of the market value of equity on April 30 of the following year. Book-to-market (BTM) is the ratio of book value of equity to the adjusted market value of equity, calculated by multiplying the year end market value of equity by one plus the cumulative stock return over the subsequent four months. The reason for this time adjustment is that year end stock prices are not likely to fully reflect the value implications of the financial statement information. Finally, to mitigate the impact of outliers, I trim each of the variables at the bottom and top 1% of the empirical distribution each year. Table 1 presents summary statistics from the pooled time-series cross-section distributions of the variables.

[4] I use the balance sheet approach as in Sloan (1996) for measuring working capital accruals because cash flow statement information is available only from 1988.

3. The relation between growth and future profitability

Financial statement analysis and valuation studies express future profitability and firm value as a function of growth in net operating assets (ΔNOA) and current profitability, with the relative weights determined by the persistence of current earnings (Ou and Penman 1989, Feltham and Ohlson 1995, Ohlson 1995, Fairfield et al. 2003). Many studies document a conditional negative relation between ΔNOA (or components of ΔNOA) and future profitability. In particular, Fairfield et al. (2003) shows that after controlling for current profitability, both components of growth in net operating assets, working capital accruals and long-term ΔNOA, have a negative association with one-year-ahead return on assets. Similarly, Fama and French (2006) documents a negative relationship between working capital accruals and future profitability and conclude that higher asset growth is associated with lower future profitability after controlling for size, past profitability, and other fundamentals. Penman and Zhang (2006) finds that the change in NOA is the primary variable for forecasting RNOA after including current RNOA. The negative relation between ΔNOA and future profitability is explained from different perspectives in accounting and finance research. Accounting and finance studies attribute the negative relation between ΔNOA and future profitability to the following effects: (1) working capital accruals imply low earnings quality (Sloan 1996, Xie 2001, Richardson et al. 2005); (2) ΔNOA reflects excess capitalization that leads to lower earnings and larger book value, both of which imply a reduction in profitability (Barton and Simko 2002, Hirshleifer et al. 2004); (3) inter-temporal accounting biases depress earnings and accounting rates of return when investment grows (Penman and Zhang 2002, Fairfield et al. 2003, Richardson et al. 2006); (4) ΔNOA reflects over-investment by some companies (Jensen 1986, Titman et al. 2004); and (5) investment leads to a decline in average profitability due to diminishing returns on investment (Fairfield et al. 2003p, Zhang 2007, Wu et al. 2010).

Despite extensive evidence and discussion about the negative relation between ΔNOA and future profitability, ΔNOA has positive implications for future profitability because of the information contained in balance sheet and the increased profitability associated with growth. Over the last three decades, for both economic and accounting reasons, earnings volatility has gradually increased and earnings persistence has declined (Givoly and Hayn 2000, Dichev and Tang 2008), therefore book value provides more incremental information about firm value and future performance. Relatedly, there has been a shift of value relevance from earnings to book value (Collins et al. 1997, Francis and Schipper 1999), i.e., book value becomes more positively related to price and value, while earnings' relation with price and value becomes weaker. The evidence suggests that the relation between ΔNOA which is a measure of the change in book value and future profitability may become more positive over time. The profitability associated with ΔNOA is higher than in the past because the profits are now contributed by both tangible and intangible assets. Intangible assets become an increasingly important form of economic resources in the recent decades. Motivated by the accounting and economic changes, this study re-examines the ability of ΔNOA and current profitability to predict future profitability. I start by re-examining the relation between ΔNOA and future profitability in Section 3.1. I describe and perform empirical analysis on the factors that drive the temporal changes in the profitability-growth relation in Section 3.2. I evaluate the continuing existence of negative effects of growth on future profitability in Section 3.3.

3.1 A re-examination of the relation between ΔNOA and future profitability

Following Fairfield et al. (2003), I examine the conditional relation between ΔNOA and future profitability using the following equation:

$$RNOA_{t+1} = \beta_0 + \beta_{\Delta NOA}\, \Delta NOA_t + \beta_{RNOA}\, RNOA_t + \varepsilon$$

In Table 2, I report summary statistics for the estimated coefficients from the cross-sectional regression over the full sample period (1967-2010) as well as for two equal-length sub-periods (1967-1988 and 1989-2010). $\beta_{\Delta NOA}$ is negative and significant for the full sample period, -0.0438 (t-stat=-4.0), which is consistent with the findings of existing literature. For the first sub-period, 1967-1988, which largely overlaps with the 1964-1993 sample period used in Fairfield et al. (2003), the negative relation between ΔNOA and future profitability is particularly strong. $\beta_{\Delta NOA}$ for this sub-period, -0.1040 (t-stat=-18.3), is more negative than the -0.05 average coefficient reported in Fairfield et al. (2003), mainly because the sample used by Fairfield et al. (2003) includes the years 1989-1993. However, for the second sub-period, 1989-2010, the relation is insignificant: $\beta_{\Delta NOA}$ is 0.0164 (t-stat=1.5). The difference between $\beta_{\Delta NOA}$ in the two sub-periods is highly significant, 0.1204 (t-stat=9.7). When the second sub-period is divided into two equal length sub-periods, $\beta_{\Delta NOA}$ is -0.0149 (t-stat=-1.2) for the 1989-1999 period and 0.0425 (t-stat=3.2) for the 2000-2010 period. The difference in $\beta_{\Delta NOA}$ for 1989-1999 and 2000-2010 is highly significant (t-stat=3.1).

As expected, β_{RNOA} is positive and highly significant in both sub-periods; however, it is substantially smaller in the second sub-period. β_{RNOA} declines from 0.7874 (t-stat=55.4) in the first sub-period to 0.6166 (t-stat=18.2) in the second. This decline is statistically significant (t-stat=-4.6). β_{RNOA} for the first sub-period is comparable to the average coefficient of 0.78 in Fairfield et al. (2003).

The time-series pattern of $\beta_{\Delta NOA}$ and β_{RNOA} with a 95% confidence interval is plotted in Figure 1. $\beta_{\Delta NOA}$ fluctuates around -0.1 during the years 1967-1985, increases to about -0.05 during the years 1986-1995, and is mostly positive after that. β_{RNOA} is relatively stable around 0.8 during the years 1968-1983. It declines monotonically over the subsequent years, and it reaches its minimum value of around 0.3 in 1999. After 2000, the coefficient rebounds to 0.7 where it is relatively stable for the remainder of the sample period.

3.2 Explanations for the changes in the relation between ΔNOA and future profitability

What could explain the change in the sign of $\beta_{\Delta NOA}$ and the decline of β_{RNOA} over time? Because (1) stock prices reflect expected future profitability, (2) RNOA measures relative earnings, and (3) ΔNOA is a change in book value, the decrease in β_{RNOA} and the increase in $\beta_{\Delta NOA}$ are consistent with the shift of value relevance from earnings to book value over time.[5] Studies examining the value relevance of financial statement information (e.g., Collins et al. 1997, Francis and Schipper 1999, Givoly and Hayn 2000) document a substantial decline in the incremental value relevance of earnings and a corresponding increase in the value relevance of book value over time. The same forces that have caused the shift of value relevance from earnings to book value likely explain the decrease in β_{RNOA} and the increase in $\beta_{\Delta NOA}$.

The reasons for the shift of value relevance from earnings to book value have been discussed extensively in accounting research. The common drivers considered include the volatility of economic activities, accounting changes, changing characteristics of public firms,

[5] The change in the book value of net operating assets reflects operating accruals, other balance sheet accruals related to non-operating events, and investments. Hribar and Collins (2002) makes the point that while balance sheet accruals reflect earnings (e.g., an increase in accounts receivable from credit sales), they are also affected by non-operating events such as mergers and acquisitions, divestitures, reclassifications, accounting changes and foreign currency translations.

and real option effects. Economic and accounting changes have caused earnings to be more volatile and less persistent. Public firms have become smaller, more volatile, less profitable, and more growth oriented. The increase in earnings volatility and the decrease in earnings persistence lead to the decline of β_{RNOA}. The sign change of $\beta_{\Delta NOA}$ is attributable to the improved ability of book value to predict profitability that results from accounting changes, economic changes including increased economic volatility, changes in the characteristics of public firms, and increased intangibles, and real options effects. The increasing emphasis on balance sheet/fair value oriented accounting principles aligns book value to market value, thereby enhancing book value's ability to predict future profitability. From the perspective of real option valuation, the value relevance of book value increases when profitability is low and volatile, because book value measures the resources that can be liquidated or adapted for alternative uses. As business operation shifts from being fixed assets oriented to intangible oriented, profits are generated by both operating assets growth and intangibles. A unit of growth in net operating assets is now associated with a higher level of profitability than in the past because of the profits contributed by intangibles.

I discuss how these effects might affect β_{RNOA} and $\beta_{\Delta NOA}$ in detail in Section 3.2.1. I empirically relate β_{RNOA} and $\beta_{\Delta NOA}$ to temporal changes in the firm characteristics, intangible intensity, and accounting changes in Section 3.2.2.

3.2.1 Factors driving the changes in β_{RNOA} and $\beta_{\Delta NOA}$

In this section, I lay the groundwork for the empirical tests conducted in section 3.2.2. I explain how economic changes, accounting changes, changing firm characteristics, and real option effects may explain the temporal changes in $\beta_{\Delta NOA}$ and β_{RNOA}, i.e., the change in the relations of ΔNOA and RNOA with future profitability.

<u>Economic changes</u>

Economic volatility has increased substantially in recent decades, and caused earnings to be more volatile and less persistent. β_{RNOA} (the ability of current profitability to predict future profitability) declines accordingly. The increase in economic volatility contributes to the rise of $\beta_{\Delta NOA}$ because book value which captures the value of the firm's resources is more informative about future performance when business environment is more volatile. The intangible intensity increases substantially over the past decades. The increased intangible intensity enhances the positive relation between growth and future profitability by generating earnings that are more volatile than that generated from traditional investment, and increasing the level of profitability associated with unit growth. A given growth in net operating assets is now associated with profits that are contributed by both tangible and intangible assets.

Technological innovations, changing economic conditions, and the growing demand for global resources have caused significant changes in business operations. Using both financial and real data, economic studies document that firm-level volatility has increased over the past thirty years. For example, Campbell, Lettau, Malkiel, and Xu (2001) documents an increase in the volatility of stock returns and real activities, and Comin and Mulani (2005, 2006) shows an increase in the volatility of employment and sales growth. These changes in firm volatility are associated with increased competition in product markets due to deregulation, technological innovations, and easier access to capital markets (Chun et al. 2004, Comin and Mulani 2005, Comin and Philippon 2005).

Lev and Zarowin (1999) provides empirical evidence that the business environment is changing at an ever-increasing rate, and rapidly changing firms experience a larger increase in R&D intensity than do stable firms. They attribute the documented decline in the informativeness of earnings to the increasing pace of business change and the inadequacy of the accounting system to reflect this change. Kothari et al. (2002) shows that earnings generated by intangible assets are more volatile than that generated by traditional capital assets.

Consistent with the economic changes contributing to the increase in earnings volatility, studies (Elliott and Shaw 1988, Francis et al. 1996) document an increase in the incidence and magnitude of asset write-downs even prior to the adoption of the accounting standard mandating the asset impairment test. Donelson et al. (2011) provides evidence on the role of economic changes in explaining the observed increase in earnings volatility and the decline in earnings persistence. They construct an index of economic activities that are frequently associated with special items, and show that this index explains significant cross-sectional variation in the incidence of special items.

Accounting changes

The rise of $\beta_{\Delta NOA}$ and the decline of β_{RNOA} can also be related to increased accounting conservatism and a shift of accounting principles towards the balance sheet approach. These accounting changes have caused accounting earnings to be more volatile and less persistent, and book value to be more relevant in explaining firm value. Givoly and Hayn (2000) provides evidence of an increase in conservative financial reporting over time by documenting an increase in earnings variability. Dichev and Tang (2008) documents a deterioration of matching over time as a result of accounting and real economy evolution. They find a stark decline in earnings persistence and a twofold increase in earnings volatility.

Since the mid 1980s, standard setters have increasingly adopted a balance sheet perspective. Under the balance sheet approach, income reflects revisions in the value of assets and liabilities rather than the difference between revenues and matched expenses. Nissim and Penman (2008, page 13) points out that, under fair value accounting, "earnings are uninformative about future earnings and about value; earnings are changes in value and as such do not predict future value changes, nor do they inform about value (value 'follows a random walk,' as it is said)". The balance sheet approach, including fair value estimates, involves adjusting book value to reflect future benefits that are expected to be realized. Book value produced under the balance sheet approach is more closely aligned to market value and is a better indicator of future profitability than that produced under the income statement approach.

Over the past decades, standard setters have gradually adopted the balance sheet approach for many financial accounts, including impairment charges, goodwill and other intangibles, most financial instruments, pension assets and liabilities, plan assets and obligations under postretirement benefit programs, deferred taxes, asset retirement obligations, and other items. Research findings generally suggest that the increasing adoption of the balance sheet approach has improved the relevance of book value, increased earnings volatility, and reduced earnings persistence (e.g., Barth 1994, Barth et al. 1995, 1996, 1998, Ayers 1998, Amir et al. 2001, 2010, Riedl 2004, Dechow and Ge 2006, Hann et al. 2007, Dichev and Tang 2008, Li et al. 2011). I next provide examples of the accounting changes and research findings regarding how these accounting changes affect the ability of book value and current profitability to predict future profitability. Five accounts are discussed: business combinations, postretirement benefits, asset impairment, income taxes, and fair value accounting.

Business Combinations

Before 2001, two methods were used to account for business combinations: the purchase method, and the pooling of interests method. Since 2001, firms are no longer allowed to use the pooling method for new business combinations.[6] In 2008, the FASB made significant changes in the purchase method (referred to as the acquisition method under the new standard), which apply for business combinations consummated after 2008.

Under all three methods—pooling, purchase and acquisition—the consolidation procedure involves combining the accounts of the acquirer and the acquiree: revenues, expenses, gains and losses in the income statement; cash flows in the cash flow statement; and assets and liabilities on the balance sheet. The primary difference among the methods is in the measurement basis.

Under the purchase method, the acquiree's assets and liabilities are generally valued on the consolidated balance sheet based on their estimated fair value at the business combination date. If the amount that the acquirer paid for the acquiree's common shares is more than the fair value of the acquiree's net identifiable assets (i.e., identifiable assets minus identifiable liabilities), the excess is reported on the consolidated balance sheet as goodwill. In contrast, under pooling the book values of the acquiree's assets and liabilities are added to those of the acquirer; there is no write-up of assets or recognition of goodwill. The presumption is that the two firms have combined their operations but are otherwise operating as before, with the stockholders of the two firms becoming stockholders in the combined entity. Thus, the purchase method results in more informative measures of net operating assets.

[6] The choice of combination method prior to 2001 was not discretionary. A number of specific conditions had to be met for a transaction to be reported as pooling of interests. Two important requirements were: the acquirer must issue voting common shares in exchange for at least 90% of the voting common stock of the acquiree, and the acquisition must occur in a single transaction. Transactions that did not meet one or more of the criteria were accounted for using the purchase method.

Starting in 2009, under the acquisition method, essentially all acquired assets and liabilities, including goodwill, are fully marked-to-market. (Under the purchase method, some asset and liabilities were reported at amounts different from fair value, and the fair value adjustment was in proportion to parent's ownership interest in subsidiary.)

Pension

SFAS 87 (1996) and SFAS 158 (2006) induce significantly more income volatility and impair the value relevance of income, while the value relevance of book value is improved (Hann et al. 2007). Hann et al. (2007) studies the value- and credit-relevance of financial statements under fair-value versus smoothing models of pension accounting. They show that fair-value pension accounting introduces considerable volatility in net income, reducing its persistence and partially obscuring the underlying information in operating income. Fair-value income is less value relevant than smoothing income because of its lower persistence, and the fair value pension obligation on balance sheet is marginally more value relevant. Their evidence suggests that the fair value pension accounting model impairs the value- and credit-relevance of the combined financial statements unless transitory gains and losses are separated from more persistent income components. They find that the fair-value model improves (impairs) the credit relevance of balance sheet (income statement) numbers.

Asset impairment

SFAS No. 121, effective in 1996, was the first standard to explicitly address the recognition and measurement of the impairment of long-lived assets, goodwill, and certain identifiable intangibles.[7] Prior to the issuance of SFAS No. 121, SFAS No. 5 *Accounting for Contingencies,*[8] had provided some general guidance in that it required firms to record losses related to impaired assets, but the FASB Emerging Issues Task Force (EITF) noted that "there were divergent measurement practices in accounting for impairment of assets.". Riedl (2004) shows that the incidence of write-downs increased significantly after the adoption of SFAS No. 121. SFAS No. 121 was superseded by SFAS No. 144 in 2002, but the general provisions were retained. Asset write-downs reflect a change in the present value of the cash flows expected from the asset, and should therefore serve to better align the book value to the market value. Indeed, studies show that firms recording write-downs were performing poorly prior to the write-downs, so by recording the write-downs managers were responding to economic changes (Elliott and Shaw 1988, Francis et al. 1996, Rees et al. 1996).

While the increased recognition of write-downs may have improved the information content of book value, it reduced earnings persistence. Riedl (2004) shows that "big bath" reporting is more strongly associated with write-offs after SFAS No. 121. The significant increase in earnings following a big bath (Haggard et al. 2011) reduces earnings persistence.

[7] SFAS No. 121 "requires that long-lived assets and certain identifiable intangibles to be held and used by an entity be reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount of an asset may not be recoverable. In performing the review for recoverability, the entity should estimate the future cash flows expected to result from the use of the asset and its eventual disposition. If the sum of the expected future cash flows (undiscounted and without interest charges) is less than the carrying amount of the asset, an impairment loss is recognized. Otherwise, an impairment loss is not recognized. Measurement of an impairment loss for long-lived assets and identifiable intangibles that an entity expects to hold and use should be based on the fair value of the asset. … Examples of valuation techniques include the present value of estimated expected future cash flows using a discount rate commensurate with the risks involved, option-pricing models, matrix pricing, option-adjusted spread models, and fundamental analysis. … an impairment loss should be reported as a component of income from continuing operations before income taxes…"

[8] SFAS No. 5 "requires accrual by a charge to income (and disclosure) for an estimated loss from a loss contingency if two conditions are met: (a) information available prior to issuance of the financial statements indicates that it is probable that an asset had been impaired or a liability had been incurred at the date of the financial statements, and (b) the amount of loss can be reasonably estimated. … In some cases, the carrying amount of an operating asset not intended for disposal may exceed the amount expected to be recoverable through future use of that asset even though there has been no physical loss or damage of the asset or threat of such loss or damage. … The question of whether, in those cases, it is appropriate to write down the carrying amount of the asset to an amount expected to be recoverable through future operations is not covered by this Statement."

Information content of earnings is found to be impaired for firms reporting large negative special items (Elliot and Hanna 1996).

SFAS No. 142 was issued in 2001 to supersede APB Opinion No. 17, Intangible Assets, issued in 1970. SFAS No. 142 addresses financial accounting and reporting for acquired goodwill and other intangible assets. Under SFAS No. 142, goodwill and intangible assets that have indefinite useful lives are not amortized but instead are tested for impairment at least annually. The FASB recognized that this standard may increase earnings volatility, but it argued that the enhanced disclosures about goodwill and intangible assets will improve the financial statement users' ability to assess future profitability and cash flows. Goodwill impairment loss is estimated from management's projections of future cash flows of the business unit/asset-group, and it is shown to be value relevant and a leading indicator of future profitability. Specifically, Li et al. (2011) reports that investors and financial analysts revise downward their expectations of value and earnings on the announcement of an impairment loss; goodwill impairment serves as a leading indicator of a decline in future profitability. The results suggest that the recognition of impairment charges improves the value relevance of book value.

Impairment of goodwill/unamortized intangibles, write-down/off of assets, and restructuring charges are usually included in special items. The frequency and magnitude of special items, especially negative special items, have increased dramatically over the past decades (Elliot and Hanna 1996, Dechow and Ge 2006, Fairfield et al. 2009, Donelson et al. 2011, Johnson et al. 2011) due to both accounting and economic changes (Dichev and Tang 2008, Donelson et al. 2011). Large negative special items typically result from a balance sheet perspective accounting that focuses on measuring assets and liabilities to reflect up-to-date economic conditions. Earnings generated under balance sheet oriented accounting reflect the change in the value of net assets during the period and are more volatile and less persistent. Large negative special items are found to play an important role in explaining the low persistence of earnings in low accrual firms (Dechow and Ge 2006).

Income taxes

Another example of the shift towards the balance sheet approach is the accounting for income taxes. Effective for fiscal years beginning after December 15, 1992, SFAS No. 109 requires an "asset and liability" approach in accounting for income taxes. Deferred taxes are considered assets and liabilities of the firm, and deferred tax expense is measured as the current year change in net deferred tax liabilities, including adjustments to reflect changes in enacted tax rates and in the expected realizability of deferred tax assets (using a valuation allowance). Studies have shown that SFAS No. 109 increased the value relevance of deferred tax accounts. Deferred tax components—deferred tax assets, valuation allowance, the adjustment of deferred tax accounts for enacted tax rate changes, and the net realizable value of deferred taxes from losses and credits carried forward—all provide value relevant information (Ayers 1998, Amir et al. 2001, Amir et al. 2010). Valuation allowances are also informative about the realization of deferred tax assets in the future and future taxable income (Kumar and Visvanathan 2003).

