Accounting earnings and cash flows as measures of firm performance
The role of accounting accruals

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Abstract
This paper investigates circumstances under which accruals are predicted to improve earnings' ability to measure firm performance, as reflected in stock returns. The importance of accruals is hypothesized to increase (i) the shorter the performance measurement interval, (ii) the greater the volatility of the firm's working capital requirements and investment and financing activities, and (iii) the longer the firm's operating cycle. Under each of these circumstances, cash flows are predicted to suffer more severely from timing and matching problems that reduce their ability to reflect firm performance. The results of empirical tests are consistent with these predictions.

Key words: Capital markets; Accruals; Operating cycle; Timing and matching problems; Summary measures of performance

JEL classification: C52; G14; M41

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1. Introduction

Earnings are the summary measure of firm performance produced under the accrual basis of accounting. Earnings are important since they are used as a summary measure of firm performance by a wide range of users. For example, they are used in executive compensation plans, in debt covenants, in the prospectuses of firms seeking to go public, and by investors and creditors. The objective of this paper is to better understand the role of accruals in producing earnings as one of the key outputs of the accounting process. Specifically, the paper examines how accruals improve earnings' ability to reflect firm performance and the circumstances in which accruals are important in performing this role.

The view adopted in this paper is that the primary role of accruals is to overcome problems with measuring firm performance when firms are in continuous operation. Information asymmetries between management and other contracting parties create a demand for an internally generated measure of firm performance to be reported over finite intervals. This measure can be used to contract and recontract as well as to evaluate and reward management. The success of a firm depends ultimately, on its ability to generate cash receipts in excess of disbursements. Therefore, one performance measure that could be used is net cash receipts (realized cash flows). However, over finite intervals, reporting realized cash flows is not necessarily informative. This is because realized cash flows have timing and matching problems that cause them to be a 'noisy' measure of firm performance. To mitigate these problems, generally accepted accounting principles have evolved to enhance performance measurement by using accruals to alter the timing of cash flows recognition in earnings.

Two important accounting principles that guide the production of earnings are the revenue recognition principle and the matching principle. The revenue recognition principle requires revenues to be recognized when a firm has performed all, or a substantial portion, of services to be provided and cash receipt is reasonably certain. The matching principle requires cash outlays associated directly with revenues to be expensed in the period in which the firm recognizes the revenue. By having such principles, the accrual process is hypothesized to mitigate timing and matching problems inherent in cash flows so that earnings more closely reflects firm performance.

The view that accruals will improve the ability of earnings to measure firm performance is expressed by the FASB. For example, Statement of Financial Accounting Concepts No. 1, paragraph 44 states:

'Information about enterprise earnings and its components measured by accrual accounting generally provides a better indication of enterprise performance than does information about current cash receipts and payments.'
However, the use of accruals introduces a new set of problems. Management typically have some discretion over the recognition of accruals. This discretion can be used by management to signal their private information or to opportunistically manipulate earnings. Signaling is expected to improve the ability of earnings to measure firm performance since management presumably have superior information about their firm's cash generating ability (Holthausen and Leftwich, 1983, Watts and Zimmerman, 1986, Holthausen, 1990, and Healy and Palepu, 1993). Therefore, a credible signal will reduce information asymmetry and result in more efficient contracting. However, to the extent that management use their discretion to opportunistically manipulate accruals, earnings will become a less reliable measure of firm performance and cash flows could be preferable. This alternative view of accrual accounting is often expressed in the popular press:

'Many financial analysts regard operating cash flow as a better gauge of corporate financial performance than net income, since it is less subject to distortion from differing accounting practices' (Chemical Week, May 8, 1991, p. 28).

'A growing number of portfolio managers and analysts insist that cash flows is a more meaningful measure of a company's value than reported earnings' (Institutional Investor, August 1988, p. 55).

Therefore, it is an empirical question as to whether the net effect of accruals is to improve or reduce the ability of earnings to measure firm performance.

The concern that management will use their information advantage to opportunistically manipulate accruals is consistent with the allowable set of accruals being limited by accounting conventions (Watts and Zimmerman, 1986). Accounting conventions, such as objectivity, verifiability and the use of the historical cost valuation model, limit the flexibility of management to manipulate revenue and expense recognition. In the absence of problems with information asymmetries, such conventions would be dysfunctional since they place a constraint on earnings' ability to reflect firm performance. However, since management manipulation is not always detectable (at least over short measurement intervals), contracting parties desire a performance measure that is reliable (and verifiable by auditors) so that there are bounds on the manipulation that can occur. The accrual process is therefore the result of a trade-off between relevance and reliability (Ball, 1989; Watts and Zimmerman, 1986, p. 206; Statement of Financial Accounting Concepts No. 2, paragraph 90). This suggests that earnings will also suffer from timing and matching problems over short time intervals but to a lesser extent than realized cash flows.

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1 The term accrual is used in a general sense and includes both accruals and deferrals.
In this paper, the empirical tests use stock price performance as the benchmark against which to compare realized cash flows and earnings. Stock prices are viewed as encompassing the information in realized cash flows and earnings concerning firm performance. The paper makes predictions concerning problems with realized cash flows and how earnings overcomes these problems through the use of accruals. Therefore, the focus of the tests is to assess the ability of each measure to reflect firm performance in their realized form (as opposed to their innovative or unexpected form). Existing research has generally focused on determining whether the unexpected component of earnings or cash flows can incrementally explain abnormal stock returns (Bowen, Burgstahler, and Daley, 1987; Livnat and Zarowin, 1990). The results are generally consistent with both cash flows and earnings providing incremental information vis-a-vis one another. However, these tests do not directly address the question of which measure is a relatively superior summary measure of firm performance given the choice of one. This is of interest since it is rare to observe the use of both earnings and cash flows in contracts. For example, the Sibson & Company's (1991) survey indicates that earnings are almost universally used in executive compensation contracts. Few firms use both earnings and cash flows to assess management performance. The purpose of this paper is to examine why earnings is the most frequently used summary measure of firm performance.

