# DO INVESTORS OVERVALUE FIRMS WITH BLOATED BALANCE SHEETS?

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When cumulative net operating income (accounting value added) outstrips cumulative free cash flow (cash value added), subsequent earnings growth is weak. In this circumstance, we argue that investors with limited attention overvalue the firm, because naïve earnings-based valuation disregards the firm's relative lack of success in generating cash flows in excess of investment needs. The normalized level of net operating assets is therefore a measure of the extent to which operating/reporting outcomes provoke excessive investor optimism. Consequently, if investor attention is limited, net operating assets will predict negative subsequent stock returns. In our 1964-2002 sample, net operating assets scaled by beginning total assets is a strong negative predictor of long-run stock returns. Predictability is robust with respect to an extensive set of controls and testing methods.

## 1. Introduction

Information is vast, and attention limited. People therefore simplify their judgments and decisions by using rules of thumb, and by processing only subsets of available information. Experimental psychologists and accountants have documented that individuals (including investors and financial professionals) concentrate on a few salient stimuli (see e.g., the surveys of Fiske and Taylor (1991) and Libby, Bloomfield, Nelson (2002)). Doing so is a cognitively frugal way of achieving good, though suboptimal decisions. An investor who values a firm based on its earnings performance rather than performing a complete analysis of financial variables is following such a strategy.

Several authors have argued that limited investor attention and processing power causes systematic errors that affect market prices.[1] Systematic errors may derive from a failure to think through the implications of accounting rule changes or earnings management. However, even if accounting rules and firms' discretionary accounting choices are held fixed, some operating/reporting outcomes will highlight positive or negative aspects of performance more than others.

In this paper, we propose that the level of net operating assets—defined as the difference on the balance sheet between all operating assets and all operating liabilities—measures the extent to which operating/reporting outcomes provoke excessive investor optimism. We will argue that the financial position of a firm with high net operating assets superficially looks attractive, but is deteriorating, like an overripe fruit ready to

[1] See, e.g., Hirshleifer and Teoh (2003), Hirshleifer, Lim and Teoh (2003), Hong, Torous, and Valkanov (2003), Hong and Stein (2003), Pollet (2003), and Pollet and Stellavigna (2003), and the review of Daniel, Hirshleifer and Teoh (2002).

drop from the tree. In other words, a high level of net operating assets, scaled to control for firm size, indicates a lack of sustainability of recent earnings performance.

A basic accounting identity states that a firm's net operating assets are equal to the cumulation over time of the difference between net operating income and free cash flow (see Penman (2002), p.230 for the identity in change form):

$$Net\ Operating\ Assets_T = \sum_0^T Operating\ Income_t - \sum_0^T Free\ Cash\ Flow_t \qquad (1)$$

Thus, net operating assets are a cumulative measure of the discrepancy between accounting value added and cash value added— 'balance sheet bloat.'

An accumulation of accounting earnings without a commensurate accumulation of free cash flows raises doubts about future profitability. In fact, we document that high normalized net operating assets (indicating relative weakness of cumulative free cash flow relative to cumulative earnings) is a positive indicator of past earnings performance, but is also an indicator of declining future earnings performance.

If investors have limited attention and fail to discount for this unsustainability, then firms with high net operating assets will be overvalued relative to those with low net operating assets. In the long run, such mispricing will on average be corrected. This implies that firms with high net operating assets will on average earn negative long-run abnormal returns, and those with low net operating assets will earn positive long-run abnormal returns.

Net operating assets can also be interpreted as the cumulation over time of the firm's operating accruals and investment in operations. To see this, separate free cash flow in Equation (1) into the difference between cash flow from operations and investment in operations, and re-arrange the terms. Equation (1) then becomes:

$$
\begin{aligned}
Net\ Operating\ Assets_T &= \sum\nolimits_0^T (Operating\ Income_t - Cash\ Flow_t) + \sum\nolimits_0^T Investment_t \\
&= \sum\nolimits_0^T Operating\ Accruals_t + \sum\nolimits_0^T Investment_t,
\end{aligned} \tag{2}
$$

where the difference between operating income and cash flow from operation is operating accruals. Equation (2) indicates that firms with high net operating assets tend to have high cumulative operating accruals and investment. As argued in more detail in Section 2, high cumulative accruals provide a warning signal about the profitability of investment. Thus, we argue that high net operating assets (normalized appropriately to reflect the size of the firm) tends to be associated with heavy investments when prospects for profitable growth are limited.

Furthermore, equation (2) indicates that net operating assets reflect the full history of flows, and therefore is potentially a more comprehensive return predictor than the single-period slices considered in past literature.[2] It is also simpler, as it derives from the current year balance sheet, rather than being calculated as a difference across years in balance sheet numbers. We document here that the level of normalized net operating assets has greater power, over a longer horizon, to predict returns than the related flow variables. Intuitively, a flow variable provides only a fragmentary indicator of the degree to which operating/reporting outcomes provoke excessive investor optimism.

A possible reason why high net operating assets may be followed by disappointment is that the high level is a result of an extended pattern of earnings management that must

[2] For example, current-period operating accruals are negative predictors of stock returns for up to two years ahead, possibly because investors fail to distinguish between more persistent and less persistent earnings components (Sloan (1996)). Alternative measures of accruals have been found to have different explanatory power for re turns (see, e.g., Collins and Hribar (2002), Teoh, Welch, and Wong (1998a, b), and Thomas and Zhang (2002)). Richardson, Sloan, Soliman, and Tuna (2003) and Fairfield, Whisenant and Yohn (2003) report evidence of one-year-ahead stock return predictability based upon operating and investing accruals.

soon be reversed; see Barton and Simko (2003)[3]. Alternatively, even if firms do not deliberately manage investor perceptions, investors with limited attention may fail to make full use of available accounting information. Thus, the interpretation of net operating assets that we provide in this paper accommodates, but does not require, earnings management.[4]

To test for investor misperceptions of firms with bloated balance sheets, we measure stock returns subsequent to the reporting of net operating assets. The level of net operating assets scaled by beginning total assets (hereafter NOA) is a strong and robust negative predictor of future stock returns for at least three years after balance sheet information is released. We call this the *sustainability effect*, because high NOA is an indicator that past accounting performance has been good but that good performance is unlikely to be sustained in the future; and that investors with limited attention will overestimate the sustainability of accounting performance.

A trading strategy based upon buying the lowest NOA decile and selling short the highest NOA decile is profitable in 35 out of the 38 years in the sample, and averages equally-weighted monthly abnormal returns of 1.24 %, 0.83% and 0.57%, all highly

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[3] If investors overvalue a firm that manages earnings upward, the price will tend to correct downward when further earnings management becomes infeasible. Barton and Simko provide evidence from 1993-1999 that the level of net operating assets inversely predicts a firm's ability to meet analysts' forecasts. Barton and Simko's perspective further suggests that low net operating assets constrain firms' ability to manage earnings downward (in order to take a big bath or create `rainy day' reserves; see DeFond (2003)). Choy (2003) documents that the Barton and Simko (2003) finding derives from industry variations in net operating assets.

[4] A branch of the accruals literature provides evidence that managers take advantage of investor naiveté about accruals to manage perceptions of auditors, analysts, and investors. See, e.g., Teoh, Welch, and Wong (1998a, b), Rangan (1998), Ali, Hwang and Trombley (2000), Bradshaw, Richardson, and Sloan (2000), Xie (2001), and Teoh and Wong (2002).

significant, in the first, second and third year, respectively, after the release of the balance sheet information. In these strategies, each firm's monthly abnormal returns are obtained by subtracting its benchmark portfolio returns that has been matched for firm size, book-to-market, and past 12-month return. Then, either equal- or value-weighted mean returns are calculated for each NOA decile. The effect remains strong with value weights, and adjustments for CAPM, and 3- or 4-factor models.

The effect also remains strong after including, in addition to the above controls, the past one-month returns, three-year returns, and current-period operating accruals using a Fama-MacBeth methodology. The coefficient on NOA is highly statistically significant, indicating that the sustainability effect is distinct from the monthly contrarian effect (Jegadeesh (1990)), the momentum effect (Jegadeesh and Titman 1993), the long-run winner/loser effect (DeBondt and Thaler (1985), and the accruals anomaly (Sloan (1996)). Also, since book-to-market and past returns are measures of past and prospective growth, these controls suggest that the findings are not a risk premium effect associated with the firm's growth rate. Furthermore, the ability of NOA to predict returns is robust to eliminating from the sample firms with equity issuance or M&A activity exceeding 10% of total assets.

The evidence from the negative relationship between NOA and subsequent returns suggests that investors do not optimally use the information contained in NOA to assess the sustainability of performance. A Mishkin test that includes accruals, cash flows, and NOA as forecasting variables of future earnings and returns is similarly consistent with investor overoptimism about the earnings prospects of high-NOA firms, although this nonlinear test requires the trimming of outliers to obtain convergence.

Further tests indicate that NOA remains a strong return predictor after additionally controlling for the sum of the last three years of operating accruals, and the latest change in NOA. These findings suggest that NOA provides a cumulative measure of investor misperceptions about the sustainability of financial performance that captures information beyond that contained in flow variables such as operating accruals or the latest change in NOA.

Finally, we find that the sustainability effect has continued to be strong during the most recent 5 years. The sustainability effect was strongest in 1999 coinciding with the recent boom market, and the predictive power of NOA is robust to the exclusion of this year. The predictive effect of NOA remained strong even during the market downturn in 2000. Thus, it seems that arbitrageurs were not, in our sample, fully alerted to NOA as a return predictor.

## 2. Motivation and Hypotheses

A premise of our hypothesis is that investors have limited attention and cognitive processing power. Theory predicts that limited attention will affect market prices and trades in systematic ways. In the model of Hirshleifer and Teoh (2003), information that is more salient or which requires less cognitive processing is used by more investors, and as a result is impounded more fully into price. Investors' valuations of a firm therefore depend on how its transactions are categorized and presented, holding information content constant. Reporting, disclosure, and news outcomes that highlight favorable aspects of the available information set imply overpricing, and therefore negative subsequent abnormal stock returns. Similarly, outcomes that highlight adverse aspects imply undervaluation, and positive long-run abnormal stock returns.

Several empirical findings address these propositions. There is evidence that stock prices react to the republication of obscure but publicly available information when provided in a more salient or easily processed form.[5] If different investors allocate limited attention to different industries, a shock arising in a specific industry will take time to be impounded in the stocks of firms in other industries. Recent tests have identified industry lead-lags effects in stock returns lasting for up to two months.[6]

Hirshleifer and Teoh (2003) predicted that stocks with high disclosed but unreported employee stock options should on average earn negative long-run abnormal returns, as should firms with large positive discrepancies between disclosed pro forma versus GAAP definitions of earnings. Subsequent tests have confirmed these implications (Garvey and Milbourn (2003), Doyle, Lundholm and Soliman (2003)).

If attention is sufficiently limited, investors will tend to treat an information category such as earnings uniformly even when, owing to different accounting treatments, its meaning varies—functional fixation. Several empirical studies examine the effects of accounting rules or discretionary accounting choices by the firm on market valuations. Since such treatments affect earnings, they will affect the valuations of investors who use earnings mechanically, even if the information content provided to observers is held constant. As discussed in the review of Kothari (2001), the empirical evidence from tests of such 'functional fixation' is mixed.

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[5] See Ho and Michaely (1988); the empirical tests and debate of the `extended functional fixation hypothesis' in Hand (1990, 1991) and Ball and Kothari (1991); and Huberman and Regev (2001).

[6] See Hong, Torous, and Valkanov (2003) and Pollet (2003)). Pollet and Stellavigna (2003) further find that market prices do not reflect long-term information implicit in demographic data for future industry product demand.

The operating accruals anomaly of Sloan (1996) is a natural implication of limited attention; more processing is required to examine each of the cash flow and operating accrual pieces of earnings separately than to examine earnings alone. However, this argument does not explain why investors focus on earnings alone rather than cash flow alone.

If an investor is going to allocate scarce attention to a single flow measure of value added, the level of earnings does seem to be the better choice. Past research has shown that there is information in operating accruals that makes earnings more highly correlated than cash flow with contemporaneous stock returns (Dechow (1994)). This may explain why in practice, valuation based on earnings comparables (such as P/E and PEG ratios) is common. Nevertheless, a pure focus on earnings leads to systematic errors, as it neglects the incremental information contained in cash flow value-added.