Fair value accounting

Fair value accounting[9] is currently applied to all derivatives, most investments in fixed income securities, and some investments in equity securities. The reported amounts of other

[9] SFAS 115, effective for fiscal years beginning after December 15, 1993, addresses the accounting and reporting for investments in equity securities that have readily determinable fair values and for all investments in debt securities. Under this standard, investments are classified in three categories and accounted for as follows. Debt securities that the enterprise has the positive intent and ability to hold to maturity are classified as held-to-maturity

financial instruments increasingly involve fair value considerations. Examples include options and restricted stock, retained components from transferred financial assets and extinguished liabilities, and financial instruments with characteristics of both liabilities and equity. Research has generally shown that fair value estimates of investment securities provide significant explanatory power beyond that provided by historical costs (Barth 1994, Barth et al. 1996, Nelson 1996, etc.), and that fair value based earnings are more volatile than historical cost earnings for economic reasons (Barth et al. 1995, Hodder et al. 2006).

Changing firm characteristics and real options

In conjunction with the economic and accounting changes, public firms have become smaller, less profitable, and more growth oriented (Fama and French 2001). The value relevance literature generally focuses on the changing characteristics of public firms as the primary explanation for the shift of value relevance from earnings to book value. Collins et al. (1997) attributes the shift of value relevance to the increasing frequency and magnitude of special items and negative earnings, changes in average firm size, and the increase in intangible intensity. These changes reduce earnings persistence and increase earnings volatility, i.e., special items (Dechow and Ge 2006) and negative earnings (Hayn 1995) are relatively transitory, and intangible-driven earnings are more volatile than earnings generated by other investments (Kothari et al. 2002). Therefore, the ability of current profitability to predict future profitability declines.

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securities and reported at amortized cost. Debt and equity securities that are bought and held principally for the purpose of selling them in the near term are classified as trading securities and reported at fair value, with unrealized gains and losses included in earnings. Debt and equity securities not classified as either held-to-maturity or trading are classified as available-for-sale and reported at fair value, with unrealized gains and losses excluded from earnings and reported in a separate component of shareholders' equity."

These changes in firm characteristics also imply an increase in the value relevance of book value through the real option effects. Burgstahler and Dichev (1997) demonstrates that the relevance of book value increases when profitability is low. This is because book value captures the value of existing resources, and the option to adopt existing resources for alternative use is particularly valuable when profitability is low. In related work, Barth et al. (1998) shows that the incremental explanatory power of equity book value (net income) increases (decreases) as financial health decreases. The decline of average profitability (Fama and French 2001) therefore implies an increase in the value relevance of book value. The value of real options also become increasingly important because volatility has increased significantly over the past thirty years, and volatility is the primary determinant of the value of real options (Grullon et al. 2011).

3.2.2 Empirical analysis of the factors driving the changes in β_{RNOA} and $\beta_{\Delta NOA}$

In this section, I empirically relate β_{RNOA} and $\beta_{\Delta NOA}$ to temporal changes in firm characteristics, intangible intensity, and accounting changes. I first show that relevant firm characteristics, including stock return volatility, earnings volatility, sales growth volatility, the frequency of negative earnings, the frequency of special items, and R&D intensity all have changed systematically over the sample period. Both β_{RNOA} and $\beta_{\Delta NOA}$ are highly correlated with cross-sectional average values of these firm characteristics. In particular, β_{RNOA} ($\beta_{\Delta NOA}$) is significantly positively (negatively) related to both stock return volatility, earnings volatility, and sales growth volatility. The change of $\beta_{\Delta NOA}$ is more pronounced for intangible intensive firms. Lastly, as an attempt to relate $\beta_{\Delta NOA}$ to specific accounting changes, I compare $\beta_{\Delta NOA}$ between groups of firms that are expected to have different sensitivity to the accounting changes about asset impairment and deferred taxes. However, the empirical evidence does not validate the effects of accounting changes.

<u>Temporal changes in firm characteristics</u>

Table 3 presents the average values of select firm characteristics for both sub-periods, as well as the change (with the related t-statistics) in the average values between the two sub-periods. The average values of the characteristics are calculated for each sub-period as the time-series means of the cross-sectional means (first panel of Table 3) or the cross-sectional medians (second panel). The characteristics include stock return volatility, RNOA volatility, sales growth volatility, an indicator variable for negative earnings, an indicator variable for special items, an indicator variable for large special items (larger than 5% of sales), ΔNOA, RNOA, book-to-market value of NOA, and R&D intensity.

As expected, the variables exhibit significant differences between the two sub-periods. Stock return volatility, RNOA volatility, and sales growth volatility all increase significantly. Stock return volatility increases from 0.1236 to 0.1584 (t-stat=5.7 for the difference), RNOA volatility from 0.0418 to 0.1217 (t-stat=6.8 for the difference), and sales growth volatility from 0.1906 to 0.3402 (t-stat=7.0 for the difference). The proportion of negative earnings increases from 0.1466 to 0.3641 (t-stat=9.6 for the difference). The proportion of non-zero (large) special items increases from 0.1765 (0.0384) to 0.5309 (0.1624), and both changes are highly significant. Average RNOA drops from 0.0949 in the first sub-period to 0.0008 in the second, and the difference is highly significant (t-stat=-6.0). The change in the median value of RNOA is smaller but still highly significant, from 0.0948 in the first period to 0.0698 in the second (t-stat=-5.0 for the difference). Apparently, profitability has become strongly negatively skewed, and so the importance of the adaptation and other downside-protection real options has increased. The value of real options also proliferates because of the increase in intangible intensity. The median R&D intensity increases from 0.0176 to 0.0474, and the difference is significant (t-stat=8.0). The increase in mean R&D intensity is even larger, which is driven by the R&D activities of start-up firms. The average book-to-market ratio of NOA declines significantly, from 0.8418 to 0.6396, reflecting the increase in unrecognized intangibles.[10]

As discussed in the previous section, the rise of $\beta_{\Delta NOA}$ and the decline of β_{RNOA} are related to the lower persistence and higher volatility of profitability caused by economic and accounting changes. The following analysis of the mean reverting pattern of profitability demonstrates the decline in RNOA persistence and the increase in RNOA volatility. For each sub-sample (1967-1988 and 1989-2010), ten equally-sized portfolios based on RNOA are formed in each year (i.e., base year 0), and the median value of RNOA for each portfolio is calculated for each of the years 0 through 10. Figure 2 plots the time-series medians (over all the base years) of the portfolio median RNOA. As expected, the cross-sectional variation in RNOA is substantially larger in the second sub-period, and the persistence of RNOA is substantially smaller. The magnitude of RNOA reversion is much larger in the second period than the first period for most of the portfolios.

Relating β_{RNOA} and $\beta_{\Delta NOA}$ to the changes in firm characteristics

To determine whether the observed trends of $\beta_{\Delta NOA}$ and β_{RNOA} can be explained by the changes in firm characteristics, I perform correlation and regression analyses. Table 4 presents the pair time-series correlation coefficients (Spearman above the diagonal, and Pearson below) among $\beta_{\Delta NOA}$, β_{RNOA}, average values of the firm characteristics, and a time trend (year). The

[10] Alternative explanations for the decline in the book-to-market ratio are increases in either current profitability or current growth. However, average RNOA declines and average ΔNOA does not increase.

characteristics are generally highly correlated with each other as well as with the time trend. As expected, $\beta_{\Delta NOA}$ (β_{RNOA}) is strongly positively (negatively) correlated with each of the volatility measures and with R&D intensity, negatively (positively) correlated with the book-to-market ratio of operating assets, and negatively (positively) correlated with profitability.

While the correlations in Table 4 demonstrate strong relations between $\beta_{\Delta NOA}$, β_{RNOA} and the firm characteristics, they may all be driven by a common time trend. To control for time effects, I plot $\beta_{\Delta NOA}$, β_{RNOA}, and the mean annual stock return volatility (RNOA volatility) over time in Panel A (Panel B) of Figure 3. The plots clearly demonstrate that the correlation between $\beta_{\Delta NOA}$ and the two volatility measures is not simply due to a time trend.

To formally examine the relation between the coefficient $\beta_{\Delta NOA}$ (or β_{RNOA}) and volatility measures, the following time-series regression is performed:

$$\beta_{\Delta NOA} \text{ (or } \beta_{RNOA}) = \beta_0 + \beta_1 \text{ Year} + \beta_2 \text{ Stock\_volatility} + \beta_3 \text{ RNOA\_volatility} + \beta_4 \text{ Salesgr\_volatility} + \beta_5 \text{ S\&P\_return} + \varepsilon$$

S&P500 return is included in the regression to control for economic cycles. The regression results are reported in Table 5. As shown in Panel A which provides the results for $\beta_{\Delta NOA}$ as the dependent variable, the coefficients of all the volatility measures are highly significant even after controlling for the time trend. The explanatory power of RNOA volatility and sales growth volatility is incremental to that of stock return volatility. As stock return volatility captures economic shocks, the incremental power of RNOA volatility suggests that accounting effects, in addition to economic effects, contribute to the $\beta_{\Delta NOA}$ shift over time. For β_{RNOA} (Panel B), however, only the coefficient of sales growth volatility is significant. Overall, the empirical analysis in this section indicates that the trends of $\beta_{\Delta NOA}$ and β_{RNOA} are related to the factors laid out in Section 3.2.1, i.e., economic and accounting changes, changes in the characters of the public firms, and the real option value effects.

Relating $\beta_{\Delta NOA}$ to the intangible intensity

To provide evidence regarding that ΔNOA indicates a higher level of profitability than in the past because profits are now generated by both growth in operating assets and intangibles, I examine $\beta_{\Delta NOA}$ over time for firms with high and low level of intangible intensity. I partition firms based on the book-to-market ratio of net operating assets each year, i.e., above or below the median in each year. Firms with low book-to-market ratio are expected to have a more significant change in $\beta_{\Delta NOA}$. I plot $\beta_{\Delta NOA}$ over time for both groups in Figure 4. $\beta_{\Delta NOA}$ exhibits a shift from negative to positive over time for both groups, and the shift is more pronounced for the low group after the late 1980s. When intangibles become an increasingly important form of investment and assets, low group generates higher profitability per unit ΔNOA than high group, attributable to the benefits and profits generated by the intangibles.

Relating $\beta_{\Delta NOA}$ to accounting changes

I perform the following analysis as an attempt to relate $\beta_{\Delta NOA}$ to specific accounting changes. I select the changes in accounting for impairment and deferred taxes. These changes are expected to have bigger effects on firms with a high level of fixed assets because these firms are more prone to impairments and have larger depreciation expense which is a major book-and-tax difference. I partition firms based on the ratio of fixed assets to average total assets each year, i.e., above or below the median in each year. The $\beta_{\Delta NOA}$ of the high group is expected to exhibit a more dramatic change following the years of the accounting changes (i.e., year 1992 for SFAS 109, year 1996 for SFAS No. 121) than the low group. I plot $\beta_{\Delta NOA}$ for both groups over time in

Figure 5. $\beta_{\Delta NOA}$ shifts from negative to positive over time for both groups, but the shift is more pronounced for the low group starting from mid 1980s. The evidence does not reveal the effects of accounting changes. Instead, it provides additional support for the effects of the increased intangible intensity over time, because the ratio of fixed assets to average total assets is highly correlated with the intangible intensity. The spearman correlation between the book-to-market ratio of operations and the fixed asset ratio is 0.182. The effects of accounting changes may be dominated by the effects of the economic changes. To provide direct evidence on the effects of the accounting changes, collection of additional information is required to conduct further analysis.

3.3 Are the negative effects of ΔNOA still relevant?

The findings that ΔNOA did not predict a decline in profitability in the second part of the sample period does not necessarily imply that the negative effects of growth on profitability are no longer at work. In this section I show that ΔNOA still has negative implications for future profitability by providing the following evidence: (1) there is a strong negative relation between lagged ΔNOA and future profitability in the second half of the sample period; (2) decomposing ΔNOA, I find that the relation between the following components of ΔNOA and future profitability is significantly negative for both sub-periods: working capital accruals, depreciation, and the change in PP&E minus depreciation (although the magnitude declines significantly over time for working capital accruals and the change in PP&E minus depreciation), while the relation between the change in intangible assets, the change in other NOA and future profitability changes from negative to positive.

3.3.1 The negative relation between lagged ΔNOA and future profitability

The overall positive relation between ΔNOA and future profitability represents the net effect of ΔNOA on future profitability, i.e., the negative effects are offset by the positive effects due to the changes discussed in Section 3.2. To disentangle the negative effects from the positive, I examine the incremental information of the one- and two-year lagged ΔNOA regarding future profitability, after controlling for current ΔNOA.[11] Because both the negative and positive effects of ΔNOA on future profitability may persist for multiple years, finding that the lagged ΔNOA terms are negatively related to future profitability in the second half of the sample period would confirm the continuing presence of the negative effects of growth on profitability.

Net operating assets essentially reflect the cumulative difference between operating income and free cash flow (Hirshleifer et al. 2004), and this difference reverses over many future years. The pattern of reversal depends on the transactions giving rise to the initial difference. For example, when a firm inflates the balance sheet by over-capitalizing expenditures as fixed assets (a positive ΔNOA), subsequent depreciation is increased by a constant amount each period over the asset useful life. In contrast, overstating revenue by "stuffing the channels" would fully reverse in the subsequent period unless the company re-engages in this earnings management activity. Thus, ΔNOA may have negative implications for both near- and long-term profitability.

Similarly, the positive effects of ΔNOA on profitability may exhibit variable time patterns. Examples of the positive effects of ΔNOA on future profitability include a decrease in the tax valuation allowance due to an increase in expected earnings, or an impairment charge triggered by a reduction in expected earnings (Rees et al. 1996, Li et al. 2011). Both examples

[11] In unreported tests, I include three-year-lagged ΔNOA in the future profitability regression. The coefficient on the three-year-lagged ΔNOA is not significant, and the coefficients of other explanatory variables, i.e., current ΔNOA, one- and two-year lagged ΔNOA, do not change significantly.

suggest a positive correlation between ΔNOA and future profitability, with the time pattern of the correlation depending on the pattern of related future earnings.

I assess the possible negative effects of ΔNOA on future profitability by including lagged values of ΔNOA in the future profitability regression:

$$RNOA_{t+1} = \beta_0 + \beta_{\Delta NOA}\,\Delta NOA_t + \beta_1\,\Delta NOA_{t-1} + \beta_2\,\Delta NOA_{t-2} + \beta_{RNOA}\,RNOA_t + \varepsilon$$

The regression results are reported in Table 6. $\beta_{\Delta NOA}$ and β_{RNOA} are generally similar to what are reported in Table 2. The coefficients of one- and two-year lagged ΔNOA are insignificant in the first sub-period, -0.0042 (t-stat=-0.9) and 0.0004 (t-stat=0.1), but are negative and significant in the second period, -0.0275 (t-stat=-4.4) and -0.0131 (t-stat=-2.1).[12] These results support the hypothesis that the negative effects of growth on future profitability continue to exist in the second period, but that the negative effects are dominated by the positive effects in the following year.

3.3.2 The relation between components of ΔNOA and future profitability

I also examine whether any of the negative effects of ΔNOA on future profitability are still relevant by decomposing ΔNOA into components. This allows for further examination of the

[12] The finding that the delayed negative effects of growth on profitability are stronger in the second sample period is consistent with managers opportunistically utilizing the balance-sheet approach. The shift from an income statement to balance sheet approach makes book value more relevant, but it also provides managers with flexibility to manipulate income in ways that take long periods to unwind. The balance sheet approach often incorporates assumptions and estimates that are projected far into the future. Consider the following examples. Impairment charges could reflect managers' appropriate response to decreases in the assets' ability to generate income (Smith 1993, Rees et al. 1996, Li et al. 2011), or they could be the result of managerial manipulation to improve future earnings (Francis et al. 1996, Burgstahler et al. 2002). The latter results in a negative effect of growth on future profitability, while the former indicates a positive effect. Studies have shown that after the implementation of SFAS 121 and SFAS 142, asset write-offs have become more strongly associated with "big bath" reporting behavior, suggesting greater managerial discretion in reporting (Riedl 2004, Li et al. 2011). As another example, by understating the valuation allowance for deferred tax assets (an increase in NOA), managers may be able to overstate current income at the expense of future income (when the deferred tax asset expires unutilized). Similarly, by understating expected compensation increases and therefore expected benefit payments under defined benefit pension plans (an increase in NOA), managers may be able to postpone the related expenses for many years.

incremental relation of each component with future profitability. I examine the relation of the components of ΔNOA with future profitability by running the following regression and report the results in Table 7:

$$RNOA_{t+1} = \beta_0 + \beta_1\, \Delta WC_t + \beta_2\, DepAcc_t + \beta_3\, Oth\Delta PP\&T_t + \beta_4\, \Delta Intan_t + \beta_5\, \Delta OthNOA_t + \beta_6\, RNOA_t + \varepsilon$$

Working capital accruals, defined as the change in working capital minus depreciation expense (as in Sloan 1996), is significantly negatively related to future profitability for both sub-periods, -0.1419 (t-stat=-13.9) for the first and -0.0594 (t-stat=-2.4) for the second, although the magnitude of the coefficient declines significantly over time (t-stat=3.0 for the change). The coefficient of depreciation (negative sign) is -0.1122 (t-stat=-2.6) in the first period and -0.1897 (t-stat=-3.8) in the second, and the change is marginally significant (t-stat=-1.2). The coefficient of the change in PP&E minus depreciation becomes less negative over time: -0.1044 (t-stat=-12.0) in the first period and -0.0317 (t-stat=-2.4) in the second, and the change is significant (t-stat=4.6). The changes in the coefficients are consistent with the effects of intangibles: growth in working capital accruals and fixed assets (hence less depreciation) is associated with a higher level of profitability. At the same time, the coefficient of the change in intangible assets shifts from -0.0496 (t-stat=-1.8) in the first period to 0.0010 (t-stat=0.1) in the second, and the increase is marginally significant (t-stat=1.6). The coefficient of the other ΔNOA changes significantly from -0.1073 (t-stat=-14.5) to 0.0493 (t-stat=-3.5). The results provide further support for the inference that the negative implications of ΔNOA for future profitability are still in force. The positive effects grow stronger over time and now dominate the negative effects.

4. Implications for the accrual anomaly

The changes in the relation between ΔNOA and future profitability have important implications for the accrual anomaly—i.e., the negative relation between ΔNOA and future stock returns. The prevailing explanation for the anomaly in the literature is that ΔNOA implies a reduction in future profitability, and investors fail to fully appreciate this negative relation; the mispricing is corrected when future earnings are announced. In support of this explanation, several studies (e.g., Fairfield et al. 2003, Fama and French 2006) document that ΔNOA is negatively related to future profitability after controlling for current profitability. However, the positive relation between ΔNOA and future profitability documented in this study implies that the anomaly should no longer exist. Therefore, I proceed to re-examine the relation between ΔNOA and future stock returns.

4.1 The accrual anomaly over time

Since Sloan (1996) first documented the accrual anomaly, the literature has generally found it to be robust. However, a few recent studies (Richardson et al. 2010, Wu et al. 2010, Green et al. 2011) report that forming investment strategies based on ΔNOA does not generate significant abnormal return in the mid 2000s. Yet Green et al. (2011) notes that "although hedge returns to Sloan's (1996) accrual anomaly are not currently positive on average, they may not always remain so". Similarly, Wu et al. (2010) suggests that the deterioration of the accrual anomaly in recent years reflects its counter-cyclical nature, and the accruals effect is likely to mean-revert in the near future. Moreover, the profitability of an investment strategy depends on business conditions, type and magnitude of profit opportunities in other strategies, and many other known or unknown factors that may change over time. For example, Richardson et al.

(2010) reports that the post-earnings-announcement drift was weaker for a few years until 2002, generated marginally positive returns for the years 2003-2005, and became insignificant again in recent years. They note "the possibility that time varying expected returns could explain the attenuation in the return profile of the ΔNOA and SUE characteristic portfolios".

I examine the accrual anomaly over the period 1967-2010 (stock returns through April 2012), extending the sample periods employed in prior studies. To assure robustness, I use Fama-MacBeth regression, a portfolio approach, and a Fama-French factor analysis. Table 8 reports the results of the following regression:

$$Ret_{t+1} = \beta_0 + \beta_1 \Delta NOA_t + \beta_2 RNOA_t + \beta_3 RNOA_{t-1} + \beta_4 Size_t + \beta_5 BTM_t + \beta_6 Beta_t + \beta_7 Idio\_Volat_t + \beta_8 Ret_t + \varepsilon$$

Consistent with prior studies, ΔNOA negatively predicts future stock returns. In addition, the coefficient of size is negative and significant, the coefficients of book-to-market and momentum (Ret_t) are positive and significant, the coefficient of market beta is insignificant, and the coefficient of idiosyncratic volatility is negative rather than positive (see, e.g., Ang et al. 2006).

The annual ΔNOA coefficients to predict future returns are plotted in Figure 6. For the majority of the sample years, the ΔNOA coefficient is negative. Similar to the findings in prior studies, the accrual anomaly weakens during the mid 2000s; however, the negative relation between ΔNOA and future stock returns resumes after 2006 with a large magnitude. In addition, for several years during the 1970s, the anomaly was insignificant but, similar to the pattern observed in the late 2000s, those years were followed by a strong and consistent performance. Visual examination of the time-series pattern suggests that while the magnitude of the coefficient may have declined during the second half of the sample period, it remains consistently negative. The last two sets of regression results reported in Table 8 confirm that ΔNOA's ability to predict future returns remains essentially unchanged. The coefficients of ΔNOA are significant in both sub-periods, and the difference between the sub-periods is insignificantly different from zero. Moreover, as reported in Table 9, all components of ΔNOA remain significantly negatively related to future stock returns in the second period, and neither the coefficients nor their significance level changes significantly.