Research by Rayburn (1986), Wilson (1986, 1987), and Bernard and Stober (1989) examines whether unexpected cash flows and accruals are significant in a regression where abnormal stock returns are the dependent variable. The results of Rayburn and Wilson are consistent with both components having incremental information, while Bernard and Stober find little evidence of either component having incremental information. As the focus of these studies is to test for information content, they do not directly assess whether reported earnings is a superior summary measure to realized cash flows. To do this, it is necessary to demonstrate that setting the coefficient on reported accruals and realized cash flows to be equal results in a better specified model than constraining the coefficient on reported accruals to zero. The evidence to date is ambiguous (Jennings, 1990). This study builds on existing research by (i) formally establishing that earnings is a superior summary measure of firm performance, (ii) demonstrating the role of accruals in mitigating temporary matching problems in cash flows, and (iii) identifying the determinants of timing and matching problems in cash flows, thus highlighting the circumstances under which accruals play a more important role in measuring firm performance.

\[ \text{Earnings is the aggregate of cash flows and accruals (i.e., earnings = cash flows + accruals).} \]

Therefore, earnings places equal weights on both components. If cash flows have incremental information over earnings, then this implies that the coefficients on accruals and cash flows are not equal (and vice versa). Biddle and Seow (1992) discuss in detail incremental information content versus relative explanatory power.
The paper predicts that for firms in steady state (i.e., firms with cash requirements for working capital, investments, and financing that are relatively stable), cash flows have few timing and matching problems and are a relatively useful measure of firm performance. However, for firms operating in volatile environments with large changes in their working capital and investment and financing activities, cash flows will have more severe timing and matching problems. Thus, cash flows' ability to reflect firm performance will decline as the firms' working capital requirements and investment and financing activities increase. Accruals are predicted to mitigate timing and matching problems in cash flows. As a consequence, earnings are predicted to better reflect firm performance than cash flows, in firms with more volatile operating, investment and financing activities. The paper also predicts that cash flows and earnings will be equally useful in industries with short operating cycles. However, in industries with long operating cycles, cash flows are predicted to be a relatively poor measure of firm performance. The results are consistent with these predictions.

Finally, the paper provides evidence on the relative importance of various accrual components. In particular, working capital accruals are demonstrated to be more important for mitigating timing and matching problems in cash flows than long-term operating accruals. Meanwhile, the class of special item accruals that are made primarily in response to previous over- or understatements of accruals are shown to reduce the ability of earnings to reflect firm performance.

The next section develops the research hypotheses and discusses the use of stock returns as the benchmark measure of firm performance. Section 3 provides details on sample selection and variable measurement. Section 4 presents the results of the empirical tests, and Section 5 concludes.

2. Testable predictions

The existence of information asymmetries between the firm's managers and outside parties contracting with the firm creates a demand for a summary measure of firm performance. This measure can be used to evaluate management and as a source of information to investors and creditors on the firm's cash generating ability. The problem faced by contracting parties is that although management is the most informed party to report on the firm's performance, they are also evaluated and rewarded based on the firm's performance. Therefore, in the absence of objective procedures to determine performance, external parties have difficulty assessing the reliability of signals produced by management. On the one hand, contracting parties could demand that managers report realized cash flows. These can be objectively measured but are influenced by the timing of cash receipts and disbursements. For example, management would be penalized for purchasing inventory (above beginning inventory levels) even if
this was a positive net present value decision. On the other hand, management could attempt to determine the firm’s expected future cash flows. This, however, would provide management with so much reporting flexibility that any signal produced would be difficult to verify and would result in an unreliable measure of firm performance.

The accrual process can be viewed as trading off these two problems when producing earnings. The accrual process provides rules on the timing of cash flow recognition in earnings so that earnings will more closely reflect firm performance than realized cash flows. However, accruals are also required to be objective and verifiable. For example, expenditures can only be capitalized when there is objective and verifiable evidence that the cash flows will be realized. Requiring objectivity and verifiability limits management’s discretion. This will reduce the usefulness of reported earnings in circumstances where management has private information concerning firm performance and could reveal this information through reported earnings. However, this will also reduce the possibility that management can provide false information for a private gain. If existing accruals are the outcome of efficient contracting, then accruals, on average, will improve the ability of earnings to measure firm performance relative to realized cash flows. Alternatively, if the dominant effect of accruals is to provide management with flexibility to manipulate earnings, then realized cash flows will provide a relatively more useful summary measure of firm performance over short measurement intervals.

2.1. Measurement interval predictions

This study compares the ability of earnings relative to net cash flows and cash from operations to reflect firm performance. Net cash flows will fluctuate with cash inflows and outflows associated with the firm’s investment and financing activities as well as the firm’s operating activities. Net cash flows have no accrual adjustments and are hypothesized to suffer severely from timing and matching problems (see Appendix 1). Cash from operations reflects the net cash flows generated by the firm’s operating activities. This measure includes accruals that are ‘long-term’ in nature (i.e., do not reverse within one year) and mitigate timing and matching problems associated with the firm’s investment and financing activities. However, cash from operations exclude accruals associated with changes in firms’ working capital requirements. Earnings contain accruals that mitigate the timing and matching problems associated with firms’ operating, investment, and financing cash flows. Therefore, earnings are predicted, on average, to be a more useful measure of firm performance than either cash flow measure. This generates the first prediction:

Hypothesis 1. There is a stronger contemporaneous association between stock returns and earnings than between stock returns and realized cash flows over short measurement intervals.
A short measurement interval is defined as one quarter or one year. Consider increasing the time interval over which performance is measured (e.g., four years). Over longer intervals, cash flows will suffer from fewer timing and matching problems and so the importance of accruals diminishes. Therefore, over longer intervals, earnings and realized cash flows are expected to converge as measures of firm performance (assuming clean surplus). Hypothesis 2 predicts the direction of convergence:

**Hypothesis 2.** The contemporaneous association of stock returns with realized cash flows improves relative to the contemporaneous association of stock returns with earnings as the measurement interval is increased.

The alternative hypothesis is that due to the manipulation of accruals, cash flows are superior to earnings over short intervals. Under the alternative hypothesis, earnings will improve relative to cash flows over longer measurement intervals. Note, however, that the ability of earnings to reflect firm performance is also expected to improve over longer measurement intervals (Easton, Harris, and Ohlson, 1992; Warfield and Wild, 1992). Generally accepted accounting principles trade off relevance and reliability so that accruals do not completely mitigate all short-term timing and matching problems in realized cash flows. An empirical investigation of Hypothesis 2 can provide insights into the economic importance of accruals. Evidence that cash flows’ ability to reflect firm performance is poor over intervals that are commonly used to report firm performance and converge to that of earnings only over long measurement intervals, would confirm the economic importance of accruals.

### 2.2. Cross-sectional predictions

Consider the following simplified example of a firm with only one accrual, accounts receivable. [For a more comprehensive model of accruals the reader is referred to Jones (1991).] Let

\[ C_t = (1 - \phi)S_t + \phi S_{t-1}. \]

Now

\[ C_t = (1 - \phi)S_t + \phi S_{t-1}. \] (1)
Thus, earnings will differ from realized cash flows in each period to the extent that (i) credit sales are excluded from realized cash flows and (ii) realized cash flows include collections from the previous period's credit sales.

Eq. (1) can provide insights into determinants of cross-sectional variation in the usefulness of accruals. If a steady-state firm is defined as one that is neither growing nor declining (i.e., neither increasing nor reducing sales), then this implies that \( S_t = S_{t-1} \). Substituting \( S_t \) for \( S_{t-1} \) in Eq. (1) reveals that \( C_t = S_t \). Therefore, in a steady-state firm there will be no difference between the numbers reported under a cash system or an accrual system and accruals are less important. Consider instead the case of a firm that has the same sales in period \( t-1 \) to the steady-state firm but has an increase (or decrease) in sales in period \( t \). In this case \( S_t \neq S_{t-1} \) and:

\[
S_t - C_t = \varphi \Delta S_t, \quad \text{where} \quad \Delta S_t = (S_t - S_{t-1}) .
\]

Eq. (2) reveals that the magnitude of the difference between revenues and cash flows for any period will be greater (i) the larger \( \varphi \) (i.e., the proportion of sales on credit) and (ii) the larger the magnitude of the change in revenues (\( \Delta S_t \)). Alternatively stated, the difference between earnings and cash flows is increasing in the absolute magnitude of the change in the balance of accounts receivable, \( \varphi \Delta S_t \), over the period.

