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Do Stock Prices of Property Casualty Insurers Fully Reflect Information about Earnings, Accruals, Cash Flows, and Development?

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Abstract. This paper examines whether the stock prices of property and casualty (P&C) insurers fully reflect information contained in earnings, cash flows and accruals, and one particular accrual—development of loss reserves. The reserve for policy losses is a major accrual for P&C firms, requires substantial judgment and is the subject of unique disclosures that reveal the ex post error in management estimates. We find that investors underestimate the persistence of cash flows and overestimate the persistence of accruals for P&C insurers, but our evidence suggests the market does not underestimate the persistence of the development accrual.

Keywords: Financial reporting, accruals, earnings management, market efficiency, property and casualty insurance, policy loss reserves

1. Introduction

A central feature of the financial reporting model is accrual accounting, which recognizes income when earned, independent of the timing of cash receipts and disbursements. A crucial element of accrual accounting is its reliance on management's judgments and estimates to allow better matching of costs and revenues. The information provided by accrual accounting to investors, however, depends on the extent to which accruals reflect managers' information. The degree to which investors infer managers' information from reported accruals depends on how investors process accrual information, and their ability to undo potential manipulation by management. We address this question by examining whether the stock prices of property and casualty insurers *fully* reflect information contained in earnings, cash flows, and accruals, and one particular accrual—development of loss reserves.

The property and casualty insurance industry provides a rich context in which to examine the behavior and informativeness of accruals. Accrual accounting plays a major role in the estimation of liabilities and the determination of income for property and casualty ("P&C") insurers. In particular, the reserve for policy losses is the major liability of P&C insurers, with a mean of 25.5% of total assets for our sample. The provision for policy losses is a major expense item, with a mean of 72.0% of total premiums paid. Furthermore, the reserve and provision require management to exercise substantial judgment in estimating future cash payments that will be required to pay for losses currently incurred. These payments occur over several years and have a duration that is longer than many of the operating accrual items typically found in industrial companies, with the possible exception of depreciation.

The judgment required to estimate these amounts provides management an opportunity to exercise its discretion over the timing and magnitude of amounts recognized, as Petroni

(1992) shows. She documents that P&C insurers experiencing financial difficulty underestimate policy loss reserves. Beaver and McNichols (1998) show that revisions in prior years' loss reserve estimates, (called development of loss reserves), behave as if discretion is exercised. In particular, if loss reserves fully reflect management's information at the time of estimation, one would expect the development of loss reserves to have a mean of zero and to be serially uncorrelated. Beaver and McNichols find significant positive serial correlation in development, consistent with management reflecting information in the loss reserve gradually over time. They also find that controlling for current development, stock prices are significantly associated with future loss reserve development. Furthermore, the market assigns a higher coefficient on the current development of firms with greater serial correlation in their development. Taken together, the results suggest that management gradually reflects information in the development of policy loss reserves, but that capital markets at least *partially* reflect information about future development in prices.

Our present study examines whether equity prices of P&C insurers *fully* reflect current development information. This inquiry is motivated by research on market efficiency with respect to earnings in general and accruals in particular. Recent research has documented a number of empirical regularities consistent with the hypothesis that capital markets do not fully incorporate accounting information, particularly earnings.[1] Especially relevant to our study, Sloan (1996) finds that the market overestimates the persistence of accruals and underestimates the persistence of cash flows. Our focus on the P&C industry is motivated by the extensive disclosures the SEC requires it to provide about loss reserves, its primary accrual. In particular, we argue that one component of the accrual, development of loss reserves, may be fully reflected in prices even if accruals in general are not. We contend this for two reasons. First, the industry-specific disclosures on policy loss reserves, including their development, may make it more transparent for investors to assess the implications of current development for future earnings. Second, our prior study supports this contention in that we find investors at least partially reflect future development in pricing.

We examine the market's use of information about earnings, cash flows, and accruals in a distinctive informational setting, one in which investors have access to substantial information about management's historical ability to estimate loss reserves. On an annual basis, P&C insurers disclose the revisions of their estimates of loss reserves for the current and ten preceding years. By providing data relevant to estimating the time series properties of development, the development disclosures may enable market participants to better estimate the persistence of accruals than is possible for firms in a variety of nonfinancial sectors.[2] Our study therefore provides evidence on whether such disclosures are sufficient to enable prices to reflect information about a major accrual of P&C insurers.

We first examine whether the market efficiently prices the accruals and cash flows of P&C insurers. To allow comparability with Sloan's (1996) findings for nonfinancial firms, we apply his empirical procedures to our sample of P&C insurers. We examine the time series properties of accruals and cash flows with respect to forecasting future earnings. We then estimate a set of joint equations and test whether the coefficients assigned to the accruals and cash flow components of earnings in explaining contemporaneous abnormal returns are consistent with their predictive ability for future earnings. Because we expect that development may differ from other accruals, we decompose total accruals into two components, development and other accruals. We then examine the predictive ability of development, other accruals, and cash flows with respect to forecasting future earnings, and estimate the related set of joint equations to test whether contemporaneous abnormal returns reflect the implications of these earnings components consistently. To provide additional evidence to our contemporaneous returns tests, we examine the bivariate and multivariate association of cash flows, accruals, and development with future abnormal returns, to assess the extent to which future returns are explained by accruals, development, and cash flows.

We find that capital markets appear to underestimate the persistence of cash flows and overestimate the persistence of other accruals relative to their time series behavior, consistent with Sloan (1996). We confirm the disparity between the time series properties of cash flows and accruals and their valuation with bivariate and multivariate analyses of the association between future abnormal returns and earnings, cash flows, and accruals. We find that current year earnings are not significantly associated with subsequent year abnormal returns. However, current year accruals are significantly negatively associated with subsequent year abnormal returns and current year cash flows are significantly positively associated with subsequent year abnormal returns.

We next examine whether investors misestimate the persistence of the development component of current year accruals. We find that development reported in period t is associated with abnormal returns in periods $t - 1$ and t, but is not associated with abnormal returns in period $t + 1$. The association with abnormal returns in year $t - 1$ confirms the findings of Beaver and McNichols (1998), who conclude that the implications of development for future development and hence future earnings is at least partially reflected in security prices. The association with abnormal returns in year t confirms the findings of Anthony and Petroni (1997), who find that current development is significantly associated with current security returns. The lack of association with abnormal returns in year $t + 1$ indicates that the implications of development for future earnings are fully reflected in contemporaneous security prices. The finding is robust to two alternative definitions of abnormal returns. When examined in the context of multiple regressions including other accruals, development accruals, and cash flows, the magnitude of abnormal returns associated with the development component of accruals remains insignificant while the cash flow and the other accruals variables are generally significant. The findings suggest that the extensive disclosures about loss reserve accruals of P&C insurers help investors to estimate the persistence and valuation implications of this component of accruals.

The paper is organized as follows: Section 2 describes accounting for claim losses. Section 3 discusses market efficiency and our estimation procedures. Section 4 develops the hypotheses, and Section 5 describes the sample and variable definitions. Section 6 presents the results, and Section 7 provides a summary and concluding remarks.