Figure 7 plots the annual size-adjusted hedge portfolio returns generated from implementing a ΔNOA strategy, where the annual size-adjusted hedge portfolio return is measured as the difference between the annual size-adjusted return on the low ΔNOA portfolio (bottom ΔNOA decile) and that on the high ΔNOA portfolio (top ΔNOA decile). Similar to the regression results, the portfolio approach does not generate significant abnormal return during the mid 2000s and the late 1970s. The mean hedge return generated from the ΔNOA strategy is 7.2% for the first sub-period, and 15.9% for the second. The 8.7% increase (t-stat=2.1) in the hedge return between the two sub-periods is statistically and economically significant.

The results from regressing low-minus-high ΔNOA portfolio returns on the Fama-French (1993) factors and the momentum factor are reported in Table 10. The alpha is 0.0118 (t-stat=6.8) for the entire sample period, and it increases significantly from 0.0054 (t-stat=3.3) in the first sub-period to 0.0178 (t-stat=6.0) in the second (t-statistic for the increase is 3.7).

In contrast to the regression results, both the factor analysis and the portfolio approach reveal that the returns associated with the ΔNOA strategy increase over time. The difference between the regression and the portfolio approach/factor analysis results (i.e., the decrease in the ΔNOA coefficient, the increase in the portfolio hedge return, and the increase in abnormal return from factor analysis) can be understood by considering the cross-sectional variability of

ΔNOA.[13] The annual standard deviation of ΔNOA increases from 15.6% in the first sub-period to 28.7% in the second, and the increase is significant (t-stat = 7.4).

4.2 Existing Explanations for the accrual anomaly

Having shown that the accrual anomaly still exists, I next study the explanations for the anomaly offered in prior research. Two alternative explanations for the negative relation between ΔNOA and future stock returns have been offered in the literature.

The first explanation suggests that ΔNOA is negatively related to risk, so the return predictability of ΔNOA is not anomalous. Economic theory suggests that a decline in discount rates should lead to both an increase in the firm's operating assets (i.e., more projects have positive net present value) and a decline in realized stock returns (Fama and French 1995 & 1996, Zhang 2007, Wu et al. 2010). Penman and Zhu (2012) takes the view that the observed "anomalous" returns associated with working capital accruals are consistent with rational pricing because working capital accruals forecast forward earning yields and growth in the same direction in which they forecast returns. The Fama-French factor analysis (Table 10) provides evidence supporting the possible role of risk. High-minus-low, small-minus-big, and the momentum factors all load positively in explaining the low-minus-high ΔNOA portfolio return. The loading of the market factor is negative, indicating that the ΔNOA strategy is counter-cyclical.

[13] To illustrate how the increase in the variability of ΔNOA can explain the difference between the regression and portfolio results, consider the following example. Case (a): mean ΔNOA is equal to -1 for the bottom decile and 1 for the top decile, and the size-adjusted portfolio return is 10% for the bottom decile and -10% for the top decile. Under this setting, the hedge return is 20%, and the ΔNOA coefficient when regressing future stock returns on ΔNOA is 10. Case (b): mean ΔNOA is equal to -10 for the bottom decile and 10 for the top decile, and the size-adjusted stock portfolio return is 20% for the bottom decile and -20% for the top decile. Under this setting, the hedge return is 40% and the ΔNOA coefficient is 2. Note that the hedge return is larger in case (b) while the ΔNOA coefficient is smaller, and this difference is due to the increase in the cross-sectional variability of ΔNOA.

While the results of the Fama-French factor analysis suggest that exposure to risk factors contributes to the negative relation between ΔNOA and future stock returns, risk is unlikely to fully explain the anomaly given the significant "intercept". Hirshleifer et al. (2012) shows that "it is the accrual characteristic rather than the accrual factor loading that predicts returns", which is consistent with the behavioral/mispricing hypothesis. Moreover, the consistency of the anomaly throughout the sample period (see Figures 6 and 7), the relatively small magnitude of negative abnormal returns when the strategy does not work, and the fact that strategy performs well in recession years,[14] suggest that risk-pricing is unlikely to fully explain the negative relation between ΔNOA and future stock returns.

The second explanation for the anomaly is that ΔNOA predicts a decline in future profitability and investors fail to fully appreciate this negative relation. Stock prices fully impound the information when future profitability is announced. However, this explanation cannot explain the persistence of the anomaly because ΔNOA does not predict a reduction in the next year's profitability during the last twenty years as this study shows.

4.3 Hypothesized Explanation for the accrual anomaly

In this section I conjecture and show that the accrual anomaly is associated with the divergence between the market reaction to ΔNOA and the future profitability implications of ΔNOA throughout the sample period. Investors are always over-optimistic about the profitability implications of ΔNOA, i.e., in the first half of the sample (1967-1988), investors do not fully react to the negative effects of growth on profitability, and in the second half (1989-2010), they

[14] Lakonishok et al. (1994) assesses the risk-based explanation to the value/glamour strategy based on the argument that value stocks would be fundamentally riskier if they underperform glamour stocks in "bad" states of the world.

appear to over-emphasize the positive implications of ΔNOA for future profitability. I also rule out the possibility that in recent years the accrual anomaly is caused by market mispricing of the past (rather than current) ΔNOA.

4.3.1 Divergence between the market pricing and the profitability implications of ΔNOA

My empirical results with respect to the first sub-period are consistent with the prevailing explanation for the accrual anomaly: ΔNOA is negatively related to future profitability and investors do not fully react to this negative relation (e.g., Sloan 1996, Xie 2001, Fairfield et al. 2003). However, in the second sub-period, I find that ΔNOA is positively related to future profitability, and yet the accrual anomaly persists. I conjecture that the persistence of the anomaly in the second sub-period is related to investors' excessive focus on the positive information in ΔNOA. The positive information in ΔNOA results from the economic changes and the accounting principles shifting toward a balance sheet/fair value approach. In their survey paper, Dichev et al. (2012) reports that CFOs express concerns that "over-emphasis of the fair value approach is misguided". Investors' over-extrapolation of certain information items is the alternative explanation for several stock market anomalies: investors initially overreact to the information item, and the stock return predictability of that item reflects the future reversal of the overreaction. For example, the value/growth anomaly is argued to be attributable to investors' overreaction to the past performance of glamor firms (e.g., De Bondt and Thaler 1985, Lakonishok et al. 1994). To summarize, I conjecture that the accrual anomaly is associated with the divergence between the market reaction to ΔNOA and the future profitability implications of ΔNOA throughout the sample period.

I examine this conjecture by comparing the market pricing of ΔNOA with the profitability implications of ΔNOA. The market pricing of ΔNOA is assessed by regressing contemporaneous stock returns on ΔNOA and control variables:

$$Ret_t = \beta_0 + \beta_1 \Delta NOA_t + \beta_2 \Delta NOA_{t-1} + \beta_3 \Delta NOA_{t-2} + \beta_4 RNOA_t + \beta_5 RNOA_{t-1} + \beta_6 Size_{t-1} + \beta_7 BTM_{t-1} + \beta_8 Beta_{t-1} + \beta_9 Idio\_Volat_{t-1} + \beta_{10} Ret_{t-1} + \varepsilon$$

The regression results are reported in Table 11. During the first sub-period investors' reaction to ΔNOA is negative, but it changes to be strongly positive in the second sub-period (t-statistic=7.1 for the change). Table 12 shows that the changes in investors' response to all the components of ΔNOA are similar.

To compare and contrast the market reaction to ΔNOA with the future profitability implications of ΔNOA, I plot in Figure 8 the time-series pattern of the ΔNOA coefficients from the contemporaneous stock return regression (Table 11) and $\beta_{\Delta NOA}$ from the profitability regression (Table 2). As the scale of the ΔNOA coefficients from the contemporaneous stock return regression and $\beta_{\Delta NOA}$ are not comparable, I "standardize" each coefficient series by dividing the coefficients by their time-series standard deviation. The variability of the standardized coefficients is comparable across the two series. In other words, the magnitude of changes in the standardized coefficients is comparable across the two series.

From the mid 1960s through the early 1980s, $\beta_{\Delta NOA}$ is significantly negative and relatively stable, indicating that ΔNOA has strong negative implications for future profitability. $\beta_{\Delta NOA}$ slopes upward in the mid 1980s, and becomes positive in the mid 1990s. It fluctuates mainly in the positive range from the late 1990s onwards, suggesting that ΔNOA has net positive implications for future profitability during this period. In contrast, the ΔNOA coefficient from the contemporaneous stock returns regression slopes upward from the mid 1970s, becomes positive in the early 1980s, and stabilizes in the positive range after the late 1980s. It indicates that investors start to react positively to ΔNOA in the early 1980s, and their positive reaction has remained relatively stable since then.

A comparison of $\beta_{\Delta NOA}$ and the ΔNOA coefficient from the contemporaneous stock returns regression suggests the following with respect to the persistence of the accrual anomaly. During the period 1966-1987, ΔNOA has strong negative implications for future profitability but investors fail to fully react to those implications. However, starting from the late 1980s, the market seems to overprice the positive implications of ΔNOA relative to the realization of future profitability. The decline of the anomaly in the mid 2000s is in a period when investors' reaction to ΔNOA and the profitability implications of ΔNOA converge. The resumption of the anomaly in the late 2000s can be explained by a divergence between market expectations and profitability realizations, i.e., investors continue to react positively to ΔNOA while ΔNOA does not positively predict future profitability during that short period of time. Considering that market pricing of ΔNOA has been stable over the past twenty years, it is the profitability implications of ΔNOA that shift over time and diverge from market pricing.

4.3.2 The possible role of lagged NOA in explaining the accrual anomaly

In Section 3.3.1, lagged values of ΔNOA are shown to be negatively related to future profitability. Because ΔNOA and lagged ΔNOA are highly correlated (average cross-sectional Pearson (Spearman) correlation coefficient between ΔNOA and lagged ΔNOA over the sample years is 0.24 (0.30)), it is possible that the negative relation between ΔNOA and future stock return in the second sub-period is due to the market mispricing of lagged ΔNOA. I next examine whether the persistence of the accrual anomaly is related to the market mispricing of lagged ΔNOA by including one- and two-year lagged ΔNOA in the profitability regression:

$$Ret_{t+1} = \beta_0 + \beta_1\, \Delta NOA_t + \beta_2\, \Delta NOA_{t-1} + \beta_3\, \Delta NOA_{t-2} + \beta_4\, RNOA_t + \beta_5\, RNOA_{t-1} + \beta_6\, Size_t + \beta_7\, BTM_t + \beta_8\, Beta_t + \beta_9\, Idio\_Volat_t + \beta_{10}\, Ret_t + \varepsilon$$

The results, reported in Table 13, show that the ΔNOA coefficient is not significantly altered by the inclusion of the lagged ΔNOA terms, suggesting that the delayed effects of ΔNOA do not explain the persistence of the accrual anomaly. One-year lagged ΔNOA negatively predicts stock returns throughout the sample period, and the coefficient of the two-year lagged ΔNOA is negative and significant only in the last twenty years.

5. Robustness Tests

<u>Alternative measures of ΔNOA and RNOA</u>

To be comparable with existing studies and remove the possibility that the results are driven by the relation between cash and future profitability, I repeat all the analysis with the alternative measures of ΔNOA and RNOA that exclude cash and the related interest income. Net operating assets are measured as total assets minus cash, short-term investment, and non-debt liabilities; NOPAT, the numerator of RNOA, is calculated as net income before extraordinary items and after minority interest, minus after-tax special items, plus after-tax interest expense, minus after-tax interest income, plus minority interest in income. All the major results hold for the alternative measures. Table 14 reports the results from examining the relation between growth and future profitability with the alternative measures. The results are consistent with the primary analysis, i.e., ΔNOA changes from negatively to positively predicting future profitability over time.

<u>Excluding merger and acquisition cases</u>

Assets acquired and liabilities assumed in a business combination may have different implications for future profitability from existing resources. To remove the possible effects of business combinations, I repeat the major analysis excluding observations with significant business combinations. Firms having either a change of intangible or cash paid for acquisitions greater than 5% of average total assets are considered as having significant business combinations. The major results hold after excluding significant business combination cases, as reported in Table 15.

<u>Positive versus negative ΔNOA</u>

Positive and negative ΔNOA may have different implications for future profitability. For example, Barth et al. (1998) shows that pricing multiples and the incremental explanatory power of equity book value (net income) increase (decrease) as financial health decreases, because liquidation values and probability of default affect equity values. To ensure that the results are not driven by the negative growth cases, I allow different coefficients for positive and negative growth and report the results in Table 16. For firms with positive ΔNOA, $\beta_{\Delta NOA}$ is -0.1183 (t-stat=-22.5) for the first sub-period, and increases significantly to -0.0659 (t-stat=-8.3) in the second. For firms with negative ΔNOA, $\beta_{\Delta NOA}$ changes from -0.0341 (t-stat=-2.2) in the first sub-period to 0.3465 (t-stat=7.4) in the second, and the change is significant (t-stat=7.7). Firms with negative ΔNOA are likely to have more intangibles.

6. Conclusion and limitations

Growth in net operating assets has both negative and positive implications for future profitability. Positive implications are expected to grow stronger over time due to economic and accounting changes. From the valuation perspective, future profitability can be expressed as a weighted average of current profitability and growth in net operating assets, with the weights depending on the persistence of current earnings. Prior research finds a decline in earnings persistence and a shift of value relevance from earnings to book value over time. This study reexamines the ability of growth in net operating assets and current profitability to predict future profitability. Contrary to the understanding of an overall negative relation between ΔNOA and future profitability, this study finds that the relation has been positive since the mid 1990s. The ΔNOA coefficient from the future profitability regression ($\beta_{\Delta NOA}$) is negative in the first half of the sample period (1967-1988), but slopes upward in the late 1980s, and becomes positive after the mid 1990s.

The shift in the relation between ΔNOA and future profitability is related to the increase in book value's ability to predict future profitability and the increased intangible intensity. $\beta_{\Delta NOA}$ is strongly correlated with stock return volatility, earnings volatility, special items, R&D intensity, and other volatility-related characteristics. The increase in earnings volatility and the improvement in the relevance of book value are attributable to economic and accounting changes, changing characteristics of public firms, and the increased importance of real options. Moreover, as the intangible intensity increases over time, ΔNOA is associated with a higher level of profitability because the profits now are contributed by both ΔNOA and intangibles.

This paper further shows that the negative effects of ΔNOA on future profitability continue to exist in the second half of the sample period, but the negative effects are dominated by the positive effects of ΔNOA in the following year. Decomposing ΔNOA reveals that working capital accruals, depreciation, and the change in PP&E minus depreciation remain negatively related to future profitability throughout the sample period. In contrast, the relation between the change in intangible assets, the other ΔNOA and future profitability shifts from negative to positive.

The shift in the relation between ΔNOA and future profitability has important implications for the accrual anomaly—i.e., the negative relation between ΔNOA and future stock returns. The prevailing explanation for the anomaly is that ΔNOA implies a reduction in future profitability, which investors fail to fully appreciate; the mispricing is corrected when future earnings are announced. The change in the future profitability-ΔNOA relation documented in this study implies that the anomaly should no longer exist. Indeed, several recent studies document that the accrual anomaly weakens during the mid 2000s. I examine the accrual anomaly over the period of 1967 to 2010, and find evidence that the accrual anomaly still exists. Specifically, the results show that the anomaly resumes after 2006, and in the 1970s there was a short period during which the anomaly was insignificant and exhibited a similar pattern as that found in the mid 2000s. When the entire sample period is divided into two equal length sub-periods, the change in the magnitude of the anomaly between the two sub-periods is insignificant. Additionally, all components of ΔNOA are significantly related to future stock returns, and the strength of these relations does not change during the sample period.

Considering the change in the future profitability-ΔNOA relation, what could explain the persistence of the accrual anomaly throughout the sample period? Risk may contribute to the persistence of the anomaly over time, but it seems unlikely to fully explain it. I conjecture and show that the anomaly is related to the divergence between the market pricing and profitability implications of ΔNOA throughout the sample period. Specifically, investors do not fully react to the negative profitability implications of ΔNOA through the late 1980s, and they seem to over-emphasize the positive implications of ΔNOA afterwards. The decline of the anomaly in the mid 2000s is shown to be associated with the convergence of investors' expectations and the realization of the future profitability. The anomaly resumes in the late 2000s as the divergence emerges again: investors continue to react positively to ΔNOA while ΔNOA becomes insignificantly related to future profitability. Over the last twenty years, investors' reaction to ΔNOA has been relatively stable, and it is the profitability implications of ΔNOA that shift over time and cause the divergence.

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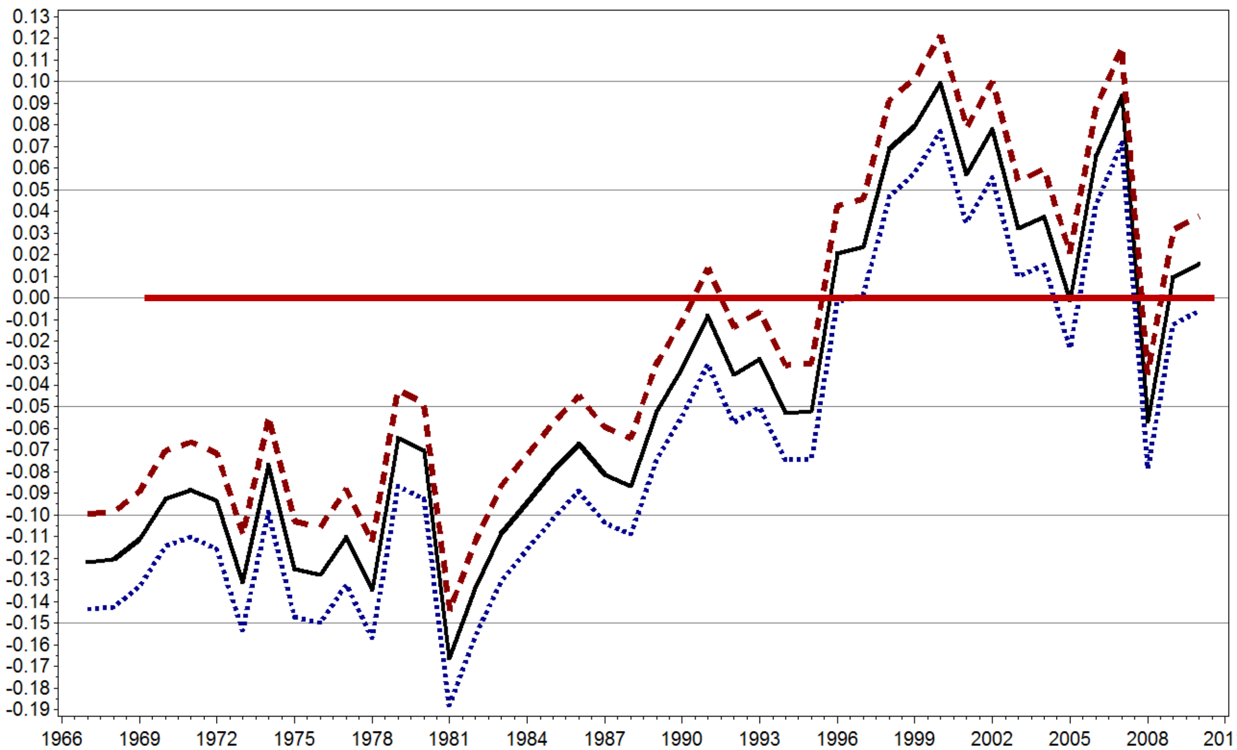
Figures

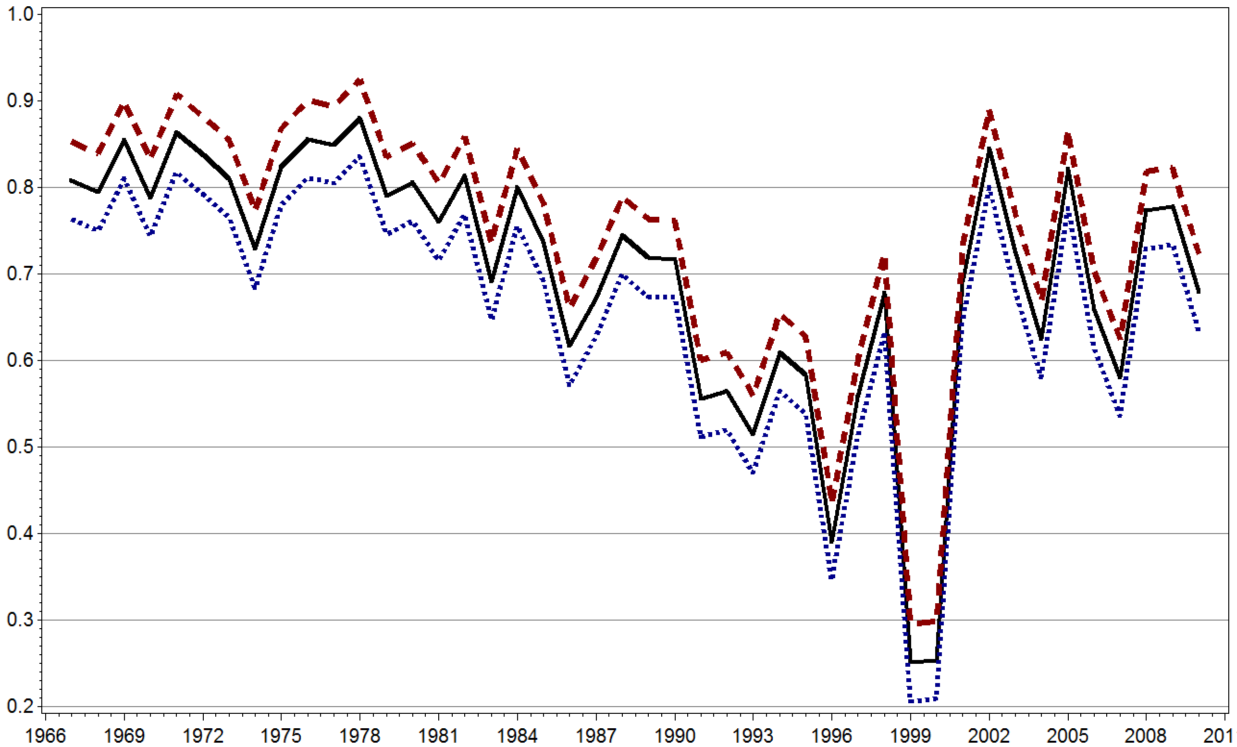
Figure 1: Coefficients from regressing future profitability on growth in net operating assets and current profitability

$$RNOA_{t+1} = \beta_0 + \beta_{\Delta NOA}\, \Delta NOA_t + \beta_{RNOA}\, RNOA_t + \varepsilon$$