This analysis highlights where accruals are expected to play an important role in measuring firm performance. The accrual process is most important for firms that have had large changes in the net balance of their noncash accounts. Consider for example, a ship building firm that obtains a lucrative construction contract. The construction takes several accounting periods and the payment by the customer occurs on completion of the contract. Under generally accepted accounting principles, revenue recognition for this contract is based on an engineer's estimate of the degree of completion. If cash collection is reasonably certain, then the actual timing of the cash collection is not relevant for reporting purposes. Realized cash flows for the firm could easily be negative in the early periods because of purchases required for the construction contract. Revenues on the other hand (through an increase in accounts receivable) are positive, and the application of the matching principle will lead to positive earnings. Thus, earnings will better reflect the contract's value and indicate that the firm has performed well in each of the periods. This highlights an important feature of the accrual process. If accruals reduce timing and matching problems in cash flows, then earnings are expected to reflect relatively more value-relevant events when earnings and cash flows differ by the greatest magnitude.

While the analysis focuses on accounts receivable, it is readily generalizable to aggregate accruals (the net change in noncash accounts). When aggregate accruals are large in magnitude (either positive or negative) earnings will more closely reflect firm performance than realized cash flows. Eq. (2) suggests that cash flows are not a poor measure of firm performance for firms that are in
steady state. However, when firms undertake new investment and financing activities or experience large changes in their working capital requirements (when $\phi AS_t$ is large in absolute magnitude), realized cash flows are expected to be a relatively poor measure of firm performance. Under such circumstances, realized cash flows suffer from timing and matching problems and are less able to reflect firm performance. Accruals are expected to reduce these problems in earnings. This leads to the following hypothesis:

**Hypothesis 3.** The larger the absolute magnitude of aggregate accruals made by a firm, the lower the contemporaneous association between stock returns and realized cash flows relative to the association between stock returns and earnings.

The fourth hypothesis predicts the type of firms for which the volatility of accruals will be large and hence realized cash flows will be a poor measure of firm performance. Eq. (2) reveals that the change in accounts receivable, $\phi AS_t$, is composed of two components, $\phi$ and $AS_t$. Therefore, the magnitude of accruals is larger, the greater the change in the level of sales, $AS_t$, and the larger the proportion of sales on credit, $\phi$. Generalizing from sales, $S_t$ can proxy for the level of operating activity and $\phi$ can proxy for the length of the operating cycle. The operating cycle measures the average time elapsing between the disbursement of cash to produce a product and the receipt of cash from the sale of the product. Firms with longer operating cycles are expected to have larger working capital requirements for a given level of operating activity. Therefore, in firms with longer operating cycle, a given change in the level of operating activity ($AS_t$) is expected to translate into a larger change in the required level of working capital ($\phi AS_t$). Thus, the length of the operating cycle is predicted to be an underlying determinant of the volatility of working capital. Cash from operations excludes accruals relating to the firm's operating activities. Hence the ability of cash from operations to measure firm performance is expected to decline as the length of the operating cycle increases. This leads to the following hypothesis:

**Hypothesis 4.** The longer a firm's operating cycle, the more variable the firm's working capital requirements and the lower the contemporaneous association between stock returns and realized cash flows.

Working capital accruals are hypothesized to reduce the timing and matching problems inherent in cash from operations. Hence, the ability of earnings to reflect firm performance is not expected to be as sensitive to the length of the operating cycle.

Finally, the paper investigates several components of accruals. Although, on average, accruals are predicted to improve earnings' ability to reflect firm performance, certain components are hypothesized to be less important in
performing this role. The first test compares short-term working capital accruals to long-term operating accruals. Working capital accruals such as accounts receivable and inventory have existed for centuries (Littleton, 1966). If accruals evolved to mitigate timing and matching problems in cash flows, then these accruals are predicted to mitigate the more severe timing and matching problems. In contrast, Watts (1977) and Watts and Zimmerman (1979) argue that more recent long-term operating accruals (such as depreciation) are influenced by the political process and so the motivation for their inclusion in earnings is less clear. Therefore, the association of cash from operations with stock returns is predicted to be less sensitive to the magnitude of long-term operating accruals.

The second test investigates special items. Special items represent the cumulative effect of previous under- or overstatement of accruals. Prior to APB No. 30 these items were predominantly classified as ‘extraordinary’ since they are nonrecurring in nature and are not expected to be relevant for measuring current performance (e.g., Nichols, 1974; Barnea, Ronen, and Sadan 1975). However, management had discretion to determine what special items would be classified as ‘extraordinary’ and therefore excluded from earnings (from continuing operations). This discretion was perceived to be used by management to manipulate earnings. APB No. 30 reduced the discretion of management by requiring that special items flow through income from continuing operations so that ‘clean surplus’ is maintained and cumulative earnings is measured objectively. Therefore, special items are an accrual adjustment that is predicted to reduce earnings’ ability to reflect firm performance.

2.3. Stock returns as a benchmark measure of firm performance

This paper assumes that stock markets are efficient in the sense that stock prices unbiasedly reflect all publicly available information concerning firms’ expected future cash flows. Therefore, stock price performance is used as a benchmark to assess whether earnings or realized cash flows better summarize this information. Earnings, realized cash flows, and stock prices are each scaled

3 Accruals that are the outcome of the political process will not necessarily reduce earnings’ ability to measure firm performance. Many transactions that result in these accruals did not occur prior to regulation. Therefore, the same procedures may have evolved in an unregulated environment and be consistent with the objectives of contracting parties (see also Ball, 1989).

4 See for example, ‘Accounting Panel seen curbing the use of special items’, Wall Street Journal, March 15, 1973, p. 2, that notes ‘critics contend the proliferation of special items has confused investors and enabled corporate managements to gloss over bad business decisions. Too often, they charge, routine losses are allowed to pile up. Then, when finally written off as an ‘extraordinary’ loss, the write-off is inflated, sweeping all the ‘garbage’ off the books and setting up a healthy profit rebound.’
by beginning of period price. This improves the specification of the test (see Christie, 1987). Thus, cash flows and earnings are set up as competing performance measures to explain stock returns. Market-wide returns are deducted from stock returns because they have low associations with both realized cash flows and earnings, so this improves the power of the empirical tests (Sloan, 1991). Similar results are obtained when raw stock returns are substituted as the dependent variable. The performance measure (either realized cash flows or earnings) that has a higher association \(R^2\) with stock returns is then interpreted as more effectively summarizing firm performance.