2. Accruals and Accounting for Claim Losses

As mentioned earlier, the losses on claims filed by policyholders are a major accrual of P&C insurers. Under accrual accounting, the future payments for a year's policyholder losses are estimated and expensed in the policy year, rather than waiting until the future period in which cash payments are made for settled claims. This requires estimation of the costs to settle

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Reserves for loss and loss adjustment expenses, net of reinsurance	$297,853	$391,748	$472,010	$525,220	$547,098	$554,034	$574,619	$755,101	$552,320	$489,033	$388,418
Paid (cumulative) as of:											
One year later	180,516	197,555	242,757	300,707	320,264	327,634	344,876	519,969	351,985	304,714	
Two years later	238,947	271,163	328,606	391,970	401,019	403,434	423,713	635,861	485,462		
Three years later	272,955	310,757	366,369	420,853	426,412	425,671	443,055	721,445			
Four years later	289,901	326,495	377,980	429,791	433,642	432,086	457,430				
Five years later	296,310	330,014	381,507	431,791	436,522	434,949					
Six years later	297,764	330,879	382,230	432,975	437,365						
Seven years later	298,098	331,433	382,108	433,096							
Eight years later	298,649	331,344	382,129								
Nine years later	298,583	331,421									
Ten years later	298,541										
Reserves re-estimated as of:											
One year later	294,504	357,220	402,706	473,974	473,209	491,048	490,166	715,637	526,730	424,406	
Two years later	302,991	342,365	397,847	449,348	461,343	447,880	465,036	725,098	537,635		
Three years later	304,925	340,760	389,559	442,508	440,198	438,726	453,431	751,302			
Four years later	302,661	333,432	384,948	433,408	437,350	435,128	460,947				
Five years later	298,764	332,100	382,331	432,370	436,929	435,942					
Six years later	298,603	331,191	381,996	432,661	437,600						
Seven years later	298,319	331,274	381,914	433,050							
Eight years later	298,661	331,184	382,126								
Nine years later	298,531	331,473									
Ten years later	298,640										
Redundancy (Deficiency)	$(787)	$60,275	$89,884	$92,170	$109,498	$118,092	$113,672	$3,799	$14,685	$64,627	

Figure 1. Loss reserves and payments on claim losses of 20th Century Industries as of December 31,1997[a]. (amounts in thousands)

NOTE 8. LIABILITY FOR UNPAID LOSSES AND LOSS ADJUSTMENT EXPENSES

The following table provides a reconciliation of the beginning and ending liability for unpaid losses and loss adjustment expenses ("LAE"):

	1997	1996	1995
		(Amounts in thousands)	
Reserves for losses and LAE, net of reinsurance recoverables, at beginning of year	$489,033	$552,320	$755,101
Add:			
Provision for unpaid losses and LAE for claims occurring, in the current year, net of reinsurance	672,402	760,325	891,066
Decrease in provision for insured events of prior years, net of reinsurance	(64,627)	(25,590)	(39,464)
Total incurred losses and loss adjustment expenses, net of reinsurance	607,775	734,735	851,602
Deduct losses and LAE payments for claims, net of reinsurance, occurring during:			
The current year	403,676	446,037	534,414
Prior years	304,714	351,985	519,969
Total payments, net of reinsurance	708,390	798,022	1,054,383
Reserve for unpaid losses and LAE, net of reinsurance recoverables, at year end	388,418	489,033	552,320
Reinsurance recoverables on unpaid losses, at year end	49,469	54,496	32,514
Reserves for losses and LAE, gross of reinsurance recoverables on unpaid losses, at year end	$437,887	$543,529	$584,834

[a] As a result of changes in estimates of insured events in prior years, the provision for losses and loss adjustment expenses decreased by $64,627,000, $25,590,000, and $39,464,000 in 1997, 1996 and 1995, respectively, due to a combination of improvements in the claims handling process and unanticipated decreases in frequency and severity. The 1997, 1996, and 1995 decreases in provisions for insured events of prior years is offset by increases in losses related to the Northridge Earthquake of $24.75 million, $40 million, and $60 million, respectively.

Figure 1. (*continued*)

claims filed during the year as well as claims that will be filed in subsequent years, so called incurred but not reported claims. By estimating the losses from a year's policies, the costs of these losses can be recognized as expense in the same period in which the related premium revenue is recognized. For management, this involves estimating the magnitude and timing of the future cash flows. With some exceptions, such as workers' compensation claims and medical malpractice, the provision should equal aggregate expected cash payments without present value considerations.

Statement of Financial Accounting Standards No. 5, "Accounting for Loss Contingencies" (SFAS 5), covers loss contingencies in general, and applies to the accounting for policy losses. SFAS No. 5 requires the recognition of losses of principal only to the extent that they are "probable" and "reasonably estimable." However, these terms are not well defined, and are therefore subject to judgment that varies greatly in practice. Furthermore, there is substantial uncertainty about the timing and amount of future cash payments. The loss reserve therefore requires substantial judgment by management and thereby allows substantial discretion.

Financial reporting by P&C insurers requires disclosure of management's estimate of policy loss reserves for prior fiscal years. For example, Figure 1 shows the 1997 loss reserve disclosure for 20th Century Industries. Their 1997 disclosure shows the company's original estimate of the loss reserve at the balance sheet date in 1996 ($489,033,000), as well as their current estimate ($424,406,000). The difference in these estimates is known as development. It reflects the change in the company's policy loss reserves related to prior years' claims. An increase (decrease) in the loss reserve decreases (increases) total accruals and income, and implies the reserve was too low (high), conditional on information that arrived in the subsequent year. In 20th Century's case, its development is -$64,627,000, which increases its 1997 pretax income by $64,627,000.

As 20th Century Industries' disclosure illustrates, P&C insurers are required to disclose their updated estimates of loss reserves corresponding to their financial statement liability for the past nine years, and most do so for ten years. This results in what is known as a loss reserve triangle, which shows the sequence of revisions over time for a given financial reporting year and the aggregate revisions across policy years. In 20th Century's case, the cumulative redundancy (deficiency) was positive for all but 1987. This disclosure makes clear that its ultimate liability has been smaller than that initially reported for each of the prior nine years, and typically by a sizable amount.

Beaver and McNichols (1998) argue that if development fully reflects management's information, year-to-year development should be serially uncorrelated.[3] Their study provides evidence that development of prior years' policy loss reserves is in fact highly serially correlated, which means development that reduces net income in year t is expected to reduce net income in year $t + 1$. This study addresses whether the distinctive disclosure environment, which allows investors to estimate development's serial dependence, enables investors to fully reflect the implications of current development for future development in prices.

3. Market Efficiency and Mishkin Estimation Procedures

In a capital market that is efficient with respect to publicly available data, prices behave as if publicly available information is fully reflected in prices. In such a market, it is not possible to earn abnormal returns from trading strategies based on publicly available data. Market efficiency implies that capital markets process the implications of publicly available information for future earnings and cash flows in an unbiased manner. As Sloan (1996) argues, the ability of current and past earnings, accruals, and cash flows to predict future earnings should be reflected in prices at each point in time. Moreover, prices should weight the respective variables according to their predictive ability. In other words, prices should neither overestimate nor underestimate how important earnings or its components are in forecasting future earnings. One would therefore expect a consistency between the predictive ability implied by the time series characteristics of earnings and the implicit weight on earnings in price. This is closely related to the concept of rational expectations, where prices at any point in time reflect unbiased expectations of future value-relevant variables. Much attention has been directed toward whether current prices reflect unbiased forecasts of future prices. The rational expectations concept implies current prices reflect unbiased expectations about other value relevant variables, such as future earnings, as well.

Foster, Olsen, and Shevlin (1984), Bernard and Thomas (1990), Abarbanell and Bernard (1992), and Ball and Bartov (1996) document that security prices underestimate the implications of earnings forecast errors for future earnings. In other words, earnings are more persistent than investors assume. Sloan (1996) finds that accruals are less persistent than cash flows, as reflected in their lower coefficient in predicting future earnings. Yet, the market appears to apply too high a coefficient to accruals relative to their predictive ability for future earnings. Sloan also forms a "hedge" portfolio based on the accrual component in earnings and finds abnormal returns associated with investing long in the firms with the lowest accruals and short in the firms with the highest accruals.

We examine whether prices of P&C insurers' equity *fully* reflect the implications of development, other accruals, and cash flows. Specifically, following Mishkin (1983) and Sloan (1996), we test whether there is an inconsistency between the predictive ability of accruals and the weights on accruals that are implicit in prices. Sloan applies Mishkin's (1983) rational expectations methodology to develop a system of equations that permits a test of consistency between the weights assigned to predictors of earnings, accruals, and cash flows based on the earnings response coefficients obtained from a regression of security returns on unexpected earnings. In this study, we estimate this system of equations jointly to test for consistency between the weights assigned to predictors of earnings and their weights in explaining contemporaneous security returns. We also directly test the implications for future abnormal returns by examining their association with the components of current year earnings.

4. Hypotheses

We assess whether share prices of P&C insurers fully reflect the information in loss reserve development, other accruals and cash flows. The motivation for our hypotheses follows.

