The Interaction of NOA and Accruals in the Mispricing of Balance Sheet Bloat

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Abstract

Consistent with US findings, this paper documents a negative relationship between future stock returns and each of accruals and net operating assets (NOA). While accruals and NOA convey unique information for future returns, NOA appears to have a moderating influence on the accruals effect. A significant accruals effect is observed amongst stocks with high NOA. In contrast, no accrual effect exists for stocks with low NOA. This finding suggests that, contrary to conventional belief, high levels of accruals per se are not bad news. An accrual effect only arises for firms that have a sustained track record of not converting accruals into cashflow. A regression-based version of the Mishkin rationality test finds that NOA and, to a lesser extent, accruals are overpriced. Importantly, inferences from these rationality tests are shown to be highly sensitive to econometric assumptions over the error term in the panel regression.

JEL classification: G12, G14
Keywords: market efficiency; anomaly; mispricing; net operating assets; accruals; clustered standard errors

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1. Introduction

The primary purpose of financial statements is to provide relevant and reliable information to a variety of end users, including shareholders, potential investors and equity analysts. In an efficient market, new information inherent in financial statements is impounded into prices quickly and in an unbiased manner. While pricing errors may occur in an efficient market, not only are they unlikely to be systematic, but competition between investors will ensure that any mispricing is short lived.

Increasingly, however, financial economists are questioning whether market participants have the requisite cognitive ability to assure market efficiency. Hirshleifer, Hou, Teoh and Zhang (HHTZ) (2004, p.298) note that "information is vast and attention limited". They conjecture that investors focus on selected line items from financial statements, thereby forming their judgements using a subset of all available information. In such instances, investors may make systematic errors in processing information which manifest themselves in stock prices.

Sloan's (1996) study of accruals is a prominent example of apparent investor mispricing of financial statement information. While the cashflow and accrual components of current-period earnings have different implications for future earnings, stock returns behave as if investors fixate on the aggregate earnings line item. This failure to adequately differentiate between the components of earnings suggests an obvious trading strategy based on companies' relative levels of reported accruals. Indeed, the significance of profits from trading the so-called accruals anomaly has had a profound impact on investment practice.

Under the accrual-based approach to accounting, accruals are an outcome of bookkeepers' attempts to assign revenue and expenses to the accounting period in which they arise, irrespective of when the associated cashflow occurs. Accruals are expected to subsequently convert into cashflow in a timely manner, at which point the previous accrual is reversed. If, however, accruals do not generate the anticipated cashflow, then earnings were misstated in the period during which the accrual was raised. While, in theory, rational investors will monitor the conversion of accruals into cashflows and make appropriate inferences about the likely persistence of earnings, Sloan's (1996) empirical findings that investors appear to fixate on bottom-line earnings does not engender confidence.

Of particular relevance to the current paper, HHTZ (2004) study the relationship between net operating assets (NOA) and the cross-section of stock returns. In doing so, they build on two key aspects of the above discussion. First, NOA is defined as the inter-temporal accumulation of periodic differences between operating earnings and free cash flow; in effect, NOA is the 'lifetime' discrepancy between accounting value added and cash value added. If, as Sloan suggests, the decomposition of single-year earnings into cashflow and accrual components provides a signal of mispricing, then a multi-period counterpart like NOA is also likely to convey mispricing. Second, given that accruals are intended to be a temporary accounting treatment to accommodate the timing difference between a transaction and its resulting cashflow, NOA measures the extent to which past accruals have persistently *not* translated into realised cashflows. Consistent with these arguments, HHTZ (2004) document a strong negative relationship between NOA and future returns to US stocks, using both portfolio sorts and cross-sectional regressions.

The current paper makes a number of contributions to this emerging literature. First, the paper is the first to investigate the relationship between NOA and Australian stock returns, and one of the few outside the US. As described in Section 2, the Australian equity market exhibits distinct idiosyncrasies compared to the US. In particular, Australian firms are: (i) notably less profitable, with approximately half of all firms reporting losses, (ii) generate modest cashflows that on average are more than offset by negative accruals, and (iii) have a high representation of resource-sector stocks. As such, the study represents an important out-of-sample test of the generalisability of HHTZ's (2004) finding. Second, we thoroughly re-examine the accrual anomaly in the Australian environment, where work in this area is in its infancy and findings to date are mixed.

As an extension of HHTZ (2004), a third and important contribution is to explore the *unique* predictive ability of NOA and accruals. NOA and accruals are closely related, yet distinct, concepts. Since NOA is a cumulative (i.e., multi-period) measure of accruals, HHTZ (2004) conjecture that NOA is likely to be a superior predictor of future returns. Indeed, their cross-sectional regressions show that NOA is significantly negatively associated with future returns and this relationship remains when accruals are included as an independent variable. However, accruals itself is also significantly negatively related to future returns (even in the presence of NOA). This finding suggests that NOA and accruals may contain unique information regarding future stock returns. Whereas HHTZ (2004) only document this finding statistically, the current paper assesses the economic significance of each variable by estimating average returns to portfolios double-sorted on NOA and accruals.

The final contribution is econometric in nature. Following Sloan (1996), many capital market studies have employed the Mishkin (1981; 1983) test to examine whether the timeseries properties of variables of interest (e.g., earnings, accruals, cashflows) are rationally impounded into stock prices. However, a recent paper by Kraft, Leone and Wasley (KLW) (2007) highlights the vulnerability of the Mishkin procedure to omitted variable problems. KLW (2007) propose an OLS-based approach that is equivalent to the Mishkin test, yet is more conducive to accommodating potential omitted variables. In addition to being the first Australian application of the KLW test to the accruals (and NOA) anomaly, we also explore the sensitivity of these rationality tests to assumptions over the regression error terms. To the best of our knowledge, the importance of conducting these rationality tests as panel regressions with clustered standard errors has not previously been considered.

The main findings of the paper are summarised as follows. Using data for ASX-listed firms spanning 1989 to 2010, accruals and NOA are each shown to exhibit a significant negative relationship with future returns. This is apparent both in regressions of individual stock returns on characteristics of interest, and using portfolio sorts. The effects are economically significant. Value-weighted spread portfolios constructed according to accruals and NOA generate monthly returns of 1.59% and 1.26% respectively. Adjusting for risk factors via a three-factor asset pricing model diminishes the spread returns, yet they remain statistically significant.

Further, while NOA and accruals convey unique information for future returns, NOA is the dominant effect. Portfolios formed by double sorting on the two characteristics reveal an interesting interaction. Controlling for accruals, an NOA effect persists across four of the five accrual quintiles. In contrast, controlling for NOA, an accrual effect only exists amongst the two highest NOA groupings. This finding challenges conventional beliefs that low accrual stocks consistently outperform high accrual stocks. Rather, it suggests that high levels of accruals per se are not ‘bad’. Viewing accruals and NOA as single- and multi-period metrics respectively, the finding implies that a high level of accruals is only bad news when a firm has a sustained track record of accruals not translating into future cashflows (i.e., high NOA). For stocks with low NOA, a one-off incident of high accruals does not trigger lower returns.

Arguably, the most important finding of this paper is to demonstrate the sensitivity of statistical inference under popular rationality tests to both potential omitted variable problems and inappropriate assumptions over the distribution of error terms. Consistent with KLW (2007), conclusions regarding the mispricing of accruals, cashflows and NOA (and therefore the efficiency with which market prices impound relevant information) can change dramatically when sensible control variables are included. More importantly, rationality tests that assume “vanilla” OLS assumptions over the distribution of model error terms can significantly understate standard errors and therefore exaggerate *p*-values. Implementing KLW’s (2007) OLS-based approach to rationality tests as a panel regression with double clustered standard errors is relatively straight forward, certainly more so than accommodating non-vanilla errors under the Mishkin-style approach. In any case, our findings suggest that it is imperative to utilise an econometric approach that accommodates more realistic assumptions over the error terms.

The remainder of the paper is structured as follows. Section 2 presents a brief review of relevant prior literature relating to the mispricing of NOA and accruals, including prior Australian findings on the Australian accruals anomaly. Data sources, construction of key variables and descriptive statistics are described in Section 3. Section 4 presents the main empirical analysis and results. Econometric issues surrounding omitted variables and assumptions over model errors are analysed in Section 5, while Section 6 conducts robustness analysis. Section 7 concludes the paper.

2. Literature Review

2.1 Background on Accruals and NOA Anomalies

Starting with Sloan (1996), an extensive empirical literature has examined the relationship between the cross-section of stock returns and (many variations of) accruals. Company earnings are highly persistent from year to year. Similarly, the cashflow and accrual components of earnings are also persistent, but to differing degrees. The ability of investors to accurately infer the persistence of earnings, cashflows and accruals lies at the epicentre of the accruals anomaly.