There are two potential explanations for observing a low association between realized cash flows or earnings and stock returns in a given measurement interval. First, realized cash flows (earnings) could suffer from matching problems because the cash inflows and cash outflows (revenues and expenses) from a particular productive activity are recognized in different measurement intervals. This mismatching of cash receipts and disbursements (or revenues and expenses) introduces negatively serially correlated temporary components ('noise') into the performance measures. As the stock market is efficient, stock returns will reflect the expected net benefit of the productive activity. Therefore, matching problems will adversely affect the performance measure's association with stock returns. Second, realized cash flows (earnings) could suffer from timing problems even in the absence of matching problems. This occurs when the cash receipts and disbursements (revenues and expenses), although being correctly matched (i.e., recognized in the same time interval), are reflected in stock returns in an earlier measurement interval (Collins, Kothari, Shanken, and Sloan, 1992). Note that the two explanations are not mutually exclusive, and this paper does not provide tests to separately determine the extent of each

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5 Sloan (1992) argues that market-wide movements are predominantly driven by macroeconomic factors such as changes in expected returns rather than changes in expected future cash flows. This implies that removing market-wide movements from stock returns should facilitate the assessment of which measure best summarizes information concerning future cash flows.

6 The paper can be thought of as providing a direct empirical test of the following proposition in FASB Statement of Concepts No. 1, paragraph 43: '. . . interest in an enterprise's future cash flows and its ability to generate favorable cash flows leads primarily to an interest in information about its earnings rather than information directly about its cash flows. Financial statements that show only cash receipts and payments during a short period, such as a year, cannot adequately indicate whether an enterprise's performance is successful.'

7 FASB Statement of Concepts No. 2 defines timeliness as having information available to a decision maker before it loses its capacity to influence decisions. In the context of this paper, if a measure has timing problems, then it will be a less useful summary measure of performance to use in contracts or to report to investors. Timeliness is operationalized by determining whether the information in earnings or cash flows measured over a given interval is also reflected in stock returns measured over the same time interval.
Both timing and matching problems are predicted to become less acute when performance is measured over longer intervals. This occurs because, as the length of the measurement interval is increased, the probability that individual revenue and expense items are recognized in the wrong period is reduced.

Existing research has investigated ways of incorporating additional information into the research design to mitigate timing and matching problems in earnings. In mitigating timing problems in earnings, Collins, Kothari, Shanken, and Sloan (1992) include lagged stock returns as an additional explanatory variable. In attempting to mitigate matching problems in earnings, Lev and Thiagarajan (1993) incorporate additional financial statement information, while Ramesh and Thiagarajan (1993) incorporate information in earnings' time-series properties. However, in the research design adopted in this paper, no attempt is made to control for timing and matching problems. The objective of this paper is to evaluate which performance measure (realized cash flows or earnings) better summarizes firm performance as reflected in stock returns. Both timing and matching problems reduce the usefulness of a performance measure and also reduce its association with stock returns. Therefore, attempting to control for these problems would defeat the purpose of the test. For example, earnings could have timing and matching problems either because of accounting conventions, such as objectivity and verifiability, or because of management manipulation of accruals. However, it would defeat the purpose of the test if an attempt was made to control for these problems when assessing earnings' ability to summarize firm performance. This is particularly the case when comparing earnings to realized cash flows because accruals are hypothesized to mitigate the timing and matching problems in cash flows. Hence incorporating additional information in an attempt to extract the temporary components in cash flows would understate the role of accruals. In this respect, earnings are predicted to be a more useful measure of firm performance than cash flows exactly because they are predicted to have fewer timing and matching problems.

Although stock prices are assumed to encompass the information in earnings and cash flows, this does not imply that internally generated summary measures of firm performance are redundant. For example, stock markets react to the release of earnings information and to forecasts of earnings (Foster, 1977; Patell, 1976). Thus, the production of financial information such as earnings is an integral part of price formation. If it is costly for firms to disclose information,
then disclosing a summary measure is more desirable (Black, 1993). Aggregating
information is also a more efficient way to communicate with users when there
are information processing costs (Beaver and Demski, 1979; Beaver, 1981,
p. 167). Finally, Sloan (1993a) presents evidence consistent with earnings-based
incentives being incrementally useful over stock price based incentives for
rewarding management. Sloan's results suggest that including earnings in com-
pensation contracts helps shield executives from fluctuations in firm value that
are beyond their control (see also Banker and Datar, 1989).

The final issue of concern is assessing whether stock price performance is an
appropriate benchmark to evaluate earnings and cash flows. If price deviates
from fundamentals and does not efficiently summarize information concerning
expected future cash flows, then it will be an inappropriate benchmark. Consis-
tent with prior capital market research (e.g., Ball and Brown, 1968; Beaver and
Dukes, 1972; Beaver and Landsman, 1983), this paper relies on the large
accumulated body of empirical evidence that stock prices appear to rapidly
impound new information. However, additional robustness tests are also con-
ducted to control for the possibility that the stock market could fixate on one
performance measure and ignore valuable information in the other. For
example, practitioners often suggest that the stock market fixates on reported
earnings, and the paper conducts additional empirical test to guard against this
potential concern.

3. Sample description and variable measurement

3.1. Data

The sample consists of firms listed on the New York Stock Exchange or the
American Stock Exchange. Three measurement intervals are examined: quarter-
ly, annual, and four-yearly. Firms are required to have accounting data avail-
able on either the 1990 versions of the COMPUSTAT Merged Expanded Annual
Industrial file, the COMPUSTAT Merged Research Annual Industrial
file, or the COMPUSTAT Quarterly Industrial file. Firm observations are
excluded if they do not have data to calculate earnings per share, cash from
operations per share, or net cash flows per share. This results in a sample of
26,793 firm-quarter observations, 30,489 firm-year observations, and 10,041
firm-four-year observations. The firms are also required to have monthly re-
turns available on the CRSP tapes. This reduces the sample of firms to 20,716
firm-quarter observations from 1980 to 1989, 28,647 firm-year observations
from 1960 to 1989, and 5,454 firm-four-year (nonoverlapping) observations from
1964 to 1989. The sample excludes firm observations with the most extreme one
percent of earnings per share, cash from operations per share, or net cash flows
per share. This reduces the sample to 19,733 firm-quarter observations, 27,308 firm-year observations, and 5,175 firm-four-year observations.\(^9\)