The level of net operating assets can help identify those operating/reporting outcomes that highlight the more positive versus negative aspects of performance, thereby provoking investor errors. As discussed in the introduction, it does so by providing a cumulative measure of the discrepancy over time between accounting value added (earnings) and cash value added (free cash flow). Cumulative net operating income measures the success of the firm over time in generating value after covering all operating expenses, including depreciation. Similarly, cumulative free cash flow measures the success of the firm over time in generating cash flow in excess of capital expenditures.

If past free cash flow deserves positive weight, along with past earnings, in a rational forecast of the firm's future earnings, then a positive discrepancy between the two indicates that future earnings will decline, and a negative discrepancy indicates that earnings will increase. An investor who naively forms valuations based upon the information in past earnings will tend to esteem a firm with high net operating assets for its strong earnings stream, without discounting adequately for the firm's relative weakness in generating free cash flow.

This argument does not require that cumulative free cash flow be a more accurate measure of value added than cumulative earnings, nor that accounting accruals be largely noise. What it does require is that cumulative free cash flows contain some incremental information about the firm's prospects that is not subsumed by cumulative earnings.

There are at least two reasons why cumulative free cash flow is incrementally informative to cumulative earnings about future prospects. First, the extent to which earnings comes from operating accruals rather than cash flow is, empirically, a negative forecaster of future earnings (e.g. accruals are less persistent than cash flows – Dechow (1994)). Second, free cash flow additionally reflects the information embodied in cumulative investment levels, which can affect future firm performance both directly, and in interaction with operating accruals.

With regard to the first point (the predictive power of the split of earnings between cash flow and operating accruals), if earnings management is the source of high cumulative accruals, then these adjustments will add noise to accruals as indicators of the economic condition of the firm. Even if accruals are informative, this noise reduces the optimal weight that a rational forecaster would place on past earnings versus cash flows in predicting future performance.

Even if managers do not manage earnings, certain types of problems in the firm's operations will tend to increase the cumulative levels of operating accruals, and therefore will increase higher net operating assets. For example, high levels of lingering, unpaid receivables will increase the cumulative accruals component of net operating assets.[7] To the extent that high receivables may not be fully realized in cash, they contain adverse incremental information (beyond that in past earnings) about future earnings. Therefore, when high cumulative accruals increase net operating assets, an investor who fails to discount for adverse information about low quality receivables will overvalue the firm.

A mirror image of this reasoning applies to firms with high cumulative deferred revenues. Customer cash advances not yet recognized as revenues on the income statement, leads to higher cash flow relative to earnings, and so to lower net operating assets. So a higher cumulative level of cash advances (owing, for example, to an increase in demand) contributes to cumulative earnings outstripping cumulative cash flow.

To the extent that high deferred revenues indicate that future earnings will be realized, they contain favorable incremental information (beyond that in past earnings) about future earnings. So when high cumulative cash advances increase net operating assets, an investor who fails to take into account the favorable information contained in the high deferred revenues will tend to undervalue the firm.

[7] Although receivables are short-term, the worst receivables will tend to linger longer, stretching the period during which accruals accumulate. Furthermore, if the lingering of receivables today is indicative of a high failure rate on new receivables in the next year, the problem telescopes forward. Such chaining of bad receivables will tend to elongate the period during which mispricing corrects out.

Combining these elements, we see that high cumulative accruals that derive, for example, from high unpaid receivables or low deferred revenues increase net operating assets, contain adverse information about future earnings prospects, and contribute to overvaluation.[8] This implies that high net operating assets are associated with low subsequent stock returns.

We now turn to the second point, that the investment piece of cumulative free cash flow may provide information about future performance (incremental to the information contained in earnings), and that this effect can interact with cumulative accruals. By (2), even a firm that has zero accruals can have high net operating assets. So even without any interaction between the effects of accruals and investment, a high cumulative level of investment may indicate low profitability if this level results from empire-building agency problems and managerial overoptimism. If investors fail to discount fully for managerial agency problems and biases, they will tend to overvalue firms with high investment levels. On the other hand, high cumulative investment per se could be a favorable indicator about investment opportunities. So the effect of investment on investor misperceptions depends upon a balance of forces.

However, we expect a more systematic conclusion from the interaction between the effects of cumulative investment and of cumulative accruals. We have argued that a high level of cumulative accruals is a warning signal for the firm's future prospects. In such a

[8] High net operating assets firms have high past earnings and earnings growth, which on average predicts higher future earnings as well. So we do not argue that future earnings will be lower for high net operating assets firms than for low net operating assets firms, but that the earnings of high net operating assets firms will on average decline, whereas the earnings of low net operating assets firms will increase. Our discussion below concerns the adverse information about firm prospects contained in the investment piece of free cash flow, which is incremental to the favorable information contained in past earnings growth.

circumstance, high cumulative investment tends to be a further negative indicator, because it indicates that the firm is investing heavily at a time when prospects for profitable growth are limited.

Again, such investment could be a result of managerial agency problems and bias. More subtly, even positive net present value investment may be associated with future low profits if this investment is a result of obsolescence of the firm's fixed assets (consistent with low unbooked sales). For example, when customer advances decline, new investment in production facilities may be necessary to maintain product quality and market share, and hence the preexisting level of the net cash flow stream. In either case, the combination of high cumulative accruals and high cumulative investment is an indication that the firm is unlikely to earn increasing profits.

Thus, selecting firms based on high net operating assets exposes the dark side of both accruals and of investment.[9] Rising cumulative accruals can reflect growth and cash to come, but can also indicate lingering problems in converting accruals into actual cash flow. High cumulative investment can reflect strong investment opportunities, but can also reflect overinvestment or a need to replace obsolescent fixed assets. High earnings and earnings growth per se are indicators of good business conditions and growth opportunities, and may be associated with high accruals and investment. If strong earnings are in large part corroborated by strong cash flow, then business conditions are more likely to be good, high accruals are more likely to be converted into future cash flow, and investment may add substantial value.

[9] Net operating assets can be high even though either cumulative investment or cumulative accruals is low. However, since high net operating assets is the sum of cumulative investment and accruals, it will be statistically associated with high levels of both.

However, high net operating assets firms are not selected based on earnings growth per se, but based on the cumulative sum of investment and accruals. Since the selection of firms is based on the relative shortfall between cash flow and earnings, the favorable cumulative earnings performance receives relatively little corroboration from cash flow. In this situation, the firm's business environment is likely to be deteriorating. These weakening business opportunities call forth the dark side of the investment. The high cumulative investment of these firms is likely to represent either overinvestment, or replacement of obsolescent fixed assets.

If investors with limited attention fail to recognize the information contained in free cash flow about future financial performance, they will fail to foresee the financial deterioration that tends to follow a period of high net operating assets, or the improvement that tends to follow a period of low net operating assets. They will therefore overvalue firms with high net operating assets and undervalue firms with low net operating assets.

Reinforcing intuition is provided by separating depreciation from operating accruals in Equation (2), NOA can be rewritten as:

$$\begin{aligned} &\textit{Net Operating Assets}_T \\ &= \sum\nolimits_0^T \textit{Operating Accruals except Depreciation}_t + \sum\nolimits_0^T \textit{Investment}_t - \sum\nolimits_0^T \textit{Depreciation}_t \end{aligned} \quad (3)$$

The last two terms reflect the difference between cumulative investment and cumulative depreciation. For a firm in a zero-growth steady state, current investment is equal to current depreciation, so the latest change in net operating assets is equal to the non-depreciation operating accruals. Thus, a firm with high net operating assets is likely to be a growing firm, in the sense that cumulative investment has been higher than cumulative depreciation, and to have high non-depreciation accruals. This alternative decomposition confirms the intuition discussed earlier that scaled net operating assets proxies both for misinterpretations relating to investment activity and to operating accruals.[10]

Finally, by Equation (2), firms with high net operating assets will tend to have high cumulative past investment. These firms may have generated high internal cash flow. If the investment exceeded internally generated cash, they must have financed some of this investment through external finance. It is therefore useful to verify whether any relation between scaled net operating assets and subsequent stock returns is incremental to the new issues puzzle of Loughran and Ritter (1995). We describe such tests in Subsection 4.2.

## 3. Sample Selection, Variable Measurement, and Data Description

Starting with all NYSE-AMEX and NASDAQ firms in the intersection of the 2002 COMPUSTAT and CRSP tapes, the sample period spans 462 months from July 1964 through December 2002. To be included in the analysis, all firms are required to have sufficient financial data to compute accruals, net operating assets, firm size, book-to-market ratios, and 12-month return momentum. An initial sample of 1,625,570 firm-month observations is available for the Fama-MacBeth monthly cross-sectional regressions and the characteristics portfolio-matching analyses. The different test methods impose varying restrictions depending on the controls such as past returns over various horizons.

[10] In the decomposition of equation (2) the latest change in net operating assets is equal to the sum of current operating accruals and current investment. To the extent that net operating assets is a proxy for growth, any ability of scaled net operating assets to predict returns can reflect risk rather than market inefficiency. It is therefore important in empirical testing to control for growth-related risk measures.

*3.1 Measurement of NOA, Earnings, Cash Flows, and Accruals*

Scaled net operating assets (NOA) are calculated as the difference between operating assets and operating liabilities, scaled by lagged total assets, as:

$$NOA_t = (Operating\ Assets_t - Operating\ Liabilities_t)\ /\ Total\ Assets_{t-1} \quad (4)$$

Operating assets are calculated as the residual from total assets after subtracting financial assets, and operating liabilities are the residual amount from total assets after subtracting financial liabilities and equity, as follows:

$$Operating\ Assets_t = Total\ Assets_t - Cash\ and\ Short\text{-}Term\ Investment_t \quad (5)$$

$$Operating\ Liabilities_t = Total\ Assets_t - Short\text{-}Term\ Debt_t - Long\text{-}Term\ Debt_t - Minority\ Interest_t - Preferred\ Stock_t - Common\ Equity_t\ . \quad (6)$$

Table 1 provides the associated Compustat item numbers. We also consider an alternative net operating asset calculation in subsection 4.1.3 because some items are inherently difficult to classify as either operating or financing.

The accounting firm performance variables, *Earnings* and *Cash Flows*, are defined respectively as income from continuing operations (Compustat#178)/lagged total assets, and as *Earnings – Accruals.* The latter variable is operating accruals, and is calculated using the indirect balance sheet method as the change in non-cash current assets less the change in current liabilities excluding the change in short-term debt and the change in taxes payable minus depreciation and amortization expense, deflated by lagged total assets,

$$Accruals_t = [(\Delta Current\ Assets_t - \Delta Cash_t) - (\Delta Current\ Liabilities_t - \Delta Short\text{-}term\ Debt_t - \Delta Taxes\ Payable_t) - Depreciation\ and\ Amortization\ Expense_t]/Total\ Assets_{t-1}. \quad (7)$$

As in previous studies using operating accruals prior to SFAS #95 in 1988, we use this method to ensure consistency of the measure over time, and for comparability of results with the past studies. We include Accruals and the most recent change in NOA scaled by beginning total assets as control variables to evaluate whether NOA provides incremental predictive power for returns.

When calculating net operating assets and operating accruals, if short-term debt, taxes payable, long-term debt, minority interest, or preferred stock has missing values, we treat these values as zeroes to avoid unnecessary loss of observations. Because we scale by lagged assets, the Earnings variable reflects a return on assets invested at the beginning of the period. The stock return predictability that we document remains significant when we scale by ending instead of beginning total assets, scale by current or lagged sales, and impose a number of robustness data screens such as excluding firms in the bottom size deciles or stock price less than 5 dollars.

*3.2 Measurement of Asset Pricing Control Variables*

Following the recommendation of Daniel, Grinblatt, Titman and Wermers (1997), we use the characteristics approach for the asset pricing control variables in predicting returns. Size is the market value of common equity (in millions of dollars) measured as the closing price at fiscal year end multiplied by the number of common shares outstanding. The book-to-market ratio is the book value of common equity divided by the market value of common equity, both measured at fiscal year end.