Unlike the cash component of earnings which is highly objective, accruals are unavoidably subjective. While many accruals arise naturally during the course of business, these non-discretionary accruals are nonetheless premised on an anticipated translation into cash in the near future. Management also make discretionary accruals which are potentially vulnerable to earnings manipulation. The quality of such discretionary accruals adds a further element of subjectivity. For these reasons, cashflows are more persistent than accruals, and therefore have greater influence on future earnings.

While these are elementary concepts, Sloan (1996) demonstrates that prices behave as if investors fixate on the aggregate earnings line item, without differentiating between cashflow and accrual components. In doing so, investors overestimate the persistence of accruals and underestimate the persistent of cashflows. Sloan (1996) reports that a trading strategy that enters long (short) positions in low (high) accruals stocks earns statistically and economically significant profits over the following 12-24 months.

While the accrual anomaly has attracted considerable attention and motivated much subsequent research, a well-accepted explanation remains elusive. One explanation offered for the accrual and other accounting-based anomalies is that market participants do not have the requisite cognitive ability to accurately price financial statement components and thus ensure market efficiency. Noting that "information is vast and attention limited", HHTZ (2004) suggest that information that is salient and easily processed is more likely to be accurately impounded into stock prices. Conversely, investors with limited attention are susceptible to firm attempts to manipulate their perceptions (through earnings management, for example) (Hirshleifer and Teoh, 2003). When accounting distortions exist, therefore, investors are less likely to accurately price earnings components (Xie, 2001; Dechow and Dichev, 2002; Richardson et al., 2005). If these distortions are due to unsustainable accounting practices (e.g., earnings management via excessive accruals) that will have to be reversed in the future, investors will be disappointed at that time (Barton and Simko, 2002). Even if firms do not intentionally distort financials, investors with limited attention might still fail to fully utilise all available financial information, resulting in mispriced securities (HHTZ, 2004).

Many papers subsequent to Sloan (1996) have investigated extensions and variations of the accruals anomaly. Chan, Chan, Jegadeesh and Lakonishok (2006) examine the individual components of accruals. While changes in accounts receivable and accounts payable contribute to the anomaly, changes in inventory primarily drive the profitability of trading accruals. Similarly, Thomas and Zhang (2002) also find strong evidence attributing the accrual anomaly to inventory changes. Xie (2001) borrows from the earnings management literature by using the Jones (1991) model to partition total accruals into discretionary and normal accruals. Statistical tests suggest that the market overestimates the persistence of both normal and discretionary accruals (and underestimates the persistence of cashflows), but it is the mispricing of discretionary accruals that gives rise to profitable trading strategies. Rather than using the Jones (1991) model, Chan et al. (2006) estimate discretionary accruals by extrapolating past trends in sales growth and accruals. Nonetheless, they report similar findings to Xie (2001).

While the majority of this literature retains Sloan's 'single-period' decomposition of earnings into cashflow and accruals, HHTZ (2004) take a different tack by introducing the concept of net operating assets (NOA). NOA is defined as the inter-temporal accumulation of annual differences between operating income and free cash flow over the life of a company:

$$\text{Net Operating Assets}_T = \sum_{t=0}^{T} \text{Operating Income}_t - \sum_{t=0}^{T} \text{Free Cash Flow}_t \quad (1)$$

Clearly, NOA and accruals are closely related concepts. Whereas accruals are simply the difference between accounting earnings and cash flows at a given point in time, NOA captures the lifetime discrepancy between accounting value added and cash value added. In essence, NOA is a measure of cumulative (net) accruals.

As discussed above, accruals are raised with the anticipation that they will convert into cashflow (and be reversed) in a timely manner. If this indeed transpires, the magnitude of NOA will be small and earnings quality will be high. Conversely, a large discrepancy between accounting and cash value added ('balance sheet bloat') suggests that past accruals have persistently not translated into cash, thereby raising concerns over the persistence of future earnings.

Using a similar argument to Sloan's (1996) suggestion that investors fixate on aggregate earnings, HHTZ (2004) argue that, if investors have limited attention and fail to understand the implications of NOA, then firms with high NOA may be overvalued relative to those with low NOA. To the extent that such mispricings are likely to be corrected, high (low) NOA firms are expected to earn negative (positive) abnormal returns. Further, since given NOA captures cumulative differences between earnings and cash flow, HHTZ (2004, p.300) conjecture that "NOA may be a more comprehensive predictor of future returns than a single-period slice like accruals".

Using both portfolio sorts and Fama-MacBeth cross-sectional regressions, HHTZ (2004) document a strong negative relationship between NOA and future stock returns, stretching three years beyond the release financial statements. Notably, the regression slope on NOA remains significant when accruals are also included as an independent variable. As such, the NOA effect does not appear to be a simple manifestation of the accrual anomaly. Curiously, while the regression slope on accruals is also significantly negative, HHTZ (2004) do not compare the economic significance of accruals and NOA using portfolio returns.

2.2 Prior Australian Findings

The accrual anomaly has been exhaustively researched and documented in the US (for example, Xie, 2001; Elgers et al., 2003; Collins et al., 2003; Desai et al., 2004; Mashruwala et al., 2006; Bushee and Raedy, 2006; Lev and Nissim, 2006; Xu and Lacina, 2009). Outside the US, Soares and Stark (2009) report evidence of profitable accrual-spread trading in the UK. Further, Pincus et al. (2007) study the anomaly in 20 countries and suggest that it is a global phenomenon.

Only a handful of prior studies have examined the Australian accruals anomaly, with mixed findings to date. Pincus et al. (2007) report statistical evidence that the market inefficiently prices accruals and that this allows economically significant abnormal returns to accrual spread trading. Their study, however, is limited to approximately 200 Australian stocks per annum over 1994-2002. Anderson et al. (2009) examine the persistence and pricing of earnings, free cash flows and accruals over the period 1992-2004 with a modest sample of approximately 260 firms per year. They report an underestimation of the persistence of both accruals and cashflows.

Clinch et al. (2012) benefit from a broader cross-section of sample stocks over an extended time period (1991-2008). While they report evidence of an accrual anomaly, with the accrual-spread portfolio generating positive abnormal returns, their Australian results exhibit some idiosyncrasies.

Contrary to Sloan (1996), investors appear to underestimate the persistence of aggregate earnings, but curiously, they make greater errors in assessing the impact of cashflows on the persistence of earnings than accruals.

Less concerned with the existence of the accrual anomaly per se, Taylor and Wong (2012) highlight the importance of methodological choices and research design issues to inferences drawn in anomaly studies. In particular, they demonstrate that the treatment of outliers (often arising on small stocks) can play a pivotal role in findings. Evidence favouring the existence of an accrual anomaly attenuates where extreme return observations are trimmed from the sample and/or stocks are value-weighted into accrual portfolios. Dou et al. (2013) corroborate these findings. Using both portfolio sorts and cross-sectional regressions, they provide strong evidence that the Australian accrual anomaly is driven by small/micro stocks.

Finally, it is worth highlighting that, while Australia is a well-developed capital market, the corporate landscape exhibits some notable differences from the US that are potentially relevant to the mispricing of accruals, cashflows and NOA. Sloan (1996, Table 1) and HHTZ (2004, Table 1) document that US firms generate healthy cashflows and earnings on average. In contrast, approximately half of all Australian firms report losses in any given year (Balkrishna et al., 2007). On average, cashflows are modest and are more than offset by negative accruals. This is attributable in no small way to the prevalence of resource-sector stocks, many of which are small companies in the early exploration stage of their life cycle.

These stylised facts have influenced prior Australian research on the accruals anomaly, and are also potentially relevant to the study of NOA. For example, in the population of sample stocks, Clinch et al. (2012) report the usual overpricing of earnings persistence attributable to accruals, but a curious underpricing of persistence attributable to cashflows. These full sample findings are robust to the exclusion of mining stocks. However, when their sample is partitioned according to whether a firm makes a profit or loss, the underpricing of cashflows is confined to loss-making firms.

Anderson et al. (2009) also consider asymmetric effects in the persistence and pricing of accruals and cashflows depending on how the sample is partitioned. Their ‘base case’ firms (which comprise loss-making, microcap, non-dividend paying, resource firms) are expected to exhibit transitory earnings, the persistence of which are more likely to be mispriced. Contrary to their priors, the accruals and cashflows of base case firms appear to be rationally priced, while earnings components of industrial sector firms were both mispriced. Their piecewise linear variation of the Mishkin approach detects no statistical difference between profit and loss partitions.

Section 6 of this paper re-considers the main analysis for various partitions of the Australian sample. Nonetheless, the differences between the composition and characteristics of US and Australian companies allow an important out-of-sample test of the generalisability of Sloan’s (1996) and HHTZ’s (2004) findings.

3. Data and Descriptive Statistics

3.1 Data Sources and Key Variables

Data for the study are drawn from two sources. Aspect Huntley provides annual financial statement data for ASX-listed firms from 1989 to 2009. Monthly stock market data (returns, market capitalisation, industry codes) are available from SIRCA's Share Price and Price Relative (SPPR) database spanning the period 1974-2010.