3.2. Variable definitions

All financial statement variables used in the empirical tests are on a per-share basis and scaled by beginning-of-period price. Scaling by price avoids spurious correlations due to size and reduces problems with heteroskedasticity (Christie, 1987). The variables are defined as follows:

\[
\begin{align*}
E & = \text{earnings per share (excluding extraordinary items and discontinued operations), scaled by beginning-of-period price;} \\
\Delta WC & = \{\Delta \text{(noncash) working capital/number of common shares outstanding})/P_{t-1} \text{ with } \Delta \text{(noncash) working capital} = \Delta AR + \Delta Inv + \Delta OthCA - \Delta AP - \Delta TP - \Delta OthCL, \text{ where } \Delta \text{ is the change in each variable from period } t - 1 \text{ to } t, AR \text{ is accounts receivable, } Inv \text{ is inventory, } OthCA \text{ is other current assets, } AP \text{ is accounts payable, } TP \text{ is tax payable, and } OthCL \text{ is other current liabilities;}^{10} \\
CFO & = \text{cash from operations per share, scaled by beginning-of-period price; } \{(\text{operating income before depreciation} - \text{interest} - \text{taxes} - \Delta \text{ (noncash) working capital)/number of common shares outstanding})/P_{t-1}; \\
NCF & = \text{change in the balance of the cash account on a per-share basis (net cash flow per share), scaled by beginning-of-period price;} \\
OA & = \text{all operating accruals per share-scaled by beginning-of-period price; } \{(\text{earnings} - \text{cash from operations})/\text{number of common shares outstanding)})/P_{t-1}; \\
LTOA & = \text{long-term operating accruals per share, scaled by beginning-of-period price; } \{(\text{earnings} - \text{cash from operations} - \Delta \text{(noncash working capital)}/\text{number of common shares outstanding})/P_{t-1}; \\
AA & = \text{the net change in all noncash accounts (aggregate accrual adjustments) on a per-share basis, scaled by beginning-of-period price; } \{(\text{earnings} - \text{net cash flows})/\text{number of common shares outstanding})/P_{t-1}; \\
\text{Earnings before special items} & = \text{pretax earnings excluding special items, scaled by beginning-of-period price, where special items include }
\end{align*}
\]

\(^9\)Initial tests showed that outliers were often more than five standard deviations from the mean and in some cases unduly affected the regression results. The cut-off point is, however, arbitrary; footnotes will report the main results for the sample including outliers.

\(^{10}\)As in Bowen, Burgstahler, and Daley (1987) and Rayburn (1986), short-term accruals such as notes payable and the current portion of long-term debt are excluded under the premise that these relate more to financing activities than to operations.
adjustments applicable to prior years, any significant nonrecurring item, nonrecurring profit or loss on sale of assets, investments etc., write-downs or write-offs of receivables, intangibles, etc., flood, fire, and other natural disaster losses.

\[
R_{it} = \text{CRSP buy-and-hold stock return (including dividends) for firm } i \text{ over time interval } t, \text{ where } t \text{ is the contemporaneous quarter, year, or four-year period, minus the CRSP value-weighted market index (including dividends) over the corresponding fiscal period.}
\]

3.3. Descriptive statistics

Table 1 presents descriptive statistics on the variables used in the analysis. Earnings per share, scaled by price, has a median value of 0.016, 0.090 and 0.383 for the quarterly, annual, and four-year intervals, respectively. Annual earnings are greater than four times the quarterly number, while the four-year earnings are greater than four times the annual earnings. A similar pattern is observed for cash from operations and net cash flows. Since the variables are scaled by beginning-of-period price, average reported values will tend to increase disproportionately over longer intervals due to the reinvestment of earnings. A second difference is that the quarterly data is available only from 1980, while the annual data is available from 1960. In Table 1, net cash flows have a lower mean than earnings. This is expected since a firm's financing and investment policies affect net cash flows but not earnings. For example, when a firm pays dividends, it reduces retained earnings and cash but not reported earnings. Table 1 indicates that over the quarterly interval, relative to earnings, both cash from operations and net cash flows have more negative realizations. In addition, both cash flow measures have higher standard deviations than earnings. Over longer intervals, both the standard deviation and the proportion of negative realizations for the cash flow measures decline relative to earnings. One explanation for this pattern is that accruals off-set extreme negative and positive cash flow realizations associated with mismatched cash receipts and disbursements over short measurement intervals. Table 2 investigates this issue in more detail.

Table 2 examines whether cash flows have time-series properties consistent with them suffering from matching problems. If cash flows suffer from temporary mismatching of cash receipts and disbursements, then this suggests that (i) changes in cash flows will exhibit negative autocorrelation, i.e., a large cash outflow this period is more likely to be followed by a large cash inflow next period. For example, in the ship building firm discussed in Section 2.2, the change in cash flows is expected to be negative in the first period when expenditures are made and positive in the next period when cash is collected. Therefore, changes in cash flows are likely to contain temporary components that are reversed over time. If accruals are used to match cash receipts and disbursements associated with the same economic event, then (ii) changes in
Table 1
Descriptive statistics of data for the quarterly, annual, and four-year intervals

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std. dev.</th>
<th>Median</th>
<th>Upper quartile</th>
<th>Lower quartile</th>
<th>Percent negative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quarterly</strong> (observations = 19,733)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earnings (E)</td>
<td>0.009</td>
<td>0.044</td>
<td>0.016</td>
<td>0.258</td>
<td>0.006</td>
<td>17.61</td>
</tr>
<tr>
<td>Change in working capital (AWC)</td>
<td>0.003</td>
<td>0.097</td>
<td>0.004</td>
<td>0.033</td>
<td>-0.023</td>
<td>44.93</td>
</tr>
<tr>
<td>Cash from operations (CFO)</td>
<td>0.025</td>
<td>0.098</td>
<td>0.023</td>
<td>0.059</td>
<td>-0.009</td>
<td>30.32</td>
</tr>
<tr>
<td>Net cash flows (NCF)</td>
<td>0.000</td>
<td>0.058</td>
<td>0.000</td>
<td>0.017</td>
<td>-0.017</td>
<td>50.29</td>
</tr>
<tr>
<td>Stock returns</td>
<td>-0.007</td>
<td>0.160</td>
<td>-0.020</td>
<td>0.079</td>
<td>-0.111</td>
<td>55.60</td>
</tr>
<tr>
<td><strong>Annual</strong> (observations = 27,308)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earnings (E)</td>
<td>0.086</td>
<td>0.134</td>
<td>0.090</td>
<td>0.147</td>
<td>0.046</td>
<td>11.40</td>
</tr>
<tr>
<td>Change in working capital (AWC)</td>
<td>0.026</td>
<td>0.203</td>
<td>0.023</td>
<td>0.094</td>
<td>-0.030</td>
<td>36.84</td>
</tr>
<tr>
<td>Cash from operations (CFO)</td>
<td>0.138</td>
<td>0.234</td>
<td>0.107</td>
<td>0.222</td>
<td>0.025</td>
<td>19.13</td>
</tr>
<tr>
<td>Net cash flows (NCF)</td>
<td>0.016</td>
<td>0.110</td>
<td>0.004</td>
<td>0.044</td>
<td>-0.024</td>
<td>44.75</td>
</tr>
<tr>
<td>Stock returns</td>
<td>0.027</td>
<td>0.431</td>
<td>-0.030</td>
<td>0.213</td>
<td>-0.238</td>
<td>53.63</td>
</tr>
<tr>
<td><strong>Four-year</strong> (observations = 5,175)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earnings (E)</td>
<td>0.405</td>
<td>0.453</td>
<td>0.383</td>
<td>0.638</td>
<td>0.175</td>
<td>11.90</td>
</tr>
<tr>
<td>Change in working capital (AWC)</td>
<td>0.145</td>
<td>0.451</td>
<td>0.086</td>
<td>0.267</td>
<td>-0.022</td>
<td>29.41</td>
</tr>
<tr>
<td>Cash from operations (CFO)</td>
<td>0.555</td>
<td>0.589</td>
<td>0.464</td>
<td>0.834</td>
<td>0.195</td>
<td>10.76</td>
</tr>
<tr>
<td>Net cash flows (NCF)</td>
<td>0.059</td>
<td>0.191</td>
<td>0.018</td>
<td>0.098</td>
<td>-0.025</td>
<td>38.07</td>
</tr>
<tr>
<td>Stock returns</td>
<td>0.172</td>
<td>1.203</td>
<td>-0.099</td>
<td>0.592</td>
<td>-0.581</td>
<td>54.24</td>
</tr>
</tbody>
</table>