In addition to these controls, we also include controls for one month-reversal, 12-month momentum, and three-year reversal, all measured relative to the test month *t* of returns. Ret(-1:-1) is the return on the stock in month *t-1*. Ret(-12:-2) is the cumulative return between month *t-12* and month *t-2*. Finally, Ret(-36:-13) is the cumulative return between month *t-36* and month *t-12*. Thus, the return control variables are updated each month as the Fama-MacBeth cross-sectional regressions roll forward in time. The NOA, Accruals, Size and Book-to-market variables, however, are only updated every 12 months. In addition to these controls, we also report results after additional adjustments for the CAPM, the Fama-French 3-factor model, and the Carhart (1997) 4-factor model which includes a momentum factor.

### *3.3 Summary Statistics of Data Characteristics*

Table 1 describes the mean and median values for selected same-period characteristics of the sample by NOA deciles. Firms are ranked annually by NOA and sorted into ten portfolios. Net operating assets vary from about a median of 25% of lagged total assets in the lowest NOA decile to about 150% in the highest NOA decile. This suggests that high NOA firms are likely to have experienced recent very rapid growth, and opens the possibility that investors may have misperceived the sustainability of this growth.

Table 1 reports that Low NOA firms experienced recent poor earnings performance while high NOA firms experienced recent good earnings performance; earnings varies monotonically from a median of −0.5% for NOA Decile 1 to a median of 14.4% for NOA decile 10. This difference in performance is driven by large differences in Accruals across extreme NOA deciles. Accruals increase monotonically across NOA deciles from a large negative 8.6% for NOA decile 1 to a large positive 13.8% for NOA decile 10. Operating Cash Flows do not vary monotonically across deciles. NOA decile 10, however, has significantly lower Cash Flows than all other deciles. NOA decile 1's

Cash Flows are similar to those of NOA decile 8 and 9, and are slightly lower than the Cash Flows in deciles 2 through 7, which are quite similar to each other.

The high level of Earnings for NOA decile 10 despite its extreme low level of Cash Flows reflects the extremely high Accruals in NOA decile 10. Similarly, the extreme negative accruals for NOA decile 1 contribute to the portfolio's low Earnings despite its moderate level of Cash Flows.

Our hypothesis concerns investors failing to attend sufficiently to the cumulative history of accruals and investment. Table 1 reports short-term trends in Earnings in relation to NOA. These are the current period change in Earnings and the next period change in Earnings. The low-NOA deciles 1 and 2 experience the worst current decline in Earnings, and achieve amongst the highest turnaround in Earnings in the next period, with the highest rebound occurring in NOA decile 1. NOA decile 10, acting like a mirror reflection, does well previously and subsequently does poorly. Thus, the behavior of earnings before and after NOA sorting dates is as hypothesized. If, in addition, investors ignore the fact that NOA provides information about reversals in earnings growth, NOA will predict future abnormal returns.

Turning to stock market characteristics, Table 1 indicates that extreme (both high and low) NOA firms have the smallest size measured by either book value of equity or market value of equity; the lowest book-to-market ratios; and the highest betas. Thus, the extreme deciles seem to be small, possibly high growth or are overvalued, and risky firms. It is therefore essential to carefully control for risk in measuring abnormal returns.

Panels C and D provide summary statistics on the components of NOA. All components contribute substantially to variations in NOA, with an especially strong contribution coming from SAsset in decile 10.

Put Table 1 about here.

Table 2 reports the correlations between NOA, the variable of interest, and the performance measures and firm characteristics. NOA is persistent; the correlation between NOA and next period NOA is positive and significant. As expected from the identity in equation (2), NOA and Accruals are positively correlated.

Also consistent with Table 1 findings, the Spearman correlation indicates that NOA is positively correlated with Earnings, and current period change in Earnings, and is negatively associated with Cash Flows and next period change in Earnings. Because of outliers, the Pearson and Spearman correlations are of the opposite sign for NOA with Earnings, and with current period change in Earnings. After trimming the extremes at 0.5% the sign of Pearson correlations match the sign of the Spearman correlations. While Table 1 shows similar characteristics in terms of size, beta, and book-to-market for extreme levels of NOA relative to the middle deciles, the correlations indicate that NOA is negatively correlated with beta and positively correlated with firm size. The correlation with book-to-market is positive for the Spearman and negative for the Pearson tests.

Put Table 2 about here.

*3.4 Industry Distribution Across NOA Deciles*

Table 3 reports the industry distribution of our sample across NOA deciles pooled across all sample years. Each decile is widely represented by all the two-digit SIC codes. Following Fama-French (1992), industry (four digit SIC) codes are grouped into fourteen industry groups. Panel A reports the percentage of firms in each industry group for each NOA decile. Comparing across NOA deciles, the extreme NOA deciles (1 and 10) have a relatively lower presence in the Food, Textile, Chemicals, and Durables industry groups. The extreme NOA deciles also have a higher presence in the Mining and Construction, Transportation, and Computers industry groups. In addition, NOA decile 1 has a relatively high presence in the Pharmaceuticals and Financials groups, and a relatively lower presence in the Extractive, Utilities, Retail, and Services groups. NOA decile 10 has a relatively higher presence in the Extractive and Utilities industry groups.

Panel B reports the percentage of firms in each NOA decile within each industry group. Looking across NOA deciles, the extreme NOA deciles (1 and 10) have a relatively larger presence in Mining and Construction, Computers, and Financials industry groups. Low NOA deciles additionally have a larger presence among Pharmaceuticals, and Transportation, and high NOA deciles have a larger presence among Agriculture, Extractive, and Utilities industry groups. Given the industry variation in NOA noted here, we have verified that our main findings remain strong when we industry-demean our net operating assets measure (results not reported; see Zhang (2004) for an industry study on NOA).

Put Table 3 about here.

## 4. The Sustainability Effect

We have hypothesized that a high level of net operating assets is an indicator of strong past earnings performance, but also of deteriorating future financial prospects. We have also hypothesized that investors with limited attention neglect this adverse indicator, leading to stock return predictability. We first evaluate these hypotheses by presenting the time profile of accounting and stock return performance in the periods surrounding the sorting year by NOA deciles. We then test the ability of NOA to predict stock returns controlling for standard asset pricing variables and accounting flow variables.

### *4.1 Time Trends in Earnings and Returns for Extreme NOA Deciles*

Figure 1 describes the time series means of Earnings and annual raw buy-and-hold stock returns for the extreme NOA deciles 1 and 10. Earnings for high NOA firms hit a peak—and for low NOA firms a trough—in the conditioning year. High NOA is associated with upward trending Earnings over the previous several years. This upward trend sharply reverses after the conditioning year, creating a continuing downward average trend in Earnings. Low NOA is associated with a mirror-image trend pattern. From five years prior to the conditioning year, average Earnings uniformly trends down. From the sorting year onwards, average Earnings uniformly trends upwards.

In general, behavioral accounts of over-extrapolation of earnings or sales growth trends involve a failure to recognize the regression phenomenon, so that forecasts of future earnings are sub-optimal conditional on the past time series of earnings. Conditional on high NOA, earnings growth does not just revert to a normal, slower rate, it turns sharply negative. An investor who, owing to limited attention, neglects the information contained in NOA for future earnings is in for a rude surprise. Conditional on NOA, his forecast errors are severe even if he optimally processes the past time series of earnings, and has no general propensity to overextrapolate earnings trends.

Average Earnings is uniformly higher for high NOA firms than for low NOA firms, which reflects the respective glory or disgrace of their past. As a result, even though high NOA predicts a sharp drop in earnings, *cross-sectionally* high NOA need not predict lower future Earnings across firms. This depends on the balance between the time-series and the cross-sectional effect.

Do high NOA firms, as hypothesized, earn low subsequent returns? The annual raw returns of high NOA versus low NOA firms display a dramatic cross-over pattern through the event year. High NOA firms earn higher returns than low NOA firms before the event year, and lower returns after. As the event year approaches, the (non-cumulative) annual returns of high NOA firms climb to about 35% in year –1, but the returns are under 5% in year +1. Low NOA firms somewhat less markedly switch from doing poorly in year –1 to well in year +1. Even as far as 5 years after the event year, high NOA firms are averaging annual returns lower than those of low NOA firms. This longer term difference in raw returns in post-event years 3-5 may reflect the difference in size and beta that was noted in Table 2 between the extreme NOA deciles.

### *4.1 Are High- NOA Firms Overvalued? Abnormal Returns Tests*

#### *4.1.1 Abnormal Returns by NOA Deciles*

To test the sustainability hypothesis, it is important to control for risk and other known determinants of average returns. Table 4 reports the average returns of portfolios sorted on NOA as defined in Section 2. Every month, stocks are ranked by NOA, placed into deciles, and the equal-weighted and value-weighted monthly raw and characteristic adjusted returns are computed. We require at least a four-month gap between the portfolio formation month and the fiscal year end to ensure that investors have the financial statement data prior to forming portfolios. The average raw and characteristic-adjusted returns and t-statistics on these portfolios, as well as the difference in mean returns between decile portfolio 1 (lowest ranked) and 10 (highest ranked), are reported.

We calculate abnormal returns using a characteristic-based benchmark to control for return premia associated with size, book-to-market and momentum. Whether these known return effects derive from risk or mispricing is debated in the literature; in either case, we test for an effect that is incremental to these known effects.[11] The benchmark portfolio is based on the matching procedure used in Daniel, Grinblatt, Titman, and Wermers (1997). All firms in our sample are first sorted each month into size quintiles, and then within each size quintile further sorted into book-to-market quintiles.[12] Stocks are then further sorted within each of these 25 groups into quintiles based on the firm's past 12-month returns, skipping the most recent month (e.g., cumulative return from t-12 to t-2). Stocks are weighted both equally and according to their market capitalizations within each of these 125 groups. The equal-weighted benchmarks are employed against equal-weighted portfolios, and the value-weighted benchmarks are employed against value-weighted portfolios. To form a size, book-to-market, and momentum-hedged return for any stock, we simply subtract the return of the benchmark portfolio to which that stock belongs from the return of the stock. The expected value of this return is zero if size, book-to-market, and past year return are the only attributes that affect the cross-section of expected stock returns.

Using the characteristic adjustment method, Table 4 indicates that there is a strong and robust relation between a firm's NOA and its subsequent abnormal stock returns for

[11] The book-to-market control may be especially important, because high- or low-NOA firms potentially have different growth characteristics from other firms. Book-to-market is a standard inverse proxy for a firm's growth opportunities, since, in an efficient market, a firm's stock price reflects the value of its growth opportunities.

[12] Our requirement of valid NOA data tilts our sample toward larger firms. Employing all CRSP-listed firms (with available size, book-to-market, and past twelve-month returns) to construct the benchmarks yielded similar, if not stronger, results for both value-weighted and equal-weighted portfolios.

at least 3 years after the reporting of NOA. In the year following the sorting date, the monthly adjusted equally weighted return spread between low and high NOA deciles is 1.24% per month (t = 10.31). In year t+2 the effect is also strong, 0.83% per month (t = 7.66), and remains highly significant in year t+3, 0.57% per month (t = 5.44). The NOA spread is more than 88% larger than the operating accruals spread (operating accruals divided by beginning total assets; not included in table) in year t+1, a differential that grows to over 138% in year t+3. The predictability of NOA declines over time; the hedge returns decline by about one-third in each successive year.

Put Table 4 about here.

The returns when we double-adjust by examining CAPM, Fama-French 3-factor, and 4-factor $\alpha$'s are generally quite similar to those of the basic characteristics-adjusted hedge return. As is commonly the case, return predictability is stronger using equal weights than value weights, but all hedge returns are highly significant. The strong predictability of stock returns based upon NOA is consistent with the sustainability hypothesis.

These abnormal returns seem to offer a profitable arbitrage opportunity. Potential gains are larger on the short side than the long side. Mean abnormal returns tend to be larger in absolute value for the highest NOA decile (-0.73%, -0.54%, and -0.30%, all highly significant, in years t+1, t+2 and t+3 respectively) than for the lowest decile (0.51%, 0.29%, and 0.27%, all highly significant in years t+1, t+2 and t+3 respectively). However, even for an investor who is limited to long positions, substantial profits are achievable based upon the sustainability effect. In year t+1 and t+2, there are significantly positive abnormal returns associated with the five lowest ranking NOA portfolios. Significant abnormal returns are achievable using the four lowest ranked NOA portfolios in year t+3 as well. In contrast (results not reported), in this sample pure long trading is not profitable based upon the operating accruals anomaly.