4.1. Forecasting Future Earnings

We first examine the predictive ability of the accruals and cash flow components of current earnings for future earnings to provide a basis for comparison with prior research on noninsurance firms. Our first estimation equation is:

$$Earnings_{t+1} = \gamma_0 + \gamma_1\ Accruals_t + \gamma_2\ Cash\ Flows_t + u_{t+1} \tag{1}$$

This equation regresses subsequent year earnings, $Earnings_{t+1}$, on current year accruals and cash flows.[4] Based on Sloan (1996), one might posit that accruals are less persistent than cash flows. However, since the nature of the accruals of P&C insurers and industrial firms are different, we do not make this prediction. The development of loss reserves exhibits positive serial correlation, which could result in greater persistence than for industrial firms. On the other hand, the P&C industry is very sensitive to interest rate changes and catastrophes, which would cause their accruals to be less persistent.

Our second prediction equation tests whether development of loss reserves has explanatory power for future earnings, controlling for other accruals and cash flows. Specifically, we estimate:

$$Earnings_{t+1} = \gamma_0 + \gamma_1\ Othacc_t + \gamma_2\ Cash\ Flows_t + \gamma_3\ Development_t + u_{t+1} \tag{2}$$

where $Othacc_t$ is defined as total accruals less the development accrual. Following the reasoning related to equation (1), we do not make a specific prediction about the magnitude of the coefficients. Our primary interest is not in these coefficients *per se* but in how they compare to the coefficients that reflect the market's pricing of these variables.

4.2. Valuation Implications

Following Sloan (1996), we assume that only unexpected changes in earnings are correlated with abnormal returns. We use earnings forecasting equation (1) to specify expected and unexpected earnings, allowing separate coefficients to be estimated for the cash from operations and accruals components. This equation, in conjunction with equation (3), specifies our system of equations:

$$Abnormal\ Return_{t+1} = \beta(Earnings_{t+1} - \gamma_0 - \gamma_1^*\ Accruals_t - \gamma_2^*\ Cash\ Flows_t) + e_{t+1} \tag{3}$$

Equations (1) and (3) provide the structure for our first test of whether capital markets fully reflect the information embedded in the time series behavior of earnings components. Under the null hypothesis that the information about earnings components is fully reflected in prices, $\gamma_1 = \gamma_1^*$ and $\gamma_2 = \gamma_2^*$. Under the alternative, at least one of the pairs of coefficients is unequal. Sloan (1996) found that investors assign too high a coefficient to accruals, $\gamma_1 < \gamma_1^*$, and too low a coefficient to cash flows, $\gamma_2 > \gamma_2^*$. As discussed earlier, the substantial additional disclosures provided in this sector potentially permit investors to assess the implications of development for future earnings and hence value. In particular, the supplemental disclosures with respect to the development of loss reserves can potentially enable market participants to draw inferences regarding the persistence of accruals that are not available to investors in Sloan's broad sample of firms across all nonfinancial sectors. This hypothesis tests for a very strong implication of investors fully reflecting the supplemental information in loss reserve disclosures. That is, if investors fully reflect the implications of the loss reserve disclosures, they will properly assess the persistence of all accruals and cash flows of P&C firms. Stated formally,

H_1: The earnings expectations embedded in stock prices are consistent with the persistence of the accrual and cash flow components of earnings.

We then use earnings prediction equation (2) to specify expected and unexpected earnings, allowing separate coefficients to be estimated for the cash from operations, development, and other accruals components.

$$Abnormal\ \ Return_{t+1} = \beta(Earnings_{t+1} - \gamma_0 - \gamma_1^*\ Othacc_t - \gamma_2^*\ Cash\ Flows_t - \gamma_3^*\ Development_t) + e_{t+1} \quad (4)$$

Because we hypothesize that the supplemental disclosures facilitate better estimation of the persistence of the development component of accruals, we posit the null hypothesis of market efficiency (i.e., equality of coefficients). Stated formally,

H_2: The earnings expectations embedded in stock prices are consistent with the persistence of the development, other accrual, and cash flow components of earnings.

As for H_1, this hypothesis reflects a fairly broad implication of investors' use of supplemental loss reserve disclosures. However, the design of this test also permits a direct comparison of the coefficient on development in the prediction equation, γ_3, to the respective coefficient in the pricing equation, γ_3^*. We therefore can assess whether development is priced in a manner consistent with its predictive ability, even if other accruals and cash flows are not.

Finally, we test whether abnormal returns can be earned based on earnings, accruals, cash flows, or development. This hypothesis is similar to H_1 and H_2 but is a more direct test of the implications of mispricing for future abnormal returns. Under the null hypothesis that prices fully reflect development, cash flows, and other accrual information, the expected value of subsequent abnormal returns associated with portfolios formed on the basis of these variables is zero. The alternative hypothesis is that the expected abnormal returns conditional on any of these variables is non-zero.

We test this hypothesis using bivariate and multivariate approaches. Consistent with our primary research question, we focus these tests on development, and provide evidence on the association between subsequent abnormal returns and other accruals and cash flows for descriptive purposes. The first bivariate approach, following Bernard and Thomas (1990) and Sloan (1996), examines the abnormal returns in year $t + 1$ to portfolios formed by the decile of development scaled by average total assets in year t. Our second bivariate approach examines the correlations between subsequent year abnormal returns and the cash flow, development, and other accrual components of earnings.

H_3: There is no association between subsequent year abnormal returns and current development.

The multivariate approach regresses subsequent year abnormal returns on development, other accruals, and cash flows. We test for a significant association between subsequent year abnormal returns and each component of earnings, incremental to the others, to assess the extent that each earnings component contributes to any observed mispricing. Specifically, we estimate:

$$\textit{Abnormal Return}_{t+1} = \alpha_0 + \alpha_1\ \textit{Othacc}_t + \alpha_2\ \textit{Cash Flows}_t + \alpha_3\ \textit{Development}_t + e_{t+1} \quad (5)$$

where $\textit{Abnormal Return}_{t+1}$ is the abnormal return in the subsequent year. Our null hypothesis is that the coefficient on development, α_3, is zero, and the alternative hypothesis is that it is negative:

H_4: There is no association between subsequent year abnormal returns and current development, conditional on other accruals and cash flows.

5. Sample and Variable Definitions

P&C insurers' accruals are of interest because of their magnitude, their long-term uncertain nature, and the unique disclosures provided about them. Furthermore, the industry engages in a relatively homogeneous set of activities, although companies can differ by mix of product lines. Sample firms were initially identified if their primary SIC code from COMPUSTAT was 6331, or through the availability of a loss reserve triangle, through searches in Lexis/Nexis and internet databases. Our primary sample consists of 121 firms: 94 of these have a primary COMPUSTAT SIC code of 6331, and the remaining 27 have a primary SIC code of 3577, 6211, 6311, 6321, 6324, 6351, or 6411. These P&C insurers have required financial statement data available on COMPUSTAT, security returns available on CRSP for at least some of the years in the 1988–1997 sample period, and development data in their 10-K filings.[5] To mitigate the effects of extreme values, we exclude observations with values below (above) the 1% (99%) fractiles of the earnings, accrual, cash flow, development, and return distributions in analyses reported on actual values.[6] These data requirements result in an initial sample of 690 firm-year observations.

Our empirical tests require the measurement of five variables: earnings, cash from operations, accruals, development, and abnormal security returns. Following Sloan (1996), we define earnings as (pretax) operating income after depreciation (COMPUSTAT Item 178) divided by average total assets. We also examined the sensitivity of our results to measuring net earnings after special items but before extraordinary items (COMPUSTAT Item 18), to measuring net earnings from the statement of cash flows (COMPUSTAT Item 123), and to deflation by number of shares outstanding and by average total assets. The untabulated findings are essentially the same under these alternative measures.

We measure cash flows as cash from operations under Statement of Financial Accounting Standards No. 95 (SFAS 95), (COMPUSTAT Item 308), which limits our sample to the 1988–1997 period.[7] Collins and Hribar (2000) find that the use of this variable provides a more powerful measure than alternative estimates of cash flows, based on their study of nonfinancial firms.