The key variable of interest in this study is net operating assets. Firm *i*'s NOA in year *t* is estimated as the difference between operating assets and operating liabilities, scaled by prior year total assets:

$$NOA_{i,t} = \frac{\text{Operating Assets}_{i,t} - \text{Operating Liabilities}_{i,t}}{\text{Total Assets}_{i,t-1}}. \quad (2)$$

Following Penman (2012), total assets can be partitioned into operating assets and financial assets. Accordingly, operating assets in (2) are estimated as total assets (Aspect Huntley data item #5090) less the sum of cash (#4990) and short-term investments (#5010). Similarly, operating liabilities are estimated as total liabilities (#6040) less the sum of short-term debt (#6000) and long-term debt (#6020).

Accruals are estimated using the direct approach, which is facilitated by the introduction of AASB 1026 Statement of Cashflows in 1992. Given that Aspect Huntley data commences in 1989, it is possible to commence the analysis in 1990 by using the indirect approach to estimating accruals. However, Hribar and Collins (1995) warn that this approach can induce substantial measurement error (see also Austin and Bradbury, 1995; Clinch, Sidhu and Sin, 2002; Clinch et al., 2012 for Australian evidence of this measurement error). Accordingly, the analysis trades off two extra years of data for the greater precision with which cashflows and accruals are estimated using the direct approach. Consistent with Clinch et al. (2012), firm *i*'s accruals in year *t* are estimated as earnings before tax, net interest, abnormal and significant items (#8012), less cashflow from operations (#9100) adjusted for interest (#9065, #9070) and tax (#9075). As with net operating assets, accruals are scaled by prior year total assets.

Several other variables are employed, either as controls in the regression analysis or in the formation of factor-mimicking portfolios. Firm size (Size) is the market capitalisation drawn from SIRCA SPPR. Book-to-market (BM) is book value (total shareholders equity (#7010) less outside equity interests (#280), preference shares (#201, #202) and future tax benefits (#319, #366, #457, #1169) scaled by market capitalisation. As at month *t*, two measures of a stock's past performance are calculated as the buy-and-hold return from month *t*-12 to *t*-1 (Prior12), and the buy-and-hold return from month *t*-36 to *t*-13 (Prior36).

It is relevant to note that 81% of our sample companies have June reporting dates and over 84% report in June or earlier. Accordingly, in a given year *t*, variables based on financial accounting data (e.g., NOA, accruals, cashflows, earnings, BM) utilise year *t* accounting information if the company's reporting date is June or earlier. For companies with reporting dates July through December, year *t* variables are estimated using year *t*-1 accounting data. This provides a lag of at least six months between the reporting date and the time at which key variables are assumed to be in the public domain.

Given our use of the direct approach to estimating accruals, and the fact that key variables are scaled by lagged total assets, the initial sample comprises all firm-year observations from Aspect Huntley between 1991 and 2009 for which matching records are available in SIRCA SPPR. Stocks with non-ordinary share type and/or identified as investment funds or property trusts are excluded. Reasonableness checks are applied to the components of operating assets, operating liabilities and accruals.[1] Further, firm-year records are omitted where the estimated NOA or accruals lie outside the 1st or 99th percentiles of the respective distributions. The primary sample for the study comprises 14,875 firm-year observations on 2,068 unique firms. The cross-section ranges from 510 firms in 1992 to 1332 in 2009, with an average of 826 firms per annum.

3.2 Descriptive Statistics

Table 1 presents descriptive statistics for key variables utilised in the study. NOA ranges from -0.1070 to 4.0994.[2] The mean (median) of 0.7442 (0.7144), along with the interquartile range (0.4902 to 0.8977), indicate that the sample falls in an economically plausible range. For their U.S. sample, HHTZ (2004, Table 1) only report summary statistics for decile portfolios. However, mean NOA for these decile portfolios ranges from 0.247 to 1.596, which is broadly consistent with the current summary statistics.

Table 1 also presents summary statistics on other stock characteristics that provide a useful depiction of the composition of the Australian equity market. First, the distribution of market capitalisation of Australian stocks is severely right skewed. While the mean market cap is $588m, the median is only $31m. Second, BM ratios are also right skewed, with a median of 0.583 indicating a tendency towards growth. Both of these characteristics have been well documented in prior work (Dou et al., 2013). The prior momentum variables show modest medians, but extremely high dispersion.

Summary statistics on earnings, accruals, cashflows and retained earnings also highlight important features of Australian stocks that differentiate them from their U.S. counterparts. Over the sample period, the average Australian firm recorded an annual loss of 7.77% of lagged total assets. While this may seem incredulous, it is in fact highly consistent with prior findings. For example, Clinch et al. (2012) report average earnings-to-assets of -9.50% over the 1991-2008 period which they attribute to the high representation of resource stocks, many of which are in the early exploration stages of

[1] For example, on the asset side, total assets must be positive, while short-term investments and operating assets must be non-negative. On the liability side, total liabilities, short-term debts, and operating liabilities must be non-negative. A handful of records showing non-positive total assets are removed, since total assets are used to scale key variables.

[2] Given the definition of operating assets and operating liabilities, there is nothing to suggest that NOA must be strictly positive. Be that as it may, only 379 of the 14,875 firm-year observations (2.5% of the sample) have negative NOA.

their life. Earnings are also severely left skewed, with a handful of firms reporting large losses. Arguably, the medians paint a more realistic portrait, with positive cashflows (1.59%) and approximately equal occurrence of profits and losses (median earnings of 0.02%).

Table 2 reports correlations between key variables. The upper (lower) triangles report Spearman (Pearson) estimates. Rather than a pooled approach, correlations are estimated on a year-by-year basis, with the time series average of yearly correlations reported.

Several key points emerge. First, NOA and accruals exhibit positive correlation. This is consistent with the notion that NOA is a measure of cumulative accruals. It also further motivates our analysis of the unique influences of NOA and accruals on the cross-section of stock returns. The fact that the magnitude of this correlation is modest alleviates concerns over multicollinearity when both NOA and accruals are included in the regression analysis of Section 3.1. Second, consistent with intuition, earnings are highly correlated with cashflows. Third, cashflows and accruals are negatively related.

4. Empirical Analysis and Results

4.1 Preliminary Regression Analysis

Fama and French (2008) advocate the regression approach for its ability to estimate the marginal influence of a variable of interest, whilst simultaneously controlling for other stock characteristics known to be associated with returns. Accordingly, the following panel regression is employed to provide a preliminary analysis of the potential joint roles that NOA and accruals play in the cross-section of stock returns:

$$\begin{aligned} R_{i,t+1} = \alpha &+ \beta_1 \ln\left(\text{Size}_{i,t}\right) + \beta_2 \ln\left(\text{BM}_{i,t}\right) + \beta_3 \text{Prior12}_{i,t} + \beta_4 \text{Prior36}_{i,t} \\ &+ \beta_5 \text{Accruals}_{i,t} + \beta_6 \text{NOA}_{i,t} + \varepsilon_{i,t+1} \end{aligned} \tag{3}$$

The panel comprises 11,619 firm-year observations spanning 1992-2009. The independent variables are constructed as described in Section 3.1; specifically, they are estimated as at December of each year *t*. The dependent variable is the 12-month buy-and-hold return on stock *i* from January-December of year *t*+1.

In light of the positive skewness documented for market capitalization and BM in Section 3.2, natural logs of these variables are taken. Further, all variables are winsorised at the 1st and 99th percentiles to mitigate the potential influence of extreme values. All statistical inference employs standard errors that are clustered by both firm and year (see Peterson, 2008; Thompson, 2011). Table 3 reports the regression results.

As a base case, Model 3a includes only the four control variables. Consistent with the existence of size and value effects, the negative (positive) relationships between returns and Size (BM) are statistically significant. Neither of the price momentum variables (Prior12 and Prior36) display explanatory power. These findings for the base case remain largely intact when the other key independent variables are added (i.e., NOA and accruals).

Model 3b shows a highly significant negative association between NOA and future stock returns (β_6 = -0.1209, $p < 0.001$). As such, a 10% increase in year-*t* NOA (expressed as a percentage of lagged total assets) results in a 1.209% decline in stock returns over year *t*+1. Similarly, Model 3c documents a significant negative relationship between accruals and future stock returns, consistent with an accrual anomaly (β_5 = -0.2343, p = 0.0235).

Section 3.2 documents a modest positive correlation between NOA and accruals, consistent with the notion that NOA is a cumulative measure of accruals. Naturally, this raises the possibility that NOA and accruals may capture similar information. Model 3d, however, suggests that NOA and accruals have unique influences on future stock returns. The relationship between NOA and future stock returns is largely unaffected by the inclusion of accruals (β_6 = -0.1137, $p < 0.001$). The negative association between accruals and returns also remains, albeit with reduced statistical significance (β_5 = -0.2057, p = 0.0308).

