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# Accruals' persistence, accruals mispricing and operating cycle: evidence from the US

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## Abstract

**Purpose** – The purpose of this paper is to investigate the effect of operating cycle on the differential persistence of accruals and cash flow, and the market reaction to the different components of earnings across firms with various operating cycles.

**Design/methodology/approach** – By examining the US public firms' earnings and the capital market reaction to different components of earnings, from 1964 to 1993, it is found that the longer the operating cycle, the lesser will be the persistent of accruals.

**Findings** – This result is consistent with Sloan's theory that the differential persistence of accruals is attributable to estimation errors in accruals. Moreover, the market efficiency test shows that the mispricing of accruals is greater for firms with longer operating cycle, indicating that investors fixate on earnings, while ignoring the persistence of accruals among firms with different earnings quality.

**Originality/value** – This paper adds to the growing literature that has begun to examine the factors affecting accrual persistence and accrual mispricing by indicating that the length of operating cycle can play a role. In addition, it provides fresh evidence that the market fixates on earnings, thus emphasizing the importance of contextual analysis of financial statement. Finally, it corroborates Sloan and Xie that estimation errors in accruals drive the lower persistence of accruals.

**Keywords** Earnings, Capital markets, Public sector organizations, United States of America

**Paper type** Research paper

## I. Introduction

Earnings better gauge corporate financial performance than operating cash flows, because accruals address timing and mismatching problems underlying the contemporaneous operating cash flows. However, the accrual process is the result of a trade-off between relevance and reliability (Dechow, 1994; Ball, 1989), because management can use their information advantage to opportunistically manipulate accruals to achieve their own benefits (Gaver *et al.*, 1995; Bartov *et al.*, 2002).

Sloan (1996) finds that the accruals component of earnings is less persistent than the cash component of earnings, and he attributes the weaker persistence of accruals to the subjectivity and opportunism in the estimation of accruals. He and a large body of follow-up studies also argue that investors tend to over-estimate the persistence of accruals and under-estimate the persistence of cash flows when forming earnings expectations.

Martin (2007) argues that a variety of factors can affect the persistence of accruals. Dechow (1994) predicts that the longer a firm's operating cycle, the more variable the firm's working capital requirement. This paper investigates the accruals persistence and the mispricing of accruals across the US firms with different operating cycles. It has been documented that accruals are less persistent and overpriced by the market.

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However, it leaves the question whether the length of the operating cycle affects accrual persistence and its overpricing. This paper aims to examine the effect of the operating cycle on the differential persistence of accruals and cash flow, and the market reaction to the different components of earnings across firms with various operating cycles.

My empirical evidence suggests that the longer the operating cycle, the less persistent of accruals. This result is consistent with Sloan' (1996) theory that the differential persistence of accruals is attributable to estimation errors in accruals. Moreover, the market efficiency test shows that the mispricing of accruals is greater for firms with a longer operating cycle, indicating that investors fixate on earnings, while ignoring the persistence of accruals among firms with different earnings quality.

The paper contributes to accounting literature in several ways. First, it includes the operating cycle in the literature of accrual persistence and mispricing, and demonstrates that the operating cycle also plays a role in determining the differential persistence of accruals. Second, it provides fresh evidence that the market fixates on earnings, thus emphasizing the importance of the contextual analysis of financial statement information (Lev and Thiagarajan, 1993). Last but not least, it corroborates Sloan (1996) and Xie (2001) that estimation errors in accruals drive the lower persistence of accruals.

## II. Literature review and hypotheses development

### *1.* H1 *development*

I borrowed the simplified model used in Dechow (1994) to show the effect of the operating cycle on the accrual requirement. In her model, only one accrual, accounts receivables, is considered. Cash ($C_t$) collected in an accounting period is from the current cash sales and last period's credit sales. That is:

$$C_t = (1 - \varphi)S_t + \varphi S_{t-1}$$

where:

- $S_t$ – sales revenue in accounting period $t$;
- $\phi$ – proportion credit sales in period $t - 1$ and cash is collected in period $t$; and
- $\phi$ – constant over time.