Accruals are defined as earnings less cash from operations. This is distinct from the Sloan (1996) study where accruals were approximated as depreciation plus changes in selected current operating assets and liabilities. In our study, accruals are a derived number, while in Sloan's study, cash flow was derived from his accrual approximation. Our data on development of loss reserves is collected from firms' 10-K filings. Development is measured as the difference from the prior year's loss reserve estimate, and is signed to have the same effect on income as other accruals. That is,

$$Development_{t+1} = \text{Year } t \text{ loss reserve reported in year } t - \text{Year } t \text{ loss reserve reported in year } t + 1.$$

Applying this formula to the 20th Century Industries data, the company's 1997 development would be signed as \$64,627,000, consistent with its effect on total accruals and income.

Annual raw returns are constructed from the CRSP database by compounding monthly returns. We examine two measures of abnormal returns. The first, *ABRET1,* is the difference between the actual return and the return on the market portfolio, defined as the percentage change in the Value Weighted Index of NYSE, AMEX, and NASDAQ firms combined. The second measure, *ABRET2,* is actual returns less the return on a portfolio of stocks from the same size decile on CRSP, where the deciles are defined in terms of market capitalization of all common stocks in the index. Abnormal returns for year t are measured beginning in April of fiscal year t and ending March 31 of fiscal year $t + 1$.

6. Findings—Analysis of Earnings, Cash Flows, and Components of Accruals

6.1. Discussion of Means and Medians

Table 1 reports the means and medians of the variables used in our analysis for the 690 firm-years for which one year ahead earnings, current earnings, current accruals, current cash flows and one-year ahead security returns are available. The summary statistics are reported for ten decile portfolios ranked by the ratio of accruals to average total assets. The mean accrual ranges from –10.47% to a high of 7.04%, indicating wide variation in the accrual composition of earnings across portfolios. Interestingly, this also produces a monotonic inverse relation in mean cash flow to total assets, which ranges from 14.32% to –0.01%. The two components are negatively correlated with one another. This is expected from the basic nature of accruals, because the effect of accrual accounting is to provide a "smoothing" of earnings relative to cash flows, consistent with the research of Dechow (1994) and Dechow, Kothari, and Watts (1998).

In fact, the negative association is sufficiently strong that the implied mean ratio of current earnings to total assets (return on total assets) is essentially flat across portfolios 2–8. For example, the mean for portfolio 2 is 4.09% (10.22 − 6.13%), while the mean for portfolio 8 is 4.13% (0.90 + 3.20%).[8] There is also systematic variation in size across the portfolios. The mean size of the firms as measured by book value of total assets is significantly smaller in the extreme portfolios. This is expected in that operations are likely to be more volatile for smaller firms, leading to a greater disparity between cash flows and earnings for these firms in a given year.

Table 1. Mean and median values of selected characteristics for portfolios of firms formed annually by assigning firms to deciles based on the magnitude of accruals.[a] (Sample consists of 690 firm-years between 1988 and 1997).

	$Accruals_t$	$Cash\ Flows_t$	$Earnings_t$	$Earnings_{t+1}$	$ABRET1_{t+1}$	$ABRET2_{t+1}$	$Size_t$
Panel A: Means of Selected Variables							
1 Lowest	−0.1047	0.1432	0.0385	0.0386	−0.0154	0.0164	1686.0655
2	−0.0613	0.1022	0.0409	0.0446	−0.0130	0.0247	2329.2537
3	−0.0434	0.0878	0.0444	0.0407	0.0011	0.0404	4829.0023
4	−0.0291	0.0741	0.0451	0.0463	0.0053	0.0464	7441.1383
5	−0.0192	0.0589	0.0401	0.0406	0.0646	0.1036	11714.0089
6	−0.0125	0.0536	0.0411	0.0383	−0.0314	0.0034	12662.1164
7	−0.0020	0.0410	0.0391	0.0393	−0.0164	0.0144	18895.9847
8	0.0090	0.0320	0.0413	0.0406	−0.0649	−0.0420	10972.7690
9	0.0279	0.0292	0.0571	0.0456	−0.0599	−0.0163	5621.0200
10 Highest	0.0704	−0.0001	0.0702	0.0587	−0.0874	−0.0434	5134.4387
Panel B: Medians of Selected Variables							
1 Lowest	−0.1024	0.1456	0.0469	0.0437	−0.0109	0.0259	263.9290
2	−0.0538	0.1024	0.0413	0.0431	0.0213	0.0135	561.7130
3	−0.0387	0.0826	0.0413	0.0412	−0.0340	0.0092	699.8140
4	−0.0257	0.0704	0.0415	0.0425	0.0019	0.0586	1481.1295
5	−0.0178	0.0559	0.0374	0.0411	0.0160	0.0726	2183.6390
6	−0.0112	0.0494	0.0406	0.0381	−0.0299	−0.0061	3687.7270
7	−0.0009	0.0372	0.0377	0.0355	−0.0469	−0.0367	4377.5780
8	0.0096	0.0318	0.0419	0.0358	−0.0394	−0.0457	1712.2950
9	0.0270	0.0294	0.0532	0.0441	−0.0734	−0.0254	905.7000
10 Highest	0.0613	0.0043	0.0626	0.0580	−0.0975	−0.0439	557.0150

[a]The firm characteristics are computed as follows:

$Accruals_t$ = Operating income (DATA178) minus cash from operations (DATA308) in year t, deflated by average total assets (DATA6) in year t.

$Earnings_{t+1}$ = Operating income after depreciation (DATA178) deflated by average total assets in year $t+1$.

$Cash\ Flows_t$ = Cash flow provided by operations (DATA308) deflated by average total assets in year t.

$ABRET1_{t+1}$ = Actual security return less value-weighted index return in year $t+1$. Return is a twelve month return commencing in the fourth month after the fiscal-year end for year t.

$ABRET2_{t+1}$ = Actual security return less return on a size-matched, value-weighted portfolio of firms. The size portfolios are based on market value of equity deciles of NYSE, AMEX, and NASDAQ firms. The decile rankings and decile returns are provided by CRSP. Return is a twelve month return commencing in the fourth month after the fiscal-year end for year t.

$Size_t$ = Total assets (in millions of dollars) measured at the end of fiscal year t.

6.2. *Estimation of Prediction Equations*

Table 2 reports the estimation results for equation (1), in which earnings for year $t+1$ are regressed on year t accruals and cash flows. Based on the unranked data, the accrual and cash flow coefficients are 0.586 and 0.604, respectively. While the accruals coefficient is slightly lower, the difference is small and is not significantly different from zero. The difference is greater for the ranked data, where the accrual coefficient is 0.732, while the cash flow coefficient is 0.901, and the difference is significant with probability value 0.0001.

Table 2. Estimation results from ordinary least squares regressions of future earnings on the accrual and cash flow components of current earnings (t-statistics in parentheses).[a] (Sample consists of 690 firm-years from 1988–1997).

$$Earnings_{t+1} = \gamma_0 + \gamma_1\ Accruals_t + \gamma_2\ Cash\ Flows_t + u_{t+1} \quad (1)$$

	Actual values estimation	Ranked values estimation
Parameter	Parameter estimate (t-statistics)	Parameter estimate (t-statistics)
γ_0	0.015 (8.08)**	−2.856 (−7.47)**
γ_1	0.586 (16.70)**	0.732 (16.49)**
γ_2	0.604 (18.82)**	0.901 (20.32)**
F-test of $\gamma_1 = \gamma_2^{b}$:	0.62	27.61
Probability value:	0.43	0.0001

[a]Earnings, accruals, and cash flows are defined in Table 1.
**Denotes significance at the .05 level using a two-tailed t-test.

The finding is consistent with Sloan's (1996) finding that accruals are less persistent than cash flows. All of the coefficients are significantly different from zero.