All financial statement variables are on a per-share basis and scaled by beginning-of-period price. Observations for the quarterly interval are from 1980 to 1989, the annual interval from 1960 to 1989, and for the four-year interval from 1964 to 1989. Stock returns are adjusted for the CRSP value-weighted index. The four-year observations are nonoverlapping and are the cumulated one-year values per share (after adjusting for the number of common shares outstanding), scaled by beginning of period price.

accruals will also exhibit negative autocorrelation and (iii) accruals will be negatively correlated with changes in cash flows, since the change in cash flows is expected to be temporary. This negative correlation is expected to decline over longer intervals as matching problems in cash flows become less severe.
Panel A of Table 2 presents firm-specific first-order annual autocorrelations for each performance measure: net cash flows, cash from operations, and earnings. The results indicate that changes in net cash flow per share exhibit average negative autocorrelations of $-0.523$. Changes in operating cash flow per share exhibit slightly smaller average negative autocorrelations of $-0.434$, while changes in earnings per share has an even smaller negative autocorrelation of $-0.175$.\footnote{This analysis is performed using the change in each performance measure. Using the level of each performance measure (on a per-share basis) gives consistent results. That is, earnings per share is closer to a random walk so that the coefficient on lagged earnings per share is closer to one than that of either the coefficient on net cash flows or cash from operations.} The change in each accrual measure also exhibits negative autocorrelation. These result are consistent with (i) and (ii) above. They are consistent with cash flows containing larger temporary components than earnings.

Turning to the third point discussed above. If accruals are used to smooth temporary fluctuations in cash flows, then changes in cash flows and accruals will be negatively correlated. In addition, if matching problems are more acute over short measurement intervals, then the correlations will be more negative over short intervals. Panel B of Table 2 indicates that the average correlation between changes in net cash flows and aggregate accruals is $-0.876$ over the quarterly interval, $-0.553$ over the annual interval, and $-0.407$ over the four-year interval. Similar results are reported for correlations between changes in cash from operations and changes in working capital. Panel B also reports the correlation between changes in cash from operations and changes in earnings. Over longer intervals, as the temporary components in cash flows 'cancel each other out', changes in earnings and changes in cash from operations will have a higher positive correlation with each other (if clean surplus holds). The average correlation between these measures increases from 0.059 for the quarterly interval to 0.300 for the four-year interval. These results are consistent with the matching principle, since accruals 'smooth' the temporary components in cash flows. They are also consistent with the alternative view that management uses accruals to opportunistically 'smooth' earnings regardless of whether this improves earnings' ability to measure firm performance. That is, for a reason other than reflecting firm performance, management desires to reduce the variability in earnings (e.g., to reduce borrowing costs; see Trueman and Titman, 1988). Evidence that earnings better reflects firm performance than does cash flows would be consistent with the negative correlation being due to matching. This issue is investigated in more detail in the next section.

The negative autocorrelations in Table 2 suggest that accruals and cash flows have predictable temporary components. This has important implications for studies investigating accrual manipulation (e.g., DeAngelo, 1988; Pourciau, 1993). These studies have modeled the change in accruals as the discretionary
Table 2
Firm-specific annual first-order autocorrelation coefficients and Pearson correlations for earnings, cash from operations, net cash flows, and accrual measures

<table>
<thead>
<tr>
<th>Performance measures</th>
<th>Mean</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>ΔNet cash flow per share</td>
<td>0.523</td>
<td>0.539</td>
</tr>
<tr>
<td>ΔOperating cash flow per share</td>
<td>-0.434</td>
<td>-0.439</td>
</tr>
<tr>
<td>ΔEarnings per share</td>
<td>-0.175</td>
<td>-0.177</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Accrual measures</th>
<th>Mean</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>ΔAggregate accruals per share</td>
<td>-0.438</td>
<td>-0.470</td>
</tr>
<tr>
<td>ΔChange in working capital per share</td>
<td>-0.465</td>
<td>-0.472</td>
</tr>
</tbody>
</table>

**Panel A: Annual first-order autocorrelation coefficients**

Panel B: Firm-specific Pearson correlations

<table>
<thead>
<tr>
<th>Corr(ΔNet cash flow per share, (t), ΔAggregate accruals per share, (t))</th>
<th>Quarterly</th>
<th>Annual</th>
<th>Four-year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quarterly</td>
<td>-0.876</td>
<td>-0.952</td>
<td></td>
</tr>
<tr>
<td>Annual</td>
<td>-0.553</td>
<td>-0.602</td>
<td></td>
</tr>
<tr>
<td>Four-year</td>
<td>-0.407</td>
<td>-0.698</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Corr(ΔCash from operations per share, (t), ΔChange in working capital per share, (t))</th>
<th>Quarterly</th>
<th>Annual</th>
<th>Four-year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quarterly</td>
<td>-0.702</td>
<td>-0.720</td>
<td></td>
</tr>
<tr>
<td>Annual</td>
<td>-0.646</td>
<td>-0.672</td>
<td></td>
</tr>
<tr>
<td>Four-year</td>
<td>0.362</td>
<td>0.616</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Corr(ΔCash from operations per share, (t), ΔEarnings per share, (t))</th>
<th>Quarterly</th>
<th>Annual</th>
<th>Four-year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quarterly</td>
<td>0.059</td>
<td>0.060</td>
<td></td>
</tr>
<tr>
<td>Annual</td>
<td>0.132</td>
<td>0.398</td>
<td></td>
</tr>
<tr>
<td>Four-year</td>
<td>0.300</td>
<td>0.545</td>
<td></td>
</tr>
</tbody>
</table>

Corr(ΔNet cash flow per share, \(t\), ΔEarnings per share, \(t\))

<table>
<thead>
<tr>
<th>Quarterly</th>
<th>Annual</th>
<th>Four-year</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.384</td>
<td>0.423</td>
<td></td>
</tr>
<tr>
<td>0.352</td>
<td>0.411</td>
<td></td>
</tr>
<tr>
<td>0.230</td>
<td>0.469</td>
<td></td>
</tr>
</tbody>
</table>

A sample of 595 firms (from a total of 1,222) is used to calculate the correlations over the quarterly interval; each firm is required to have at least 16 quarterly observations. A sample of 827 (from a total of 2,761) firms is used to calculate the correlations and autocorrelations over the annual interval; each firm is required to have at least 16 annual observations. A sample of 715 firms (from a total of 2,024) are used to calculate the correlations over the four-year interval; each firm is required to have at least 4 four-year observations. All autocorrelations and correlations are significant at the 5 percent level using a two-tailed test. Data for the quarterly interval are from 1980 to 1989, the annual interval from 1960 to 1989, and for the four-year interval from 1964 to 1989.