These findings for Model 3 are highly consistent with the cross-sectional regressions of HHTZ (2004), who also report unique roles (at least statistically) for NOA and accruals in explaining the cross-section of stock returns. Whether or not NOA and accruals each have economically important predictive ability for future stock returns is explored next by documenting the returns to portfolios sorted on these variables.

4.2 NOA Portfolio Sorts

Starting in December 1992, all sample stocks are ranked by NOA and sorted into decile portfolios. The portfolios are held without rebalancing for the next 12 months.[3] This procedure is repeated annually through to December 2009, resulting in a 216-month time series of returns to NOA-sorted decile portfolios spanning January 1993 through December 2010.

Table 4 Panel A reports summary statistics that characterise the stocks in the NOA-sorted portfolios. By construction, NOA increases from 0.1043 for portfolio #1 to 1.7168 for portfolio #10. This spread is remarkably similar to HHTZ (2004, Table 1), where NOA ranges from 0.247 to 1.596. The increase in accruals is approximately monotonic across NOA deciles, consistent with the modest positive correlation reported in Table 2. NOA portfolio #1 comprises the smallest sample stocks by market capitalization ($79m), raising concerns about the potential influence of a small-firm effect. However, by Australian standards, $79m is by no means small.[4] NOA portfolio #1 also comprises stocks with the lowest BM (0.6444), however there is little variation in BM across other NOA deciles. Of the two momentum variables, the most discernible pattern is an increase in Prior36 across NOA deciles.[5]

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[3] To be specific, the portfolios are genuine buy-and-hold investments. Accordingly, portfolio returns are estimated following the approach of Liu and Strong (2008) to avoid potential rebalancing bias.

[4] To illustrate, as at December 1992 (December 2009), a market capitalization of $79m would place a stock in the top 20th (33rd) percentile.

[5] Note, however, that the results are unlikely to be unduly influenced by long-term reversals effects. Prior work shows no evidence of reversals (Dou et al., 2013). Similarly, Table 3 finds no relationship between Prior36 and future returns.

In Table 4 Panel B, the relationship between NOA and future stock returns is examined using both raw and risk-adjusted portfolio returns. While the relationship is by no means monotonic, the Low and High NOA deciles generate the highest and lowest average raw return respectively. This is the case regardless of whether stocks are value or equal weighted into portfolios. A spread portfolio that enters long (short) positions in the Low (High) NOA stocks generates statistically significant average monthly returns of 1.2582% when stocks are value weighted and 1.7921% when stocks are equally-weighted.[6]

In order to estimate risk-adjusted returns, we construct the requisite factor-mimicking portfolios to employ the Fama and French (1993) three-factor asset pricing model. Brailsford, Gaunt and O'Brien (2012) argue that the composition of the Australian equity market warrants two minor departures from the strict Fama and French (1993) approach to constructing factors.

First, since the distribution of Australian market capitalisation is severely right skewed, the median market capitalisation does not adequately differentiate between 'small' and 'big' stocks.[7] Rather, Brailsford et al. (2012) denote 'big' stocks as those that contribute the top 90% of total market capitalisation, and 'small' stocks as the stocks that contribute the remaining 10% of total market capitalisation.

Second, rather than determining the book-to-market (BM) cut-offs using the population of stocks, Brailsford et al. (2012) use the 30th and 70th percentiles from the Top 200 stocks by market capitalization at each portfolio formation point. This reflects the observation of Fama and French (2008) that small and micro stocks are not only numerous, but exhibit much greater dispersion of characteristics like BM. Accordingly, if cut-offs are based on the population, very few big stocks will be assigned to extreme BM portfolios.

Although these procedures for determining the size and BM cut-offs differ from Fama and French (1993), Brailsford et al. (2012) show that they generate size/BM sorted portfolios that capture genuine differences in size and BM of Australian firms. Given the size and BM cutoffs at a particular portfolio formation point, the usual Fama-French procedure is followed. In brief, each December, stocks are sorted into six portfolios (two size groups, three BM groups) using independent cutoffs based on the procedure described above. The six portfolios are held without rebalancing for 12 months and value-weighted returns to each portfolio are estimated. This procedure is repeated each year through to December 2009. Following Fama and French (1993), returns on the six portfolios are averaged such that the size-mimicking factor (*SMB*) is BM-neutral and the BM-mimicking factor (*HML*) is size-neutral. Finally, the market risk premium is the difference between CRIF value-weighted market index and risk free rate.

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[6] Since equally-weighted portfolios are more susceptible to extreme returns that can occur on small stocks (Taylor and Wong, 2012), we emphasise the findings for the value-weighted portfolios throughout this paper.

[7] To illustrate, as at December 2009, the mean and median market capitalisations are $506m and $22m respectively. Clearly, if the median market cap is the cutoff point for classifying stocks as big and small (as per Fama and French), stocks as small as $23m will be regarded as 'big'. The resulting SMB size factor may not capture the true extent of the size premium.

Panel B reports risk-adjusted returns to the spread portfolio in the form of intercepts from the Fama-French three-factor model. Monthly alphas on VW and EW portfolios are 0.7505 and 1.3507 respectively, each significant at better than the 5% level. Accordingly, the profitability of the NOA spread portfolio remains highly significant after controlling for common risk factors. Overall, Table 4 presents strong evidence to support the existence of an economically significant NOA effect in average stock returns in Australia.

4.3 Accruals Portfolio Sorts

Decile portfolios sorted by accruals are constructed in an identical manner to the NOA portfolios in Section 4.2, with the first and last portfolio formation dates in December 1992 and 2009 respectively. Table 5 Panel A reports that accruals range from -0.3182 for portfolio #1 to 0.1462 for portfolio #10. Again, the modest positive correlation between NOA and accruals is evident. With the exception of a positive relationship between Prior36 and accruals, there are no obvious patterns between accruals and other characteristics that might proxy for risk factors.

Table 5 Panel B exhibits the familiar accruals anomaly. When stocks are value weighted into portfolios, average monthly returns decrease near monotonically from 1.2562% for portfolio #1 to -0.3332 for portfolio #10. The spread portfolio that enters long (short) positions in portfolio #1 (portfolio #10) generates 1.5892% per month, which is significant at the 1% level. Adjusting for common risk factors, the Fama-French three-factor alpha is 1.0674% and significant at the 5% level.

At face value, a comparison of Table 4 and Table 5 suggests that the accrual anomaly is more economically significant than the NOA effect in returns. For value-weighted portfolios, the accruals spread portfolio outperforms the NOA spread portfolio on both a raw and risk-adjusted basis. However, both strategies perform consistently over the 18-year sample period. Figure 1 presents the annualised buy-and-hold return to NOA and accrual spread trading on a year-by-year basis. NOA (accrual) spread trading generates positive annual returns in all but two (four) of the 18 years. As such, the findings strongly suggest that NOA and accruals exhibit a negative relationship with future returns.

4.4 NOA-Accruals Double Sorted Portfolios

The empirical findings to this point can be summarised as follows. Portfolio sorts in Section 4.2 and Section 4.3 document a negative relationship between average returns and NOA and accruals respectively. Economically, the accruals effect appears stronger. The regression analysis of Section 4.1 also suggests that NOA and accruals have unique influences on average returns, with the former showing the stronger statistical relationship.

To further explore the unique roles of NOA and accruals for the cross-section of stock returns, a double sorting procedure is employed to control for one characteristic whilst allowing the other to vary. Starting December 1992, quintile breakpoints are identified for both NOA and accruals. Sample stocks are sorted independently into 25 NOA-accruals portfolios.[8] Monthly returns to value-weighted buy-and-hold portfolios are estimated over the following 12 months. This double-sorting procedure is repeated annually through to December 2009. This generates a 216-month time series of returns to the 25 NOA-accruals portfolios.

Table 6 reports the average returns to the double-sorted portfolios. Controlling for accruals (i.e., reading down each column), there is an apparent NOA effect. For each level of accruals, the Low NOA portfolio outperforms the High NOA portfolio. The NOA spread is statistically significant at the 10% level or better in four out of five cases. In contrast, the accruals effect is less convincing. Controlling for NOA (i.e., read across each row), the average returns to the Low accruals portfolio exceeds the average return to the High accruals portfolio in each case. However, the accruals spread is statistically significant only for the two highest NOA levels.

This finding potentially casts the accrual anomaly in a new light. Since Sloan (1996), it has been widely believed that stocks reporting a high level of accruals in the most-recent period will subsequently underperform stocks with low accruals. In essence, high accruals are bad news for future returns. Table 6, however, suggests that this is not necessarily true. Rather, the signal in current-period accruals depends on the stock's track record in converting accruals into cashflow. Viewing NOA as an inter-temporal measure of 'balance sheet bloat', a high level of accruals is only bad news if the company has a sustained track record of recording accruals that do not subsequently convert into cash (i.e., if the company has considerable balance sheet bloat). In contrast, for a company with minimal bloat, the implications of high current-period accruals for future returns are negligible. Future returns are similar for low NOA stocks, regardless of the current level of accruals.