Table 3 presents the estimation results for equation (2), in which accruals are separated into development and other accruals components. The estimation using actual values results in a coefficient of 0.590 on other accruals, 0.606 on cash flows, and 0.570 on the development variable. Each of the components of income is significantly positively associated with future earnings. However, none of the coefficients is significantly different from the other coefficients. The estimation using ranked values, however, indicates a different pattern. Specifically, the coefficient on other accruals, 0.684, is significantly greater than that on development, 0.316, and both are significantly smaller than the coefficient on cash flows, 0.866. The discrepancy between the ranked and unranked estimation results suggests the possibility that influential observations may be influencing the parametric results. To investigate this possibility further, we have applied influence diagnostics by Belsey, Kuh, and Welsch (1980) to all our regression analyses.[9]

6.3. Joint Estimation of Time Series and Abnormal Returns Equations

Table 4 reports the estimation results for equations (1) and (3), the accrual and cash flow decomposition. The estimates for γ_1, the coefficient on accruals, and γ_2, the coefficient on cash flows, are 0.587 and 0.604 respectively, as reported earlier. With respect to *ABRET1* (defined relative to the value weighted market index), the estimate of γ_1^* (γ_2^*) is 0.730 (0.492) and the estimate of β is 3.338. Taken at face value, the results suggest that investors place too little weight on cash flows and too much weight on accruals. To determine the significance of this difference, an alternate set of equations is estimated imposing the constraint that $\gamma_1 = \gamma_1^*$ and $\gamma_2 = \gamma_2^*$. The relevant test statistic is a likelihood ratio statistic that is distributed as a

Table 3. Estimation results from ordinary least squares regressions of future earnings on the accrual, cash flow, and development components of current earnings (t-statistics in parentheses).[a] (Sample consists of 690 firm-years from 1988–1997).

$$Earnings_{t+1} = \gamma_0 + \gamma_1\ Othacc_t + \gamma_2\ Cash\ Flows_t + \gamma_3 Development_t + u_{t+1} \quad (2)$$

Parameter	Actual values estimation: Parameter estimate (t-statistics)	Ranked values estimation: Parameter estimate (t-statistics)
γ_0	0.015 (7.98)**	−3.89 (−8.70)**
γ_1	0.590 (16.16)**	0.684 (14.80)**
γ_2	0.606 (18.44)**	0.866 (19.04)**
γ_3	0.570 (9.50)**	0.316 (10.14)**
F-test of $\gamma_1 = \gamma_3$:	0.11	56.69
Probability value:	0.74	0.0001
F-test of $\gamma_1 = \gamma_2$:	0.54	31.09
Probability value:	0.46	0.0001
F-test of $\gamma_2 = \gamma_3$:	0.36	119.28
Probability value:	0.55	0.0001

[a]

$Accruals_t$ = Operating income (DATA178) minus cash from operations (DATA308) in year t, deflated by average total assets (DATA6) in year t.

$Othacc_t$ = Accruals minus development in year t, deflated by average total assets (DATA6) in year t.

$Earnings_{t+1}$ = Operating income after depreciation (DATA178) deflated by average total assets in year $t+1$.

$Cash\ Flows_t$ = Cash flow provided by operations (DATA308) deflated by average total assets in year t.

$Development_t$ = The loss reserve estimate for year $t-1$ as estimated at the end of year t less the year $t-1$ estimate of the year $t-1$ loss reserve.

**Denotes significance at the .05 level using a two-tailed t-test.

$\chi^2(q)$ with q degrees of freedom, where $q = 2$, the number of constraints. The test statistic is 11.958 where a value of 9.21 is significant at the .01 level. When similar tests are conducted on *ABRET2* (defined relative to the return on the comparable size decile portfolio), the estimates of γ_1^* and γ_2^* are 0.674 and 0.470, respectively, and β is 2.772. The value of the likelihood ratio statistic is 7.603, which is significant at the .05 level. The findings suggest that the capital markets underestimate the persistence of cash flows and overestimate the persistence of accruals.

We also estimated this system of equations using the decile rankings of all the variables. The untabulated findings suggest that the difference in the pairs of coefficients in the prediction and pricing equations is less significant, as evidenced by an overall likelihood ratio statistic of 5.791 (5.032) when *ABRET1* (*ABRET2*) is the dependent variable in equation (3). The findings, though weaker, are consistent with the market underestimating the persistence of cash flows and overestimating the persistence of accruals.

Although not reported here, the constrained coefficients in the above likelihood ratio tests are essentially identical to the coefficients estimated from the univariate time series equation. The basic reason is that the goodness of fit of the earnings regression is greater than that of the abnormal return regression. As a result, forcing a common coefficient on both equations results in relatively higher deterioration in explanatory power on the earnings equation. Hence, the system compensates by placing greater weight on the coefficient from that regression.

Panel B of Table 4 presents the estimation results for the system of equations defined by (2) and (4). The findings indicate that the market assumes nondevelopment accruals are more persistent than their time-series behavior suggests. Consistent with the earlier findings, the market appears to underestimate the persistence of cash flows, with a coefficient of 0.514 in the pricing equation relative to a coefficient of 0.606 in the prediction equation. Similarly, γ_1 (γ_1^*) is 0.590 (0.759), consistent with the market overestimating the persistence of other accruals. By contrast, the coefficient on the development accrual in the pricing equation, 0.584, is very similar to the respective coefficient in the prediction equation, 0.570. To determine the significance of the difference in coefficients, we estimate equations (2) and (4) imposing the constraint that $\gamma_3 = \gamma_3^*$. The relevant test statistic is a likelihood ratio statistic that is distributed as a χ^2 with 1 degree of freedom. The test statistic for the *ABRET1* estimation indicates the difference in the coefficients is not significantly different from zero. Although none of the individual differences is significant, the magnitude of the differences across the coefficients is sufficient to reject the hypothesis that all the coefficients are equal. The estimation results suggest that the greatest differences are between the coefficients on cash flows and on other accruals.

Similar results are found for the estimation with *ABRET2* as dependent variable. Specifically, the market appears to underestimate the persistence of cash flows, with a coefficient of 0.495 in the pricing equation relative to a coefficient of 0.605 in the prediction equation. Similarly, γ_1(γ_1^*) is 0.593 (0.710), consistent with the market overestimating the persistence of other accruals. Furthermore, we are unable to reject the hypothesis that the coefficient on development in the pricing equation, 0.605, is equal to the coefficient on development in the prediction equation, 0.504. Taken as a whole, the findings suggest that prices do reflect the implications of development for future earnings but do not reflect the implications of other accruals or cash flows.[10]

Lastly, we estimated this system of equations using the decile rankings of all the variables. The untabulated findings suggest that the difference in the pairs of coefficients in the prediction and pricing equations is significant with probability value less than 0.05, as evidenced by an overall likelihood ratio statistic of 9.239 (8.810) when *ABRET1* (*ABRET2*) is the dependent variable in equation (4). However, the coefficients on development in the prediction and pricing equations remain insignificantly different. The findings are consistent with the market underestimating the persistence of cash flows and overestimating the persistence of other accruals.

6.4. Analysis of Future Abnormal Returns

While the evidence of inconsistency between the time series coefficient and that implied by market prices is consistent with market inefficiency, it is not direct evidence of market inefficiency for several reasons. First, model misspecification could account for the apparent

Table 4. Estimation results from nonlinear generalized least squares estimation of the stock price reaction to information about future earnings in accrual, cash flow, and development components of current earnings.[a] (Sample consists of 690 firm-years between 1988 and 1997).