Thus, accruals are equal to:

$$S_t - C_t = \varphi \Delta S_t = \varphi(S_t - S_{t-1}).$$

As a result, the magnitude of the accruals depends on both the proportion of credit sales and the change in revenue. This paper focuses on the effect of operating cycle. According to Dechow (1994), $\phi$ is a proxy for the length of the operating cycle. Therefore, the longer the average time elapsing between the disbursement of cash to produce a product and the receipt of cash from the sale of product, the larger the magnitude of the operating accrual is. Furthermore, Dechow documents that "the length of the operating cycle is an underlying determinant of the volatility of working capital". Firms with longer operating cycles tend to have more volatile working capital requirements.

High volatile working capital is difficult to estimate, as more uncertainty is involved in the accruals process. According to Sloan (1996), Xie (2001) and Dechow and Dichev (2002), the greater degree of subjectivity in accruals result in the lower persistence, relative to the cash component of earnings. Linking the above literature, I have the first prediction:

*H1.* The longer the operating cycle, the less persistent is the accruals component of earnings.

*2.* H2 *development*

Sloan (1996) documents that investors make systematic errors in assessing the implications of current earnings on future earnings, that is, they tend to over-estimate the persistence of accruals and under-estimate the persistence of cash flows when forming earnings expectations. Thus, stock returns are systematically lower when realized earnings are less than expected for high-accrual firms. As a result, an investment strategy that exploits this market bias earns abnormal returns of around 10 per cent in the year following the earnings announcement. This empirical regularity has been named the "accrual anomaly". Once we have the empirical evidence regarding the effect of the operating cycle on the persistence of accruals, the remaining question is the extent to which stock price reflect the different persistence of the accruals and cash flows across firms with different operating cycles.

Sloan (1996) and Xie (2001) conclude that investors fixate on earnings and fail to distinguish between the accrual and cash flow components of current earnings. Following their line of reasoning, we predict that for firms with longer operating cycles, investors fixate on earnings ignoring not just the different properties between accruals and cash flows, but also the even lower persistence of accruals for the long operating-cycle firms than the short operating-cycle firms. Thus, the null hypothesis is:

*H2a.* The mispricing of accruals is greater for firms with longer operating cycle.

However, Schwert (2001) argues that "anomalies are empirical results that seem to be inconsistent with maintained theories of asset pricing". According to the efficient market theory, investors are rational and are able to see through earnings management, and thus price accruals differently based on the firm's operating cycle, in particular, the degree of subjectivity in accruals. Thus, I have the following alternative prediction:

*H2b.* The mispricing of accruals is less severe for firms with longer operating cycle.

Whether the null hypothesis or the alternative hypothesis is correct is an empirical issue.

## III. Sample and variable measurement

Sloan's (1996) sample includes a 30-year period from 1964 to 1993. Both samples require that firm-year observations have required financial statement data and return data. To be consistent with prior research, I use all firms, except those from the financial sector, with available data in the intersection of both Compustat's annual industrial and research files and the CRSP's monthly stock returns file, and the period spans from 1964 to 1993. I exclude the observations from the financial sector, because

there are not enough financial statement data available to compute accruals for these companies. The final sample has 36,023 firm-year observations.

The definition of variables used in the paper will follow Sloan (1996) and Fairfield *et al.* (2003a). I deflate earnings, accruals, operating cash flows (CFO) and other variables, except stock returns, by the firm size, in order to facilitate cross-sectional and temporal comparisons of the relationship between future earnings performance and the relative weight of the two components of current earnings: accrual and cash flows. The earnings are defined as:

$$\text{Earnings}_t = \frac{\text{OPINC}_t}{\text{Average}(\text{TA}_{t-1} + \text{TA}_t)}$$

where:

OPINC – operating income after depreciation and amortization (Compustat item 178); and

TA – total assets (Compustat item 6).

Accruals are computed by the indirect method, as suggested by Sloan (1996) and Fairfield *et al.* (2003a). Thus, I can compare my result with prior research, and also no data is available to compute accruals through direct method before 1988. Thus:

$$\text{Accrual}_t = \frac{(\Delta\text{AR}_t + \Delta\text{INV}_t + \Delta\text{OTHERCA}_t) - (\Delta\text{AP}t + \text{OTHERCL}_t) - \Delta\text{DepAmort}}{\text{Average}(\text{TA}_{t-1} + \text{TA}_t)}$$

where:

ΔAR – change in accounts receivable (Compustat item 2);

ΔINV – change in inventory (Compustat item 3);

ΔOTHERCA – change in other current assets (Compustat item 68);

ΔAP – change in accounts payable (Compustat item 70);

ΔOTHERCL – change in other current liabilities (Compustat item 72); and

DepAmort – depreciation and amortization expense (Compustat item 14).