Finally, the interaction between accruals and NOA documented in Table 6 suggests an obvious trading strategy. A spread portfolio that enters long positions in stocks with low levels of both current accruals and NOA and short positions in stocks with both high accruals and NOA generates a return of 2.60% per month average over the following 12 months. Returns of this magnitude far exceed the returns to spread trading either accruals or NOA alone. As such, NOA may be a useful moderating variable to accrual filters that are commonly employed in investment practice.

[8] Quintiles (rather than deciles) are employed to ensure that each portfolio comprises a respectable number of stocks. The application of independent breakpoints produces a surprisingly even distribution of stocks to the 5 x 5 grid of portfolios. On average, each portfolio contains 32 stocks. The lowest (highest) number of stocks in a portfolio is 17 (50).

5. Are NOA and Accruals Rationally Priced?

Although the primary purpose of this paper is to investigate the relationship between NOA, accruals and stock returns, it is common in capital markets studies to test whether stock prices rationally impound information about future earnings contained in observables likes cashflows, accruals and, in our case, NOA. Accordingly, this section considers the rational pricing of these variables using an approach recently proposed by Kraft et al. (2007). In doing so, we lever upon the fact that the KLW test is an OLS-based procedure to also consider the extent to which key assumptions about error terms in the panel regression may influence inferences from the rationality tests.

Historically, rationality tests have been conducted by estimating a system of equations using non-linear least squares and testing a cross-equation restriction (Mishkin, 1981; 1983). KLW (2007) raise a number of important issues concerning the Mishkin test. First, they note that the Mishkin test is asymptotically equivalent to a simple and intuitive (single equation) OLS regression procedure. KLW (2007) proceed to demonstrate that the OLS and Mishkin approaches produce virtually identical coefficient estimates and inferences, and therefore see little advantage in utilising the more-complicated Mishkin test.

Second, KLW (2007) highlight that the Mishkin approach is vulnerable to the common omitted variable problem.[9] In the current context, even if market efficiency is rejected, it is difficult to infer that a specific variable (like accruals or NOA) is the cause of the mispricing rather than a correlated omitted variable. While the omitted variable problem is well-understood in classic OLS scenarios, KLW (2007) suggest that researchers may not fully understand its implications under the Mishkin approach. For these reasons, as well as those described shortly relating to standard errors, this paper adopts KLW's OLS regression-based approach to conduct market efficiency tests.

In the current context, KLW's OLS-equivalent of the Mishkin approach is:

$$\begin{aligned} R_{i,t+1} - R_{B,t+1} = \phi_0 + \phi_1 ACC_{i,t} + \phi_2 CFO_{i,t} + \phi_3 NOA_{i,t} \\ + \phi_4 \ln(Size_{i,t}) + \phi_5 \ln(BM_{i,t}) + \phi_6 \text{Prior12}_{i,t} + \phi_7 \text{Prior36}_{i,t} + \varepsilon_{i,t+1} \end{aligned} \quad (4)$$

$R_{i,t+1}$ is stock *i*'s buy-and-hold return from January to December of year *t*+1 and $R_{B,t+1}$ is the buy-and-hold return over the same period for a portfolio of stocks matched to the market cap and BM of stock *i*. In brief, 25 portfolios are formed each December by double sorting sample stocks into size and BM quintiles. These benchmark portfolios serve as an estimate of the expected return for each stock *i*. All independent variables are as previously defined.[10]

[9] An omitted variable problem arises when a variable that is omitted from a model is correlated with both the dependent variable and one of the included independent variables. In such a case, even if the estimated slope on the included variable is significant, this may be spurious since the omitted variable has an association with the dependent variable.

[10] Sloan's (1996) original application of the Mishkin procedure used size deciles as benchmark portfolios in estimating abnormal returns. While many alternatives are possible, Barber and Lyon (1997) provide strong support for benchmark portfolios matched on size and BM.

KLW (2007) demonstrate that the rational pricing of an accounting variable (e.g., accruals, cashflow, NOA) requires that the variable is uncorrelated with future abnormal returns. Hence, KLW's OLS-equivalent of the Mishkin test simply requires a *t*-test that the relevant slope (ϕ) equals zero. In contrast, a significant positive (negative) estimate of a slope implies that the variable in question in underpriced (overpriced).[11]

The four control variables in model (4) are included with an eye towards potential omitted variable problems. KLW (2007) demonstrate that coefficient estimates and inferences drawn from a Mishkin analysis are sensitive to the exclusion of other potential explanatory variables. Indeed, they show that the mispricing of accruals reported by Sloan (1996) vanishes when additional explanatory variables are included. Hence, they strongly advocate the inclusion of other variables that may assist in forecasting earnings and/or future returns. Whereas this adds complexity to the estimation of the Mishkin system of equations, it is trivial to include control variables in model (4).

As is the case when using the Mishkin approach, model (4) is estimated by pooling the sample across years and stocks. Increasingly, however, financial economists have become concerned with potential violation of the 'vanilla' OLS assumptions that model error terms are distributed iid. In an attempt to address these issues, researchers employing the Mishkin approach have followed a Fama-MacBeth-style approach, whereby models are estimated on a year-by-year basis, then annual coefficient estimates are averaged.[12]

KLW (2007) are clearly aware of these econometric issues, noting in footnote 13 that pooling data induces cross-sectional and inter-temporal correlations that potentially affect standard errors. Indeed, they go as far as estimating the Mishkin equations on an annual basis, presumably in response to these concerns. However, they do not address the issues within their OLS-based approach.

Recognising model (4) as an unbalanced panel regression, we believe that a major advantage of using KLW's regression-based approach is that the particular econometric concerns discussed above are easily accommodated using recently-developed techniques for clustering standard errors in panel regressions. Petersen (2009) conducts simulation experiments to demonstrate the perils of assuming vanilla OLS assumptions with panel data, thereby providing strong motivation to use clustered standard errors. Thompson (2011) further extends the idea by showing how to cluster standard errors on two (or more) dimensions, making it an ideal approach for panel regressions.

Our analysis of whether stock prices rationally impound information inherent in NOA, accruals and cashflows proceeds as follows. First, model (4) is estimated as suggested by KLW (2007) by pooling the data across years and stocks, yet with the vanilla OLS assumptions over error terms. Second, model (4) is re-estimated as a panel regression with standard errors clustered on both years and

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[11] KLW (2007) demonstrate the equivalence of this OLS test to the better-known Mishkin procedure, both analytically and empirically.

[12] For example, HHTZ (2004, Table 8) and KLW (2007, Tables 3 and 4) estimate the Mishkin models annually. Annual estimation is intended to accommodate period-specific effects, and also alleviates numerical convergence difficulties with large pooled panels.

companies as per Thompson (2011). While the slopes estimates (ϕ) are unaffected by the assumption over error terms, the standard errors and resulting *t*-statistics change to the extent that the vanilla assumptions are violated in the panel data. As such, in addition to the usual rational pricing analysis, we demonstrate the vulnerability of the KLW test (and indirectly by association, the Mishkin test) to distributional assumptions that are inconsistent with the panel data.

Table 7 reports the results of the rational pricing analysis. For each variation of model (4) estimated, Table 7 reports the estimated OLS slopes, the *p*-value under vanilla assumptions (in round parentheses) and the *p*-value using double clustered stand errors <in sharp parentheses>.

Model 4a is the KLW equivalent of the Mishkin test of the rational pricing of accruals and cashflows (ala Sloan, 1996, Clinch et al., 2012). Using vanilla standard errors, the significant negative coefficient on accruals (-0.1685) indicates that accruals are overpriced. This finding is consistent with the prior findings of Clinch et al. (2012, Table 3) over a similar sample period. In model 4b, the pricing of NOA is also considered. Again using vanilla standard errors, the significant negative coefficients on accruals (-0.1344) and NOA (-0.0875) indicate overpricing, while the significant slope on cashflows (0.0462) suggests underpricing.

The statistical significance and direction of mispricing of accruals, cashflows and NOA is identical to the Mishkin results reported by HHTZ (2004, Table 8). Of course, this inference is based on vanilla standard errors. Table 7 shows some dramatic differences in *p*-values when standard errors are clustered by year and company, evidently suggesting that the panel data violates vanilla assumptions. Specifically, the underpricing of cashflows is no longer statistically significant <*p*=0.4414> and accrual overpricing is now barely significant <*p*=0.0973>. NOA overpricing, however, remains highly significant <*p*<0.001>.