Panel A: βΔNOA (with a 95% confidence interval)



Panel B: βRNOA (with a 95% confidence interval)



Panel C: R-squared

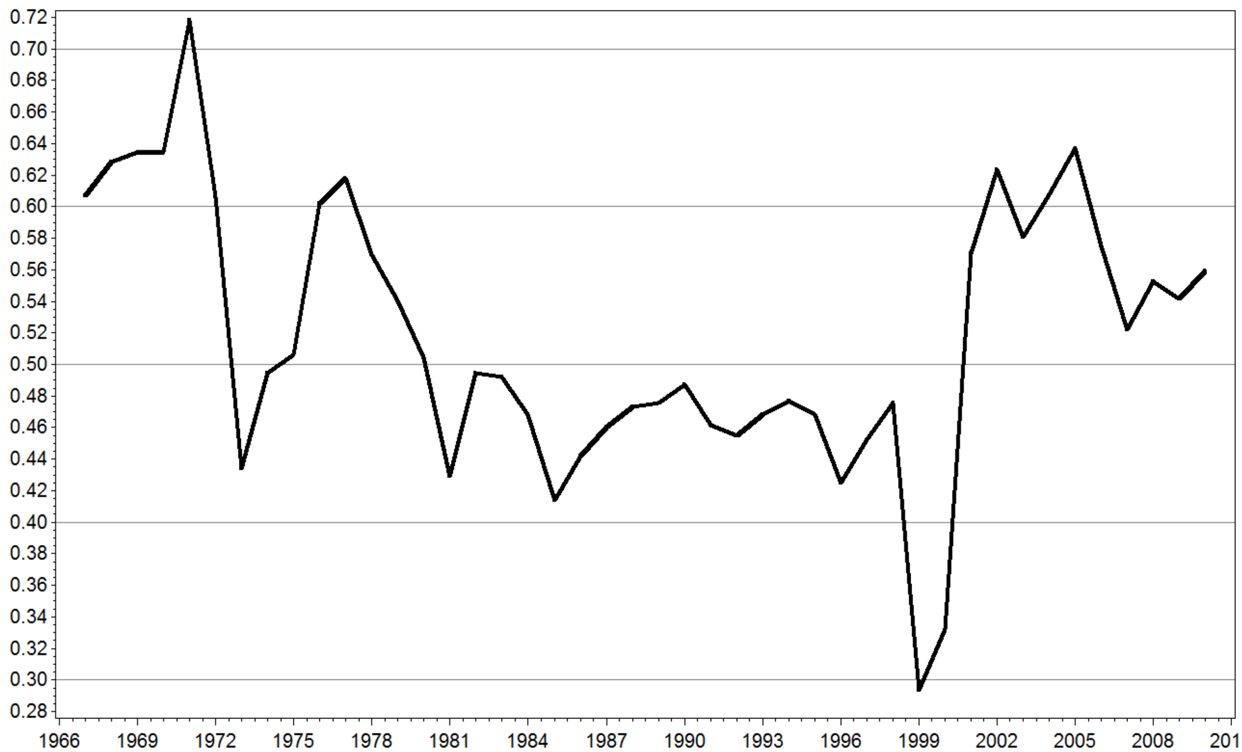
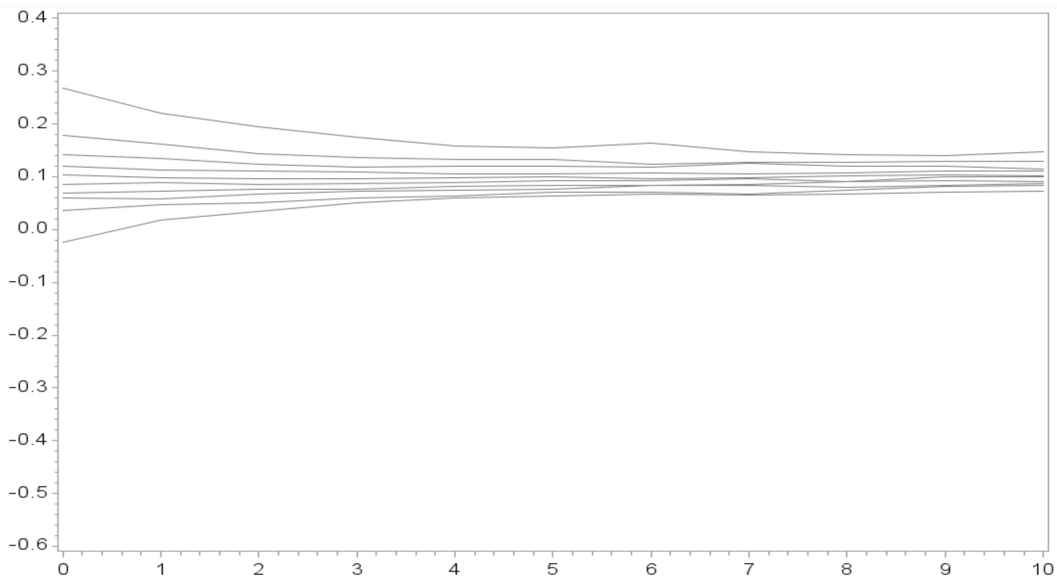
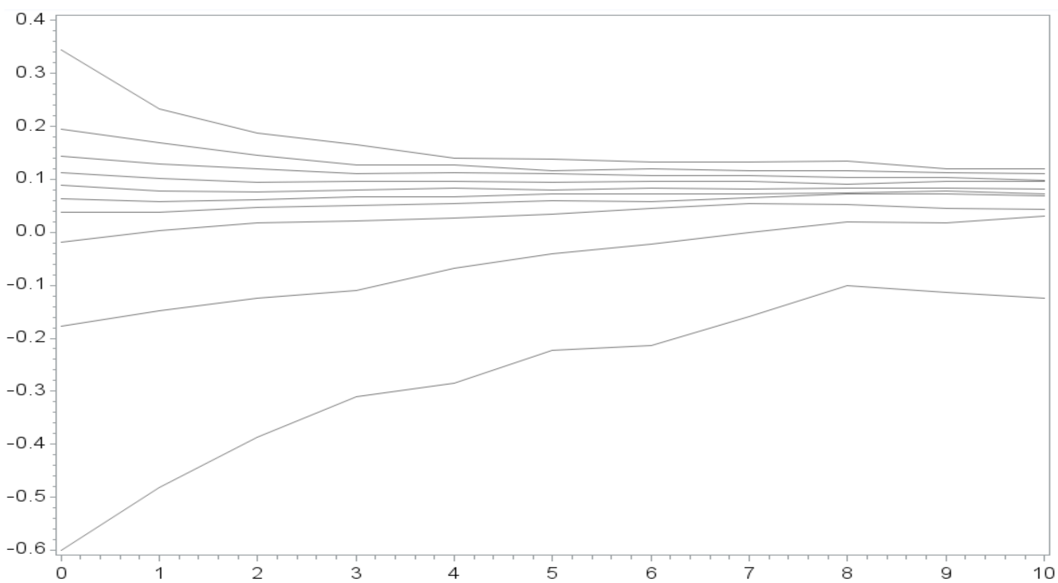


Figure 2: The Persistence of Return on Net Operating Assets

Panel A: 1967-1988



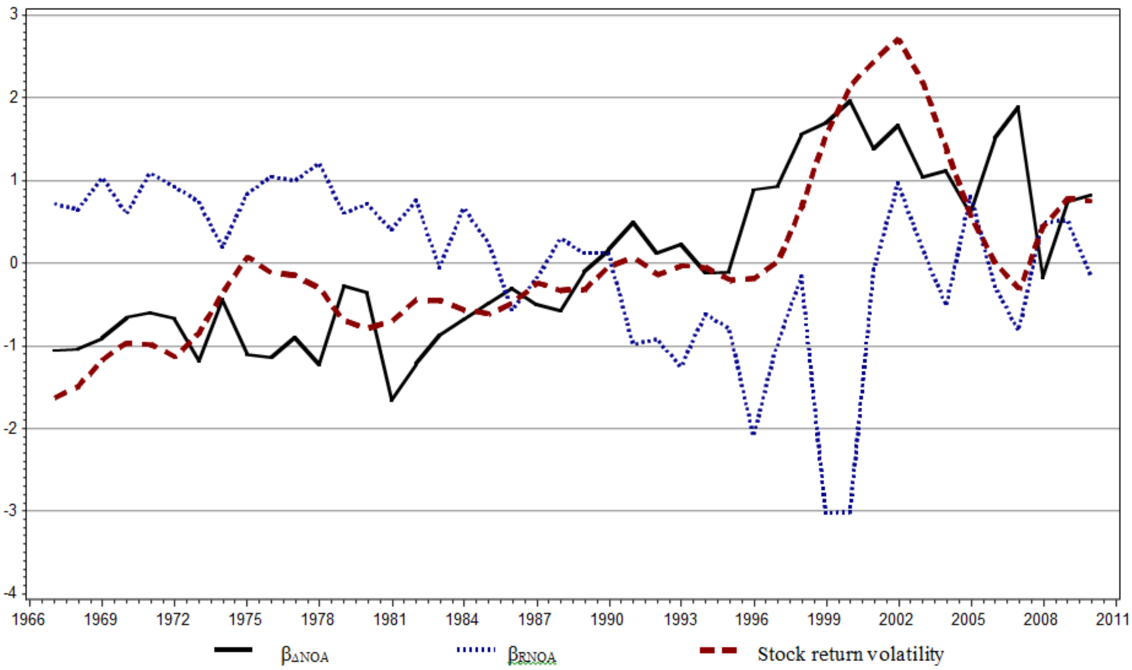
Panel B: 1989-2010



Ten equally-sized portfolios are formed each base year (year 0) based on RNOA, and the median value of RNOA is calculated annually (years 0 to 10) for each of the ten deciles. The figures present the time-series medians (over all the base years) of the portfolio medians.

Figure 3: Coefficients from the future profitability regression and the mean annual volatility

Panel A: $\beta_{\Delta NOA}$, β_{RNOA}, and stock return volatility



Panel B: $\beta_{\Delta NOA}$, β_{RNOA}, and RNOA volatility

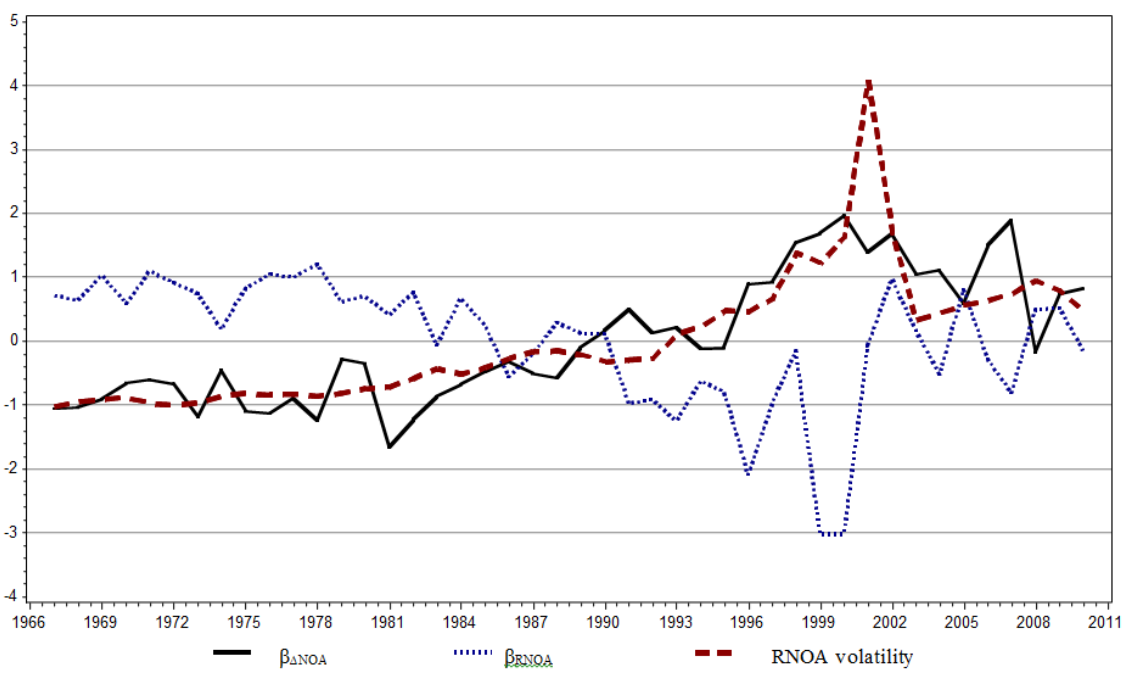


Figure 4: Coefficient $\beta_{\Delta NOA}$ of the high vs. low group of firms partitioned based on the book-to-market ratio of net operating assets each year

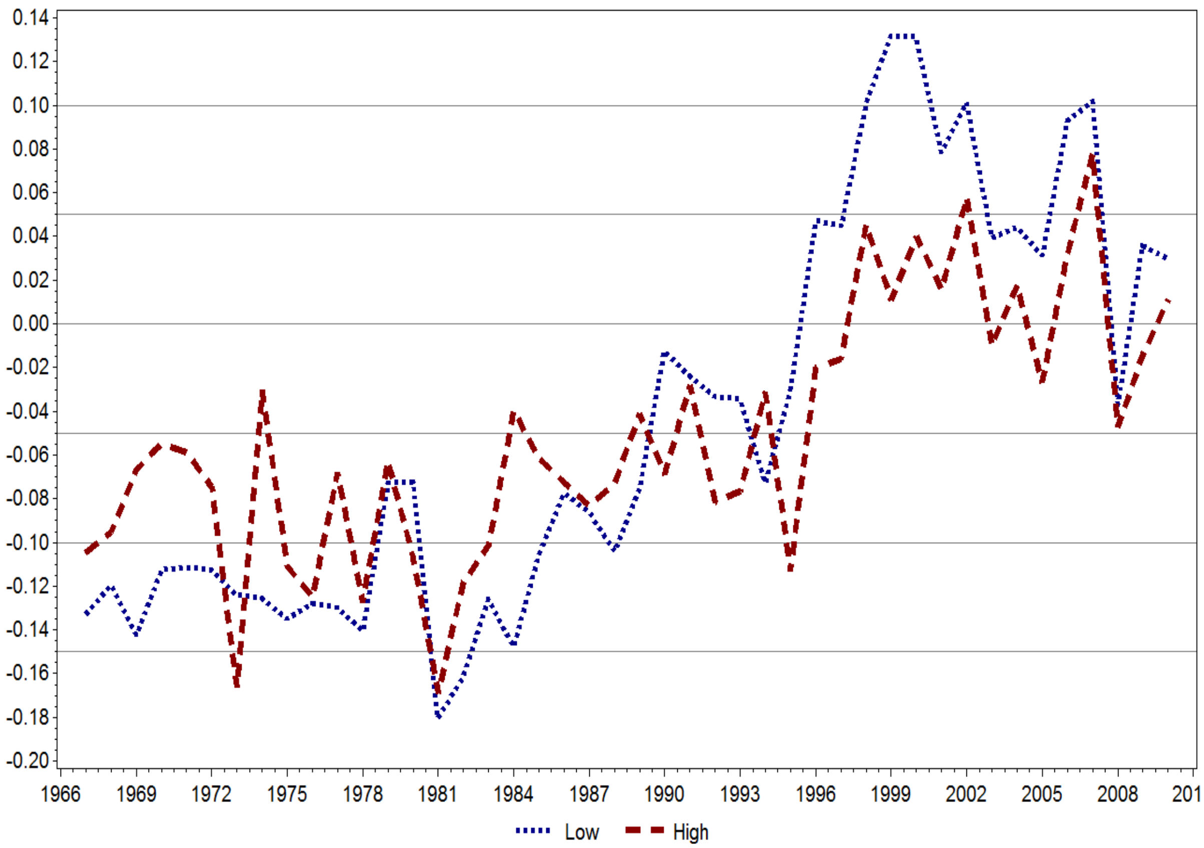


Figure 5: Coefficient $\beta_{\Delta NOA}$ of the high vs. low group of firms partitioned based on the ratio of fixed assets to average total assets each year

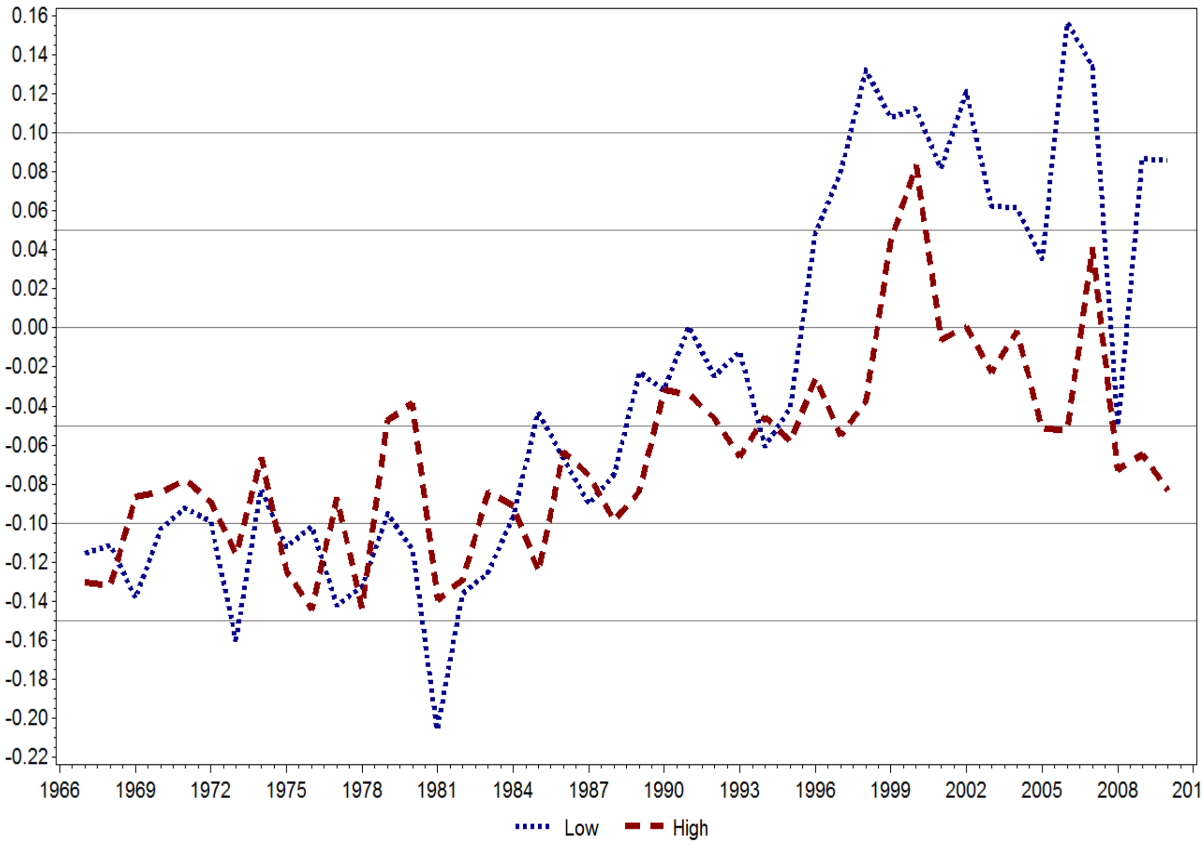


Figure 6: Coefficient (β_1) from regressing future stock return on growth in net operating assets and control variables

$$Ret_{t+1} = \beta_0 + \beta_1\,\Delta NOA_t + \beta_2\,RNOA_t + \beta_3\,RNOA_{t-1} + \beta_4\,Size_t + \beta_5\,BTM_t + \beta_6\,Beta_t + \beta_7\,Idio\_Volat_t + \beta_8\,Ret_t + \varepsilon$$