Cash component of earnings is calculated by subtracting accruals from operation income (OPINC):

$$\text{CFO}_t = \frac{\text{OPINC}_t - \text{Accrual}_t}{\text{Average}(\text{TA}_{t-1} + \text{TA}_t)}$$

Operating cycle is the average length of period from cash payment to produce to cash receipt from sales:

$$\text{Operating cycle} = \left(\frac{\frac{AR_t + AR_{t-1}}{2}}{\frac{\text{Sales}}{360}}\right) + \left(\frac{\frac{INV_t + INV_{t-1}}{2}}{\frac{\text{COGS}}{360}}\right) - \left(\frac{\frac{Ap_t + Ap_{t-1}}{2}}{\frac{\text{purchases}}{360}}\right).$$

where:

Sales – net sales (Compustat item 12);

COGS – cost of goods sold (Compustat item 41); and

Purchases – $INV_t + COGS - INV_{t-1}$.

And other variables are defined as before. In the test, I use the rank of operating cycle (rcycle) rather than the real value, in order to suppress the extreme observations, which may contaminate the result.

The measurement of the firm's annual stock return begins four months after the firm's fiscal year end. Following Sloan (1996) and Fairfield *et al.* (2003a), I use the size-adjusted abnormal stock return (Saret), computed as the difference between a firm's annual buy-and-hold return and the annual buy-and-hold return for the same 12-month period on the market-capitalization-based portfolio decile to which the firm belongs.

## IV. Empirical evidence

### *1. Descriptive data*

Table I provides descriptive statistics on one-year-ahead ROA, current ROA, accruals, cash flows and operating cycle. The mean of the size-adjusted-return is −0.011. The means of accruals and cash flows are −0.025 and 0.130, respectively. The average operating cycle is 102 days, but the extremes could be significantly different from the average. Earnings, that is, return on assets, are about 10 per cent. All the above data are approximately of the similar magnitude and same sign as described by Fairfield *et al.* (2003a), Sloan (1996) and Dechow (1994), thus my data is valid, excluding the possibility that my results are driven by the invalid data.

Table II shows the correlations between one-year-ahead ROA, current ROA, accruals, cash flows, the operating cycle and size-adjusted-return. As expected, Table II reports positive unconditional correlations among accruals and the operating cycle,

**Table I.** Descriptive statistics on one-year-ahead earnings (FROA), current earnings (ROA), component of current earnings, size-adjusted annual buy-and-hold returns and operating cycles

| Variable | Mean | SD | Minimum | Maximum |
|---|---|---|---|---|
| *Panel A: raw return and size-adjusted return* | | | | |
| Saret | −0.01055 | 0.364017 | −0.96054 | 1.672664 |
| *Panel B: components of current ROA* | | | | |
| Acc | −0.02534 | 0.089937 | −1.13187 | 1.453136 |
| CFO | 0.130216 | 0.110856 | −1.4959 | 1.421542 |
| *Panel C: one-year-ahead and current ROA* | | | | |
| ROA | 0.104843 | 0.097022 | −1.27163 | 1.832899 |
| FROA | 0.101763 | 0.097372 | −2.16438 | 1.186 |
| *Panel C: operating cycle* | | | | |
| Tcycle | 101.7697 | 291.4127 | −12312.9 | 32389.11 |

suggesting that more working capital requirements for firms with a long operating-cycle. Moreover, both accruals and the rank of operating cycle are negatively related with future abnormal returns, indicating that high accruals and long operating cycles are associated with low returns. In addition, the correlation between accruals and CFO is negative, consistent with Dechow and Dichev (2002) that two components of earnings are negatively related.