Two points warrant emphasis. First, if the vanilla assumptions were a reasonable approximation for the dataset, the clustered standard errors would mimic the vanilla standard errors; that is, no harm is done by using clustered standard errors. The fact that inferences regarding the mispricing of key variables change so dramatically highlights the importance of using the more-sophisticated approach to estimating standard errors. It also raises questions over the validity of market in/efficiency conclusions drawn in many prior studies that utilize KLW and Mishkin style tests based on vanilla assumptions.

The second point to note is that models 4a and 4b remain vulnerable to potential omitted variables. As such, models 4c and 4d also include four control variables that are potentially correlated with key variables of interest and may also be relevant to future earnings and returns.

Comparing models 4a and 4c gives an indication of the potential influence of omitted variables on traditional Sloan-style tests of accruals and cashflows. For vanilla standard errors, model 4c provides strong statistical evidence that accruals (cashflows) are over (under) priced. The underpricing of cashflows was not evident in model 4a when control variables were omitted. Of course, in light of the importance of using clustered standard errors noted above, the ultimate test of accrual/cashflow mispricing lies in model 4c with double clustered standard errors. Table 7 shows that, when standard errors are estimated to accommodate departures from vanilla OLS assumptions, there is no evidence that either accruals <p=0.1391> or cashflows <p=0.1212> are mispriced.

Comparing models 4b and 4d brings the mispricing of NOA into consideration. With vanilla standard errors and the inclusion of control variables, there is strong evidence that accruals (*p*=0.0058) and NOA (*p*=0.0001) are overpriced and that cashflows (*p*=0.0015) are underpriced. Double clustering standard errors, however, paints a vastly different picture. Neither accruals <*p*=0.1763> or cashflows <*p*=0.1394> are mispriced. NOA, however, remains significantly overpriced <*p*=0.001>.

To summarise, the only variable for which Table 7 presents convincing evidence of mispricing is NOA. Contrary to prior studies that conclude that investors overestimate the persistence of accruals, no evidence of accrual mispricing is found. More importantly, Table 7 dramatically illustrates the importance of controlling for potential omitted variable problems and accommodating cross-sectional and inter-temporal patterns in panel data when conducting Mishkin-style rationality tests.

6. Robustness Analysis

Section 2 highlights a number idiosyncrasies of the Australian equity market that have the potential to influence a study involving earnings, accruals, cashflows and NOA. This section rounds off the paper by briefly considering the robustness of the main findings to various partitions of the sample.

Table 1 reports that the median earnings of Australian companies over the sample period are essentially zero.[13] As such, the sample is divided approximately evenly between loss-making and profit-making firms. Whether firm profitability is relevant to the mispricing of NOA, cashflows and accruals is an empirical issue.

Table 8 Panel A reports summary statistics for partitions of the full sample according to profitability. While there is little discernible difference in NOA or BM, loss-making firms tend to have significantly smaller market caps and are recent losers (perhaps better assessed via medians than means). The magnitude of retained earnings (i.e., retained *losses*) suggests that losses are quite persistent within the loss-making partition.

Table 9 Panel A reports the KLW-style rational pricing analysis for each partition. As was the case with the full sample, the significant negative coefficient on NOA suggests that it is overpriced. Whereas accruals appeared to be rationally priced in the full sample, Table 9 suggests that this finding depends very much on which partition is examined. While there is no evidence that the accruals of loss-making firms are mispriced, the accruals of profitable firms are mispriced (ϕ_1 = -0.1775, *p* = 0.0621).

In light of the prevalence of mining stocks in the Australian equity market, Table 8 Panel B partitions the full sample into resource and non-resource stocks. There is support for the conjecture of Clinch

[13] Sloan (1996, Table 1) reports positive mean and median earnings for each accruals decile. Similarly, HHTZ (2004, Table 1) report positive mean earnings in all but one NOA decile. Clearly, US companies are more profitable than Australian companies.

et al. (2012) that mining stocks tend to be small, unprofitable firms in early stages of their life. While the median market cap of resource stocks is about half that of non-resource stocks, there is little difference in NOA, BM and prior momentum. Resource stocks do however have significantly larger losses, lower cashflows and larger retained losses.

While the full sample results found no evidence of cashflow mispricing, Table 9 Panel B documents significant underpricing of the cashflows of non-resource stocks (ϕ_2 = 0.2308, p < 0.001). For both partitions, NOA are again significantly overpriced.

7. Conclusion

There is a vast international literature that examines the relationship between stock returns and various financial statement items. While the so-called accrual anomaly of Sloan (1996) has attracted much attention, this paper studies a variation of accruals recently proposed by HHTZ (2004). Whereas accruals are simply the difference between earnings and cashflows at a single point in time, net operating assets capture the lifetime discrepancy between accounting value added and cash value added. In essence, NOA measures the extent to which past accruals have not translated into future cashflows ('balance sheet bloat').

Prior research has shown a negative relationship between US stock returns and each of accruals and NOA. This paper contributes to the literature by showing that, while accruals and NOA are closely related, they provide unique signals for future returns. Accruals and NOA each display a statistically and economically significant negative relationship with future stock returns. However, NOA has a moderating influence on the accruals effect. Whereas convention wisdom suggests that low accrual stocks consistently outperform high accrual stocks, we show that this is only the case for stocks with high levels of NOA. Viewing accruals and NOA as single- and multi-period metrics respectively, the finding implies that a high level of accruals is only bad news when a firm has a sustained track record of accruals not translating into future cashflows (i.e., high NOA).

The paper also makes an important contribution to the literature concerned with assessing the extent to which market prices rationally impound financial statement information. KLW (2007) advocate a regression-based equivalent of the popular Mishkin rationality test, on the grounds that it is more conducive to accommodating potential omitted variable problems. We also argue that the regression-based approach can (and should) be augmented in conjunction with recently-developed procedures for estimating clustered standard errors in panel regressions. Our empirical results demonstrate that inferences drawn from Mishkin/KLW-style rationality tests are highly sensitive to distributional assumptions made over model error terms. Making vanilla assumptions over error terms leads to erroneous conclusions that accruals (cashflows) are over (under) priced. When the panel regression accommodates standard errors clustered on both firm and time, neither accruals or cashflows are mispriced. To the best of our knowledge, the importance of conducting rationality tests as panel regressions with clustered standard errors has not previously been examined. In light of the dramatic difference in inferences, questions arise over the validity of market in/efficiency conclusions drawn in numerous prior studies.

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Table 1: Descriptive Statistics

This table reports summary statistics for the pooled sample of 14,875 firm-year observations spanning 1992-2009. **NOA** is the difference between operating assets and operating liabilities, scaled by lagged total assets. **Market capitalisation** is number of ordinary shares multiplied by the closing share price each December. **Book-to-market** is the book value scaled by market capitalisation. **Prior12** is the stock's buy-and-hold return over month t-12 to month t-1. **Prior36** is the stock's buy-and-hold return over the month t-36 to t-13. **Earnings** are the reported earnings before interest, tax, abnormal and significant items, scaled by lagged total assets. **Cashflows** are the cashflows from operations, scaled by lagged total assets. **Accruals** is the difference between earnings and accruals, scaled by lagged total assets.

	Mean	Std Dev	Min	25th	Median	75th	Max
Net operating assets	0.7442	0.4789	-0.1070	0.4902	0.7144	0.8977	4.0994
Market cap ($m)	588.8836	338.6500	0.0231	9.8630	31.7506	164.6229	144,710.0000
Book-to-market	0.8270	0.8574	0.0318	0.3086	0.5830	1.0304	6.0283
Prior 12-month	0.2341	0.9558	-0.8755	-0.2917	0.0246	0.4226	5.3500
Prior 36-month	0.5393	1.7135	-0.9200	-0.3872	0.0769	0.7600	10.4286
Earnings	-0.0777	0.3057	-1.3686	-0.1841	0.0002	0.1058	0.5096
Cashflows	-0.0192	0.2638	-1.0913	-0.1259	0.0159	0.1383	0.5863
Accruals	-0.0590	0.1734	-0.7827	-0.1016	-0.0359	0.0078	0.4850
Retained earnings	-1.3631	2.9556	-18.7736	-1.4608	-0.2705	0.0778	0.5295

Table 2: Correlation Matrix

This table reports correlations between key variables defined in Table 1. The upper (lower) triangles report Spearman (Pearson) estimates. The correlation between each pair is estimated on a year-by-year basis over the period 1992-2009, with the time series average of yearly correlations reported.