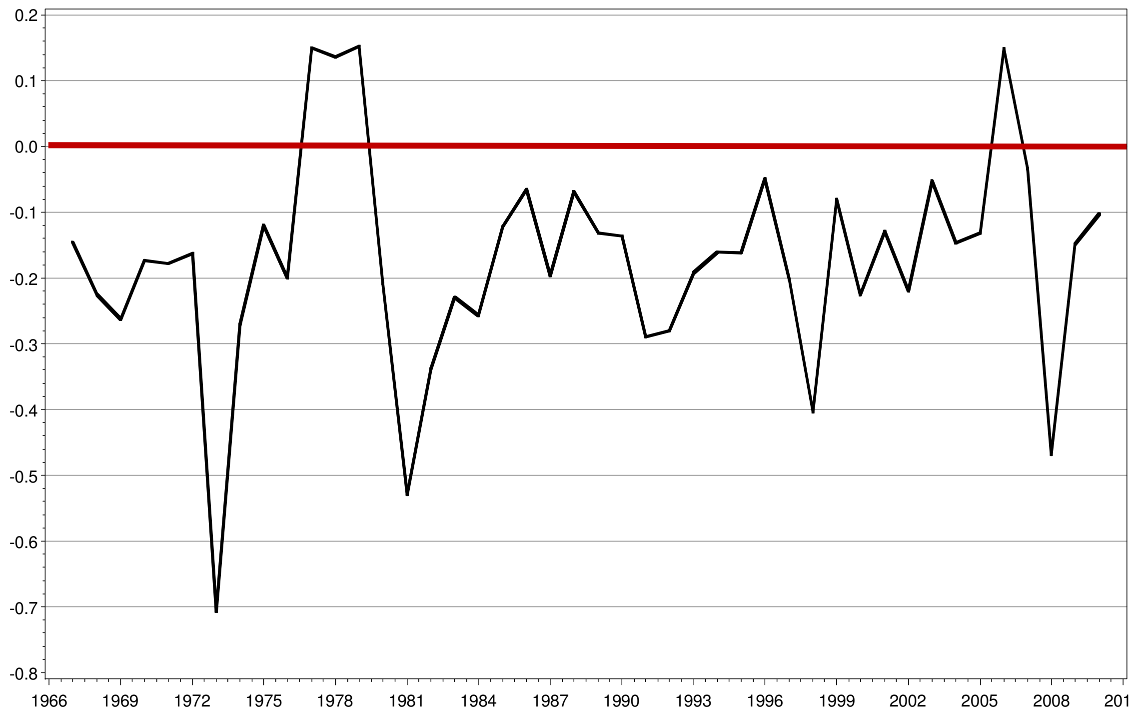
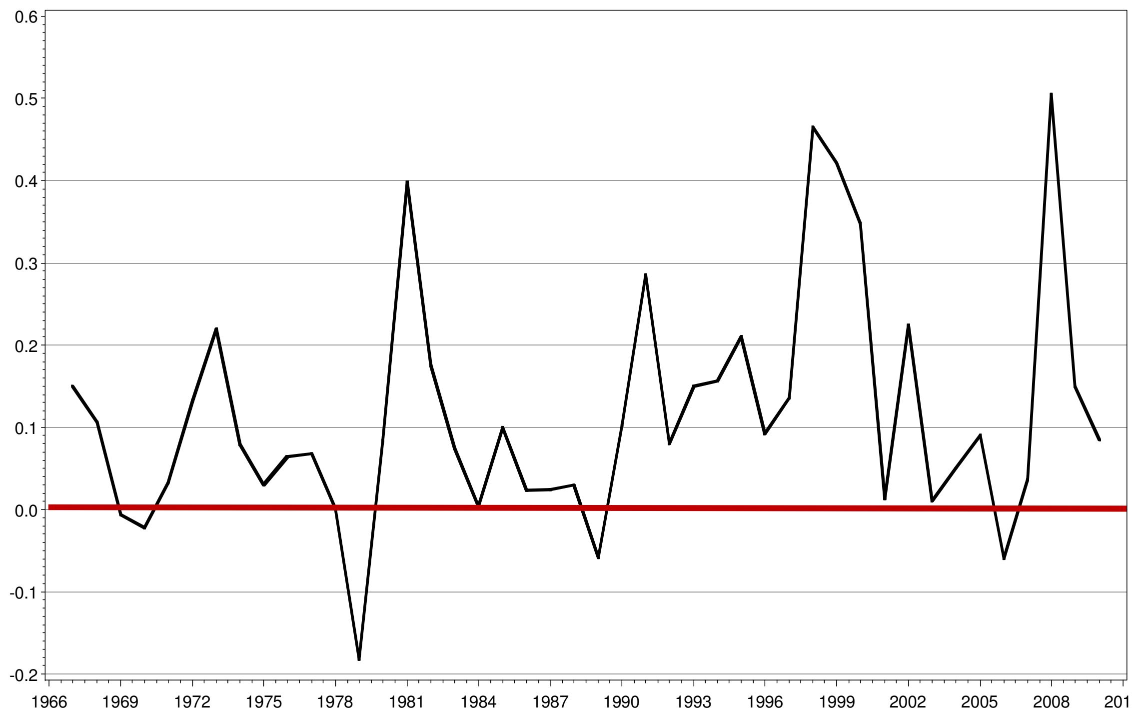
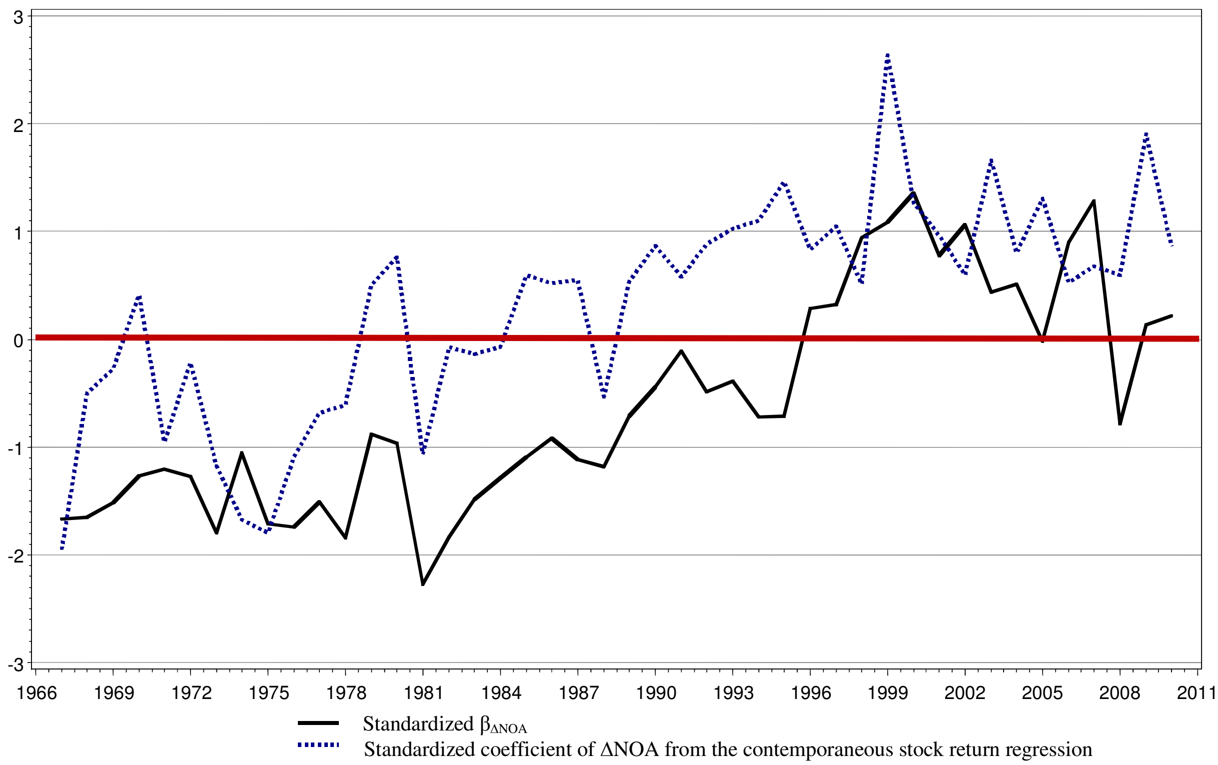


Figure 7: Annual size-adjusted return to hedge portfolios based on the growth in net operating assets



This figure plots the annual size-adjusted hedge portfolio return generated by implementing a ΔNOA strategy. The annual size-adjusted hedge portfolio return is measured as the difference between the annual size-adjusted return on a low ΔNOA portfolio (bottom ΔNOA decile) and the return on the high ΔNOA portfolio (top ΔNOA decile). The portfolios are sorted on April 30 of the year subsequent to the ΔNOA year, and the return window starts on the following day. All non-financial/utility NYSE/AMEX/NASDAQ firms with December fiscal year end are included. ΔNOA is measured using annual financial data from Compustat. Size-adjusted return is calculated as the raw stock return minus the contemporaneous return on a size-matched portfolio. Size portfolios are formed using the 10 deciles of market value of equity at the end of April in the following year. Hedge portfolios are rebalanced annually.

Figure 8: Standardized coefficients from separate regressions of contemporaneous stock return and future profitability on growth in net operating assets and control variables



Each coefficient series is standardized by dividing the annual coefficient by its time-series standard deviation. The variability of the standardized coefficients is comparable across the two series. In other words, the magnitude of change in the coefficients in any sub-period is comparable across the two series.

Tables

Table 1: Descriptive Statistics

	Obs.	Mean	Std. Dev.	5%	25%	50%	75%	95%
ΔNOA	94451	0.10	0.27	-0.24	-0.02	0.06	0.16	0.62
ΔWC	92114	0.01	0.08	-0.11	-0.02	0.01	0.05	0.16
DepAcc	94678	-0.05	0.03	-0.11	-0.06	-0.04	-0.03	-0.01
OthΔPP&T	94475	0.08	0.10	-0.01	0.03	0.06	0.11	0.28
ΔIntan	94997	0.01	0.08	-0.03	0.00	0.00	0.00	0.12
ΔOthNOA	91302	0.03	0.20	-0.19	-0.03	0.00	0.05	0.35
RNOA	93960	0.03	0.34	-0.42	0.01	0.08	0.14	0.29
Ret	88402	0.13	0.59	-0.61	-0.23	0.05	0.36	1.14
Total assets	97205	1466	4914	11	43	152	725	6842
BTA	96791	0.49	0.24	0.08	0.33	0.49	0.67	0.86
BTM	93482	0.69	0.64	0.08	0.29	0.53	0.92	1.90
Beta	79287	1.14	0.70	0.14	0.68	1.08	1.51	2.39
Idio_Volat	79287	0.15	0.07	0.07	0.10	0.13	0.18	0.29

The sample period is from 1967 to 2010. The variables are defined as follows:

ΔNOA	=	The annual change in net operating assets (total assets minus non-debt liabilities), divided by average total assets
ΔWC	=	Working capital accruals divided by average total assets, where working capital accruals are estimated as the change in working capital, as in Sloan (1996)
DepAcc	=	Depreciation (negative sign) divided by average total assets
OthΔPP&T	=	Change in PP&E minus depreciation, divided by average total assets
ΔIntan	=	Change in intangible assets divided by average total assets
ΔOthNOA	=	ΔNOA – ΔWC – DepAcc - OthΔPP&T - ΔIntan
RNOA	=	Return on net operating assets, calculated as the ratio of net operating profit after tax (NOPAT) to beginning-of-period net operating assets, where NOPAT = Net income before extraordinary items - special items × (1- tax rate) + interest expense × (1- tax rate) + preferred dividend + non-controlling interest income
Ret	=	Stock return from May 1 of year t through April 30 of year t+1
Total assets	=	Total assets in millions of USD
BTA	=	Book value of common equity divided by total assets
BTM	=	Ratio of book value of equity to the adjusted market value of equity (=market value of equity at year end × (1+cumulative stock returns over the first 4 months of the following year))
Beta	=	Slope coefficient from the market model estimated using monthly stock returns over the prior 60 months (a minimum of 30 months is required) and the S&P 500 returns
Idio_Volat	=	Root mean squared error of the market model regression

Table 2: Regression of future profitability on growth in net operating assets and current profitability

$$RNOA_{t+1} = \beta_0 + \beta_{\Delta NOA}\, \Delta NOA_t + \beta_{RNOA}\, RNOA_t + \varepsilon$$

Years	Statistic	Intercept	ΔNOA	RNOA	Mean R²	Mean Obs.
67 – 10	Mean	0.0116	-0.0438	0.7020	0.5184	1951
	t-stat	3.6	-4.0	31.4		
67 – 88	Mean	0.0225	-0.1040	0.7874	0.5350	1367
	t-stat	8.6	-18.3	55.4		
89 – 10	Mean	0.0007	0.0164	0.6166	0.5018	2535
	t-stat	0.1	1.5	18.2		
	Diff.	-0.0218	0.1204	-0.1708		
	t-stat	-3.9	9.7	-4.6		
89 – 99	Mean	0.0082	-0.0149	0.5888	0.4646	2399
	t-stat	1.6	-1.2	18.7		
00 – 10	Mean	-0.0056	0.0425	0.6398	0.5328	2648
	t-stat	-0.7	3.2	11.2		
	Diff.	-0.0137	0.0574	0.0510		
	t-stat	-1.5	3.1	0.8		

This table reports the results from Fama-MacBeth regression of next year's return on net operating assets ($RNOA_{t+1}$) on growth in net operating assets (ΔNOA_t) and current RNOA. The variables are defined as follows:

ΔNOA = The annual change in net operating assets (total assets minus non-debt liabilities), divided by average total assets

RNOA = Return on net operating assets, calculated as the ratio of net operating profit after tax (NOPAT) to beginning-of-period net operating assets, where NOPAT = Net income before extraordinary items - special items × (1- tax rate) + interest expense × (1- tax rate) + preferred dividend + non-controlling interest income

Table 3: Firm characteristics over time

Statistic	Years	Stock volatility	RNOA volatility	Sales growth volatility	Negative earnings	Special items	Large spec. items	ΔNOA	RNOA	BTM_NOA	R&D Int.
Mean	67-10	0.1410	0.0818	0.2654	0.2553	0.3537	0.1004	0.0939	0.0478	0.7407	0.2774
	67-88	0.1236	0.0418	0.1906	0.1466	0.1765	0.0384	0.0867	0.0949	0.8418	0.0361
	89-10	0.1584	0.1217	0.3402	0.3641	0.5309	0.1624	0.1011	0.0008	0.6396	0.5187
	Diff.	0.0348	0.0799	0.1496	0.2174	0.3543	0.1240	0.0143	-0.0941	-0.2022	0.4826
	t-stat	5.7	6.8	7.0	9.6	10.1	9.7	0.9	-6.0	-5.0	7.6
Median	67-10	0.1293	0.0392	0.1366	0.0227	0.2727	0.0000	0.0557	0.0823	0.7173	0.0325
	67-88	0.1146	0.0272	0.1179	0.0000	0.0000	0.0000	0.0624	0.0948	0.8444	0.0176
	89-10	0.1440	0.0513	0.1553	0.0455	0.5455	0.0000	0.0490	0.0698	0.5901	0.0474
	Diff.	0.0293	0.0241	0.0374	0.0455	0.5455	0.0000	-0.0134	-0.0250	-0.2543	0.0298
	t-stat	5.3	8.7	4.8	1.0	5.0	N/A	-1.7	-5.0	-6.2	8.0

This table reports the average values of firm characteristics for each of the two sub-periods, the changes in the average values, and t-statistics for the changes. The average values of the characteristics are calculated as the time-series means of the cross-sectional means or medians. The characteristics are:

ΔNOA	=	The annual change in net operating assets (total assets minus non-debt liabilities), divided by average total assets
RNOA	=	Return on net operating assets, calculated as the ratio of net operating profit after tax (NOPAT) to beginning-of-period net operating assets, where NOPAT = Net income before extraordinary items - special items × (1- tax rate) + interest expense × (1- tax rate) + preferred dividend + non-controlling interest income
RNOA volatility	=	Standard deviation of RNOA over the current and prior two years
Sales growth volatility	=	Standard deviation of sales growth over the current and prior two years
Stock volatility	=	Standard deviation of monthly stock returns over the prior 60 months (a minimum of 30 months is required)
Negative earnings	=	Indicator variable for negative earnings
Special items	=	Indicator variable for special items
Large special items	=	Indicator variable for large special items (larger than 5% of sales)
BTM_NOA	=	The ratio of net operating assets to the sum of net operating assets and the difference between the adjusted market value of equity and book value
Beta	=	Slope coefficient from the market model estimated using monthly stock returns over the prior 60 months (a minimum of 30

		months is required) and the S&P 500 returns
R&D intensity	=	R&D expense divided by sales

Table 4: Time-series correlations (Spearman above the diagonal, Pearson below) of the coefficients from the future profitability regression and average firm characteristics

Panel A: Firm characteristics measured using the cross-sectional mean

Variable	$\beta_{\Delta NOA}$	β_{RNOA}	Year	Stock volatility	RNOA volatility	Sales growth volatility	Negative earnings	Special items	Large sp. Items	ΔNOA	RNOA	BTM_ NOA	R&D Intensity
$\beta_{\Delta NOA}$		-0.67	0.84	0.73	0.86	0.81	0.87	0.83	0.85	0.23	-0.87	-0.56	0.84
β_{RNOA}	-0.63		-0.58	-0.41	-0.62	-0.64	-0.65	-0.55	-0.63	-0.57	0.63	0.54	-0.63
Year	0.82	-0.49		0.81	0.93	0.82	0.90	0.98	0.93	0.09	-0.85	-0.57	0.90
Stock volatility	0.75	-0.38	0.73		0.82	0.70	0.82	0.84	0.84	-0.09	-0.77	-0.33	0.67
RNOA volatility	0.80	-0.47	0.78	0.82		0.93	0.96	0.94	0.97	0.14	-0.90	-0.51	0.88
Sales volatility	0.81	-0.56	0.75	0.75	0.94		0.89	0.82	0.87	0.19	-0.90	-0.56	0.84
Negative earnings	0.82	-0.61	0.9	0.79	0.87	0.88		0.92	0.97	0.07	-0.94	-0.51	0.87
Special items	0.81	-0.45	0.99	0.76	0.79	0.77	0.92		0.95	0.04	-0.85	-0.55	0.89
Large sp. Items	0.80	-0.52	0.90	0.80	0.90	0.88	0.97	0.92		0.1	-0.91	-0.50	0.87
ΔNOA	0.17	-0.66	0.02	-0.21	-0.10	0.05	-0.02	-0.06	-0.09		-0.12	-0.41	0.25
RNOA	-0.82	0.75	-0.68	-0.77	-0.80	-0.81	-0.82	-0.67	-0.78	-0.2		0.58	-0.87
BTM_NOA	-0.55	0.42	-0.59	-0.24	-0.43	-0.51	-0.58	-0.59	-0.51	-0.34	0.42		-0.71
R&D intensity	0.79	-0.40	0.83	0.58	0.69	0.63	0.69	0.80	0.72	0.11	-0.60	-0.59	

Panel B: Firm characteristics measured using the cross-sectional median

Variable	$\beta_{\Delta NOA}$	β_{RNOA}	Year	Stock volatility	RNOA volatility	Sales volatility	Negative earnings	Special items	Large sp. Items	ΔNOA	RNOA	BTM_ NOA	R&D Intensity
$\beta_{\Delta NOA}$		-0.67	0.84	0.67	0.84	0.68	0.19	0.67	N/A	-0.13	-0.68	-0.69	0.82
β_{RNOA}	-0.63		-0.58	-0.37	-0.61	-0.51	-0.07	-0.15	N/A	-0.13	0.41	0.61	-0.54
Year	0.82	-0.49		0.76	0.94	0.75	0.15	0.77	N/A	-0.29	-0.62	-0.68	0.80
Stock volatility	0.72	-0.35	0.71		0.81	0.74	0.25	0.63	N/A	-0.36	-0.59	-0.40	0.58
RNOA volatility	0.84	-0.55	0.92	0.81		0.88	0.26	0.71	N/A	-0.28	-0.67	-0.63	0.81
Sales volatility	0.72	-0.49	0.71	0.79	0.89		0.26	0.57	N/A	-0.27	-0.59	-0.53	0.67
Negative earnings	0.21	-0.01	0.15	0.37	0.33	0.40		0.25	N/A	-0.26	-0.26	-0.05	0.25
Special items	0.72	-0.11	0.77	0.71	0.74	0.60	0.25		N/A	-0.33	-0.60	-0.45	0.75
Large sp. Items	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A

ΔNOA	-0.19	-0.22	-0.34	-0.53	-0.40	-0.37	-0.41	-0.43	N/A		0.59	-0.05	-0.11
RNOA	-0.68	0.37	-0.60	-0.74	-0.74	-0.72	-0.43	-0.62	N/A	0.67		0.49	-0.70
BTM_NOA	-0.64	0.49	-0.66	-0.28	-0.61	-0.48	-0.08	-0.44	N/A	0.02	0.49		-0.80
R&D intensity	0.87	-0.50	0.81	0.74	0.86	0.75	0.33	0.83	N/A	-0.28	-0.75	-0.70	

This table reports the time-series correlations (Spearman above the diagonal, Pearson below) of the coefficients from the future profitability regression and average firm characteristics. The average values of the characteristics are calculated for each sub-period as the time-series means of the cross-sectional means or medians. The characteristics are:

$\beta_{\Delta NOA}$	=	The ΔNOA coefficient from the profitability regression (Table 2)
β_{RNOA}	=	The RNOA coefficient from the profitability regression (Table 2)
RNOA	=	Return on net operating assets, calculated as the ratio of net operating profit after tax (NOPAT) to beginning-of-period net operating assets, where NOPAT = Net income before extraordinary items - special items × (1- tax rate) + interest expense × (1- tax rate) + preferred dividend + non-controlling interest income
ΔNOA	=	The annual change in net operating assets (total assets minus non-debt liabilities), divided by average total assets
RNOA	=	Return on net operating assets, calculated as the ratio of net operating profit after tax (NOPAT) to beginning-of-period net operating assets, where NOPAT = Net income before extraordinary items - special items × (1- tax rate) + interest expense × (1- tax rate) + preferred dividend + non-controlling interest income
RNOA volatility	=	Standard deviation of RNOA over the current and prior two years
Sales volatility	=	Standard deviation of sales growth over the current and prior two years
Stock volatility	=	Standard deviation of monthly stock returns over the prior 60 months (a minimum of 30 months is required)
Negative earnings	=	Indicator variable for negative earnings
Special items	=	Indicator variable for special items
Large special items	=	Indicator variable for large special items (larger than 5% of sales)
BTM_NOA	=	The ratio of net operating assets to the sum of net operating assets and the difference between the adjusted market value of equity and book value
Beta	=	Slope coefficient from the market model estimated using monthly stock returns over the prior 60 months (a minimum of 30 months is required) and the S&P 500 returns
R&D intensity	=	R&D expense divided by sales

Table 5: Time-series regression of the coefficients from the future profitability regression on mean annual volatility measures

Panel A: $\beta_{\Delta NOA} = \beta_0 + \beta_1$ Year + β_2 Stock_volatility + β_3 RNOA_volatility + β_4 Salesgr_volatility + β_5 S&P_return + ε

Intercept	Year	stock return volatility	profitability volatility	Salesgr volatility	S&P return	R^2	Obs.
-9.3671	0.0047					0.6771	44
-9.4	9.4						
-0.3348		2.0638				0.5612	44
-8.3		7.3					
-0.1300			1.0547			0.6455	44
-10.9			8.7				
-0.1962				0.5743		0.6587	44
-10.8				9.0			
-6.8654	0.0034	0.8724				0.7237	44
-5.2	4.9	2.6					
-5.7671	0.0029		0.5447			0.7458	44
-4.1	4.0		3.3				
-5.6624	0.0028			0.3133		0.7614	44
-4.3	4.2			3.8			
-5.4319	0.0027	0.3830	0.4292			0.7517	44
-3.8	3.6	1.0	2.1				
-5.0189	0.0024	0.4383		0.2614		0.7708	44
-3.6	3.4	1.3		2.9			
-4.9719	0.0024	0.4544	0.4635		0.0503	0.7645	44
-3.4	3.3	1.2	2.3		1.5		
-4.8001	0.0023	0.5265		0.2568	0.0366	0.7777	44
-3.4	3.2	1.5		2.8	1.1		

Panel B: $\beta_{RNOA} = \beta_0 + \beta_1$ Year + β_2 Stock_volatility + β_3 RNOA_volatility + β_4 Salesgr_volatility + β_5 S&P_return + ε

Intercept	Year	Stock volatility	Profitability volatility	Salesgr volatility	S&P return	R^2	Obs.
12.0408	-0.0057					0.2440	44
3.9	-3.7						
1.0035		-2.1386				0.1468	44
8.8		-2.7					
0.8033			-1.2392			0.2171	44
22.4			-3.4				
0.9155				-0.8044		0.3149	44
17.6				-4.4			
11.2896	-0.0053	-0.2619				0.2450	44
2.5	-2.3	-0.2					
8.3822	-0.0038		-0.5536			0.2613	44
1.7	-1.6		-1.0				
4.6214	-0.0019			-0.6274		0.3264	44
1.0	-0.8			-2.2			
8.8745	-0.0041	0.5625	-0.7231			0.2644	44
1.8	-1.6	0.4	-1.0				
6.0463	-0.0027	0.9705		-0.7423		0.3377	44
1.3	-1.1	0.8		-2.4			
7.3894	-0.0034	0.3320	-0.8339		-0.1625	0.2970	44
1.4	-1.3	0.2	-1.2		-1.3		
5.2499	-0.0022	0.6497		-0.7255	-0.1334	0.3599	44
1.1	-0.9	0.5		-2.3	-1.2		

This table reports the results from time-series regression of $\beta_{\Delta NOA}$ (β_{RNOA}) on annual mean values of stock return volatility and profitability volatility, where

RNOA_volatility	=	Standard deviation of RNOA over the current and prior two years
Stock_volatility	=	Standard deviation of monthly stock returns over the prior 60 months (a minimum of 30 months is required)
Salesgr_volatility	=	Standard deviation of sales growth over the current and prior two years
S&P return	=	S&P500 annual return

Table 6: Regression of future profitability on current and lagged values of growth in net operating assets, controlling for current profitability

$$RNOA_{t+1} = \beta_0 + \beta_{\Delta NOA}\,\Delta NOA_t + \beta_1\,\Delta NOA_{t-1} + \beta_2\,\Delta NOA_{t-2} + \beta_{RNOA}\,RNOA_t + \varepsilon$$

Years	Statistic	Intercept	ΔNOA_t	ΔNOA_{t-1}	ΔNOA_{t-2}	$RNOA_t$	Mean R^2	Mean Obs.
67 – 10	Mean	0.0154	-0.0446	-0.0159	-0.0064	0.7528	0.5421	1657
	t-stat	5.8	-3.7	-3.7	-1.6	48.1		
67 – 88	Mean	0.0220	-0.1077	-0.0042	0.0004	0.8154	0.5578	1164
	t-stat	8.1	-15.7	-0.9	0.1	68.0		
89 – 10	Mean	0.0087	0.0186	-0.0275	-0.0131	0.6902	0.5264	2151
	t-stat	2.1	1.4	-4.4	-2.1	31.2		
	Diff.	-0.0133	0.1262	-0.0233	-0.0135	-0.1251		
	t-stat	-2.7	8.6	-3.0	-1.7	-5.0		

This table reports the results from Fama-MacBeth regression of next year's return on net operating assets ($RNOA_{t+1}$) on current RNOA and current and lagged values of growth in net operating assets (ΔNOA). The variables are defined as follows:

ΔNOA = The annual change in net operating assets (total assets minus non-debt liabilities), divided by average total assets

RNOA = Return on net operating assets, calculated as the ratio of net operating profit after tax (NOPAT) to beginning-of-period net operating assets, where

NOPAT = Net income before extraordinary items - special items × (1- tax rate) + interest expense × (1- tax rate) + preferred dividend + non-controlling interest income

Table 7: Regression of future profitability on components of growth in net operating assets, controlling for current profitability

$$RNOA_{t+1} = \beta_0 + \beta_1\, \Delta WC_t + \beta_2\, DepAcc_t + \beta_3\, Oth\Delta PP\&T_t + \beta_4\, \Delta Intan_t + \beta_5\, \Delta OthNOA_t + \beta_6\, RNOA_t + \varepsilon$$

Years	Statistic	Intercept	ΔWC	DepAcc	OthΔPP &T	ΔIntan	ΔOth NOA	RNOA	Mean R²	Mean Obs.
67 – 10	Mean	0.0087	-0.1006	-0.1510	-0.0681	-0.0243	-0.0290	0.7252	0.5362	1784
	t-stat	2.7	-6.8	-4.5	-7.1	-1.5	-2.0	31.6		
67 – 88	Mean	0.0211	-0.1419	-0.1122	-0.1044	-0.0496	-0.1073	0.8129	0.5521	1263
	t-stat	8.7	-13.9	-2.6	-12.0	-1.8	-14.5	62.6		
89 – 10	Mean	-0.0037	-0.0594	-0.1897	-0.0317	0.0010	0.0493	0.6375	0.5203	2305
	t-stat	-0.8	-2.4	-3.8	-2.4	0.1	3.5	18.0		
	Diff.	-0.0248	0.0825	-0.0775	0.0727	0.0506	0.1566	-0.1753		
	t-stat	-4.8	3.0	-1.2	4.6	1.6	9.8	-4.6		

This table reports the results from Fama-MacBeth regression of next year's return on net operating assets ($RNOA_{t+1}$) on current RNOA and components of ΔNOA. The variables are defined as follows:

ΔNOA	=	The annual change in net operating assets (total assets minus non-debt liabilities), divided by average total assets
ΔWC	=	Working capital accruals divided by average total assets, where working capital accruals are estimated as the change in working capital, as in Sloan (1996)
DepAcc	=	Depreciation (negative sign) divided by average total assets
OthΔPP&T	=	Change in PP&E minus depreciation, divided by average total assets
ΔIntan	=	Change in intangible assets divided by average total assets
ΔOthNOA	=	ΔNOA – ΔWC – DepAcc - OthΔPP&T - ΔIntan
RNOA	=	Return on net operating assets, calculated as the ratio of net operating profit after tax (NOPAT) to beginning-of-period net operating assets, where NOPAT = Net income before extraordinary items - special items × (1- tax rate) + interest expense × (1- tax rate) + preferred dividend + non-controlling interest income

Table 8: Regression of future stock return on growth in net operating assets and control variables

$$Ret_{t+1} = \beta_0 + \beta_1\,\Delta NOA_t + \beta_2\,RNOA_t + \beta_3\,RNOA_{t-1} + \beta_4\,Size_t + \beta_5\,BTM_t + \beta_6\,Beta_t + \beta_7\,Idio\_Volat_t + \beta_8\,Ret_t + \varepsilon$$

Years	Statistic	Interc.	ΔNOA	RNOA	$RNOA_{t-1}$	Size	BTM	Beta	Idio_ Volat	Ret_t	Mean R^2	Mean Obs.
67 – 10	Mean	0.1380	-0.1965								0.0149	1900
	t-stat	3.6	-6.2									
67 – 10	Mean	0.1871	-0.1731	0.1054	0.0727	-0.0099	0.0224	0.0004	-0.4213	0.0441	0.0916	1418
	t-stat	4.1	-7.0	1.9	1.7	-2.1	2.1	0.0	-2.9	2.1		
67 – 88	Mean	0.2271	-0.1828	0.1472	0.1185	-0.0126	0.0296	-0.0151	-0.7121	0.0701	0.1086	1008
	t-stat	3.6	-4.4	1.4	1.4	-1.7	2.4	-1.1	-3.8	2.8		
89 – 10	Mean	0.1472	-0.1635	0.0636	0.0270	-0.0072	0.0152	0.0160	-0.1306	0.0182	0.0745	1829
	t-stat	2.2	-6.0	1.7	1.3	-1.2	0.8	1.0	-0.6	0.5		
	Diff.	-0.0799	0.0193	-0.0837	-0.0915	0.0054	-0.0144	0.0311	0.5815	-0.0520		
	t-stat	-0.9	0.4	-0.8	-1.1	0.6	-0.7	1.4	2.1	-1.2		

This table reports the results from Fama-MacBeth regressions of next year's stock return (Ret_{t+1}) on growth in net operating assets (ΔNOA_t) and control variables by sub-period. The variables are defined as follows:

Ret_{t+1}	=	Stock return from May 1st of year t+1 through April 30th of year t+2
ΔNOA	=	The annual change in net operating assets (total assets minus non-debt liabilities), divided by average total assets
RNOA	=	Return on net operating assets, calculated as the ratio of net operating profit after tax (NOPAT) to beginning-of-period net operating assets, where NOPAT = Net income before extraordinary items - special items × (1- tax rate) + interest expense × (1- tax rate) + preferred dividend + non-controlling interest income
Size	=	logarithm of the market value of equity on April 30th of the following year
BTM	=	Ratio of book value of equity to the adjusted market value of equity (market value of equity at yearend × (1+cumulative stock returns over the first 4 months of the following year)
Beta	=	Slope coefficient from the market model estimated using monthly stock returns over the prior 60 months (a minimum of 30 months is required) and the S&P 500 returns
Idio_Volat	=	Root mean squared error of the market model regression

Table 9: Regression of future stock return on components of growth in net operating assets and control variables

$$Ret_{t+1} = \beta_0 + \beta_1\,\Delta WC_t + \beta_2\,DepAcc_t + \beta_3\,Oth\Delta PP\&T_t + \beta_4\,\Delta Intan_t + \beta_5\,\Delta OthNOA_t + \beta_6\,RNOA_t + \beta_7\,RNOA_{t-1} + \beta_8\,Size_t + \beta_9\,BTM_t + \beta_{10}\,Beta_t + \beta_{11}\,Idio\_Volat_t + \beta_{12}\,Ret_t + \varepsilon$$

Years	Statistic	Interc.	ΔWC	DepAcc	OthΔPP&T	ΔIntan	ΔOthNOA	RNOA	$RNOA_{t-1}$
67-10	Mean	0.1644	-0.3727	-0.5568	-0.1961	-0.1671	-0.0763	0.1383	0.0881
	t-stat	3.5	-6.4	-4.9	-4.3	-1.5	-1.8	2.2	1.9
67-88	Mean	0.2096	-0.3581	-0.5495	-0.1973	-0.0853	-0.0391	0.2097	0.1418
	t-stat	3.3	-4.4	-2.8	-3.3	-0.4	-0.5	1.8	1.6
89-10	Mean	0.1193	-0.3873	-0.5641	-0.1950	-0.2489	-0.1136	0.0669	0.0345
	t-stat	1.7	-4.5	-4.6	-2.8	-4.7	-4.9	1.7	1.3
	Diff.	-0.0903	-0.0292	-0.0147	0.0023	-0.1636	-0.0745	-0.1428	-0.1074
	t-stat	-1.0	-0.2	-0.1	0.0	-0.7	-0.9	-1.2	-1.2

Years	Statistic	Size	BTM	Beta	Idio_Volat	Ret_t	Mean R^2	Mean Obs.
67-10	Mean	-0.0099	0.0256	0.0006	-0.3847	0.0429	0.1031	1318
	t-stat	-2.2	2.4	0.1	-2.6	1.9		
67-88	Mean	-0.0132	0.0304	-0.0136	-0.6969	0.0683	0.1237	947
	t-stat	-1.9	2.6	-0.9	-3.7	2.7		
89-10	Mean	-0.0066	0.0208	0.0149	-0.0725	0.0174	0.0825	1688
	t-stat	-1.1	1.1	0.9	-0.3	0.5		
	Diff.	0.0066	-0.0096	0.0285	0.6244	-0.0509		
	t-stat	0.7	-0.4	1.3	2.2	-1.1		

This table reports the results from Fama-MacBeth regression of next year's stock return (Ret_t) on components of long-term growth in net operating assets (ΔLTNOA) and control variables, where

ΔWC = Working capital accruals divided by average total assets, where working capital accruals are estimated as the change in working capital, as in Sloan (1996)

DepAcc	=	Depreciation (negative sign) divided by average total assets
OthΔPP&T	=	Change in PP&E minus depreciation, divided by average total assets
ΔIntan	=	Change in intangible assets divided by average total assets
ΔOthNOA	=	ΔNOA – ΔWC – DepAcc - OthΔPP&T - ΔIntan

and the other variables are as defined in Table 8.

Table 10: Time-series regression of monthly return on a zero-investment portfolio on the three Fama and French (1993) factors (market return, size, and B/M) and momentum

$$ER_t = \beta_0 + \beta_1 RMRF_t + \beta_2 HML_t + \beta_3 SMB_t + \beta_4 UMD_t + \varepsilon$$

Years	Statistic	Interc.	RMRF	HML	SMB	UMD	R^2	Obs.
67 – 10	Mean	0.0118	-0.1443	0.5427	0.2558	0.0892	0.1964	528
	t-stat	6.8	-3.7	9.0	4.6	2.3		
67 – 88	Mean	0.0054	-0.1753	0.5452	0.1736	0.1171	0.3732	264
	t-stat	3.3	-4.8	8.9	3.0	2.7		
89 – 10	Mean	0.0178	-0.1061	0.5779	0.3284	0.0843	0.1530	264
	t-stat	6.0	-1.5	5.9	3.6	1.4		
	Diff.	0.0124	0.0693	0.0328	0.1548	-0.0328		
	t-stat	3.7	0.9	0.3	1.4	-0.4		

The dependent variable (ER_t) is the equal-weighted low-minus-high monthly ΔNOA portfolio return. I use the Fama and French (1993) three factors and momentum as explanatory variables in the factor regression. RMRF is the excess return on the value-weighted stock market portfolio. HML is the return on a zero-investment portfolio that is long on high book-to-market (B/M) stocks and short on low B/M stocks. Similarly, SMB is the return on a zero-investment portfolio that is long on small capitalization stocks and short on large capitalization stocks. UMD is the return on high-momentum stocks minus the return on low-momentum stocks, where momentum is measured over months [-12, -2].

Table 11: Regression of contemporaneous stock return on growth in net operating assets and control variables

$$Ret_t = \beta_0 + \beta_1 \Delta NOA_t + \beta_2 \Delta NOA_{t-1} + \beta_3 \Delta NOA_{t-2} + \beta_4 RNOA_t + \beta_5 RNOA_{t-1} + \beta_6 Size_{t-1} + \beta_7 BTM_{t-1} + \beta_8 Beta_{t-1} + \beta_9 Idio\_Volat_{t-1} + \beta_{10} Ret_{t-1} + \varepsilon$$

Years	Stat.	Interc.	ΔNOA	ΔNOA_{t-1}	ΔNOA_{t-2}	RNOA	$RNOA_{t-1}$	Size	BTM	Beta	Idio_Volat	Ret_{t-1}	Mean R^2	Mean Obs.
67-10	Mean	0.0695	0.0851	-0.0074	-0.0567	1.9251	-1.1736	-0.0116	0.0751	0.0024	-0.0412	-0.0652	0.1921	1350
	t-stat	1.6	2.0	-0.2	-3.0	8.6	-7.1	-2.3	6.8	0.2	-0.3	-2.8		
67-88	Mean	0.0644	-0.1226	0.1553	-0.0481	3.0842	-1.9046	-0.0163	0.0987	-0.0153	-0.2269	-0.0658	0.2480	943
	t-stat	1.1	-2.5	3.2	-1.4	11.7	-7.9	-2.1	9.1	-1.1	-1.1	-2.4		
89-10	Mean	0.0745	0.2929	-0.1701	-0.0654	0.7660	-0.4425	-0.0069	0.0515	0.0201	0.1444	-0.0645	0.1361	1758
	t-stat	1.1	9.2	-5.9	-3.7	8.4	-7.0	-1.1	2.9	1.2	0.8	-1.7		
	Diff.	0.0101	0.4155	-0.3254	-0.0173	-2.3183	1.4621	0.0093	-0.0473	0.0354	0.3713	0.0014		
	t-stat	0.1	7.1	-5.8	-0.5	-8.3	5.9	0.9	-2.2	1.7	1.3	0.0		

This table reports the results from Fama-MacBeth regression of contemporaneous stock return (Ret_t) on growth in net operating assets (ΔNOA) and control variables. The variables are as defined in Table 8.

Table 12: Regression of contemporaneous stock return on components of growth in net operating assets and control variables

$$Ret_t = \beta_0 + \beta_1\,\Delta WC_t + \beta_2\,DepAcc_t + \beta_3\,Oth\Delta PP\&T_t + \beta_4\,\Delta Intan_t + \beta_5\,\Delta OthNOA_t + \beta_6\,RNOA_t + \beta_7\,RNOA_{t-1} + \beta_8\,Size_{t-1} + \beta_9\,BTM_{t-1} + \beta_{10}\,Beta_{t-1} + \beta_{11}\,Idio\_Volat_{t-1} + \beta_{12}\,Ret_{t-1} + \varepsilon$$

Years	Statistic	Interc.	ΔWC	DepAcc	OthΔPP&T	ΔIntan	ΔOthNOA	RNOA	$RNOA_{t-1}$
67-10	Mean	0.0688	-0.0564	-0.2596	0.0532	0.3289	0.2052	1.8447	-1.0644
	t-stat	1.6	-1.0	-1.8	1.1	2.8	3.4	8.9	-8.2
67-88	Mean	0.0480	-0.1918	-0.3122	-0.0435	0.3467	-0.0229	2.9227	-1.6527
	t-stat	0.8	-2.2	-1.2	-0.6	1.6	-0.3	12.5	-9.4
89-10	Mean	0.0896	0.0791	-0.2070	0.1498	0.3110	0.4333	0.7667	-0.4762
	t-stat	1.3	1.6	-1.5	2.2	3.9	7.4	8.1	-6.8
	Diff.	0.0416	0.2709	0.1051	0.1933	-0.0356	0.4562	-2.1560	1.1765
	t-stat	0.5	2.7	0.4	2.0	-0.2	4.6	-8.6	6.2

Years	Statistic	Size	BTM	Beta	Idio_Volat	Ret_t	Mean R^2	Mean Obs.
67-10	Mean	-0.0143	0.0822	0.0065	-0.1744	-0.0518	0.1950	1297
	t-stat	-2.8	7.7	0.6	-1.3	-2.5		
67-88	Mean	-0.0173	0.1021	-0.0060	-0.3333	-0.0533	0.2522	928
	t-stat	-2.3	8.6	-0.4	-1.8	-2.1		
89-10	Mean	-0.0112	0.0623	0.0189	-0.0156	-0.0504	0.1379	1665
	t-stat	-1.6	3.7	1.2	-0.1	-1.5		
	Diff.	0.0060	-0.0398	0.0249	0.3177	0.0029		
	t-stat	0.6	-1.9	1.2	1.2	0.1		

This table reports the results from Fama-MacBeth regression of current year's stock return (Ret_t) on components of long-term growth in net operating assets (ΔLTNOA) and control variables, where

ΔWC = Working capital accruals divided by average total assets, where working capital accruals are estimated as the change in working capital, as in Sloan (1996)

DepAcc	=	Depreciation (negative sign) divided by average total assets
OthΔPP&T	=	Change in PP&E minus depreciation, divided by average total assets
ΔIntan	=	Change in intangible assets divided by average total assets
ΔOthNOA	=	ΔNOA – ΔWC – DepAcc - OthΔPP&T - ΔIntan

and the other variables are as defined in Table 8.