Panel A: Estimation results for equations (1) and (3):

$$Earnings_{t+1} = \gamma_0 + \gamma_1\, Accruals_t + \gamma_2\, Cash\ Flows_t + u_{t+1} \quad (1)$$

$$Abnormal\ Return_{t+1} = \beta(Earnings_{t+1} - \gamma_0 - \gamma_1^*\, Accruals_t - \gamma_2^*\, Cash\ Flows_t) + e_{t+1} \quad (3)$$

	Estimate		Asymptotic standard error	
Parameter	*ABRET1*	*ABRET2*	*ABRET1*	*ABRET2*
γ_1	0.587	0.595	0.035	0.035
γ_1^*	0.730	0.674	0.109	0.126
γ_2	0.604	0.607	0.032	0.032
γ_2^*	0.492	0.470	0.091	0.116
β	3.338	2.772	0.391	0.378
Test of market efficiency: $\gamma_1 = \gamma_1^*$ and $\gamma_2 = \gamma_2^*$				
Likelihood ratio statistic:	11.958**	7.603*		

Panel B: Estimation results for equations (2) and (4):

$$Earnings_{t+1} = \gamma_0 + \gamma_1\, Othacc_t + \gamma_2\, Cash\ Flows_t + \gamma_3 Development_t + u_{t+1} \quad (2)$$

$$Abnormal\ Return_{t+1} = \beta(Earnings_{t+1} - \gamma_0 - \gamma_1^*\, Othacc_t - \gamma_2^*\, Cash\ Flows_t - \gamma_3^* Development_t) + e_{t+1} \quad (4)$$

	Estimate		Asymptotic standard error	
Parameter	*ABRET1*	*ABRET2*	*ABRET1*	*ABRET2*
γ_1	0.590	0.593	0.036	0.037
γ_1^*	0.759	0.710	0.114	0.132
γ_2	0.606	0.605	0.033	0.033
γ_2^*	0.514	0.495	0.101	0.119
γ_3	0.570	0.605	0.060	0.059
γ_3^*	0.584	0.504	0.184	0.214
β	3.342	2.770	0.391	0.378
Test of market efficiency: $\gamma_1 = \gamma_1^*$ and $\gamma_2 = \gamma_2^*$ and $\gamma_3 = \gamma_3^*$				
Likelihood ratio statistic:	13.160**	8.875*		

[a]

$Accruals_t$	=	Operating income (DATA178) − cash from operations (DATA308) in year t, deflated by average total assets (DATA6) in year t.
$Othacc_t$	=	*Accruals* − development in year t, deflated by average total assets (DATA6) in year t.
$Earnings_{t+1}$	=	Operating income after depreciation (DATA178) deflated by average total assets in year $t+1$.
$Cash\ Flows_t$	=	Cash flow provided by operations (DATA308) deflated by average total assets in year t.
$Development_t$	=	The loss reserve estimate for year $t-1$ as estimated at the end of year t less the year $t-1$ estimate of the year $t-1$ loss reserve.
$ABRET1_{t+1}$	=	Actual security return less value-weighted index return in year $t+1$. Return is a twelve-month return commencing in the fourth month after the fiscal-year end for year t.
$ABRET2_{t+1}$	=	Actual security return less return on a size-matched, value-weighted portfolio of firms. The size portfolios are based on market value of equity deciles of NYSE, AMEX, and NASDAQ firms. The decile rankings and decile returns are provided by CRSP. Return is a twelve-month return commencing in the fourth month after the fiscal-year end for year t.

The critical values for a chi square statistic with two degrees of freedom are 4.605 (probability value 0.10), 5.991 (probability value 0.05), and 7.824 (probability value 0.01). The critical values for a chi square statistic with three degrees of freedom are 6.251 (probability value 0.10), 7.815 (probability value 0.05), and 9.837 (probability value 0.01).

*Denotes significant at .05 level using a chi-square test.

**Denotes significant at .01 level using a chi-square test.

disparity in coefficients. Second, the coefficients are estimated from a set of contemporaneous observations. Investors do not know the time series coefficient for the 1988–1997 sample period until 1997. Hence, there is an issue of whether the estimated coefficient could have been learned by the market prior to the end of the estimation period. Third, the results with respect to earnings components are not completely robust across samples or methods of estimation. For these reasons, we turn to three additional tests based on accruals, development, and cash flows, to assess their ability to predict future abnormal returns.

Following Sloan's (1996) analysis of accruals, we construct portfolios based upon whether the development component of accruals is relatively high or low. The strategy does not utilize specific parameter estimates from the Mishkin (1983) procedure. It is important to note that portfolio formation in a given year does not use knowledge of future data that the regression analysis implicitly does. While it is not a completely independent test, it does look at future abnormal returns from the date of portfolio formation onward. Every twelve months (starting in the fourth month after the fiscal year-end), abnormal returns are computed for each of the ten portfolios.

Our portfolio analysis examines the abnormal returns associated with portfolios formed on the basis of development in period t. We focus on development because investors' ability to interpret its implications for future earnings is the central question in our study. Table 5 presents the mean and median of several variables, for portfolios partitioned on the level of development. The mean development ranges from –3.82% of average total assets to 3.18%. The serial correlation in development can be observed by the pattern of development in period $t + 1$. The ten portfolios range from –2.11% to 2.50% and appear to be highly correlated with development for period t.

The ranking based on development exhibits a large positive correlation with earnings in both years t and $t + 1$, which is not surprising given that earnings include development.[11] In fact, the mean earnings minus development, that is operating income before development, is relatively constant across the portfolios, indicating that the differences in development account for most of the earnings variation in these portfolio means. The cash flow portfolio means do not appear to vary systematically across portfolios as a function of the magnitude of development. Two of the largest values appear in the two extreme portfolios of mean cash flows, with little variation in the eight intermediate portfolios. Not surprisingly, the accruals means are highly positively correlated with development, since development is one of the components of accruals.

The last three columns of Table 5 present the mean and median values of abnormal returns for years $t - 1$, t, and $t + 1$ for the portfolios ranked on the decile of development in year t. Consistent with our earlier study, median abnormal returns in year t–1 are increasing in development in year t, suggesting that prices at least partially reflect information about future development. Similarly, median abnormal returns in year t are increasing in contemporaneous development, consistent with the findings of Anthony and Petroni (1997). With respect to the issue of market efficiency and subsequent abnormal returns, there is less evidence of an association between development in year t and median abnormal returns in year $t + 1$.[12]

Table 6 presents pairwise correlations between earnings and its components in year t and *ABRET1* and *ABRET2* in years $t - 1$, t, and $t + 1$. The findings indicate that abnormal returns in year $t - 1$ are significantly associated with subsequent year earnings, as evidenced by a

Table 5. Mean and median values of selected characteristics for portfolios of firms formed annually by assigning firms to deciles based on the magnitude of development of the policy loss reserve.[a] (Sample consists of 690 firm-year observations between 1988 and 1997).

	$Development_t$	$Development_{t+1}$	$Accruals_t$	$Cash\ Flows_t$	$Earnings_t$	$Earnings_{t+1}$	$ABRET1_{t-1}$	$ABRET1_t$	$ABRET1_{t+1}$
Panel A: Means of Selected Variables									
1 Lowest	−0.0382	−0.0211	−0.0312	0.0653	0.0341	0.0394	−0.0096	−0.0338	−0.0814
2	−0.0123	−0.0142	−0.0241	0.0594	0.0353	0.0323	0.0169	−0.0113	−0.0315
3	−0.0048	−0.0032	−0.0149	0.0546	0.0401	0.0376	0.0195	−0.0154	−0.0141
4	−0.0018	−0.0027	−0.0113	0.0584	0.0471	0.0413	0.0296	0.0030	−0.0237
5	0.0001	−0.0008	−0.0087	0.0485	0.0398	0.0350	0.0135	−0.0131	−0.0528
6	0.0019	−0.0001	−0.0177	0.0603	0.0427	0.0377	0.0182	0.0281	−0.0670
7	0.0049	−0.0412	−0.0242	0.0764	0.0522	0.0517	0.0970	0.0300	0.0353
8	0.0095	0.0074	−0.0149	0.0664	0.0518	0.0508	0.0196	0.0355	−0.0108
9	0.0164	0.0222	−0.0097	0.0628	0.0531	0.0540	0.0362	0.0471	0.0654
10 Highest	0.0318	0.0250	−0.0064	0.0668	0.0603	0.0528	0.0404	0.0556	−0.0416
Panel B: Medians of Selected Variables									
1 Lowest	−0.0300	−0.0150	−0.0319	0.0704	0.0406	0.0357	−0.0624	−0.0624	−0.0982
2	−0.0113	−0.0092	−0.0192	0.0535	0.0345	0.0348	−0.0336	−0.0352	−0.0275
3	−0.0039	−0.0026	−0.0119	0.0463	0.0429	0.0370	−0.0032	−0.0576	−0.0399
4	−0.0008	0.0000	−0.0109	0.0492	0.0428	0.0398	0.0018	−0.0319	−0.0449
5	0.0003	0.0006	−0.0095	0.0458	0.0387	0.0349	−0.0150	−0.0032	−0.0640
6	0.0022	0.0005	−0.0162	0.0555	0.0387	0.0381	0.0177	0.0052	−0.1077
7	0.0051	0.0038	−0.0197	0.0696	0.0469	0.0448	0.0920	0.0344	0.0221
8	0.0097	0.0072	−0.0142	0.0644	0.0480	0.0467	0.0186	−0.0147	0.0508
9	0.0169	0.0150	−0.0116	0.0588	0.0488	0.0487	0.0032	0.0611	0.0498
10 Highest	0.0292	0.0240	−0.0008	0.0616	0.0576	0.0502	0.0176	0.0289	−0.0338

[a] Variables are defined in Table 4.