	NOA	Mktcap	BM	Prior12	Prior36	Earnings	Cashflows	Accruals	RE
NOA		0.17	0.11	0.03	0.20	0.16	0.07	0.17	0.19
Mktcap	0.01		-0.29	0.27	0.29	0.54	0.53	0.04	0.64
BM	0.04	-0.09		-0.39	-0.22	0.03	0.04	0.07	0.13
Prior12	0.01	0.01	-0.26		-0.04	0.21	0.18	0.03	0.14
Prior36	0.17	0.00	-0.14	-0.07		0.25	0.18	0.10	0.26
Earnings	0.09	0.14	0.07	0.06	0.02		0.83	0.23	0.74
Cashflows	0.01	0.15	0.05	0.05	-0.02	0.79		-0.22	0.69
Accruals	0.12	0.01	0.04	0.02	0.06	0.42	-0.20		0.10
RE	0.23	0.11	0.15	-0.01	0.07	0.52	0.46	0.16	

Table 3: Panel Regression Estimates

This table reports panel regression estimates from model (3). The dependent variable is the 12-month buy-and-hold return on each stock from January-December of year *t*+1. The independent variables are estimated as at December of each year *t*. **ln(Size)** is the natural logarithm of the firm's market capitalisation as at December. **ln(BM)** is the natural logarithm of the firm's book-to-market ratio. **Prior12** is the stock's buy-and-hold return over month t-12 to month t-1. **Prior36** is the stock's buy-and-hold return over the month t-36 to t-13. **NOA** is the difference between the stock's operating assets and operating liabilities, scaled by lagged total assets. . **Accruals** is the difference between the stock's earnings and accruals, scaled by lagged total assets. All variables are winsorised at the 1st and 99th percentiles. The sample comprises a panel of 11,619 firm-year observations. Standard errors are estimated after clustering on both firm and year.

Model		**ln(Size)**	**ln(BM)**	**Prior12**	**Prior36**	**NOA**	**Accruals**	**Adj R^2**
3a	Coefficient	-0.0338	0.1097	-0.0087	0.0016			2.75%
	p-value	0.0298	0.0071	0.8233	0.9319			
3b	Coefficient	-0.0291	0.1226	-0.0045	0.0088	-0.1209		3.14%
	p-value	0.0581	0.0045	0.9050	0.6516	0.0001		
3c	Coefficient	-0.0314	0.1170	-0.0068	0.0034		-0.2343	2.95%
	p-value	0.0441	0.0046	0.8580	0.8548		0.0235	
3d	Coefficient	-0.0272	0.1283	-0.0030	0.0100	-0.1137	-0.2057	3.29%
	p-value	0.0780	0.0033	0.9339	0.6091	0.0001	0.0380	

Table 4: Summary Statistics and Monthly Returns by NOA Decile

This table reports summary statistics and returns for portfolios of stocks sorted by NOA. Each December from 1992 to 2009, sample stocks are sorted into decile portfolios by NOA. Buy-and-hold portfolios are held for 12 months without rebalancing. Panel A reports summary statistics that characterise stocks in each portfolio. For NOA, Size and BM, the numbers are the mean of each characteristic. For the other characteristics (accruals, cashflows, earnings, Prior12, Prior36), Panel A reports the time series mean of the annual cross-sectional medians. Since these characteristics experience extreme values (both positive and negative), medians provide a more representative measure of the characteristic of interest. Panel B reports average monthly returns to NOA-sorted decile portfolios (both value and equal weighted portfolios are shown). The spread portfolio enters long (short) positions in portfolio 1 (portfolio 10). The risk-adjusted spread return is estimated by the intercept from a Fama-French (1993) three-factor asset pricing model. Newey-West standard errors are used to correct for autocorrelation and heteroscedasticity. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels respectively.

Panel A: Summary Statistics by NOA Decile

	Low	2	3	4	5	6	7	8	9	High
NOA	0.1043	0.3193	0.4721	0.5771	0.6645	0.7385	0.8114	0.8956	1.0324	1.7168
Accruals	-0.0511	-0.0673	-0.0567	-0.0504	-0.0432	-0.0377	-0.0285	-0.0196	-0.0152	-0.0241
Cashflows	-0.1463	-0.0417	0.0101	0.0428	0.0765	0.0865	0.0832	0.0370	-0.0031	-0.0656
Earnings	-0.2166	-0.1176	-0.0240	0.0074	0.0425	0.0608	0.0632	0.0345	0.0022	-0.0674
Size ($m)	79.8890	205.9191	485.3305	574.5697	1112.4525	802.3074	913.5806	600.1974	352.6402	380.5202
BM	0.6444	0.7450	0.8012	0.8091	0.8826	0.8655	0.8930	0.9277	0.8910	0.8046
Prior12	0.0265	0.0180	0.0160	0.0424	0.0473	0.0642	0.0650	0.0385	0.0457	0.0753
Prior36	-0.0838	-0.0834	0.0114	0.0639	0.0638	0.1374	0.1523	0.1849	0.3290	0.5873

Panel B: Monthly Returns by NOA Decile

	Low	2	3	4	5	6	7	8	9	High	Spread	FF3f alpha
VW	1.6441***	1.1907***	1.0026***	1.2855***	1.0073***	1.1085***	1.1842***	0.6749*	0.6764*	0.3859	1.2582***	0.7564**
EW	2.6225***	2.4393***	1.7113***	1.8184***	1.7594***	1.4431***	1.4859***	1.4996***	1.3728**	0.8304	1.7921***	1.3539***

Table 5: Summary Statistics and Monthly Returns by Accruals Decile

This table reports summary statistics and returns for portfolios of stocks sorted by Accruals. Each December from 1992 to 2009, sample stocks are sorted into decile portfolios by Accruals. Buy-and-hold portfolios are held for 12 months without rebalancing. Panel A reports summary statistics that characterise stocks in each portfolio. For NOA, Size and BM, the numbers are the mean of each characteristic. For the other characteristics (accruals, cashflows, earnings, Prior12, Prior36), Panel A reports the time series mean of the annual cross-sectional medians. Since these characteristics experience extreme values (both positive and negative), medians provide a more representative measure of the characteristic of interest. Panel B reports average monthly returns to Accruals-sorted decile portfolios (both value and equal weighted portfolios are shown). The spread portfolio enters long (short) positions in portfolio 1 (portfolio 10). The risk-adjusted spread return is estimated by the intercept from a Fama-French (1993) three-factor asset pricing model. Newey-West standard errors are used to correct for autocorrelation and heteroscedasticity. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels respectively.

Panel A: Summary Statistics by Accruals Decile

	Low	2	3	4	5	6	7	8	9	High
NOA	0.6650	0.6901	0.7170	0.7164	0.7506	0.7578	0.7694	0.7440	0.7568	0.8750
Accruals	-0.3182	-0.1627	-0.1000	-0.0671	-0.0452	-0.0267	-0.0106	0.0081	0.0430	0.1462
Cashflows	-0.0384	0.0406	0.0694	0.1063	0.1051	0.0740	0.0427	0.0162	-0.0194	-0.1572
Earnings	-0.3862	-0.1228	-0.0346	0.0389	0.0601	0.0471	0.0328	0.0256	0.0249	0.0087
Size ($m)	73.2547	302.2516	774.1886	1054.2335	939.6580	731.0160	879.0724	543.8907	240.2733	133.7169
BM	0.7035	0.7768	0.8457	0.7936	0.8504	0.8710	0.9349	0.9183	0.8612	0.7857
Prior12	-0.0130	0.0079	0.0568	0.0624	0.0673	0.0510	0.0444	0.0451	0.0776	0.0322
Prior36	-0.0290	0.0107	0.0632	0.1620	0.1560	0.1617	0.1376	0.1579	0.1879	0.2865

Panel B: Monthly Returns by Accruals Decile

	Low	2	3	4	5	6	7	8	9	High	Spread	FF3f alpha
VW	1.2562**	1.1343***	1.2652***	1.0401***	1.1863***	0.6305*	0.8397***	0.7318**	0.5800	-0.3332	1.5893***	1.1070***
EW	1.9765***	1.8721***	1.9762***	1.6493***	1.8207***	1.5243***	1.6477***	1.7372***	1.6316***	1.3368**	0.6397*	0.1917

Table 6: Returns to Double-Sorted Portfolios

This table reports average monthly returns to 25 portfolios double sorted on NOA and accruals. Each December from 1992 to 2009, quintile breakpoints are identified for both NOA and accruals. Sample stocks are sorted independently into 25 portfolios. Monthly returns to buy-and-hold value-weighted portfolios are estimated over the following 12 months, at which point the portfolio sorting procedure is repeated. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels respectively.

		Accruals					
		Low	2	3	4	High	Spread
NOA	Low	2.1330	1.4000	1.5600	1.6185	1.5385	0.5946
	2	1.3268	1.0849	1.3151	0.8568	1.2188	0.1080
	3	0.7894	1.1722	0.9908	0.8895	0.5914	0.1981
	4	1.7199	0.9676	0.8978	1.4828	0.2864	1.4335**
	High	0.7544	0.9485	0.5594	0.4256	-0.4622	1.2166**
	Spread	1.3786**	0.4511	0.9966*	1.1929**	2.0006***	

Table 7: KLW Mispricing Tests

This table reports results of the KLW (2007) OLS-equivalent of the Mishkin test as shown in model (4). The dependent variable is firm *i*'s buy-and-hold return over the subsequent 12 months less the buy-and-hold return on a benchmark portfolio matched on market cap and BM. The key test variables are accruals, cashflows and net operating assets. A positive (negative) slope on a test variable indicates under (over) pricing. Size, BM, Prior12, and Prior36 are included as control variables.