Figure 2 Panel A graphs the equally-weighted profits from the trading strategy by taking a long position in NOA decile 1 and a short position in NOA decile 10 broken down by year. The strategy is consistently profitable (35 out of 38 years), with the loss years occurring prior to 1973. The sustainability effect is robust with respect to the removal of the strongest year, 1999. The general conclusions for value-weighted returns in Panel B are similar, though not as uniformly consistent. In both panels, the abnormal profits are substantially larger in recent years.

Put Figure 2 about here.

The NOA profits compare favorably with those from a strategy based on going long in the lowest operating accruals deciles and taking short positions in the highest operating accruals deciles. For example (not reported in tables), the equally-weighted profits from an NOA strategy beat the profits from an operating accruals strategy in 28 out of 38 years. The number of years of higher profits is more evenly split for value-weighted profits. However, for both equal and value-weighted results, NOA performs much better than Accruals during the last 5 years; the accruals strategy yielded significant losses in 2000, 2001, and 2002. The greater predictive power of NOA suggests, as proposed in Section 2, that it is a better proxy for investor misperceptions, because it reflects balance sheet bloat more fully. In particular, NOA reflects a cumulative effect rather than just the current-period flow; and, reflects past investment as well as past accruals. It thereby provides a more complete measure of the discrepancy between past accounting value added and cash value added.

*4.1.2 Fama-MacBeth Monthly Cross-Sectional Regression Method*

In studies that claim to document how investor psychology affects stock prices, there is always the question of whether the results derive from some omitted risk factor, and how independent the findings are from known anomalies. By applying the Fama-MacBeth method, we evaluate the relation between NOA and subsequent returns with an expanded set of controls, which consist of momentum, size, and book-to-market; the short-term one-month contrarian effect, and (by using returns from month –36 to –13) the long-run winner/loser effect.

Table 5 Panels A, B, and C respectively describe the relation of conditioning variables and NOA, to returns one year, two year and three years in the future. Model 1 includes standard asset pricing controls, and Model 2 additionally includes the operating accruals variable. The coefficients confirm the conclusion of past literature that these variables predict future returns.

Put Table 5 about here.

In the Model 3 regressions, NOA in each of the panels is highly significantly negatively related to cross-sectional stock returns, confirming the sustainability effect. The *t*-statistics on NOA in Model 3 are -8.98, -4.53 and –3.39 in Panels A, B and C respectively. When both Accruals and NOA are included in the Model 4 regressions, the NOA coefficients remain highly significant. These findings confirm that the ability of NOA to predict returns is incremental to other well-known predictive variables. Panel C also indicates that the NOA effect is more persistent that the Accruals effect. The NOA t+3 result remains statistically significant whereas the Accruals t+3 result becomes insignificant.

*4.1.3 Robustness of the Sustainability Effect*

NOA in Table 5 is measured using the residual from total assets after subtracting selected financial assets to obtain operating assets and the residual from total assets after subtracting equity and financial liability items. This may inadvertently omit operating items or include financing items. For example, operating cash is often lumped together with short-term investments and so is omitted from our NOA measure. Some items could be viewed as either operating or financing. For example, long-term marketable securities can be sold in the short-term if a cash need arises, and therefore can behave like a financing rather than an operating item.[13] As a robustness check, we consider an alternative measure, NOA_alt, in which we specifically select for operating asset and operating liability items. Following Fairfield, Whisenant and Yohn (2003), operating assets include: accounts receivables, inventory, other current assets, property, plant and equipment, intangibles, and other long-term assets. Operating liabilities include accounts payable, other current liabilities, and other long-term liabilities. Table 6 notes contain the specific Compustat item numbers.

Put Table 6 about here.

Panel A of Table 6 indicates that the two measures of NOA are very similar. The means, medians, and standard deviations are almost identical, and their correlations with each other are very high. Thus, not surprisingly, all the results of Tables 4 and 5 are confirmed using NOA_alt in Table 6 Panels B and C.

[13] Goodwill can be viewed as either an operating accrual or an investment. However, NOA includes both operating accruals and investment, so we include goodwill as part of NOA.

Panel B reports the hedge profits from the NOA_alt trading strategy calculated from the characteristics-adjusted portfolio benchmark returns, and alphas from double-adjusting further using the CAPM, the Fama-French 3-factor, or 4-factor models. For brevity, only the year +1 monthly profits are reported. All the equally-weighted and value-weighted hedge returns are statistically significantly positive, confirming the robustness of Table 4 findings. Similarly, Panel C Fama-Macbeth regression results confirm that NOA is a robust predictor of abnormal returns, and the NOA effect is incremental to the operating accruals and other financial anomalies.

*4.2 Does NOA Return Predictability Derive from Other Sources?*

An alternative to the sustainability hypothesis is that the NOA captures some known anomaly distinct from the return predictors we have controlled for in previous tests. For example, the predictive power of NOA might derive from current period operating accruals (Sloan (1996)) or from the issuance of new equity. To investigate these and other possibilities, in Table 7 we examine the predictive power of different components of NOA for one-year-ahead returns. The Fama-Macbeth regressions of Table 5 are now run using alternative decompositions of NOA.

NOA is the cumulative sum of operating accruals and cumulative investment (equation 2). Thus in addition to current period operating accruals, NOA contains the current period investment, and all past operating accruals and investment. Table 7, Panel A indicates that NOA remains highly significant as a return predictor even after controlling for Accruals in the regression. The sustainability effect is not subsumed by the accruals anomaly. This implies that investment levels and past operating accruals matter, not just the most recent operating accruals.

To verify whether it is the cumulative NOA that matters, or just its latest change, Panel B describes a test that includes in addition to Accruals (and the asset pricing controls) the latest change in NOA. NOA remains highly statistically significant, indicating that the cumulative total of past investment and operating accruals matters, not just the latest investment and operating accruals. Thus, the NOA effect is incremental to both the Sloan operating accruals effect and the change in NOA effect of Fairfield, Whisenant, and Yohn (2003). Interestingly, the change in NOA is not statistically significant in the regression including both Accruals and NOA. This suggests that investor misperception about current period investment is similar to misperceptions about past operating accruals and past investment.

Since NOA reflects the history of past operating accruals, the preceding tests do not preclude the possibility that investment doesn't matter, so that the effect of NOA is a consequence of a simple additive impact of the history of past operating accruals. The regression in Panel C includes the sum of past three years operating accruals from NOA. The major remaining orthogonal component in NOA after controlling for the effects of cumulative accruals is cumulative past investment. NOA remains highly statistically significant, which indicates that cumulative investment does play a role in the strong predictive power of NOA. Comparing Panels A and B, we see that the inclusion of the sum of past three-year operating accruals instead of just the single year's lagged operating accruals barely changes the magnitude of the NOA coefficient, whereas the statistical significance of NOA increases.

The results in Panels A, B, and C together suggest that current period operating accruals, current period investment, and past period operating accruals and investment all contribute to the ability of NOA to predict returns. The sustainability effect derives from investor misperception about the ability of high operating accruals and high investments in all past periods to generate high future firm performance.

As a sensitivity analysis, we have also examined whether the NOA effect is related to the well-known new issues financing anomaly (Loughran and Ritter (1995)) by decomposing NOA into equity, debt, and cash equivalents. We found (see Hirshleifer, Hou, Teoh, and Zhang (2003) for details) that all three components of NOA predict returns with high statistical significance. Furthermore, the ability of NOA to predict returns is robust to eliminating from the sample firms with equity issuance exceeding 10% of total assets. These findings suggest that the predictive power of NOA goes beyond that of the new issues anomaly. We have also verified that the NOA predictability for returns is robust to excluding firms with M&A activity exceeding 10% of total assets.

An earlier draft of this paper explored the interaction between NOA and single-period operating accruals using an interactive variable in a regression model, as well as a two-way sort of the excess returns by NOA and accruals. The multiplicative variable was not statistically significant, but the two-way sorts suggested that there might exist a more subtle non-linear interaction. A thorough investigation of interactive effects is left for future research.

### *4.3 Mishkin Test of Rationality of Investor Forecasts*

To provide an intuitive description of how investors employ the information in NOA to forecast future performance, we extend the Mishkin approach to test whether the market efficiently weights NOA in addition to operating accruals and cash flows in predicting one-year-ahead future earnings (see Abel and Mishkin (1983) and Sloan (1996)). A Mishkin test attributes the incremental ability of NOA to forecast future returns to investor misperceptions about the ability of NOA and other variables to forecast future earnings.

Iterative weighted non-linear least squares regressions are estimated jointly every year for the following system of equations:

$$Earnings_{t+1} = \gamma_0 + \gamma_1 Accruals_t + \gamma_2 NOA_t + \gamma_3\, Cash\ Flows_{\,t} + v_{t+1} \tag{8}$$

$$Abnormal\ Ret_{t+1} = \beta(Earnings_{t+1} - \gamma_0 - \gamma_1^* Accruals_t - \gamma_2^* NOA_t - \gamma_3^* Cash\ Flows_t) + \varepsilon_{t+1}, \tag{9}$$

where Abnormal $Ret_{t+1}$ is the raw return on security minus the return on the size, book-to-market, and momentum matched portfolio benchmark for the year beginning four months after the end of the fiscal year for which operating accruals and cash flows from operations are measured. Earnings and Cash Flows are deflated by beginning period total assets for consistency with Accruals.

The forecasting equation (8) estimates the optimal weights on Accruals, NOA, and Cash Flows in predicting future earnings. The second equation (9) estimates the weights that investors place on Accruals, NOA, and Cash Flows in predicting Earnings, taking into account the predictive power of these independent variables for future returns. If the market is efficient and the model specification is correct, then the weights assigned by investors would not be statistically different from the weights assigned by the rational model for forecasting earnings. In this case, $\gamma_1 = \gamma_1^*$, $\gamma_2 = \gamma_2^*$, and $\gamma_3 = \gamma_3^*$.

Because we use annual data to estimate the system of equations, we impose a minimum four-month gap between the fiscal year end and the start of the return cumulation. The CRSP returns data ends in December 2002, so the sample for the

Mishkin test runs from fiscal year 1965 through fiscal year 2000. We have an initial 141,254 firm-year observations with sufficient returns and financial data during this period. The sample is further reduced by the requirement that observations have one-year ahead earnings from COMPUSTAT for the forecasting equation in the Mishkin test to 138,483 observations. After deleting the smallest and largest 0.5% of all pooled observations on the financial and returns variables to avoid extreme outlier effects, the final sample for the Mishkin test contains 130,468 firm-year observations.[14]

If we were to pool firm-year observations into a single pair of nonlinear regressions, the high ratio of firms to the number of time series observations could introduce residual cross-correlation. We therefore run the nonlinear system for each year separately, and then apply a Fama-MacBeth method by estimating the times series of the difference between the estimated coefficients from the forecast and market equations to test for market efficiency.[15]

Table 8 reports the time series averages of the annual coefficient estimates along with the time-series t-statistics. The statistically optimal weight, on NOA in forecasting future earnings, $\gamma_2$, is an insignificant -0.004. This reflects a balance of two effects. On the one hand, as can be seen by comparing the earnings of high- versus low-NOA firms

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[14] The estimation of the annual nonlinear Mishkin system is sensitive to extreme outliers in three of the 36 years in the sample period we examine. However, trimming extreme values can induce bias in tests of market efficiency (see Kothari, Sabino, and Zach (forthcoming)). We do not trim the data in all of the tests in the previous sections (e.g. portfolio hedge profits and the Fama-MacBeth tests), so our inferences about the predictability of long-run returns do not rely on trimming. The additional insight from the Mishkin test concerns the extent to which return predictability derives from investor errors in forecasting future earnings from accruals or NOA. When we trim the Mishkin test sample at 0.25% level instead of 0.5% level in the Mishkin test in Table 8, the results are similar.

[15] Kothari, Sabino and Zach (forthcoming) apply Fama-Macbeth averaging of the estimated coefficients across simulated independent samples in their Mishkin tests.

in Figure 1, firms with high NOA contemporaneously tend to be high-earnings firms. On the other hand, the earnings of high NOA firms decrease subsequent to the conditioning date. The low coefficient is therefore consistent with the sustainability hypothesis.