Table 6. Descriptive statistics and correlation matrix.

Panel A: Descriptive Statistics

Variable	*N*	Mean	Std. Dev.	Median
$ABRET1_{t-1}$	625	0.0287	0.2781	0.0013
$ABRET1_{t}$	664	0.0131	0.2760	−0.0034
$ABRET1_{t+1}$	690	−0.0213	0.3055	−0.0331
$ABRET2_{t-1}$	622	0.0497	0.2752	0.0176
$ABRET2_{t}$	661	0.0364	0.2746	0.0179
$ABRET2_{t+1}$	688	0.0153	0.2901	0.0031
$Earnings_{t}$	690	0.0457	0.0342	0.0439
$Othacc_{t}$	690	−0.0172	0.0498	−0.0178
$Cash\ Flows_{t}$	690	0.0619	0.0540	0.0561
$Development_{t}$	690	0.0009	0.0191	0.0009

Panel B: Pearson Correlation Coefficients with Probability Values Shown Below

	$Earnings_{t}$	$Othacc_{t}$	$Cash\ Flows_{t}$	$Development_{t}$
$ABRET1_{t-1}$	0.1723	0.0602	0.0282	0.0685
	<.0001	0.0665	0.2410	0.0436
$ABRET1_{t}$	0.2123	−0.0866	0.1743	0.1043
	<.0001	0.0129	<.0001	0.0036
$ABRET1_{t+1}$	0.0136	−0.1342	0.1264	0.0166
	0.3613	0.0002	0.0005	0.3316
$ABRET2_{t-1}$	0.2050	0.0332	0.0692	0.0767
	<.0001	0.2045	0.0423	0.0280
$ABRET2_{t}$	0.1999	−0.0837	0.1644	0.1041
	<.0001	0.0158	<.0001	0.0037
$ABRET2_{t+1}$	0.0335	−0.1115	0.1176	0.0188
	0.1899	0.0017	0.0010	0.3116

Panel C: Spearman Correlation Coefficients with Probability Values Shown Below

	$Earnings_{t}$	$Othacc_{t}$	$Cash\ Flows_{t}$	$Development_{t}$
$ABRET1_{t-1}$	0.1821	0.0105	0.0872	0.0939
	<.0001	0.3966	0.0147	0.0095
$ABRET1_{t}$	0.1983	−0.0916	0.1649	0.1229
	<.0001	0.0092	<.0001	0.0008
$ABRET1_{t+1}$	0.0330	−0.1819	0.1543	0.0237
	0.1937	<.0001	<.0001	0.2676
$ABRET2_{t-1}$	0.2135	0.0072	0.1086	0.0862
	<.0001	0.4287	0.0034	0.0158
$ABRET2_{t}$	0.2151	−0.1086	0.1778	0.1294
	<.0001	0.0026	<.0001	0.0005
$ABRET2_{t+1}$	0.0602	−0.1741	0.1570	0.0358
	0.0574	<.0001	<.0001	0.1743

Variable definitions are in table 4.

Pearson (Spearman) correlation of 0.1723 (0.1821) for *ABRET1* and a Pearson (Spearman) correlation of 0.2050 (0.2135) for *ABRET2*. However, the findings indicate a relatively weak association between abnormal returns in year $t - 1$ and the other accruals and cash flow components of earnings in year t, with Pearson (Spearman) correlations of 0.0602 (0.0105) between $ABRET1_{t-1}$ and $Othacc_t$, and Pearson (Spearman) correlations of 0.0282 (0.0872) between $ABRET1_{t-1}$ and $Cash\ Flows_t$. In contrast, the association between abnormal returns in year $t - 1$ and development in year t is significantly positive: the Pearson (Spearman) correlations are 0.0685 (0.0939) between $ABRET1_{t-1}$ and $Development_t$, and 0.0767 (0.0862) between $ABRET2_{t-1}$ and $Development_t$, consistent with the market anticipating future development as documented by Beaver and McNichols (1998).

Consistent with prior research, the findings indicate that abnormal returns in year t are significantly associated with earnings in the aggregate as well as each of its components, including development. In contrast, abnormal returns in year $t + 1$ are not significantly associated with earnings in year t, consistent with Sloan (1996). However, the findings indicate a significant negative association between abnormal returns in year $t + 1$ and the *Other Accruals* and *Cash Flows* components of earnings in year t. Finally, and most importantly from the perspective of our study, neither measure of abnormal returns in year $t + 1$ is significantly associated with year t development. The Pearson correlations between year $t + 1$ *ABRET1* (*ABRET2*) and development are 0.0166 (0.0188) and the Spearman correlations between year $t + 1$ *ABRET1* (*ABRET2*) are 0.0237 (0.0358). These correlations are much smaller than those observed between the abnormal return measures for years $t - 1$ and t and year t development. The correlation analysis suggests that the information in year t development for future earnings is fully reflected in prices by year t.

6.5. Multivariate Analysis of the Association between Abnormal Returns and the Components of Earnings

In our final analysis, we estimate several regressions of abnormal returns in different periods on development, other accruals, and cash flows in period t.[13] Because influence diagnostics suggested the presence of influential observations that resulted in differences in the coefficients on some of the variables, Table 7 reports the estimation results after deletion of outliers.[14] The first estimation equation regresses abnormal returns from the fourth month of the prior year through the third month of the current year on other accruals, cash flows, and development. In the specification with $ABRET1_{t-1}$ as the dependent variable, abnormal returns are significantly associated with nondevelopment accruals ($t = 4.30$), cash flows ($t = 5.57$), and development in year t ($t = 3.95$). A similar pattern is observed for the specification with $ABRET2_{t-1}$ as the dependent variable: abnormal returns are significantly associated with nondevelopment accruals ($t = 5.12$), cash flows ($t = 6.31$), and development in year t ($t = 4.17$). The significant coefficient on development is consistent with our earlier study that documented that investors anticipate the implications of past development for future development in prices.

The second pair of estimation equations regresses $ABRET1_t$ and $ABRET2_t$ on nondevelopment accruals, cash flows, and development. In the specification with $ABRET1_t$ as

Table 7. Estimation results from regression of abnormal returns in periods $t-1$, t and $t+1$ on accruals, cash flows, and development in period t.

$$Abnormal\ Return = \alpha_0 + \alpha_1 Othacc_t + \alpha_2 Cash\ Flows_t + \alpha_3 Development_t + e_{t+1} \quad (5)$$

Dependent variable	$ABRET1_{t-1}$	$ABRET2_{t-1}$	$ABRET1_t$	$ABRET2_t$	$ABRET1_{t-1}$	$ABRET2_{t-1}$
Intercept	−0.081	−0.067	−0.096	−0.074	−0.078	−0.060
	(−4.93)	(−3.97)	(−6.23)	(−4.74)	(−4.49)	(−3.60)
Other Accruals	1.311	1.635	0.995	0.972	−0.720	−0.307
	(4.30)	(5.12)	(3.36)	(3.28)	(−2.22)	(−0.98)
Cash Flows	1.586	1.849	1.728	1.813	0.399	0.846
	(5.57)	(6.31)	(6.52)	(6.79)	(1.35)	(2.93)
Development	1.971	2.201	2.079	2.236	−0.064	0.5073
	(3.95)	(4.17)	(4.30)	(4.56)	(−0.12)	(0.99)
Adjusted R^2	0.053	0.066	0.086	0.097	0.040	0.053
F-Value	12.04	14.71	20.67	23.38	10.10	13.07
Number of observations	587	587	626	625	654	651

Variable definitions are in Table 4.

the dependent variable, abnormal returns are significantly associated with nondevelopment accruals ($t = 3.36$), cash flows ($t = 6.52$), and development in year t ($t = 4.30$). Similarly, for the specification with $ABRET2_{t-1}$ as the dependent variable: abnormal returns are significantly associated with nondevelopment accruals ($t = 3.28$), cash flows ($t = 6.79$), and development in year t ($t = 4.56$). The findings indicate that investors at least partially reflect the implications of these variables for future earnings in price contemporaneously.