Model (4) is estimated after pooling firm-year observations across the period 1992-2009 (*n* = 11,720 firm-year observations). Standard errors of regression slopes and their corresponding *p*-values are estimated in two ways. First, "vanilla" OLS assumptions assuming that standard errors are distributed iid are estimated and *p*-values are reported in (round) parentheses. Second, a panel regression with standard errors double clustered on year and firm are estimated as per Petersen (2009) and Thompson (2011), with and *p*-values reported in <sharp> parentheses.

Model		ACC	CFO	NOA	ln(Size)	ln(BM)	Prior12	Prior36
4a	slope	-0.1685	0.0381					
	vanilla	(0.0001)	(0.1593)					
	clustered	<0.0452>	<0.5499>					
4b	slope	-0.1344	0.0462	-0.0875				
	vanilla	(0.0012)	(0.0884)	(0.0001)				
	clustered	<0.0973>	<0.4414>	<0.0001>				
4c	slope	-0.1343	0.1076		-0.0257	0.0146	0.0193	-0.0085
	vanilla	(0.0015)	(0.0006)		(0.0001)	(0.1083)	(0.0232)	(0.0477)
	clustered	<0.1391>	<0.1212>		<0.0001>	<0.1838>	<0.2488>	<0.3324>
4d	slope	-0.1170	0.0997	-0.0781	-0.0223	0.0231	0.0221	-0.0040
	vanilla	(0.0058)	(0.0015)	(0.0001)	(0.0001)	(0.0124)	(0.0093)	(0.3571)
	clustered	<0.1763>	<0.1394>	<0.0001>	<0.0009>	<0.0568>	<0.1722>	<0.6713>

Table 8: Descriptive Statistics: Robustness Analysis

This table reports summary statistics for the robustness analysis. In Panel A, the full sample is partitioned into profit and loss making firms, according to year *t* earnings. In Panel B, the full sample is partitioned into resource and non-resource stocks. **NOA** is the difference between operating assets and operating liabilities, scaled by lagged total assets. **Market capitalisation** is number of ordinary shares multiplied by the closing share price each December. **Book-to-market** is the book value scaled by market capitalisation. **Prior12** is the stock's buy-and-hold return over month t-12 to month t-1. **Prior36** is the stock's buy-and-hold return over the month t-36 to t-13. **Earnings** are the reported earnings before interest, tax, abnormal and significant items, scaled by lagged total assets. **Cashflows** are the cashflows from operations, scaled by lagged total assets. **Accruals** is the difference between earnings and accruals, scaled by lagged total assets.

Panel A	Loss-making firms (*n* = 5,837)							Profit-making firms (*n* = 5,883)						
	Mean	Std Dev	Min	25^{th}	Median	75th	Max	Mean	Std Dev	Min	25^{th}	Median	75th	Max
Net operating assets	0.71	0.55	-0.11	0.36	0.65	0.92	4.10	0.77	0.39	-0.10	0.59	0.74	0.88	4.08
Market cap ($m)	63.72	266.21	0.02	5.67	13.42	36.41	7,417.85	1,075.99	4,568.16	0.23	25.73	103.87	521.15	144,710
Book-to-market	0.87	1.00	0.03	0.26	0.55	1.10	6.03	0.82	0.76	0.03	0.37	0.63	1.02	6.03
Prior 12-month	0.24	1.15	-0.88	-0.44	-0.10	0.46	5.35	0.21	0.69	-0.88	-0.15	0.09	0.39	5.35
Prior 36-month	0.49	1.94	-0.92	-0.57	-0.15	0.67	10.43	0.56	1.41	-0.92	-0.17	0.21	0.78	10.43
Earnings	-0.29	0.30	-1.38	-0.39	-0.18	-0.08	0.00	0.13	0.10	0.00	0.06	0.10	0.16	0.50
Cashflows	-0.19	0.25	-1.10	-0.26	-0.11	-0.04	0.58	0.15	0.14	-1.10	0.08	0.13	0.21	0.58
Accruals	-0.10	0.21	-0.79	-0.17	-0.05	0.00	0.48	-0.02	0.11	-0.79	-0.07	-0.03	0.01	0.48
Retained earnings	-2.61	3.70	-18.77	-3.06	-1.24	-0.46	0.52	-0.13	0.96	-18.83	-0.08	0.07	0.16	0.52

Panel B	Non-resource firms (*n* = 6,315)							Resource firms (*n* = 5,405)						
	Mean	Std Dev	Min	25th	Median	75th	Max	Mean	Std Dev	Min	25th	Median	75th	Max
Net operating assets	0.69	0.42	-0.11	0.47	0.69	0.84	4.10	0.80	0.52	-0.11	0.51	0.75	0.97	4.02
Market cap ($m)	555.76	1,945.11	0.02	12.01	43.45	217.24	4,128.32	590.62	4,350,32	0.52	7.64	22.59	103.71	144,7110
Book-to-market	0.85	0.87	0.03	0.33	0.61	1.07	6.03	0.84	0.90	0.03	0.30	0.57	1.04	6.03
Prior 12-month	0.17	0.81	-0.88	-0.26	0.03	0.35	5.35	0.29	1.08	-0.88	-0.35	0.01	0.53	5.35
Prior 36-month	0.45	1.54	-0.92	-0.34	0.08	0.66	10.43	0.60	1.86	-0.92	-0.44	0.03	0.85	10.43
Earnings	-0.02	0.29	-1.38	-0.07	0.07	0.13	0.50	-0.15	0.31	-1.38	-0.25	-0.09	0.03	0.50
Cashflows	0.02	0.26	-1.10	-0.05	0.09	0.16	0.58	-0.07	0.26	-1.10	-0.17	-0.06	0.08	0.58
Accruals	-0.04	0.14	-0.79	-0.08	-0.03	0.01	0.48	-0.08	0.21	-0.79	-0.14	-0.04	0.01	0.48
Retained earnings	-1.04	2.85	-18.83	-0.81	-0.01	0.12	0.52	-1.74	3.06	-18.83	-2.01	-0.69	-0.10	0.52

Table 9: KLW Mispricing Tests: Robustness Analysis

This table reports robustness analysis for KLW mispricing tests from model (4). In Panel A, the full sample is partitioned into profit and loss making firms, according to year *t* earnings. In Panel B, the full sample is partitioned into resource and non-resource stocks. The dependent variable is firm *i*'s buy-and-hold return over the subsequent 12 months less the buy-and-hold return on a benchmark portfolio matched on market cap and BM. The key test variables are accruals, cashflows and net operating assets. A positive (negative) slope on a test variable indicates under (over) pricing. Size, BM, Prior12, and Prior36 are included as control variables. Model (4) is estimated after pooling firm-year observations across the period 1992-2009. Standard errors of regression slopes are estimated by double clustering on year and firm are estimated as per Petersen (2009) and Thompson (2011), with *p*-values reported in parentheses.

Partition	ACC	CFO	NOA	ln(Size)	ln(BM)	Prior12	Prior36
			Panel A: Comparison of loss- and profit-making firms				
Loss-making firms	-0.0679	0.1029	-0.0653	-0.0603	0.0253	0.0261	-0.0015
n = 5,837	(0.4962)	(0.2588)	(0.0116)	(0.0005)	(0.2555)	(0.2203)	(0.8813)
Profit-making firms	-0.1775	0.1236	-0.0773	-0.0049	0.0104	0.0445	-0.0014
n = 5,883	(0.0621)	(0.1608)	(0.0009)	(0.4602)	(0.3638)	(0.0039)	(0.8980)
			Panel B: Comparison of resource and non-resource firms				
Non-resource firms	-0.0638	0.2308	-0.0929	-0.0094	0.0067	0.0145	-0.0148
n = 6,315	(0.5423)	(<0.0001)	(0.0018)	(0.1072)	(0.6302)	(0.5428)	(0.1168)
Resource firms	-0.1096	0.0311	-0.1145	-0.0309	0.0475	0.0229	0.0038
n = 5,405	(0.2602)	(0.7461)	(<0.0001)	(0.0074)	(0.0133)	(0.2558)	(0.7096)

Figure 1

Annual Buy-and-Hold Returns to NOA and Accruals Spread Trading

Each December from 1992 to 2009, sample stocks are sorted into decile portfolios by NOA or Accruals. Value-weighted buy-and-hold portfolios are held for 12 months without rebalancing. The figure illustrates the annualized buy-and-hold return to a spread portfolio that enters long positions in stocks in portfolio #1 and short positions in stocks in portfolio #10.