Table 13: Regression of future stock return on current and lagged values of growth in net operating assets and control variables

$$Ret_{t+1} = \beta_0 + \beta_1 \Delta NOA_t + \beta_2 \Delta NOA_{t-1} + \beta_3 \Delta NOA_{t-2} + \beta_4 RNOA_t + \beta_5 RNOA_{t-1} + \beta_6 Size_t + \beta_7 BTM_t + \beta_8 Beta_t + \beta_9 Idio\_Volat_t + \beta_{10} Ret_t + \varepsilon$$

Years	Statistic	Interc.	ΔNOA	ΔNOA_{t-1}	ΔNOA_{t-2}	RNOA	$RNOA_{t-1}$
67-10	Mean	0.1777	-0.1619	-0.0620	-0.0143	0.0897	0.1088
	t-stat	4.0	-7.4	-3.8	-0.9	1.6	1.9
67-88	Mean	0.2205	-0.1686	-0.0761	0.0038	0.1217	0.1602
	t-stat	3.6	-4.7	-2.9	0.1	1.1	1.4
89-10	Mean	0.1349	-0.1552	-0.0479	-0.0324	0.0577	0.0575
	t-stat	2.1	-6.1	-2.5	-2.7	1.7	2.5
	Diff.	-0.0856	0.0134	0.0282	-0.0362	-0.0640	-0.1027
	t-stat	-1.0	0.3	0.9	-1.1	-0.5	-0.9

Years	Statistic	Size	BTM	Beta	Idio_Volat	Ret_t	Mean R^2	Mean Obs.
67-10	Mean	-0.0088	0.0200	0.0020	-0.3302	0.0395	0.0940	1362
	t-stat	-1.9	1.8	0.2	-2.3	1.9		
67-88	Mean	-0.0116	0.0253	-0.0148	-0.5870	0.0628	0.1115	955
	t-stat	-1.6	2.0	-1.1	-3.2	2.5		
89-10	Mean	-0.0059	0.0148	0.0188	-0.0734	0.0161	0.0766	1770
	t-stat	-1.0	0.8	1.1	-0.3	0.5		
	Diff.	0.0057	-0.0105	0.0337	0.5136	-0.0467		
	t-stat	0.6	-0.5	1.5	1.8	-1.1		

This table reports the results from Fama-MacBeth regression of next year's stock return (Ret_{t+1}) on current and lagged values of growth in net operating assets (ΔNOA) and control variables. The variables are as defined in Table 8.

Table 14: Regression of future profitability on growth in net operating assets and current profitability, using alternative measures of net operating assets and net operating profit after tax

$$RNOA_{t+1} = \beta_0 + \beta_{\Delta NOA}\, \Delta NOA_t + \beta_{RNOA}\, RNOA_t + \varepsilon$$

Years	Statistic	Intercept	ΔNOA	RNOA	Mean R²	Mean Obs.
67 – 10	Mean	-0.0072	0.0379	0.6710	0.5098	1884
	t-stat	-0.8	0.9	24.5		
67 – 88	Mean	0.0279	-0.1607	0.7755	0.5693	1361
	t-stat	10.2	-15.6	37.7		
89 – 10	Mean	-0.0423	0.2366	0.5665	0.4504	2407
	t-stat	-2.7	4.5	14.1		
	Diff.	-0.0702	0.3973	-0.2090		
	t-stat	-4.4	7.5	-4.6		
89 – 99	Mean	-0.0269	0.1232	0.5821	0.4947	2333
	t-stat	-2.0	2.7	14.4		
00 – 10	Mean	-0.0550	0.3311	0.5535	0.4134	2469
	t-stat	-2.1	4.2	8.3		
	Diff.	-0.0281	0.2078	-0.0286		
	t-stat	-0.9	2.3	-0.4		

This table reports the results from Fama-MacBeth regression of next year's return on net operating assets ($RNOA_{t+1}$) on growth in net operating assets (ΔNOA_t) and current RNOA. The variables are defined as follows:

ΔNOA = The annual change in net operating assets (total assets minus **cash, short-term investments** and non-debt liabilities), divided by average total assets.

RNOA = Return on net operating assets, calculated as the ratio of net operating profit after tax (NOPAT) to beginning-of-period net operating assets, where NOPAT = Net income before extraordinary items - special items × (1- tax rate) + interest expense × (1- tax rate) **- interest income × (1- tax rate)** + preferred dividend + non-controlling interest.

Table 15: Regression of future profitability on growth in net operating assets and current profitability, excluding business combinations

$$RNOA_{t+1} = \beta_0 + \beta_{\Delta NOA}\,\Delta NOA_t + \beta_{RNOA}\,RNOA_t + \varepsilon$$

Years	Statistic	Intercept	ΔNOA	RNOA	Mean R^2	Mean Obs.
67 – 10	Mean	0.0098	-0.0374	0.7285	0.5250	1657
	t-stat	3.0	-2.7	34.0		
67 – 88	Mean	0.0206	-0.1110	0.8081	0.5402	1260
	t-stat	7.6	-16.6	64.0		
89 – 10	Mean	-0.0010	0.0362	0.6490	0.5097	2055
	t-stat	-0.2	2.3	19.4		
	Diff.	-0.0216	0.1471	-0.1591		
	t-stat	-3.8	8.7	-4.5		
89 – 99	Mean	0.0061	-0.0038	0.6065	0.4651	1967
	t-stat	1.1	-0.2	18.3		
00 – 10	Mean	-0.0068	0.0694	0.6844	0.5469	2128
	t-stat	-0.9	3.3	12.7		
	Diff.	-0.0128	0.0732	0.0780		
	t-stat	-1.3	2.7	1.2		

This table reports the results from Fama-MacBeth regression of next year's return on net operating assets ($RNOA_{t+1}$) on growth in net operating assets (ΔNOA_t) and current RNOA. Observations with significant business combinations are excluded (identified as having either a change of intangible or cash paid for acquisitions greater than 5 percent of average total assets). The variables are defined as follows:

ΔNOA = The annual change in net operating assets (total assets minus non-debt liabilities), divided by average total assets

RNOA = Return on net operating assets, calculated as the ratio of net operating profit after tax (NOPAT) to beginning-of-period net operating assets, where NOPAT = Net income before extraordinary items - special items × (1- tax rate) + interest expense × (1- tax rate) + preferred dividend + non-controlling interest income

Table 16: Regression of future profitability on growth in net operating assets and current profitability, allowing different coefficients for positive and negative growth

$$RNOA_{t+1} = \beta_0 + \beta_{Pos\Delta NOA}\ Pos\Delta NOA_t + \beta_{Neg\Delta NOA}\ Neg\Delta NOA_t + \beta_{RNOA}\ RNOA_t + \varepsilon$$

Years	Statistic	Intercept	+ΔNOA	-ΔNOA	RNOA	Mean R^2	Mean Obs.
67 – 10	Mean	0.0259	-0.0921	0.1562	0.6819	0.5276	1951
	t-stat	12.2	-14.9	4.1	28.7		
67 – 88	Mean	0.0262	-0.1183	-0.0341	0.7793	0.5372	1367
	t-stat	10.4	-22.5	-2.2	49.3		
89 – 10	Mean	0.0257	-0.0659	0.3465	0.5845	0.5180	2535
	t-stat	7.4	-8.3	7.4	17.2		
	Diff.	-0.0006	0.0524	0.3806	-0.1948		
	t-stat	-0.1	5.5	7.7	-5.2		
89 – 99	Mean	0.0300	-0.0736	0.2899	0.5572	0.4800	2399
	t-stat	6.5	-7.3	5.9	18.5		
00 – 10	Mean	0.0221	-0.0595	0.3936	0.6072	0.5497	2648
	t-stat	4.4	-4.9	5.3	10.5		
	Diff.	-0.0079	0.0142	0.1037	0.0500		
	t-stat	-1.2	0.9	1.2	0.8		

This table reports the results from Fama-MacBeth regression of next year's return on net operating assets ($RNOA_{t+1}$) on growth in net operating assets (ΔNOA_t) and current RNOA. The variables are defined as follows:

ΔNOA = The annual change in net operating assets (total assets minus non-debt liabilities), divided by average total assets

RNOA = Return on net operating assets, calculated as the ratio of net operating profit after tax (NOPAT) to beginning-of-period net operating assets, where NOPAT = Net income before extraordinary items - special items × (1- tax rate) + interest expense × (1- tax rate) + preferred dividend + non-controlling interest income

Appendix

Literature Review

This thesis builds on and contributes to several major strands of research, including the accrual anomaly, the value relevance of earnings and book value, and behavioral explanations for market anomalies. I review the related literature in turn with a focus on findings that are relevant to my analysis. In some cases I discuss the same paper in multiple contexts.

1. The accrual anomaly

<u>Accruals and the accrual anomaly</u>

Accruals are utilized to mitigate the timing and matching problems of cash flows so that earnings more closely reflect firm performance in continuous operation. **Dechow (1994)** documents the benefits of accruals and establishes that earnings is a superior summary measure of firm performance. She shows that: (1) over short measurement intervals, there is a stronger contemporaneous association between stock returns and earnings than between stock returns and realized cash flows; (2) as the measurement interval increases, the contemporaneous association of stock returns with realized cash flows improves; (3) the advantage of earnings over cash flows in explaining stock returns is particularly high among firms experiencing large changes in working capital requirements, investments, and financing activities, i.e., when realized cash flows have more severe timing and matching problems; (4) the longer a firm's operating cycle, the lower the contemporaneous association between stock returns and realized cash flows; (5) long-term operating accruals play a less important role than working capital accruals in mitigating timing and matching problems; and (6) special items reduce the earnings-return association over short intervals.

While accruals generally mitigate the timing and matching problems of cash flows, they are less persistent than cash flows. **Sloan (1996)** documents the accrual anomaly – the negative relationship between accounting accruals and subsequent stock returns. Sloan hypothesizes that investors naively fixate on bottom line income and fail to appreciate the different implications of accruals and cash flows for future earnings. Firms with relatively high (low) level of accruals are overvalued (undervalued). This mispricing is subsequently corrected when earnings are realized. In support of this earnings fixation hypothesis, Sloan (1996) reports that about 40% of the predictable stock returns are concentrated around the subsequent quarterly earnings announcement dates.

Hribar and Collins (2002) assesses the error introduced by the indirect balance sheet approach to accruals estimation. They argue that the balance sheet approach relies on the presumed articulation between changes in balance sheet working capital accounts and the accrual component of revenues and expenses on the income statement. This presumed articulation breaks down when non-operating events such as reclassifications, mergers and acquisitions, divestitures, accounting changes and foreign currency translations occur. Changes in current assets and liabilities due to these non-operating events show up in the balance sheet, but do not flow through the income statement. Consequently, a portion of the changes in balance sheet working capital accounts relates to the non-operating events, and would erroneously be shown as accruals under the balance sheet approach. Specifically, they show that mergers and acquisitions introduce upward bias in balance sheet accruals, while discontinued operations induce a downward bias. They find that the error induced by using a balance sheet approach contaminates computations of discretionary or abnormal accruals, and can lead to erroneous conclusion that earnings management exists when no such opportunistic activity is present. The errors-in-variables problem may lead to the conclusion that there is no significant difference between the pricing coefficients on accruals and cash flows, while the difference is significant using a cash flow approach. Their final set of results indicate that measurement error from estimating accruals using the balance sheet approach can bias tests of market mispricing of accruals towards zero and lead to a null conclusion when significant mispricing exists.

Accruals and earnings quality

Sloan (1996) hypothesizes that the lower persistence of accruals is due to the subjectivity involved in the estimation process and/or earnings management. Subsequent studies provide evidence consistent with this hypothesis. **Xie (2001)** examines whether the market rationally prices abnormal accruals estimated using the Jones (1991) model based on changes in sales revenue and gross property, plant, and equipment. His results extend Sloan (1996) by suggesting that the lower persistence and overpricing of total accruals reported by Sloan are due largely to abnormal accruals.

Thomas and Zhang (2002) finds that the negative relation between accruals and future abnormal returns is due mainly to inventory changes. They document several empirical regularities for firms with extreme inventory changes, including (1) firms with inventory increases (decreases) experience higher (lower) profitability, growth, and stock returns over the prior five years, but those trends reverse after the extreme inventory change; (2) firms with inventory increases (decreases) experience inventory decreases (increases) in the prior year, even though profitability increases (decreases) in both years; (3) the abnormal returns observed after the inventory changes are concentrated at subsequent quarterly earnings announcements and are related to predictable earnings "surprises" reported at those announcements. They conjecture that demand shifts cause the inventory change and related profitability reversal. They consider earnings management and the impact of varying production levels on fixed manufacturing overhead absorbed in COGS as potential reasons why the market does not fully recognize the profitability reversals until the following year.

Richardson et al. (2005) investigates the relation between accrual reliability, earnings persistence, and future stock returns. They assess the different degrees of reliability of different categories of accruals and document that less reliable accruals lead to lower earnings persistence. Investors seem to fail to anticipate the lower persistence of the less reliable accruals, which results in a negative relation between accruals and future abnormal stock returns, with the relation being stronger for less reliable accruals.

Dechow and Dichev (2002) suggests an approach to measure accruals quality as the standard deviation of the residuals from firm-specific regressions of working capital accruals on past, current, and one-year-ahead cash flows from operations, where higher standard deviation denotes lower quality. They explore the relation between accruals quality and firm characteristics including the length of operating cycle, firm size, sales volatility, cash flow volatility, accruals volatility, earnings volatility, frequency of reporting negative earnings, and magnitude of accruals. Accruals quality is positively related to earnings persistence.

Francis et al. (2005) investigates whether investors price accruals quality. They find that poorer accruals quality is associated with larger costs of debt and equity. However, Core et al. (2008) questions the validity of some of their findings.

The reversing nature of the accrual accounting hinders manager's ability to make similar biased estimates in continuous periods. When book value is already bloated as a result of previous over-estimates, future profitability is likely to be depressed. Barton and Simko (2002) argues that managers' ability to optimistically bias earnings decreases with the extent to which net assets are already overstated on the balance sheet relative to a neutral application of GAAP, because net operating assets on balance sheet accumulates previous earnings management. They demonstrate that the likelihood of reporting larger positive or smaller negative quarterly earnings surprises decreases with the beginning balance of net operating assets relative to sales.

Hirshleifer et al. (2004) focuses on net operating assets as it is the cumulative difference between net operating income and free cash flow. Net operating assets measure the extent to which reporting outcomes provoke over-optimism. Hirshleifer et al. (2004) documents that net operating assets scaled by total assets is a strong negative predictor of long-run future stock returns. Net operating assets can be decomposed into the sum of cumulative operating accruals (i.e., operating income before depreciation minus operating cash flow) and cumulative investments (i.e., investment minus depreciation). Current period operating accruals, current period investments, past periods' operating accruals and investments all contribute to the ability of NOA to predict future stock returns.

An inherent property of accrual accounting is that any accrual-based earnings management in one period must reverse in another period. **Dechow at el. (2012)** shows that incorporating priors concerning the timing of the reversal can significantly improve the power and specification of tests for earnings management. Their results indicate that tests incorporating reversals increase test power by around 40% and provide a robust solution for mitigating model misspecification arising from correlated omitted variables.

Accruals, investment and growth

Fairfield et al. (2003a) extends the accrual anomaly by examining growth in net operating assets, composed of both accruals and investment in long-term net operating assets.[15] After controlling for current profitability, both components of ΔNOA – accruals and investment in long-term net operating assets – have similar negative association with one-year-ahead return on assets (ROA). They further demonstrate that the market appears to equivalently overprice accruals and investment in long-term operating assets relative to their implications for one-year-ahead ROA. The lower persistence of the accruals is therefore unlikely to be attributable to managerial discretion. Instead, they suggest that diminishing marginal returns on investment and/or conservative accounting practices contribute to the negative relation between growth in net operating assets and future profitability.

In their follow-up paper, **Fairfield et al. (2003b)** notes that, in the literature related to the differential persistence of accruals and cash flows, the dependent variable – future profitability – is measured as one-year-ahead operating income (year t+1) divided by current invested capital (year t). One-year-ahead profitability is affected not only by future income in the numerator (income effect), but also by current growth in invested capital in the denominator (growth effect). They hypothesize that the lower persistence of current operating accruals relative to cash flows in explaining future profitability is due to the differential relation of these earnings components with growth in invested capital which is the denominator of the profitability measure. To isolate the effect of current ΔNOA (in year t) on future income, they deflate future operating income by lagged NOA (year t-1) instead of current NOA and find that there is no

[15] Sloan (1996) estimates accruals (noncash earnings) using changes in consecutive balance sheets. Hribar and Collins (2002) points out that this measure of accruals also reflects non-operating events such as reclassifications, mergers and acquisitions, divestitures, accounting changes and foreign currency translations. Thus, the stock-return predictability of estimated accruals documented in Sloan (1996) may be partially due to balance sheet accruals.

differential persistence between accruals and cash flows after controlling for the effect of the deflator. The lower persistence of accruals relative to cash flows is not attributable to a negative association between accruals and one-year-ahead operating income but rather to the impact of operating accruals on growth in net operating assets. They further suggest that the market mispricing of accruals is due to investors' inability to consider growth rates and the effects of diminishing marginal returns and conservative accounting from new investment.

Penman and Zhang (2002) studies the effects of change in investment coupled with conservative accounting on earnings quality. When the firm increases investment, conservative accounting principles, which accelerate expense recognition and delay revenue recognition, lead to lower reported earnings. Conversely, reducing investment or reducing the rate of investment growth results in additional earnings. If the change in investment is temporary, current earnings is temporarily depressed or inflated and is not a good indicator of future earnings. Penman and Zhang (2002) constructs a C-score of inventory, R&D, and advertising reserves, measuring the joint effects of investment and conservative accounting. They analyze how C-score predicts changes in future return on net operating assets. The C-score is shown to forecast stock returns, indicating that investors do not fully appreciate the impact of investments and accounting conservatism on earnings quality.

Richardson et al. (2006) provides evidence on the role of temporary accounting distortions in explaining the lower persistence of the accrual component of earnings. They decompose the change in net operating assets into a growth component minus an efficiency component. The growth component – sales growth – captures the diminishing marginal returns on increased investment and/or accounting distortions in sales, while the efficiency component – the rate of change in net operating asset turnover – is negatively related to temporary accounting distortions. They find that the growth (efficiency) component is negatively (positively) correlated with future profitability. Both working capital accruals and noncurrent operating accruals are shown to be associated with SEC enforcement actions, suggesting that both components of accruals are characterized by temporarily aggressive accounting distortions that are attributable to managerial discretion.

Zhang (2007) studies two competing hypotheses for the accrual anomaly: accruals capture low quality earnings (the persistence hypothesis), versus accruals reflect investment (e.g., investment in working capital) that lead to lower stock return due to lower risk or investors' mispricing of past growth. Consistent with the investment hypothesis, Zhang finds that (1) accruals co-vary strongly with growth attributes such as employee growth, external financing, and cash sales growth, indicating that accruals capture fundamental investment information; (2) the magnitude of the accrual anomaly monotonically increases with the investment information contained in accruals, as measured by the co-variation between accruals and employee growth; and (3) accruals show stronger (weaker) predictive power for future stock returns in industries where accruals co-vary more (less) with employee growth.

Extending Zhang (2007), **Wu et al. (2010)** explores the risk-related investment hypothesis of the accrual anomaly. Under this hypothesis, accruals measure investments, which are related to changes in discount rates. Specifically, reductions in discount rates (expected returns) lead to both larger investments (and hence accruals) and lower stock returns. Consistent with this hypothesis, Wu et al. show that (1) accruals co-vary negatively with ex-ante one-year-lagged discount rate estimated from both the dividend discount model and the residual income model; (2) as accruals grow, future profitability and stock returns fall in accordance with diminishing marginal returns to investment (firms accept projects of lower profitability at lower required rate of return); (3) adding an investment factor into standard factor regression models substantially attenuates the accrual anomaly; and (4) similar to the value/growth anomaly, returns to accruals-based trading strategies are time-varying and countercyclical (high in bad times and low in good times).[16]

Harris and Nissim (2006) suggests an alternative explanation on the negative relation between growth in capital and subsequent stock return. Firms may grow earnings either by improving the profitability of existing capital or by investing additional capital. Earnings growth from incremental capital investment is less valuable than growth from improved profitability because increases in capitals, unlike improvements in profitability, introduce incremental cost of capital. Harris and Nissim (2006) shows that, in the long run, earnings growth due to increases in invested capital is valued much less than growth resulting from improved profitability. In the short run, however, investors overreact to earnings growth resulting from incremental capital investment and underreact to earnings growth due to improved profitability; this mispricing is subsequently corrected.

2. Value relevance of Earnings and Book Value

Extant research in accounting has demonstrated a decline in the value relevance of earnings and a corresponding increase in the value relevance of book value over the past decades. The literature has offered several explanations for the trends, including the impact of changing firm characteristics, the increasing significance of real options, and a regulatory shift from income statement approach to a balance sheet / fair value perspective. I start by reviewing

[16] Specifically, Wu et al. show that the variance risk premium—the difference between implied and historical volatility on the S&P 500 index which proxies for uncertainty and bad-versus-good times—predicts the returns to accruals-based strategies with a significantly positive slope.

studies documenting the shift of the value relevance from earnings to book value, and then discuss the explanations proposed for the shift.

<u>The shift of value relevance from earnings to book value</u>

Collins et al. (1997) finds that over the period 1953-1993 the combined value relevance of earnings and book value, measured using R-squared from price-level regressions, has slightly increased. While the incremental value relevance of earnings has declined, it has been replaced by the increasing value relevance of book value. They attribute the shift in the value relevance from earnings to book value to the increasing frequency and magnitude of one-time items, the increasing frequency of negative earnings, the growing number of small firms, and the increasing intangible intensity over time.