Most importantly, $\gamma_2^* > \gamma_2$, implying that investors weight NOA much too positively in forecasting future earnings. The investors' weight on NOA, 0.043, is highly significant and has the opposite sign from the point estimate of the statistically optimal weight. This overoptimistic perception of NOA is significantly larger than the over-weighting of Accruals. When NOA is included in the system, the point estimate indicates that investors still overweight Accruals ($\gamma_1^* > \gamma_1$), as in past research, but the difference here is marginally insignificant (t=1.82). (The significant underweighting of cash flows by investors is also consistent with past research.) Thus, the test indicates that investors view NOA much too positively in forecasting future earnings; the overweighting of NOA does not derive solely from current operating accruals. The result that investors view NOA too positively is robust to using Sum_Accruals or change in NOA in place of Accruals.

Put Table 8 about here.

## 5. Conclusion

If investors have limited attention, then accounting outcomes that saliently highlight positive aspects of a firm's performance will encourage higher market valuations. When cumulative accounting value added (net operating income) over time outstrips cumulative cash value added (free cash flow), we argue that it becomes hard for the firm to sustain further earnings growth. We further argue that investors with limited attention tend to overvalue firm whose balance sheets are `bloated' in this fashion. Similarly, investors tend to undervalue firms when accounting value added falls short of cash value added.

The level of net operating assets, which is the difference between cumulative earnings and cumulative free cash flow over time, is therefore a measure of the extent to which operating/reporting outcomes provoke excessive investor optimism.  As such, net operating assets should negatively predict subsequent stock returns. This argument allows for the possibility of earnings management, but does not require it.

In our 1964-2002 sample, net operating assets do contain important information about the long-term sustainability of the firm's financial performance. Firms with high net operating assets normalized by beginning total assets (NOA) have high and growing earnings prior to the conditioning date, but their earning declines subsequent to the conditioning date.

Furthermore, NOA is a strong and highly robust negative predictor of abnormal stock returns for at least three years after the conditioning date. This evidence suggests that market prices do not fully reflect the information contained in NOA for future financial performance.  We call this pattern the sustainability effect.

The predictive power of NOA remains strong after controlling for a wide range of known return predictors and asset pricing controls. NOA has stronger and more persistent predictive power than flow components of NOA such as operating accruals or the latest change in NOA. This evidence suggests that there is a cumulative effect on investor misperceptions of discrepancies between accounting and cash value added. Net operating assets therefore provide a parsimonious balance sheet measure of the degree to which investors overestimate the sustainability of accounting performance.

A previous literature has documented that balance sheet ratios can be used to predict future stock returns.[16] This literature develops weighting schemes that combine various ratios to maximize predictive power, presumably by sweeping together a mixture of economic sources of predictability. In the absence of a prior conceptual framework for determining optimal weights, it is not clear whether the weights will remain stable across samples and time periods.

A distinctive feature of this paper is that we employ a simple and parsimonious aggregate balance sheet measure, net operating assets, whose predictive power is motivated by a very simple psychological hypothesis. This hypothesis is that investors have limited attention; that they allocate this attention to an important indicator of value added, historical earnings; and that this comes at the cost of neglecting the incremental information contained in cash flow measures of value added.

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[16] See, e.g., Ou and Penman (1989), Holthausen and Larcker (1992), Lev and Thiagarajan (1993), Abarbanell and Bushee (1997), and Piotroski (2000).

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Xie, H., 2001. The Mispricing of Abnormal Accruals. *The Accounting Review 76*, 357-373.

**FIGURE 1A: Time Series Property of Mean Annual Earnings Based on NOA Decile Ranking**

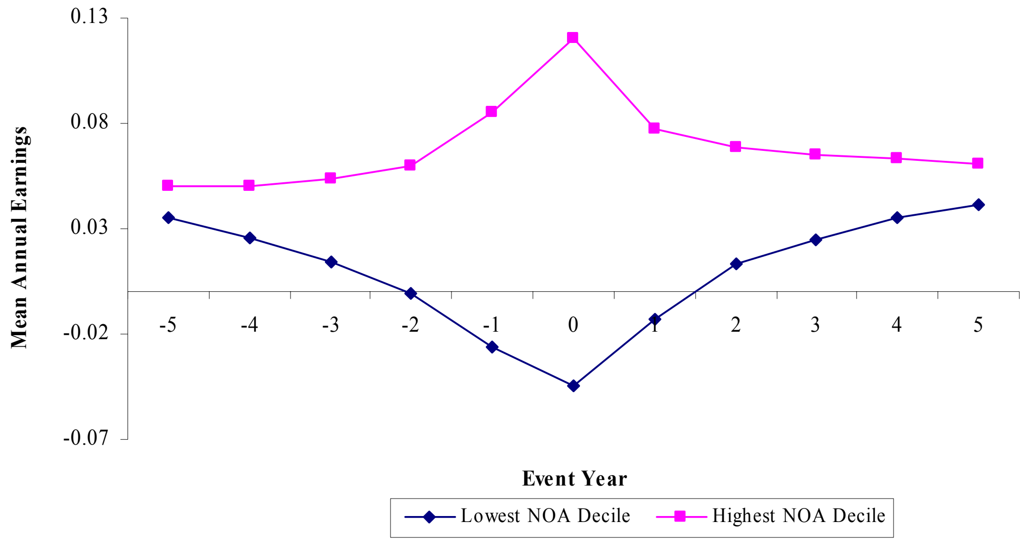
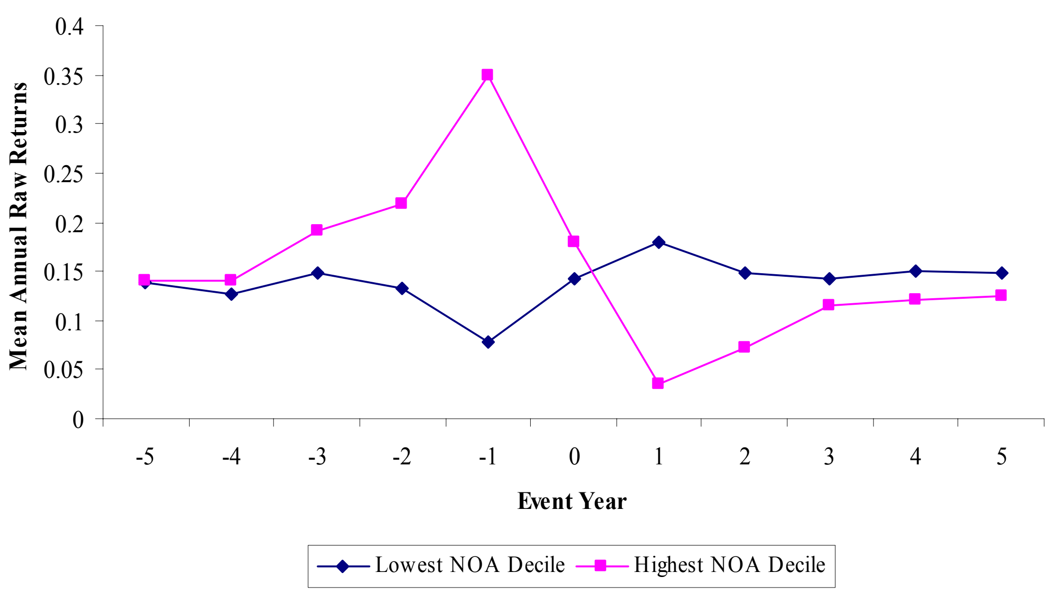



**FIGURE 1B: Time Series Property of Mean Annual Raw Returns Based on NOA Decile Ranking**




*Notes:*
NOA and Earnings are as defined in Table I. Returns are annual raw buy and hold returns starting four months after fiscal year end. Year 0 is the year in which firms are ranked and assigned in equal numbers to ten portfolios based on the magnitude of NOA.

**FIGURE 2A: Hedge Portfolio Returns (Equal-Weighted) Based on NOA Strategy**

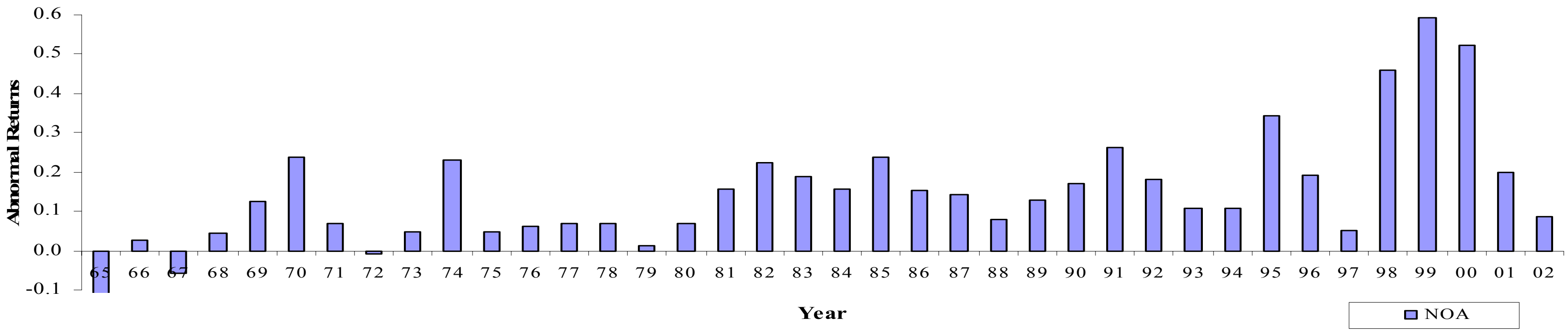
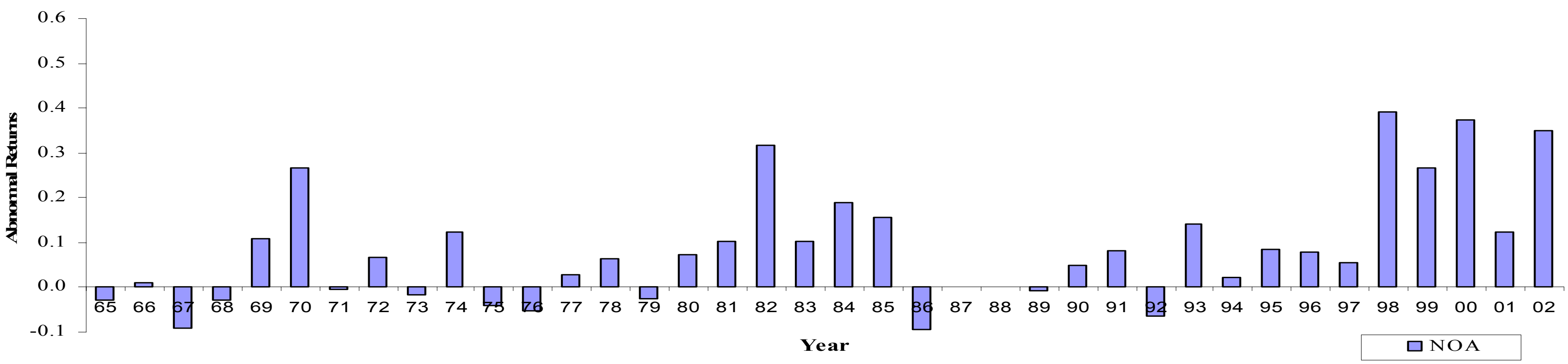



**FIGURE 2B: Hedge Portfolio Returns (Value-Weighted) Based on NOA Strategy**




*Notes*:
NOA is as defined in Table 1. Portfolios are formed monthly by assigning firms to deciles based on the magnitude of NOA in year t. The monthly abnormal return for any individual stock is the return of the stock minus the equal-weighted (value-weighted) return of a benchmark portfolio matched by size, book-to-market and momentum. Equal-weighted (Value-weighted) abnormal return for each NOA portfolio is then computed monthly. The annual abnormal returns are calculated as sum of the monthly hedging abnormal returns from January to December for each calendar year from 1965-2002. The hedging portfolio consists of a long position in the lowest NOA portfolio and an offsetting short position in the highest NOA portfolio.