*2. Test of* H1

I replicate the basic model in Sloan (1996), and the result is consistent with Sloan's conclusion that the accrual component is less persistent than the cash component of earnings, since the coefficient of accruals and cash flows are 0.725 and 0.795, respectively, and they are significantly different, as indicated by the *F*-test.

To test *H1*, I rank all the firm-year observations into deciles in terms of their operating cycles, with the longest operating-cycle as decile 9, and the bottom decile as 0. I then include the interaction term between operating-cycle rank and accruals into the Sloan's basic model, equation (1), and run equation (2):

$$\text{Earnings}_{t+1} = \alpha_0 + \alpha_1 \text{Acc}_t + \alpha_2 \text{CFO}_t + u_{t+1} \quad (1)$$

$$\text{Earnings}_{t+1} = \beta_0 + \beta_1 \text{Acc}_t + \beta_2 \text{CFO}_t + \beta_3 \text{Acc\_rcycle}_t + \beta_4 \text{rcycle}_t + e_{t+1} \quad (2)$$

The coefficient of the interaction term, $\beta_3$, is of the interest. Panel B of Table III indicates that it is $-0.002$ and the *t*-statistics is 2.57, which is significant at 1 per cent level. Thus, firms with longer operating cycles have even less persistent accruals, relative to their peers who have short operating-cycles, supporting the null hypothesis.

*3. Test of* H2

First, I do firm-year level return analysis, and use the following regression model:

$$\text{Saret}_{t+1} = \gamma_0 + \gamma_1 \text{ACC}_t + \gamma_2 \text{CFO}_t + \gamma_2 \text{ACC}_{\text{rcycle}_t} + \gamma_4 \text{rcycle}_t + \varepsilon_{t+1} \quad (3)$$

According to Sloan (1996), cash flows are positively related with future return, and therefore the coefficient on CFO is expected to be positive, and Table IV shows the result is 0.2049 and significant at the 0.001 level. For firms with long operating cycles, their accruals are more subject to manipulations and estimation errors, and therefore are less persistent as suggested in *H2*. The variable of the interest is the coefficient on the interaction term, Acc_rcycle, which captures the relation between accruals and

| | Saret | Acc | rcycle | CFO | FROA | ROA |
|---|---|---|---|---|---|---|
| Saret | 1.000 | $-0.064^*$ | $-0.036^*$ | $0.091^*$ | $0.045^*$ | $0.272^*$ |
| Acc | $-0.048^*$ | 1.000 | $0.245^*$ | $-0.486^*$ | $0.283^*$ | $0.182^*$ |
| rcycle | $-0.026^*$ | $0.190^*$ | 1.000 | $-0.152^*$ | $0.026^*$ | $0.032^*$ |
| CFO | $0.070^*$ | $-0.550^*$ | $-0.144^*$ | 1.000 | $0.612^*$ | $0.540^*$ |
| ROA | $0.036^*$ | $0.299^*$ | 0.011 | $0.633^*$ | 1.000 | $0.773^*$ |
| FROA | $0.259^*$ | $0.172^*$ | $0.020^*$ | $0.537^*$ | $0.794^*$ | 1.000 |

**Notes:** $^*$Correlations are significantly different from 0, $p$-value $< 0.01$; Spearman coefficients in the upper triangle; Pearson coefficients in the lower triangle

**Table II.** Correlations among one-year-ahead ROA, current ROA, accruals, cash flows, operating cycle and size-adjusted-return

| Variable | Equation (1) Estimate coefficient | t-value | Equation (2) Estimate coefficient | t-value |
|---|---|---|---|---|
| *Panel A: estimation results for each equation* | | | | |
| Intercept | 0.01661 | 31.98 | 0.01312 | 15.24* |
| Acc | 0.72534 | 168.18 | 0.7402 | 85.94* |
| CFO | 0.7953 | 227.31 | 0.79653 | 227.57* |
| Acc_Tcycle | | | −0.0033 | 2.57* |
| rcycle | | | 0.000711 | 5.62* |
| Ajusted $R^2$ | 0.6014 | | 0.602 | |
| *Panel B: test of differences in coefficients* | | | | |
| F-*test* | *Acc = CFO* | | *Acc + Acc_Tcycle = CFO* | |
| *F*-statistics | 343.54 | | 67.8 | |
| *p*-value | <0.001 | | <0.001 | |