*To obtain first-order autocorrelation coefficients the following regression is performed for each firm: \(ΔX_{t+1} = α + βΔX_{t-1} + ε_{t+1}\), where \(X\) is on a per-share basis and is either earnings, net cash flows, cash from operations, change in working capital, or aggregate accrual, Δ\(X_{t+1}\) is the change in \(X\) from time interval \(t\) to \(t + 1\). Aggregate accruals, is measured as the difference between earnings and net cash flows per share in time period \(t\).
component manipulated by management. However, since accruals are meanreverting, part of the reversal could be nondiscretionary. Therefore modeling the entire change in accruals as discretionary will reduce the precision of the tests and could under- or overstate the extent of manipulation (see McNichols and Wilson, 1988; Dechow, Sloan, and Sweeney, 1993). In addition, under the matching principle the change in cash flows is expected to be an important determinant of accruals. The evidence in Table 2 is consistent with accruals being negatively associated with temporary components in cash flows. This suggests that estimates of the temporary component of cash flows are useful in determining expected accruals. The evidence in Table 2 is consistent with accruals being negatively associated with temporary components in cash flows. This suggests that estimates of the temporary component of cash flows are useful in determining expected accruals. The model presented by Jones (1991) uses growth in sales and property, plant, and equipment as economic determinant of accruals. Future research could also consider incorporating cash flows in models identifying expected accruals.

4. Empirical results

Discussion of the results is divided into two sections. Section 4.1 provides tests of Hypotheses 1 and 2. Section 4.2 provides the cross-sectional tests of Hypotheses 3 and 4 and tests of components of accruals.

4.1. Measurement interval predictions

Hypothesis 1 predicts that earnings will have a stronger association with stock returns than net cash flows or cash from operations over short measurement intervals. Hypothesis 1 is examined by performing three pooled regressions: (1) stock returns on earnings, (2) stock returns on cash from operations, and (3) stock returns on net cash flows. The paper compares each measure's association with stock returns (the benchmark measure of firm performance) and judges the one with the highest association to be a more useful measure of firm performance. Table 3 presents the results of tests of Hypothesis 1. For each measurement interval, the $R^2$ is larger in regressions including earnings relative to the regressions including cash flows. The $R^2$ for the quarterly observations is 3.24 percent for earnings, 0.01 percent for cash from operations, and 0.01 percent for net cash flows. The $R^2$'s increase to 16.20 percent for earnings, 3.18 percent for cash from operations, and 2.47 percent for net cash flows over the annual interval. Over the four-year interval the $R^2$'s increase further to 40.26 percent for earnings, 10.88 percent for cash from operations, and 6.12 percent for net cash flows. Over each measurement interval, earnings are more strongly associated with stock returns than either cash flow measure. These results support Hypothesis 1. They are also consistent with Easton, Harris, and Ohlson (1992), who show that
Tests comparing the association of earnings and the association of cash flows with stock returns (adjusted for market-wide movements) over varying measurement intervals; $R_i = \alpha + \beta(X)_i + \epsilon_i$

<table>
<thead>
<tr>
<th>Independent variable (X)</th>
<th>Earnings ($E$)</th>
<th>Cash from operations ($CFO$)</th>
<th>Net cash flows ($NCF$)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quarterly</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>$-0.013$</td>
<td>$-0.008$</td>
<td>$-0.007$</td>
</tr>
<tr>
<td>($t$-statistic)</td>
<td>$(10.40)$</td>
<td>$( - 5.75)$</td>
<td>$( - 5.51)$</td>
</tr>
<tr>
<td>Coefficient</td>
<td>$0.742$</td>
<td>$0.022$</td>
<td>$0.036$</td>
</tr>
<tr>
<td>($t$-statistic)</td>
<td>$(25.71)$</td>
<td>$(1.70)$</td>
<td>$(1.61)$</td>
</tr>
<tr>
<td>Adj. $R^2$ (%)</td>
<td>$3.24$</td>
<td>$0.01$</td>
<td>$0.01$</td>
</tr>
</tbody>
</table>

$R^2_{CFO}/R^2_E = 0.003 \quad R^2_{NCF}/R^2_E = 0.003$

| **Annual**               |                |                             |                      |
| Intercept                | $-0.084$       | $-0.017$                    | $0.018$              |
| ($t$-statistic)          | $( - 29.58)$   | $( - 5.87)$                 | $(6.86)$             |
| Coefficient              | $1.297$        | $0.328$                     | $0.614$              |
| ($t$-statistic)          | $(72.65)$      | $(29.98)$                   | $(26.31)$            |
| Adj. $R^2$ (%)           | $16.20$        | $3.18$                      | $2.47$               |

$R^2_{CFO}/R^2_E = 0.20 \quad R^2_{NCF}/R^2_E = 0.15$

| **Four-year**            |                |                             |                      |
| Intercept                | $-0.510$       | $-0.199$                    | $0.081$              |
| ($t$-statistic)          | $( - 29.42)$   | $( - 9.19)$                 | $(4.76)$             |
| Coefficient              | $1.686$        | $0.675$                     | $1.56$               |
| ($t$-statistic)          | $(59.06)$      | $(25.16)$                   | $(18.40)$            |
| Adj. $R^2$ (%)           | $40.26$        | $10.88$                     | $6.12$               |

$R^2_{CFO}/R^2_E = 0.27 \quad R^2_{NCF}/R^2_E = 0.15$

Reported parameter estimates are from pooled regressions. $R_i$ is the stock return adjusted for the CRSP value-weighted index for firm $i$ calculated over the time interval $t$, where $t$ is equal to one quarter, one year, or four years. $E$ is earnings per share, $CFO$ is cash from operations per share, and $NCF$ is net cash flows per share. All variables are scaled by beginning-of-period price. The four-year values are the cumulated one-year values per share (after adjusting for the number of common shares outstanding) scaled by beginning-of-period price. The total number of observations is 19,733 for quarterly, 27,308 for annual, and 5,175 for four-year. Observations for the quarterly interval are from 1980 to 1989, the annual intervals from 1960 to 1989, and for the four-year interval from 1964 to 1989.
earnings' association with stock returns improves over longer measurement intervals.\textsuperscript{12}