**TABLE 1**
**Mean (*Median*) Values of Selected Characteristics for Ten Portfolios of Firms Formed Annually by Assigning Firms to Deciles Based on the Magnitude of Net Operating Assets**

| | Portfolio NOA Ranking | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Lowest | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Highest |
| *Panel A: Accounting Variables* | | | | | | | | | | |
| NOA | 0.245 | 0.488 | 0.589 | 0.658 | 0.712 | 0.760 | 0.810 | 0.871 | 0.972 | 1.637 |
| | *0.251* | *0.495* | *0.579* | *0.637* | *0.689* | *0.739* | *0.799* | *0.874* | *0.967* | *1.513* |
| Earnings | -0.039 | 0.034 | 0.071 | 0.089 | 0.092 | 0.103 | 0.107 | 0.112 | 0.117 | 0.076 |
| | *-0.005* | *0.052* | *0.063* | *0.078* | *0.084* | *0.098* | *0.096* | *0.108* | *0.117* | *0.144* |
| Accruals | -0.081 | -0.055 | -0.046 | -0.036 | -0.029 | -0.020 | -0.011 | 0.004 | 0.033 | 0.140 |
| | *-0.086* | *-0.058* | *-0.049* | *-0.039* | *-0.033* | *-0.021* | *-0.011* | *0.004* | *0.039* | *0.138* |
| Cash Flows | 0.042 | 0.088 | 0.116 | 0.125 | 0.121 | 0.123 | 0.118 | 0.108 | 0.084 | -0.063 |
| | *0.090* | *0.121* | *0.118* | *0.121* | *0.121* | *0.122* | *0.117* | *0.109* | *0.092* | *-0.038* |
| ΔEarnings | 0.001 | 0.000 | 0.009 | 0.008 | 0.009 | 0.012 | 0.012 | 0.017 | 0.024 | 0.055 |
| | *0.002* | *0.002* | *0.009* | *0.008* | *0.011* | *0.013* | *0.012* | *0.018* | *0.027* | *0.056* |
| $\Delta_{+1}$Earnings | 0.041 | 0.027 | 0.017 | 0.011 | 0.009 | 0.008 | 0.005 | 0.004 | 0.003 | -0.001 |
| | *0.037* | *0.027* | *0.018* | *0.011* | *0.008* | *0.007* | *0.002* | *0.003* | *0.002* | *-0.002* |
| BV ($m) | 103 | 315 | 401 | 481 | 410 | 409 | 367 | 311 | 265 | 188 |
| | *92* | *273* | *350* | *379* | *332* | *298* | *341* | *262* | *202* | *105* |
| *Panel B: Asset Pricing Factors* | | | | | | | | | | |
| MV ($m) | 382 | 974 | 1040 | 1235 | 966 | 1065 | 729 | 653 | 594 | 497 |
| | *281* | *572* | *574* | *638* | *619* | *452* | *531* | *416* | *330* | *212* |
| B/M | 0.465 | 1.172 | 0.895 | 0.918 | 0.956 | 0.943 | 0.935 | 0.880 | 0.773 | 0.607 |
| | *0.452* | *0.676* | *0.744* | *0.799* | *0.795* | *0.818* | *0.853* | *0.788* | *0.708* | *0.563* |
| Beta | 1.270 | 1.212 | 1.178 | 1.137 | 1.102 | 1.089 | 1.082 | 1.108 | 1.137 | 1.237 |
| | *1.249* | *1.190* | *1.150* | *1.127* | *1.092* | *1.098* | *1.076* | *1.091* | *1.109* | *1.199* |

*Notes:*
The sample consists of a maximum of approximately 1.63 million firm-month observations covering NYSE, AMEX and Nasdaq firms with available data from July 1964 to December 2002, and a total of 141,254 firm-year observations from fiscal year 1963 to 2000. Monthly returns are analyzed using the characteristic-matched portfolio benchmark and Fama-Macbeth-like cross-sectional regressions; annual returns are used in the Mishkin test for market efficiency.

**Variable Measurement**

Raw NOA = Operating Assets (OA)-Operating Liabilities (OL), where
(Compustat item numbers in parentheses)

- OA = Total Assets (Compustat #6) – Cash and Short Term Investment (Compustat #1)
- OL = Total Assets – STD – LTD – MI – PS - CE
- STD = Debt included in current liabilities (Compustat #34)
- LTD = Long Term Debt (Compustat #9)
- MI = Minority Interests (Compustat #38)
- PS = Preferred Stocks (Compustat #130)
- CE = Common Equity (Compustat #60)

NOA, net operating assets = Raw NOA /Lagged Total Assets
Earnings = Income From Continuing Operations (Compustat#178)/lagged total assets
Raw Accruals = (ΔCA-ΔCash)-(ΔCL-ΔSTD-ΔTP)-Dep, where Δ is the annual change, and

- CA = Current Assets (Compustat #4)
- CL = Current Liabilities (Compustat #5)
- TP = Income Tax Payable (Compustat #71)
- Dep = Depreciation and Amortization (Compustat #14)

Accruals = Raw Accruals / Lagged Total Assets
Cash Flows = Earnings - Accruals (as defined above)
ΔEarnings = Current Change in Earnings ($\text{Earnings}_t$-$\text{Earnings}_{t-1}$)
$\Delta_{t+1}$Earnings = Future Change in Earnings ($\text{Earnings}_{t+1}$-$\text{Earnings}_t$)
MV = Fiscal Year End Closing Price*Shares Outstanding (Compustat #199*#25)
BV = Book Value of Common Equity (Compustat #60), measured at fiscal year end
B/M = BV / MV (as defined above)
Beta = Estimated from a regression of monthly raw returns on the CRSP NYSE/AMEX equal weighted monthly return index. The regression is estimated using the 60-month return period ending four months after each firm's fiscal year end.

**TABLE 2**
**Pearson (Spearman) Correlation Coefficients above (below) the Diagonal**

| | NOA | $NOA_{t+1}$ | Earnings | Accruals | Cash Flows | ΔEarnings | $\Delta_{t+1}$Earnings | Beta | B/M | MV | BV |
|---|---|---|---|---|---|---|---|---|---|---|---|
| NOA | 1.000 | 0.115 | -0.201 | 0.050 | -0.225 | -0.019 | -0.042 | -0.009 | 0.021 | 0.019 | 0.047 |
| | | ***<.0001*** | ***<.0001*** | ***<.0001*** | ***<.0001*** | ***<.0001*** | ***<.0001*** | ***0.0117*** | ***<.0001*** | ***<.0001*** | ***<.0001*** |
| $NOA_{t+1}$ | 0.621 | 1.000 | 0.041 | 0.040 | 0.019 | 0.009 | -0.012 | -0.030 | -0.001 | 0.003 | -0.010 |
| | ***<.0001*** | | ***<.0001*** | ***<.0001*** | ***<.0001*** | ***0.004*** | ***<.0001*** | ***<.0001*** | *0.743* | *0.311* | ***0.000*** |
| Earnings | 0.263 | 0.247 | 1.000 | 0.250 | 0.846 | 0.070 | 0.008 | -0.038 | 0.000 | 0.023 | 0.018 |
| | ***<.0001*** | ***<.0001*** | | ***<.0001*** | ***<.0001*** | ***<.0001*** | ***0.0082*** | ***<.0001*** | ***0.900*** | ***<.0001*** | ***<.0001*** |
| Accruals | 0.320 | 0.149 | 0.300 | 1.000 | -0.306 | 0.033 | 0.001 | 0.030 | -0.002 | -0.024 | -0.030 |
| | ***<.0001*** | ***<.0001*** | ***<.0001*** | | ***<.0001*** | ***<.0001*** | *0.724* | ***<.0001*** | *0.587* | ***<.0001*** | ***<.0001*** |
| Cash Flows | -0.020 | 0.112 | 0.663 | -0.375 | 1.000 | 0.042 | 0.007 | -0.054 | 0.001 | 0.036 | 0.035 |
| | ***<.0001*** | ***<.0001*** | ***<.0001*** | ***<.0001*** | | ***<.0001*** | ***0.0162*** | ***<.0001*** | *0.673* | ***<.0001*** | ***<.0001*** |
| ΔEarnings | 0.121 | 0.127 | 0.456 | 0.142 | 0.311 | 1.000 | -0.011 | -0.014 | -0.007 | 0.273 | 0.130 |
| | ***<.0001*** | ***<.0001*** | ***<.0001*** | ***<.0001*** | ***<.0001*** | | ***0.000*** | ***<.0001*** | ***0.0164*** | ***<.0001*** | ***<.0001*** |
| $\Delta_{t+1}$Earnings | -0.011 | 0.129 | 0.057 | -0.064 | 0.095 | 0.125 | 1.000 | -0.015 | -0.001 | 0.075 | -0.024 |
| | ***<.0001*** | ***<.0001*** | ***<.0001*** | ***<.0001*** | ***<.0001*** | ***<.0001*** | | ***<.0001*** | *0.7638* | ***<.0001*** | ***<.0001*** |
| Beta | -0.008 | -0.029 | 0.018 | 0.053 | -0.036 | -0.009 | -0.019 | 1.000 | -0.006 | -0.041 | -0.072 |
| | ***0.0262*** | ***<.0001*** | ***<.0001*** | ***<.0001*** | ***<.0001*** | ***0.0079*** | ***<.0001*** | | *0.0692* | ***<.0001*** | ***<.0001*** |
| B/M | 0.061 | 0.043 | -0.157 | -0.045 | -0.072 | -0.177 | -0.073 | -0.086 | 1.000 | -0.004 | 0.001 |
| | ***<.0001*** | ***<.0001*** | ***<.0001*** | ***<.0001*** | ***<.0001*** | ***<.0001*** | ***<.0001*** | ***<.0001*** | | *0.124* | *0.834* |
| MV | 0.042 | 0.023 | 0.277 | -0.019 | 0.270 | 0.315 | 0.202 | -0.024 | -0.358 | 1.000 | 0.703 |
| | ***<.0001*** | ***<.0001*** | ***<.0001*** | ***<.0001*** | ***<.0001*** | ***<.0001*** | ***<.0001*** | ***<.0001*** | ***<.0001*** | | ***<.0001*** |
| BV | 0.084 | 0.055 | 0.244 | -0.035 | 0.269 | 0.271 | 0.191 | -0.066 | 0.077 | 0.873 | 1.000 |
| | ***<.0001*** | ***<.0001*** | ***<.0001*** | ***<.0001*** | ***<.0001*** | ***<.0001*** | ***<.0001*** | ***<.0001*** | ***<.0001*** | ***<.0001*** | |

*Notes:*
$NOA_{t+1}$ =Raw $NOA_{t+1}$/$Assets_t$. All other variables are as defined in Table I. The values in italics are p-values. Bold numbers indicate significance at less than 5% level (2-tailed).