**Table III.** Test of *H1*

**Notes:** *Significance at the 1 per cent level (two-tailed test); regressions of one-year-ahead earnings on current components of earnings and operating cycle

| Variable | Estimate | Error | t-value | $Pr > \|t\|$ |
|---|---|---|---|---|
| Intercept | −0.02443 | 0.00509 | −4.8 | <0.0001 |
| Acc | 0.07116 | 0.05091 | 1.4 | 0.1621 |
| CFO | 0.20491 | 0.02069 | 9.91 | <0.0001 |
| Acc_Tcycle | −0.01972 | 0.00762 | −2.59 | 0.0096 |
| rcycle | −0.00256 | 0.000748 | −3.42 | 0.0006 |

**Table IV.** Test of *H2*

**Notes:** Regression of one-year-ahead annual size-adjusted buy-and-hold return on current accruals, cash flow, operating cycle and the interaction term between accruals and operating cycle; equation (3)

future returns for firms that have long operating cycles, relative to those with short operating cycles. Table IV shows that the coefficient of the interaction term is × 0.01972 and statistically significant at the 0.01 level, indicating that investors fail to understand that accruals for firms with long operating-cycles suppress more future profitability than firms with short operating-cycles.

Second, I employ the framework developed by Mishkin (1983) to test whether the market rationally prices accruals for firms with different length of operating cycles. Specifically, I estimate the following regression system:

$$\text{Earnings}_{t+1} = \delta_0 + \delta_1 \text{Acc}_t + \delta_2 \text{CFO}_t + \delta_3 \text{Acc\_rcycle}_t + \delta_4 \text{rcycle}_t + e_{t+1} \quad (4)$$

$$\text{Saret}_{t+1} = \zeta + \theta(\text{Earnings}_{t+1} - \delta_0 - \delta_1^* \text{Acc}_t - \delta_2^* \text{CFO}_t - \delta_2^* \text{ACC}_{\text{rcycle}_t} - \delta_4^* \text{rcycle}_t) + \omega_{t+1} \quad (5)$$

where all variables are defined as before. Equation (4) is a forecasting model that estimates the forecasting coefficients of cash flows, accruals, operating cycles and the interaction term between accruals and the operating cycle for predicting one-year-ahead earnings. Equation (3) is a valuation equation that estimates the valuation coefficients that the market assigns to cash flows, accruals, operating cycle and the interaction term between accruals and the operating cycle.

To test whether the valuation coefficients are significantly different from their counterpart forecasting coefficients, the two equations are estimated using iterative weighted non-linear least squares (Mishkin, 1983). First, both equations are estimated jointly without imposing any constraints, and then estimated after imposing the rational pricing constraints, that is, $\delta_q^* = S_q$, where $q = 1$, 2, or 3. Market efficiency is tested using a likelihood ratio statistic that is distributed asymptotically as $x^2(q)$, where:

$$Zn \log\left(\frac{\mathrm{SSR^c}}{\mathrm{SSR^u}}\right)$$

where:

- $q$ – the number of constraints imposed by market efficiency;
- $n$ – the number of observations;
- $\mathrm{SSR^c}$ – the sum of squared residuals from the constrained weighted system; and
- $\mathrm{SSR^u}$ – the sum of squared residuals from the unconstrained weighted system.

Table V, Panel A provides the forecasting coefficients, the coefficient on accruals and cash flows are 0.740 and 0.796, respectively, and identical in magnitude to those obtained using ordinary least squares in Table III. Panel A also reports the valuation coefficients. Consistent with Sloan's (1996) conclusion that the market overestimates the persistence of accruals and underestimates the persistence of cash flows, I find that the valuation coefficient of accruals, 0.7669, is slightly higher than its forecasting coefficient, 0.7400. Moreover, the valuation coefficient of cash, 0.7005, is significantly lower than its forecasting coefficient, 0.7964. My focus is the interaction term, Acc_rcycle. The valuation coefficient of Acc_rcycle (0.005953) exceeds its forecasting coefficient (−0.00329) and is of the opposite sign. This suggests that the market appears to overvalue the accruals for the firms with long operating-cycles. In Panel B, I test whether