The third set of estimation equations regresses $ABRET1_{t+1}$ and $ABRET2_{t+1}$ on nondevelopment accruals, cash flows, and development, in the spirit of Bernard and Thomas (1990) and Sloan (1996). In the specification with $ABRET1_{t+1}$ as the dependent variable, abnormal returns are significantly negatively associated with nondevelopment accruals ($t = -2.22$), marginally positively associated with cash flows ($t = 1.35$), and insignificantly associated with development in year t ($t = -0.12$). For the specification with $ABRET2_{t+1}$ as the dependent variable: abnormal returns are not significantly associated with nondevelopment accruals ($t = -0.98$), but are positively associated with cash flows ($t = 2.93$). Similar to the specification based on $ABRET1_{t+1}$, there is no evidence of a conditional association between abnormal returns and development ($t = 0.99$).[15] The findings indicate that investors fully reflect the implications of current year development for future earnings in price contemporaneously.

The findings of the bivariate and multivariate analyses of subsequent year abnormal returns reinforce the inferences drawn from the Mishkin tests in Table 4. Specifically, those tests suggested that there was a difference in the market's pricing of other accruals and cash flows relative to their predictive ability, but that the weight applied by investors in pricing development was consistent with its implications for future earnings. The findings based on our bivariate and multivariate analyses also suggest that investors fully process the implications of development for future earnings, although they fail to do so for other components of accruals and for cash flows.

6.6. Partitioning Other Accruals

Our final analysis estimates equation (5) where the other accruals variable is separated into two components: the current loss provision and all other accruals. We estimate this by first estimating the current loss provision, and then subtracting it from other accruals. We estimate the current loss provision, *Loss,* by calculating the change in the loss reserve liability and subtracting the current year's development. This should equal the current provision for claim losses less cash payments made during the year, and reflects the loss reserve accrual not due to development.[16] This partition thus allows us to assess whether misestimation of the persistence of other accruals relates to the nondevelopment portion of the loss reserve accrual, *Loss,* or to accruals other than the loss reserve accrual, *NonLoss*.

$$\begin{aligned} \textit{Abnormal Return}_{t+1} = \alpha_0 + \alpha_1\, \textit{Loss}_t + \alpha_2\, \textit{Cash Flows}_t \\ + \alpha_3\, \textit{Development}_t + \alpha_3\, \textit{NonLoss}_t + e_{t+1} \end{aligned} \quad (6)$$

The untabulated findings suggest that both loss and nonloss related components of accruals are associated with abnormal returns. In the estimation with $ABRET1_{t+1}$ as the dependent variable, the coefficient on $Loss_t$ is negative and significant with probability 0.005 ($t = -2.84$), and the coefficient on $NonLoss_t$ is negative and significant with probability 0.07 ($t = -1.80$). In the estimation with $ABRET2_{t+1}$ as the dependent variable, the coefficient on $Loss_t$ is negative and significant with probability 0.095 ($t = -1.67$), and the coefficient on $NonLoss_t$ is negative but insignificant with probability 0.65 ($t = -0.46$). In both these regressions, the coefficient on development remains insignificant, with probability values 0.56 and 0.48, respectively. The findings therefore suggest that although investors fully process the implications of development for future earnings, they do not fully process the implications of the current provision for losses.

7. Summary and Concluding Remarks

Our study examines whether share prices fully reflect the information in cash flows, development, and other accruals. We begin by replicating Sloan's (1996) analysis of aggregate accruals and cash flows for a sample of P&C insurers. Specifically, we test whether the market responds to accrual and cash flow information in a manner consistent with its predictive ability. We next disaggregate accruals to examine the predictive ability of development and other accruals, and to assess the extent to which this is reflected in prices. We then test whether future abnormal returns are associated with development, accruals, and cash flows.

With respect to our analysis of accruals, we find that capital markets perceive earnings to be as persistent as its times series behavior would suggest. Consistent with Sloan (1996), we find that capital markets appear to overestimate the persistence of accruals and to underestimate the persistence of cash flows relative to its implied time series behavior. This disparity between the time series persistence and the weight of the variable in valuation is also reflected in the analysis of the bivariate association between future abnormal returns and earnings, cash flows, and accruals. Specifically, subsequent year abnormal returns are not significantly associated with current year earnings, but are significantly positively associated with current year cash flows and are significantly negatively associated with current year accruals. When this relation is examined on a multivariate basis, the results vary somewhat for alternative abnormal return measures. However, the overall pattern remains consistent with either overestimation of the persistence of accruals or underestimation of the persistence of cash flows.

With respect to development, we find that development reported in period t is not associated with abnormal returns in period $t + 1$. Unlike Sloan's (1996) finding that the market overestimates the persistence of accruals, our evidence suggests the market does not underestimate the persistence of the development accrual. These findings suggest that the development disclosures unique to P&C insurers may help investors to better process their time series implications. What remains puzzling, however, is why investors in this industry misestimate the persistence of other components of earnings. One possibility is that the loss reserve disclosures better enable investors to assess the persistence of development but are less useful for assessing the persistence of the other components of earnings. Why this pricing anomaly persists, and the potential for more extensive disclosure to mitigate it, remain important issues for future research.

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Notes

1. See Beaver (1998) for a summary.
2. Lundholm (2000) argues that requiring disclosures of subsequent revisions of estimates for major accruals of non-financial firms will allow investors to better identify manipulation in accruals and will improve the credibility of financial reporting.
3. Year-to-year development is calculated as the initial loss reserve estimate (shown as the top line of data on the triangle) less the reserve as re-estimated one year later.
4. The measurement of these variables is described in Section 5.
5. We collect all of the 9 available observations of one year ahead development from the first development disclosure, and then collect each subsequent year's observation from the next year's triangle.
6. Our findings are robust to this exclusion, in that we obtain similar findings on the full sample.
7. Sloan approximates cash from operations by adding depreciation to operating income and adjusting for the changes in current operating assets and liabilities to include years prior to the issuance of SFAS 95. However, this approximation is less applicable to our sample as it is not clear what the analogous computation would be. P&C insurers do not have material amounts of either inventory or depreciation, nor are their balance sheets classified into current and non-current items.
8. The difference between 7.02% and 7.04-0.01% is due to rounding.
9. The estimation results excluding influential observations lead to different inferences in only one set of regressions, in which case we describe both sets of results.
10. An interesting extension of this analysis is suggested by the findings of Petroni, Ryan, and Wahlen (2000). They partition development into discretionary, nondiscretionary, and residual components and document that the discretionary component is negatively related to future profitability, and the nondiscretionary component is positively related to future profitability. It would be interesting to examine whether investors fully reflect the implications of these components for future earnings in security prices.

11. Recall that our development variable is signed to have the same sign as the income effect of development.
12. We present the portfolio results for descriptive purposes. Our formal statistical tests of association are based on the bivariate and multivariate correlation analysis we present next.
13. The accruals variable in these models excludes development.
14. Observations with a studentized residual in excess of 2 or DFFITS statistic greater than 2 were deleted, following Belsey, Kuh, and Welsch (1980). The primary difference in estimation results relates to the coefficients on other accruals and on cash flows in the $ABRET1_{t+1}$ and $ABRET2_{t+1}$ regressions. Specifically, for the full sample, the coefficient on other accruals is -0.566 ($t = -1.44$) and the coefficient on cash flows is 0.310 ($t = 0.88$) in the $ABRET1_{t+1}$ equation. The coefficient on other accruals is -0.270 ($t = -0.72$) and the coefficient on cash flows is 0.442 ($t = 1.31$) in the $ABRET2_{t+1}$ equation.
15. Note that if investors overestimate the persistence of the development accrual, subsequent abnormal returns would be negatively associated with the current year income effect, and therefore would be reflected in a negative coefficient in equation (5).
16. Similar to our treatment for development, the sign for *Loss* and *NonLoss* is consistent with their income effects.

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