**TABLE 3**
**Industry Composition for Ten Portfolios of Firms Formed Annually by Assigning Firms to Deciles Based on the Magnitude of Net Operating Assets**

| | Portfolio NOA Ranking | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Industry Groups | Lowest | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Highest |
| ***Panel A: Percentage of the firms in each industry group for each NOA rank (Column)*** | | | | | | | | | | |
| Agriculture (0-999) | 0.4 | 0.3 | 0.3 | 0.4 | 0.3 | 0.3 | 0.5 | 0.6 | 0.6 | 0.4 |
| Mining & Construction (1000-1299, 1400-1999) | 3.1 | 2.7 | 2.7 | 2.3 | 2.3 | 2.4 | 2.6 | 2.7 | 3.5 | 3.8 |
| Food (2000-2111) | 1.6 | 2.6 | 3.4 | 3.8 | 3.9 | 3.7 | 3.7 | 3.2 | 3.1 | 2.5 |
| Textiles and Printing/Publishing (2200-2790) | 4.6 | 6.1 | 6.2 | 7.5 | 8.0 | **9.2** | **10.3** | **9.9** | 8.6 | 5.8 |
| Chemicals (2800-2824, 2840-2899) | 1.9 | 2.6 | 3.4 | 3.9 | 4.3 | 4.0 | 3.5 | 2.9 | 2.3 | 1.8 |
| Pharmaceuticals (2830-2836) | 12.0 | 4.9 | 3.4 | 2.8 | 2.5 | 2.2 | 2.2 | 2.0 | 2.2 | 2.4 |
| Extractive (1300-1399, 2900-2999) | 3.0 | 3.9 | 5.0 | 5.1 | 5.1 | 4.6 | 5.0 | 5.7 | 6.8 | 8.8 |
| Durable Manufacturers (3000-3569, 3580-3669, 3680-3999) | **20.2** | **26.2** | **30.3** | **31.2** | **31.8** | **31.3** | **30.1** | **29.1** | **26.0** | **22.1** |
| Transportation (3570-3579, 3670-3679, 7370-7379) | **18.5** | **19.5** | **14.6** | **11.4** | **9.1** | 8.3 | 7.2 | 7.5 | 8.0 | **11.7** |
| Utilities (4000-4899) | 3.8 | 4.2 | 4.4 | 5.1 | 4.6 | 4.8 | 5.5 | 5.7 | 6.5 | 7.4 |
| Retail (4900-4999) | 0.8 | 1.2 | 1.9 | 3.2 | 5.0 | 7.0 | 8.0 | 7.2 | 7.0 | 5.0 |
| Services (5000-5999) | 8.8 | **12.9** | **13.3** | **13.5** | **13.5** | **13.1** | **12.1** | **12.4** | **12.5** | 11.6 |
| Financial and other (6000-6999, 2111-2199) | 7.8 | 3.4 | 2.9 | 2.8 | 2.1 | 2.2 | 1.9 | 2.5 | 3.2 | 3.7 |
| Computers (7000-7360, 7380-9999) | **13.5** | 9.5 | 8.2 | 7.0 | 7.5 | 6.9 | 7.4 | 8.6 | **9.7** | **13.0** |
| ***Panel B: Percentage of the firms in each NOA decile for each industry group (Row)*** | | | | | | | | | | |
| Agriculture (0-999) | 9.8 | 7.3 | 7.3 | 9.8 | 7.3 | 7.3 | 12.2 | **14.6** | **14.6** | **9.8** |
| Mining & Construction (1000-1299, 1400-1999) | **11.0** | 9.6 | 9.6 | 8.2 | 8.2 | 8.5 | 9.3 | 9.6 | **12.5** | **13.5** |
| Food (2000-2111) | 5.1 | 8.3 | 10.8 | **12.1** | **12.4** | **11.7** | 11.7 | 10.2 | 9.8 | 7.9 |
| Textiles and Printing/Publishing (2200-2790) | 6.0 | 8.0 | 8.1 | 9.8 | 10.5 | **12.1** | **13.5** | **13.0** | 11.3 | 7.6 |
| Chemicals (2800-2824, 2840-2899) | 6.2 | 8.5 | 11.1 | **12.7** | **14.1** | **13.1** | 11.4 | 9.5 | 7.5 | 5.9 |
| Pharmaceuticals (2830-2836) | **32.8** | **13.4** | **9.3** | 7.7 | 6.8 | 6.0 | 6.0 | 5.5 | 6.0 | 6.6 |
| Extractive (1300-1399, 2900-2999) | 5.7 | 7.4 | 9.4 | 9.6 | 9.6 | 8.7 | 9.4 | **10.8** | **12.8** | **16.6** |
| Durable Manufacturers (3000-3569, 3580-3669, 3680-3999) | 7.3 | 9.4 | 10.9 | **11.2** | **11.4** | **11.2** | 10.8 | 10.5 | 9.3 | 7.9 |
| Transportation (3570-3579, 3670-3679, 7370-7379) | **16.0** | **16.8** | **12.6** | 9.8 | 7.9 | 7.2 | 6.2 | 6.5 | 6.9 | 10.1 |
| Utilities (4000-4899) | 7.3 | 8.1 | 8.5 | 9.8 | 8.8 | 9.2 | 10.6 | **11.0** | **12.5** | **14.2** |
| Retail (4900-4999) | 1.7 | 2.6 | 4.1 | 6.9 | 10.8 | **15.1** | **17.3** | **15.6** | **15.1** | 10.8 |
| Services (5000-5999) | 7.1 | 10.4 | **10.8** | **10.9** | **10.9** | 10.6 | 9.8 | 10.0 | 10.1 | 9.4 |
| Financial and other (6000-6999, 2111-2199) | **24.0** | **10.5** | 8.9 | 8.6 | 6.5 | 6.8 | 5.8 | 7.7 | 9.8 | **11.4** |
| Computers (7000-7360, 7380-9999) | **14.8** | 10.4 | 9.0 | 7.7 | 8.2 | 7.6 | 8.1 | 9.4 | 10.6 | **14.2** |

*Notes*:

NOA is as defined in Table 1. Each NOA decile contains the observations across all sample years. The bold numbers in Panel A are the top three biggest industry groups represented within each NOA decile. The bold numbers in Panel B are the top three NOA deciles represented within each industry group.

**TABLE 4**
**Time-series Means of Monthly Abnormal Stock Returns for NOA Decile Portfolios**
**One, Two and Three Years after Portfolio Formation**

| | ***Equal Weighted*** | | | | ***Value Weighted*** | | | |
|---|---|---|---|---|---|---|---|---|
| *Portfolio Ranking* | *raw_ew t+1* | *adj_ew t+1* | *adj_ew t+2* | *adj_ew t+3* | *raw_vw t+1* | *adj_vw t+1* | *adj_vw t+2* | *adj_vw t+3* |
| Lowest | 0.0179 | 0.0051 | 0.0029 | 0.0027 | 0.0106 | 0.0022 | 0.0012 | 0.0015 |
| | ***4.87*** | ***6.14*** | ***3.64*** | ***3.25*** | ***3.77*** | ***2.35*** | *1.28* | *1.41* |
| 2 | 0.0168 | 0.0032 | 0.0014 | 0.0012 | 0.0107 | 0.0021 | 0.0004 | 0.0011 |
| | ***5.09*** | ***5.70*** | ***2.66*** | ***2.47*** | ***4.17*** | ***2.81*** | *0.58* | *1.64* |
| 3 | 0.0157 | 0.0015 | 0.0012 | 0.0012 | 0.0113 | 0.0017 | 0.0009 | 0.0008 |
| | ***5.25*** | ***3.76*** | ***3.06*** | ***3.06*** | ***4.82*** | ***2.96*** | *1.50* | *1.39* |
| 4 | 0.0146 | 0.0012 | 0.0013 | 0.0014 | 0.0091 | 0.0007 | 0.0013 | 0.0003 |
| | ***5.15*** | ***3.03*** | ***3.40*** | ***3.15*** | ***4.20*** | *1.31* | ***2.70*** | *0.55* |
| 5 | 0.0146 | 0.0012 | 0.0009 | 0.0008 | 0.0094 | 0.0005 | 0.0007 | 0.0001 |
| | ***5.42*** | ***3.14*** | ***2.13*** | *1.75* | ***4.41*** | *0.98* | 1.33 | *0.15* |
| 6 | 0.0135 | 0.0000 | 0.0006 | -0.0003 | 0.0087 | -0.0005 | -0.0000 | -0.0001 |
| | ***5.13*** | *0.03* | *1.48* | *-0.60* | ***4.02*** | *-0.96* | *-0.03* | *-0.21* |
| 7 | 0.0133 | 0.0002 | -0.0005 | -0.0000 | 0.0089 | -0.0004 | -0.0012 | -0.0008 |
| | ***5.12*** | *0.38* | *-1.15* | *-0.01* | ***4.01*** | *-0.68* | ***-2.16*** | *-1.31* |
| 8 | 0.0106 | -0.0022 | -0.008 | -0.0008 | 0.0074 | -0.0013 | -0.0013 | -0.0003 |
| | ***4.00*** | ***-5.50*** | *-1.90* | *-1.75* | ***3.22*** | ***-2.13*** | ***-2.30*** | *-0.52* |
| 9 | 0.0093 | -0.0028 | -0.0016 | -0.0015 | 0.0072 | -0.0017 | -0.0011 | -0.0011 |
| | ***3.41*** | ***-6.34*** | ***-3.60*** | ***-3.37*** | ***3.17*** | ***-2.76*** | *-1.63* | *-1.58* |
| Highest | 0.0031 | -0.0073 | -0.0054 | -0.0030 | 0.0030 | -0.0047 | -0.0047 | -0.0035 |
| | *0.95* | ***-12.22*** | ***-8.42*** | ***-4.85*** | *1.01* | ***-5.65*** | ***-4.45*** | ***-4.02*** |
| ***Hedge(L-H)*** | 0.0148 | 0.0124 | 0.0083 | 0.0057 | 0.0076 | 0.0069 | 0.0060 | 0.0049 |
| | ***8.45*** | ***10.31*** | ***7.66*** | ***5.44*** | ***4.18*** | ***5.24*** | ***4.34*** | ***3.73*** |
| CAPM α | 0.0153 | 0.0127 | 0.0086 | 0.0063 | 0.0075 | 0.0068 | 0.0063 | 0.0053 |
| | ***8.63*** | ***10.45*** | ***7.75*** | ***5.99*** | ***4.21*** | ***5.52*** | ***4.88*** | ***3.91*** |
| Three Factor α | 0.0165 | 0.0134 | 0.0095 | 0.0074 | 0.0094 | 0.0075 | 0.0069 | 0.0063 |
| | ***10.00*** | ***11.17*** | ***8.65*** | ***7.16*** | ***5.40*** | ***5.95*** | ***5.30*** | ***4.64*** |
| Four Factor α | 0.0140 | 0.0126 | 0.0088 | 0.0067 | 0.0074 | 0.0061 | 0.0054 | 0.0058 |
| | ***8.32*** | ***10.08*** | ***7.66*** | ***6.22*** | ***3.93*** | ***4.70*** | ***4.06*** | ***4.10*** |

*Notes:*

NOA is as defined in Table 1. Every month between July, 1964 and December, 2002, portfolios are formed monthly by assigning firms to deciles based on the magnitude of NOA in year t. To allow for a minimum of a four-month lag between fiscal year end and the return month, all returns are measured from 5 months to 16 months after fiscal year end.

The monthly equal weighted abnormal return (adj_ew) for any individual stock is calculated by subtracting the equal-weighted return of a benchmark portfolio matched by size, book-to-market and momentum from the return of the stock. The equal-weighted abnormal return for each NOA portfolio is then computed monthly. The monthly value weighted abnormal return (adj_vw) for any individual stock is calculated by subtracting the value-weighted return of a benchmark portfolio matched by size, book-to-market and momentum from the return of the stock. The value-weighted abnormal return for each NOA portfolio is then computed monthly.

The hedge portfolio consists of a long position in the lowest ranked NOA portfolio and an offsetting short position in the highest ranked NOA portfolio. In addition, the intercepts, α, from time-series regressions of the return of the hedge portfolio on the CAPM model which employs excess return of the market portfolio, the Fama-French three factor model, which contains the market portfolio and two factor-mimicking portfolios associated with the size effect (SMB) and the book-to-market effect (HML), and a four factor model which adds a momentum factor-mimicking portfolio to the previous factors, are also reported.

The values in italics are t-statistics based on the time-series of the monthly portfolio abnormal stock returns. Bold numbers indicate significance at less than 5% level (2-tailed t-test).