Lev and Zarowin (1999) documents that the cross-sectional association between stock returns and reported earnings declines over the period 1978-1996. They argue that the increasing rate of economic and operation changes and the ineffective accounting treatment of such changes contribute to the temporal decline in the value relevance of earnings information. The weakening of the return-earnings association is found to be more pronounced for firms whose R&D intensity increases over the sample period than for firms with stable R&D.

Francis and Schipper (1999) examines the value relevance of financial accounting information over the period 1952-1994. They show that returns to perfect foresight trading strategies based on the sign and magnitude of earnings, on the level and change in earnings and book value, and on an assortment of fundamental signals have decreased over the sample period. However, returns based on cash flows and the sign of earnings have not changed significantly over time. Using Easton and Harris's (1991) model, Francis and Schipper find that the explanatory power of earnings levels and earnings changes for stock returns has significantly decreased over time. In contrast, the explanatory power of book value of assets and liabilities (alone or combined with earnings) for market equity values has generally increased over time.

Economics Effects

To explain the decline in the incidence of dividend payers, **Fama and French (2001a)** shows that the population of publicly traded firms tilts increasingly toward small firms with low profitability and strong growth opportunities – characteristics typical of firms that have never paid dividends. They also show that regardless of their characteristics, firms have become less likely to pay dividends.

Kothari et al. (2002) compares future earnings variability, proxied with the standard deviation of earnings levels or changes, generated from investment in R&D versus capital expenditures. The future benefits from R&D expenditures are found to be more uncertain than those from investment in capital expenditures. Book value takes on increased importance relative to earnings when earnings are more volatile or negative.

Campbell et al. (2001) reports that stock return volatility increases dramatically over the 1962-1997 period, although aggregate market volatility does not change during this time period, implying that the idiosyncratic risk of the typical stock has increased.

Comin and Mulani (2005) documents an increase in firm-level sales growth volatility, in idiosyncratic return volatility, and in corporate bond spreads and ratings. They find that the increase in firm volatility is associated with more competition in product markets, i.e., higher turnover among industry leaders for both operating income and market value. Their evidence supports that the increase in competition is linked to significant increase in R&D intensity and significant increase in debt and equity issuance. Firm volatility also increases after deregulation.

Comin and Mulani (2006) documents that the growth rate of sales and employee at the firm level have become more volatile while the growth rate of aggregate sales has become less volatile, i.e., volatility at the aggregate and firm level following diverging trends. By decomposing the variance, they show that the evolution of the volatility of aggregate growth rate of sales is driven by the covariance of sales growth between firms, given the small magnitude of the variance of firm sales. They propose to explain the diverging trend with innovations: embodied innovations that lead to new products introduce firm-level volatility while the individual gains and losses cancel each other at aggregate level; disembodied innovations symmetrically affects all firms.

Irvine and Pontiff (2009) shows a significant increase over time in the idiosyncratic volatility of firm-level earnings, cash flows, and sales, accompanying the increase in the idiosyncratic return volatility over the same period. They rule out the possibility that the finding can be explained entirely by higher proportions of smaller firms (by showing that the fundamental idiosyncratic volatility also increases for large firms), changes in the composition of industries (growing vs. contracting), new listings, or firms shifting towards focusing on fewer lines of business. They propose to explain the increase in idiosyncratic risk over time with increased competition in the economy. Their proxies for competition including ROA, industry turnover, and market share from foreign competitors have a strong cross-sectional relation with idiosyncratic return volatility, and also exhibit a time-series trend consistent with an increase in competition. Deregulated industries (i.e., with increased competition) are found to experience increased idiosyncratic risk. Examining cross-country evidence, they show that counties with greater growth in idiosyncratic return volatility tend to have more competitive economies and undergo faster change in technological innovation.

Accounting Effects

Accounting changes over the last three decades contribute to a shift in value relevance from earnings to book value by (1) emphasizing conservative adjustments such as impairment charges, (2) reducing the quality of matching in the income statement, and (3) increasingly adjusting book value to reflect current condition.

Subramanyan and Wild (1996) shows that the informativeness of earnings is inversely related to various characteristics that proxy for the likelihood that the firm will be terminated.

Basu (1997) interprets conservatism in accounting as earnings reflecting “bad news” more quickly than “good news”. Using firms’ stock returns to measure news, Basu shows that (1) the concurrent sensitivity of earnings to negative returns is two to six times as large as the concurrent sensitivity of earnings to positive returns; (2) the greater timeliness of earnings relative to cash flow is due primarily to more timely recognition of “bad news” through accruals, and accruals do not improve the timeliness of recognizing “good news” in earnings; (3) positive earnings changes tend to persist whereas negative earnings changes have a greater tendency to reverse in the next period; (4) the association between positive earnings changes and announcement period abnormal returns is stronger than negative earnings changes; and (5) the sensitivity of earnings to concurrent negative returns increases relative to that of earnings to concurrent positive returns over the last decades, suggesting that conservatism has increased over time.

Please also refer to **Lev and Zarowin (1999)** discussed previously for empirical findings regarding the decreased earnings' value relevance and how it may result from the economic and accounting changes.

Givoly and Hayn (2000) reports that firms' profitability over the period 1950-1998 has generally declined, but this decline is accompanied by a corresponding decline in cash flows. Earnings distributions have become more dispersed and increasingly negatively skewed over time. Long-term accruals have become significantly smaller and more volatile, and are the greatest contributor to the increase in earnings variability. Another trend over the sample period is the increasing significance of the more timely recognition of bad news relative to good news in earnings.

Dichev and Tang (2008) provides empirical evidence supporting the conjecture that matching becomes worse as a result of the evolution in accounting and the real economy over time. They find a clear decrease in the correlation between contemporaneous revenues and expenses and an increase in the non-contemporaneous correlation between revenues and expenses. The volatility of reported earnings has doubled, while the underlying volatilities of revenues and expenses have remained largely the same. There is a stark decline in the persistence of earnings, and an increased negative autocorrelation in earnings changes. Additional analyses show that the proliferation of one-time items and losses and changes in the real economy can only explain some but not all of the results. The authors argue that accounting-based factors play a substantial role in the temporal trends of earnings characteristics as the cash-based measures reveal none of the temporal trends identified in accrual based results, and more pronounced results are found for firms where the quality of accruals is low. The authors suggest that standard-setters' move towards a balance-sheet-based model of financial reporting has reduced the forward-looking informativeness of earnings.

Building on Dichev and Tang (2008), **Donelson et al. (2011)** disaggregates total expenses and finds that the decline in the contemporaneous association between revenues and expenses over time (and the associated increase in earnings volatility and decrease in earnings persistence) is primarily attributable to a steady increase in the frequency and magnitude of special items. They construct an index ("E-Score") of five indicator variables representing real economic events that are likely to be associated with the most common special items, including negative employee growth, merger and acquisition activity, discontinued operation, operating loss, and negative sales growth. E-Score is shown to increase over time and is associated with the cross-sectional probability of recording a special item. Targeted tests of specific special items provide little evidence that the adoption of specific accounting standards affects the frequency of the respective special items. Only for asset impairments, the implementation of SFAS 121 (effective in 1996) is found to be associated with an increase in special items, after controlling for a general time trend and the E-Score. They also show that the changing incidence of economic events is related to the well-documented increase in competition in the US economy. Specifically, two indicators of competitive pressure, the Herfindahl Index and the Altman's z-score at industry level, are both increasing over time, and correlated with E-Score.

Elliott and Shaw (1988) studies the financial accounting performance and market returns of firms taking asset write-downs during 1982-1985. They find that firms with large write-offs substantially underperform their industries in the three years preceding and including the write-off year (even after adding back the write-offs) in terms of return on assets and return on equity. The declining performances in accounting terms are associated with significantly lower industry-adjusted returns in periods three years before, event date, and 18 months following the announcement of the write-offs. In addition, analysts' current-year and year-ahead earnings forecasts were reduced significantly after the announcement. Overall, their evidence suggests that write-downs occur during a period of economic difficulties.

Elliott and Hanna (1996) shows a dramatic increase in the incidence of firms reporting large special items. The increase in the frequency with which firms report negative special items is up to three times higher than the incidence of reporting positive special items. More importantly, they find that the information content of both "earnings before special items" and "special items" is impaired when large special items are reported. The ability of unexpected "earnings before special items" to explain security returns around earnings announcements for firms associated with large write-offs is less than or equal to that for firms with no write-off. The information content of "special items" measured at the earnings announcement date appears to lessen as firms report longer sequences of large write-offs, i.e., repeated write-downs create noise, which make it more difficult for the market to discern the true/recurring earnings of the firm.

Black et al. (2000) reports that multiple occurrences of nonrecurring items such as discontinued operations, special items, or extraordinary items, have a negative effect upon market value of equity. They also find patterns of discretionary accruals consistent with managers using special items to manage earnings upward prior to multiple write-downs. Firms with multiple write-downs are more likely to go into liquidation or bankruptcy within the next five years. Single occurrences also are value-relevant and are positively correlated with market value.

Burgstahler et al. (2002) provides evidence confirming that special items are more transitory than the remaining components of earnings. Their results suggest that positive special items are largely transitory while negative special items are more of inter-period transfers, i.e., negative special items represent a shift of expense from future periods into the current period (e.g., restructuring charges) that reduce current income but increase future income.

Dechow and Ge (2006) argues that high accruals are likely to be the outcome of rules with an income statement perspective such as the booking of investment in working capital (e.g., inventory purchase) as assets to be matched against future revenue, while low accruals are likely to be the outcome of rules with a balance sheet perspective such as impairment charges to mark assets down to fair value. Consistent with this conjecture, Dechow and Ge show that for high accruals firms earnings are more useful than cash flows for predicting future earnings, but for low accrual firms cash flows are more useful. They also show that the low persistence of earnings in low accrual firms is primarily driven by special items. Consistent with the hypothesis that investors misunderstand the transitory nature of special items, low accrual firms with large negative special items are found to earn higher positive stock returns than other low accrual firms. Special item-low accrual firms perform very poorly in the special items year and there is high uncertainty and pessimism regarding the prospects of these firms. Investors appear to overweigh the probability that the firm will be unsuccessful: on average, the special item-low accrual firms turn themselves around at higher rates than expected and so experience improved stock price performance.

Barth (1994) studies a sample of U.S. banks and finds that fair value estimates of investment securities provide significant explanatory power for equity value beyond that provided by historical costs, while historical costs provide no significant explanatory power incremental to fair values. Using a measurement error model, investment securities' fair values are found to have less measurement error than historical costs vis-à-vis the amount reflected in share prices. Although fair value estimates of investment securities appear reliable and relevant to investors in valuing bank equity, fair value securities gains and losses do not. Barth interprets these findings as that although estimation error in the disclosed fair values is small enough that investment securities' fair values appear value-relevant, when two annual fair value estimates are used to calculate securities gains and losses, the effect of combined estimation errors renders securities gains and losses value-irrelevant.

Barth et al. (1995) finds that bank earnings calculated using fair value estimates of investment securities gains and losses are significantly more volatile than that calculated using historical cost securities gains and losses. However, this incremental volatility is not associated with bank share prices, indicating that investors do not perceive fair value earnings volatility as a better proxy for risk than historical cost earnings volatility. Banks would have violated regulatory capital requirements more frequently had fair value accounting for investment securities been used to calculate regulatory capital during the sample period. However, the potential increase in regulatory risk associated with fair value accounting is not reflected in bank share prices. Barth et al. also provide evidence that hypothetical fair violations are not information events to the market but historical cost violations are. Changes in interest rates that cause changes in fair value of investment securities are reflected in bank share prices.

Barth et al. (1998) shows that the explanatory power of book value for firm value is significantly higher than that of net income for financial services firms. They argue that this is because the book values of financial assets/liabilities, which comprise the majority of financial institutions' balance sheets, are recognized at amounts more closely approximating fair value.

Hann et al. (2007) studies the value- and credit-relevance of financial statements under fair-value versus smoothing models of pension accounting. They show that fair-value pension accounting introduces considerable volatility in net income, reducing its persistence and partially obscuring the underlying information in operating income. Fair-value income is less value relevant than smoothing income because of its lower persistence, and the fair value pension obligation on balance sheet is marginally more value relevant. Their evidence suggests that the fair value pension accounting model impairs the value- and credit-relevance of the combined financial statements unless transitory gains and losses are separated from more persistent income components. They find that the fair-value model improves (impairs) the credit relevance of balance sheet (income statement) numbers.

Rees et al. (1996) documents that managers recognize asset impairments in years when earnings are already low. They find significant negative abnormal accruals in the write-down year, and these abnormal accruals do not tend to reverse and are generally close to zero in the post-write-down years. They therefore suggest that the documented abnormal accruals in the write-down year are due to permanent changes in the firms' accrual balances and managers are responding to changes in economic circumstances as opposed to acting opportunistically. There is a significantly positive association between abnormal accruals and contemporaneous stock returns, which provides further support to the notion that managers' discretion provides important information on firm value.

Bartov et al. (1998) investigates the informativeness of (i.e., long term stock price performance before and after) the write-off announcements. Event date market reaction to the write-off announcements shows clear difference between two types of write-offs (i.e., the "asset write-down" category which comprises purely accounting decisions to reduce the carrying value of assets with no apparent changes in operations, and the "operating decision" category). The return to operating decision category is small and statistically insignificant, while the return to the asset write-down firms is more than double that of the operating decision firms and highly significant. Operating decisions convey two types of information that have opposite implications for abnormal returns and offset each other: a lower value of firm book value and the plan for improvements supposed to enhance future cash flows; asset write-downs convey bad news of lower values of assets. Write-offs typically distort a firm's earnings picture by packing large losses into one quarter, thereby masking the trend underlying the firm's earnings. Both types of write-offs are preceded by large stock price declines, with a significantly bigger decline for the asset write-down firms. The stock prices of both sets of write-off firms perform poorly during the year following the announcement, but the asset write-down firms perform worse than the operating decision firms.

Li et al. (2011) reports that investors and financial analysts revise downward their expectations of value and earnings on the announcement of an impairment loss. In contrast, these users of financial information do not revise their expectations on the announcement of zero impairment by firms whose goodwill was previously considered to be potentially impaired. Goodwill impairment serves as a leading indicator of a decline in future profitability. These results suggest that the accounting pronouncements requiring the recognition of impairment charges have improved the value relevance of book value.

Ayers (1998) compares the value relevance of deferred income taxes under the balance sheet approach, mandated in the U.S. by SFAS 109 after 1992, with that under the income statement approach of APB 11. SFAS No. 109 appears to increase the value relevance of deferred tax amounts in financial statements. Specifically, Ayers shows that (1) SFAS No. 109

data represents value-relevant information above and beyond APB No. 11, and (2) the changes made by SFAS No. 109 - the separate recognition of deferred tax assets, the creation of valuation allowances for deferred tax assets, and the adjustment of deferred tax accounts for enacted tax rate changes - each provide value-relevant firm data.

Amir et al (1997) finds that SFAS 109 deferred tax components arising from depreciation and amortization, restructuring charges, environmental charges, employee benefit, valuation allowance and other net deferred taxes are all value relevant for equity valuation.

Amir and Sougiannis (1999) examines how financial analysts and equity investors incorporate information on deferred taxes from carry-forwards into earnings forecasts and share prices. In providing this information each period, management must use their private information about the firm's profitability prospects, effectively providing a management earnings forecast. They find a strong positive relation between deferred taxes from carry-forwards and share prices, suggesting that these carry-forwards are valued as assets, and that the valuation allowance required under SFAS 109 assists equity investors in valuing a firm's earnings and net assets.

Kumar and Visvanathan (2003) demonstrates that disclosures of changes in deferred tax valuation allowances (VA) provide information beyond contemporaneous earnings reports. Their evidence supports a characterization where investors use VA disclosures to infer management's expectations about deferred tax assets, its realizability, and future taxable income available for realization.

Real options

Hayn (1995) hypothesizes that because shareholders have a liquidation option, losses are not expected to perpetuate and are less informative than profits about the firm's future prospects.

The empirical results are consistent with the hypothesis: both the earnings response coefficient and the information content of earnings as measured by R^2 of the return-earnings regression are depressed by the inclusion of loss cases; when the estimation sample consists only of loss cases, the magnitude of reported losses does not appear to be related to the contemporaneous stock price. Hayn also shows that the documented increase in the earnings response coefficient as the cumulation period increases appears to be due exclusively to the effect of losses, i.e., the likelihood of a cumulative loss declines with the cumulation period. The increase in the frequency of losses over the years appears to partially explain the inter-temporal decline in the earnings response coefficient and information content of earnings. The liquidation option effect extends to profitable cases where earnings are low enough to make the option attractive. In addition, the probability of losses is shown to be negatively related to firm size. Hayn proposes that structural changes in the economy and changes in accounting principles with a greater emphasis on mark-to-market accounting are two possible explanations to the observed increased frequency of losses and the decline in the earnings response coefficient over the decades.

Burgstahler and Dichev (1997) develops an option-style model that values equity as a convex function of both earnings and book value, where the function depends on the relative value of earnings and book value. Earnings measure how the firm's resources are currently used, while book value measures the value of the firm's existing resources. When the earnings/book ratio is high, implying that the firm's current activities are successful and are likely to be continued, earnings are the primary determinant of equity value. When the earnings/book ratio is low, the firm is more likely to exercise the option to adapt its resources to a superior alternative use, and book value becomes the more important determinant of equity value. The empirical evidence supports their prediction: the coefficient on earnings (book value) increases (decreases) with the earnings/book ratio. The significance of these effects increases over the sample period from 1976 to 1994.

Barth et al. (1998) hypothesizes that the value relevance of book value in explaining firm value increases when a firm's financial health deteriorates, because book value is a proxy for liquidation value or the value of abandonment options; the value relevance of net income declines when a firm's financial health deteriorates, because the stream of future abnormal earnings is likely to be relatively small in amount and short in duration. The empirical evidence from both a sample of bankrupt firms and a large sample partitioned on bond ratings supports the predictions.

Collins et al. (1999) demonstrates that the omission of book value of equity induces a negative (positive) bias in the coefficient of earnings in the price-earnings relation for loss (profit) firms, because book value is negatively (positively) correlated with profits for loss (profit) firms while positively correlated with stock price. The coefficient on earnings is reliably smaller for loss firms than for profit firms in every year, suggesting that the market views losses as more transitory and places less weight on losses; the mean coefficient on book value does not differ between profit and loss firms when aggregate bottom-line earnings are used, but significantly larger for loss firms when core earnings and transitory components of current earnings are used. Furthermore, they provide evidence on three competing hypotheses for the role that book value of equity plays in valuing loss firms: (1) a control for scale difference, (2) a proxy for expected future normal earnings, or (3) a proxy for loss firms' abandonment option. Their evidence does not support (1) but are consistent with (2) and (3).

Grullon et al. (2011) demonstrates that the positive relation between contemporaneous firm-level stock returns and firm-level return volatility is due to firms' real options. Consistent with the real option theory, they find that the positive volatility-return relation is much stronger for firms with more real options, whose value increases with volatility. They further show that the sensitivity of firm value to changes in volatility declines significantly after firms exercise their real options.

3. Market anomalies and the dynamics of investors' reaction to financial information

The field of behavioral finance has seen an explosion of studies investigating behavioral-based biases in investors' reaction to information. Some anomalies—such as earnings momentum and free cash flow anomaly—have been attributed to investors' under-reaction to relevant information; others including the value/growth and accruals anomaly have been attributed to investors' over-reaction.

Building on research in psychology that suggests that most people tend to overreact to unexpected and dramatic news, **DeBondt and Thaler (1985)** demonstrates a similar behavior in stock markets. They show that portfolios of prior "losers" outperform prior "winners," and that the large excess positive returns earned by the loser portfolio contribute significantly to the January effect.

Fama and French (1992) finds that size and book-to-market equity capture the cross-sectional variation in average stock returns associated with market beta, size, leverage, book-to-market equity, and earnings-price ratios. Moreover, market beta is unrelated to average return after controlling for size. Unlike most other studies of the value/glamour anomaly, Fama and French argue that these strategies produce superior returns because they are fundamentally risky.

Lakonishok et al. (1994) provides evidence that value (or contrarian) strategies outperform the market. Value strategies call for buying value stocks and selling glamour stocks, where value stocks are underpriced stocks relative to their intrinsic value indicators such as book value, earnings, cash flows or growth rate, and glamour stocks are overpriced stocks relative to their intrinsic value indicators. Lakonishok et al. argue that the return differentials reflect a correction of market mispricing caused by investors' naive extrapolation of firms' past sales or earnings growth. In the long-run, stock prices drift towards intrinsic value, as proxied by the fundamentals. They discuss that the return differential between glamour stocks and value stocks is partially attributable to career concerns of portfolio managers, as glamour stocks appear to be prudent investments and have lower career risk to portfolio managers compared to value stocks.

Consistent with the naïve extrapolation hypothesis, **La Porta et al. (1997)** finds that approximately one third of the annual return differentials between value stocks and glamour stocks is earned around earnings announcement dates. They also find that the return differential between value stocks and glamour stocks is smaller in large stocks than in small stocks, consistent with the notion that large stocks about which more information is available are less susceptible to mispricing than small stocks. In contrast, **Dechow and Sloan (1997)** finds no systematic evidence that stock prices reflect naive extrapolation of past trends in earnings and sales growth. Instead, they find that stock prices appear to naively reflect analysts' biased forecasts of future earnings growth, and this naive reliance on analysts' forecasts of future earnings growth can explain over half of the higher returns to contrarian investment strategies.