*Panel A: market pricing of CFO and accruals for firms with different operating cycles with their respect to their implications for one-year-ahead ROA*

| *Forecasting coefficient* | | | *Valuation coefficient* | | |
|---|---|---|---|---|---|
| *Parameter (variable)* | *Estimate* | *t-value* | *Parameter (variable)* | *Estimate* | *t-value* |
| $\delta_1$ | 0.740048 | 85.92* | $\delta_1^*$ | 0.766937 | 31.81* |
| $\delta_2$ | 0.796372 | 227.52* | $\delta_2^*$ | 0.700535 | 76.8* |
| $\delta_a$ | −0.00329 | −2.56* | $\delta_2^*$ | 0.005953 | 1.79 |
| $\delta_4$ | 0.000711 | 5.62* | $\delta_4^*$ | 0.001901 | 5.81* |

*Panel B: test of rational pricing of accruals across firms with various operating-cycles*

| *Null hypotheses* | *Likelihood ratio statistic* | *Marginal significance level* |
|---|---|---|
| Acc : $\delta_1 = \delta_1^*$ | 2.89 | 0.080 |
| CFO : $\delta_2 = \delta_2^*$ | 98.22 | $<0.0001$ |
| Acc_rcycle : $\delta_a^* = \delta_a^*$ | 6.73 | 0.0095 |

**Notes:** Non-linear generalized least estimation (the Mishkin test) of the market pricing of accruals with their respect to their implications for one-year-ahead earnings, across firms that have various operating cycles; equations (4) and (5)

**Table V.**
Test of *H2*

this mispricing is statistically significant, and apparent overpricing of accruals in long operating-cycle firms is significant ($p = 0.0095$), corroborating the null hypothesis that the mispricing of accruals is greater for firms with longer operating cycles.

## V. Conclusion

In this paper, I study whether the differential accrual persistence and accrual mispricing vary with the operating cycles. Dechow (1994) documents that the longer the operating cycle, the more volatile the accrual component of earnings. Higher accrual volatility adds estimation difficulty in the accounting process. In addition, firms with more volatile accruals are more inclined to smooth earnings. As a result, earnings of firms with long operating-cycles are of lower quality, and are subject to a greater degree of manipulation, relative to firms with short operating-cycles. Sloan (1996) and Xie (2001) argue the errors and subjectivity involved in calculating accruals result in the lower persistence of the accruals component of earnings than the cash component of earnings. Linking the above literature, I predict the differential persistence of accruals is greater for firms with long operating-cycles. I find evidence from the US public firms supporting this prediction.

Sloan (1996) and Xie (2001) also attribute the investor's inability to assess the persistence of different components of earnings into future earnings drive accrual mispricing. Given the fact that long operating cycle even reduces the persistence of accruals, I provide two hypotheses. The null hypothesis that the mispricing of accruals is greater for firms with longer operating cycle, and this prediction is based on the fact of market's fixation on earnings. In contrast, if the market is rational, and investors can see through the effect of the operating cycle on the accruals' persistence, then the mispricing of accruals is less severe for firms with longer operating-cycles, as predicted in the alternative hypothesis. The empirical evidence is consistent with the null hypothesis, suggesting that the market cannot distinguish accruals quality for firms with different length of operating cycle.

In sum, this paper adds to the growing literature that has begun to examine the factors affecting accrual persistence and accrual mispricing. I argue that long operating-cycles contribute to the greater differential persistence of accruals, and investors are unable to assess the cross-sectional variation in accrual persistence. This study also contributes to the literature explaining the differential persistence between accruals and cash flows. Sloan (1996), Xie (2001) and Dechow and Dichev (2002) argue that the lower persistence of accruals is primarily due to errors, subjectivity and opportunism involved in the accrual process. The other explanation, offered by Fairfield *et al.* (2003a, b) and Martin (2007), insists that the lower persistence of accruals, is a specific manifestation of a more general negative incremental relation between one-year-ahead ROA and growth in net operating assets, and they attribute this negative relationship to diminishing returns of the new investment. This paper documents that accruals of firms with lower earnings quality are less persistent, providing evidence to the first explanation that differential persistence between accruals and cash flows are due to their estimation precision.

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## Further reading

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