**TABLE 5**
**Fama-MacBeth Monthly Regressions of Stock Returns on Size, Book-to-Market Equity, One-Month Return, One-Year Return, Three-Year Return, Accruals and NOA**

| | LnSize | LnB/M | Ret(-1:-1) | Ret(-12:-2) | Ret(-36:-13) | Accruals | NOA |
|---|---|---|---|---|---|---|---|
| *Panel A: One Year Lagged Accruals and NOA* | | | | | | | |
| Model 1 | -0.0011 | 0.0027 | -0.0719 | 0.0058 | -0.0027 | | |
| | ***-2.42*** | ***3.78*** | ***-16.37*** | ***3.44*** | ***-3.93*** | | |
| Model 2 | -0.0012 | 0.0026 | -0.0723 | 0.0056 | -0.0023 | -0.0129 | |
| | ***-2.50*** | ***3.64*** | ***-16.50*** | ***3.34*** | ***-3.42*** | ***-6.91*** | |
| Model 3 | -0.0011 | 0.0028 | -0.0723 | 0.0056 | -0.0023 | | -0.0069 |
| | ***-2.28*** | ***4.09*** | ***-16.52*** | ***3.34*** | ***-3.52*** | | ***-8.98*** |
| Model 4 | -0.0011 | 0.0028 | -0.0727 | 0.0055 | -0.0021 | -0.0079 | -0.0058 |
| | ***-2.37*** | ***3.97*** | ***-16.63*** | ***3.26*** | ***-3.24*** | ***-3.73*** | ***-6.67*** |
| *Panel B: Two Year Lagged Accruals and NOA* | | | | | | | |
| Model 1 | -0.0011 | 0.0027 | -0.0719 | 0.0058 | -0.0027 | | |
| | ***-2.42*** | ***3.78*** | ***-16.37*** | ***3.44*** | ***-3.93*** | | |
| Model 2 | -0.0011 | 0.0026 | -0.0723 | 0.0056 | -0.0025 | -0.0093 | |
| | ***-2.44*** | ***3.76*** | ***-16.46*** | ***3.35*** | ***-3.77*** | ***-5.37*** | |
| Model 3 | -0.0011 | 0.0028 | -0.0720 | 0.0057 | -0.0026 | | -0.0033 |
| | ***-2.34*** | ***3.97*** | ***-16.41*** | ***3.41*** | ***-3.93*** | | ***-4.53*** |
| Model 4 | -0.0011 | 0.0027 | -0.0723 | 0.0056 | -0.0026 | -0.0062 | -0.0023 |
| | ***-2.38*** | ***3.94*** | ***-16.43*** | ***3.37*** | ***-3.85*** | ***-3.13*** | ***-2.68*** |
| *Panel C: Three Year Lagged Accruals and NOA* | | | | | | | |
| Model 1 | -0.0011 | 0.0027 | -0.0719 | 0.0058 | -0.0027 | | |
| | ***-2.42*** | ***3.78*** | ***-16.37*** | ***3.44*** | ***-3.93*** | | |
| Model 2 | -0.0011 | 0.0026 | -0.0720 | 0.0057 | -0.0027 | -0.0049 | |
| | ***-2.45*** | ***3.71*** | ***-16.43*** | ***3.40*** | ***-4.07*** | ***-2.97*** | |
| Model 3 | -0.0011 | 0.0028 | -0.0721 | 0.0057 | -0.0027 | | -0.0027 |
| | ***-2.34*** | ***3.94*** | ***-16.40*** | ***3.40*** | ***-4.05*** | | ***-3.39*** |
| Model 4 | -0.0011 | 0.0027 | -0.0721 | 0.0056 | -0.0027 | -0.0019 | -0.0024 |
| | ***-2.38*** | ***3.90*** | ***-16.44*** | ***3.38*** | ***-4.11*** | *-1.01* | ***-2.72*** |

*Notes*:
Accruals and NOA are as defined in Table 1. The Fama-MacBeth procedure is as follows: Every month between July, 1966 and December, 2002, the cross-section of stock returns is regressed on LnSize where size is defined as the log of the firm's market capitalization; Ln(B/M) which is the log of the book-to-market ratio; the previous month's return on the stock, denoted Ret(-1: -1); the previous year's return on the stock from month t -12 to t –2, denoted Ret (-12: -2); the return on the stock starting from month t -36 to t-13, denoted Ret( -36: -13); and Accruals and/or NOA lagged either one, two or three years. There is a minimum of a four-month gap between the fiscal year end and the return month in month t regressions. The time-series average of the monthly coefficient estimates and their associated time-series t-statistics (in italics) are reported. Bold numbers indicate significance at less than 5% level (2-tailed t-test).

**TABLE 6**
**Primary Results Based on Alternative NOA Definition**

*Panel A: Summary Statistics*

| | Mean | Median | Standard deviation | Pearson correlation | Spearman correlation |
|---|---|---|---|---|---|
| | | | | NOA_alt | NOA_alt |
| NOA | 0.9427 | 0.7254 | 22.21 | 0.92 | 0.87 |
| NOA_alt | 0.9407 | 0.7374 | 22.71 | . | . |

*Panel B: Hedge Returns based on Alternative NOA decile portfolios one year after portfolio formation*

| | $raw\_ew_{t+1}$ | $adj\_ew_{t+1}$ | $raw\_vw_{t+1}$ | $adj\_vw_{t+1}$ |
|---|---|---|---|---|
| Hedge(L-H) | 0.0135 | 0.0116 | 0.0066 | 0.0058 |
| | ***7.30*** | ***9.32*** | ***3.25*** | ***4.03*** |
| CAPM α | 0.0136 | 0.0117 | 0.0069 | 0.0062 |
| | ***7.32*** | ***9.43*** | ***3.38*** | ***4.34*** |
| Three Factor α | 0.0143 | 0.0122 | 0.0084 | 0.0067 |
| | ***8.20*** | ***9.96*** | ***4.09*** | ***4.59*** |
| Four Factor α | 0.0134 | 0.0118 | 0.007 | 0.0056 |
| | ***7.47*** | ***9.36*** | ***3.32*** | ***3.77*** |

*Panel C: Fama-Macbeth Monthly Regressions*

| | LnSize | LnB/M | Ret(-1:-1) | Ret(-12:-2) | Ret(-36:-13) | Accruals | NOA_alt |
|---|---|---|---|---|---|---|---|
| Model 1 | -0.0011 | 0.0027 | -0.0719 | 0.0058 | -0.0027 | | |
| | ***-2.41*** | ***3.79*** | ***-16.38*** | ***3.44*** | ***-3.93*** | | |
| Model 2 | -0.0012 | 0.0026 | -0.0723 | 0.0056 | -0.0023 | -0.0130 | |
| | ***-2.50*** | ***3.65*** | ***-16.51*** | ***3.35*** | ***-3.42*** | ***-6.88*** | |
| Model 3 | -0.0010 | 0.0029 | -0.0722 | 0.0057 | -0.0023 | | -0.0066 |
| | ***-2.24*** | ***4.15*** | ***-16.53*** | ***3.36*** | ***-3.47*** | | ***-8.92*** |
| Model 4 | -0.0011 | 0.0028 | -0.0726 | 0.0055 | -0.0021 | -0.0078 | -0.0057 |
| | ***-2.32*** | ***4.07*** | ***-16.64*** | ***3.30*** | ***-3.21*** | ***-3.77*** | ***-6.93*** |

*Note:*
NOA_alt = (AR+INV+OTHERCA+PPE+INTANG+OTHERLTA-AP-OTHERCL-OTHERLTL)/Lagged Total Assets
where:

| | | |
|---|---|---|
| AR | = | Account Receivable (Compustat#2) |
| INV | = | Inventory (Compustat#3) |
| OTHERCA | = | Other Current Assets (Compustat #68) |
| PPE | = | Net Property, Plant And Equipment (Compustat#8) |
| INTANG | = | Intangibles (Compustat#33) |
| OTHERLTA | = | Other Long Term Assets (Compustat#69) |
| AP | = | Account Payable (Compustat#70) |
| OTHERCL | = | Other Current Liabilities (Compustat#72) |
| OTHERLTL | = | Other Long Term Liabilities (Compustat#75) |

Accruals are as defined in Table 1. The portfolio formation procedure and the calculation of hedge returns, CAPM α, three-factor α and four-factor α are as defined in Table 4. LnSize, Ln(B/M), Ret(-1:-1), Ret(-12:-2) and Ret(-36,-13) are as defined in Table 5 The Fama-MacBeth procedure is as in Table 5. Bold numbers indicate significance at less than 5% level (2-tailed t-test).

**TABLE 7**

**Fama-MacBeth Monthly Regressions of Stock Returns on Size, Book-to-Market Equity, One-Month Return, One-Year Return, Three-Year Return, Accruals, Sum of three lagged Accruals, NOA, and Change in NOA**

*Panel A: Decomposition of NOA into Lagged Operating Accruals and All Other (Same as Model 4 of Panel A, Table 5)*

| LnSize | LnB/M | Ret(-1:-1) | Ret(-12:-2) | Ret(-36:-13) | Accruals | NOA |
|---|---|---|---|---|---|---|
| -0.0011 | 0.0028 | -0.0727 | 0.0055 | -0.0021 | -0.0079 | -0.0058 |
| ***-2.37*** | ***3.97*** | ***-16.63*** | ***3.26*** | ***-3.24*** | ***-3.73*** | ***-6.67*** |

*Panel B: Decomposition of NOA into Lagged Operating Accruals, Lagged Investment, and All Other*

| LnSize | LnB/M | Ret(-1:-1) | Ret(-12:-2) | Ret(-36:-13) | Accruals | NOA | ΔNOA |
|---|---|---|---|---|---|---|---|
| -0.0011 | 0.0029 | -0.0728 | 0.0054 | -0.0021 | -0.0072 | -0.0070 | 0.0003 |
| ***-2.33*** | ***4.38*** | ***-16.76*** | ***3.25*** | ***-3.21*** | ***-3.11*** | ***-4.04*** | *0.17* |

*Panel C: Decomposition of NOA into Sum of Three Lagged Operating Accruals and All Other (mostly Sum of Investment)*

| LnSize | LnB/M | Ret(-1:-1) | Ret(-12:-2) | Ret(-36:-13) | NOA | SumAccruals |
|---|---|---|---|---|---|---|
| -0.0011 | 0.0027 | -0.0729 | 0.0054 | -0.0023 | -0.0056 | -0.0048 |
| ***-2.38*** | ***3.90*** | ***-16.67*** | ***3.25*** | ***-3.43*** | ***-7.02*** | ***-4.89*** |

*Note:*

Accruals and NOA are as defined in Table 1. LnSize, Ln(B/M), Ret(-1:-1), Ret(-12:-2) and Ret(-36,-13) are as defined in Table 5. SumAccruals = the sum of past 3 years' Accruals. ΔNOA= change in net operating assets / lagged two year total assets.

The Fama-MacBeth procedure is as described in Table 5 Panel A. Associated time-series t-statistics (in italics) are reported. Bold numbers indicate significance at less than 5% level (2-tailed t-test).

**TABLE 8**
**Results from Annual Nonlinear Generalized Least Square Regressions (Mishkin Test)**
**Rational and Market Forecasting of Firm Returns and One-Year Ahead Earnings**

$$Earnings_{t+1}=\gamma_0+\gamma_1 Accruals_t+\gamma_2 NOA_t+\gamma_3 Cash\ Flows_{\ t}+v_{t+1}$$

$$Abnormal\ Returns_{t+1}=\beta(Earnings_{t+1}-\gamma_0-\gamma_1^{*}Accruals_t-\gamma_2^{*}NOA_t-\gamma_3^{*}Cash\ Flows_t)+\varepsilon_{t+1}$$

| | ***Parameters*** | ***Mean Estimate*** | ***T-statistics*** |
|---|---|---|---|
| Accruals | $\gamma_1$ | 0.557 | ***3.60*** |
| | $\gamma_1^*$ | 0.628 | ***14.57*** |
| NOA | $\gamma_2$ | -0.004 | *-0.57* |
| | $\gamma_2^*$ | 0.043 | ***3.10*** |
| Cash Flows | $\gamma_3$ | 0.663 | ***41.99*** |
| | $\gamma_3^*$ | 0.552 | ***16.43*** |
| | $\beta$ | 1.506 | ***13.96*** |

| Test of Market Efficiency: | | *T-test* | # of years when $\gamma_n<\gamma_n^*$ (36 years total) |
|---|---|---|---|
| Accruals | $\gamma_1=\gamma_1^*$ | *1.82* | 22 |
| NOA | $\gamma_2=\gamma_2^*$ | ***4.18*** | 28 |
| Cash Flows | $\gamma_3=\gamma_3^*$ | ***-4.18*** | 11 |

*Notes*:

Due to the limited annual observations before fiscal year 1965, the sample consists of firm-year observations from fiscal year 1965 to 2000. Accruals, NOA, Earnings and Cash Flows are as defined in Table 1. The annual abnormal return for any individual stock is calculated by subtracting the equal-weighted return of a benchmark portfolio matched by size, book-to-market and momentum from the annual raw buy and hold return of the stock. Returns are measured starting four months after fiscal year end. The system of equation is estimated iteratively using non-linear weighted least squares annually. The time-series average of the annual coefficients estimates and their associated time-series t-statistics (in italics) for whether ($\gamma_n^*$- $\gamma_n$ ) > 0 are reported. Bold numbers indicate significance at less than 5% level (2-tail t-test).