Hypothesis 2 predicts the explanatory power of realized cash flows relative to earnings will increase as the measurement interval is increased. This hypothesis is tested by computing the following ratios:

\[
\frac{R^2_{\text{CFO}}}{R^2_E}, \quad \frac{R^2_{\text{NCF}}}{R^2_E}.
\]

Since the dependent variable is the same in both the cash flows and earnings regressions, these ratios measure the relative explanatory ability of earnings and cash flows over different measurement intervals. A ratio less than one indicates that earnings explain more of the variation in stock returns than cash flows. Hypothesis 2 predicts that these ratios will increase as the measurement interval is lengthened. Table 3 indicates that as the measurement interval increases from one quarter to one year to four years, both the earnings and the cash flow measures have a higher association with stock returns. However, the ratio \(\frac{R^2_{\text{CFO}}}{R^2_E}\) increases from 0.003 for quarterly, to 0.20 for annual, to 0.27 for the four-year interval. A similar but smaller effect is observed for net cash flows. Consistent with Hypothesis 2, there is a relative increase in the explanatory power of cash flows over longer measurement interval.\textsuperscript{13}

The adjusted \(R^2\)s reported in Table 3 are consistent with the hypothesis that earnings are more strongly associated with stock returns than cash flows. However, simply comparing \(R^2\)s does not provide statistically reliable evidence that earnings is superior to cash flows. In order to formally discriminate between the two competing specifications, they are evaluated as competing nonnested models. One of the premises of the paper is that neither earnings nor cash flows are a perfect measure of firm performance because both suffer to varying degrees from timing and matching problems. Vuong (1989) provides a likelihood ratio test for model selection without presuming under the null that either model is 'true'. This allows a directional test indicating which of the competing hypotheses, if either, is closer to explaining the data. Intuitively, Vuong's tests allows us to determine which performance measure (earnings or cash flows) has relatively more explanatory power. An alternative test for nonnested model selection is the

\textsuperscript{12}Table 3 reports that, as the interval is lengthened from quarterly to four years, the intercept on earnings declines from -0.013 to -0.510. Thus a firm reporting zero earnings has, on average, a -0.013 market-adjusted stock return over the quarterly interval. However, only very poorly performing firms report zero earnings over a four-year window, so that, on average, the market-adjusted stock return for these firms is -0.510.

\textsuperscript{13}When outliers are included in the regressions the coefficients and \(R^2\)s decline in magnitude for both earnings and cash flows, but the tenor of the results is unchanged. Regressions for the annual and four-year interval were also performed using the 1980 to 1988 period (equivalent to the quarterly interval); the tenor of the results is unchanged. Regressions are also performed by year and by firm; the tenor of the results is unchanged under either specification.
J-test by Davidson and MacKinnon (1981). This test simplifies to performing a multiple regression including both cash flows and earnings. However, when both variables have incremental explanatory power (as is typically the case in the tests performed here), the J-test lacks power and cannot distinguish between the competing hypotheses. Intuitively, Vuong's test is a more powerful test than the J-test, because it can reject one hypothesis in favor of the alternative in circumstances where the J-test cannot [Appendix 2 discusses Vuong (1989)].

Table 4 reports the results of Vuong's test of nonnested models. Over each interval, Vuong's Z-statistic rejects cash from operations and net cash flows in favor of earnings. This is consistent with earnings explaining significantly more of the variation in stock returns than either cash flow measure. Since cash from operations is rejected in favor of earnings, this suggests that the accrual adjustments made to cash from operations to obtain earnings are relatively important for mitigating the timing and matching problems inherent in cash from operations. Vuong's Z-statistic comparing cash from operations to net cash flows is not significant over the quarterly interval, although it does increase in significance over longer intervals. Since the difference between net cash flows and cash from operations is the long-term investment accruals net of financing, these accruals seem relatively less important for reflecting firm performance. One explanation for this result is that firms primarily use their internally generated cash from operations to finance their investment decisions so that the net cash inflow (outflow) from these two sources is relatively small. Thus, the role of accruals in controlling for these timing and matching problems is relatively less important. Consistent with this explanation, cash from operations is found to have a strong negative correlation of approximately -0.8 with the net cash flow from investment and financing activities.

A potential concern with the tests in Tables 3 and 4 is that the cash flow variables are mismeasured. First, cash flows are determined indirectly using balance sheet and income statement data. To the extent that cash flows are measured with error, this could reduce their reported associations with stock returns. Second, it is possible that firm performance is better reflected using alternative definitions of cash flows (e.g., investment cash flows). To provide insights into these concerns, analysis is performed using cash flows obtained from the Financial Accounting Standards Board's FAS 95, Statement of Cash Flows. FAS 95 requires firms to separately report cash flows relating to operations, investments, and financing for fiscal years ending after July 15, 1988. Therefore, this avoids problems with using balance sheet data (so that the measures are likely to contain less errors), and also provides an opportunity to investigate alternative definitions of cash flows. The measures investigated include: cash from operations as reported in FAS 95, investment cash flows, financing cash flows, cash from operations plus investments, and investment cash flows plus financing cash flows. Earnings are found to have a stronger association with stock returns than any of the alternative cash flow measures.
Table 4
Results of the likelihood ratio test developed by Vuong (1989) for nonnested model selection; a significant positive Z-statistic indicates that performance measure 2 is rejected in favor of performance measure 1

<table>
<thead>
<tr>
<th></th>
<th>Vuong's Z-statistic</th>
<th>Probability</th>
</tr>
</thead>
</table>

Comparison of performance measure 1 vs performance measure 2

**Quarterly**

<table>
<thead>
<tr>
<th>Comparison of performance measures</th>
<th>Z-statistic</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earnings vs Cash from operations</td>
<td>7.60</td>
<td>(&lt; 0.001)</td>
</tr>
<tr>
<td>Earnings vs Net cash flows</td>
<td>7.62</td>
<td>(&lt; 0.001)</td>
</tr>
<tr>
<td>Cash from operations vs Net cash flows</td>
<td>0.06</td>
<td>(0.954)</td>
</tr>
</tbody>
</table>

**Annual**

<table>
<thead>
<tr>
<th>Comparison of performance measures</th>
<th>Z-statistic</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earnings vs Cash from operations</td>
<td>24.16</td>
<td>(&lt; 0.001)</td>
</tr>
<tr>
<td>Earnings vs Net cash flows</td>
<td>23.27</td>
<td>(&lt; 0.001)</td>
</tr>
<tr>
<td>Cash from operations vs Net cash flows</td>
<td>2.27</td>
<td>(0.013)</td>
</tr>
</tbody>
</table>

**Four-year**

<table>
<thead>
<tr>
<th>Comparison of performance measures</th>
<th>Z-statistic</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earnings vs Cash from operations</td>
<td>17.04</td>
<td>(&lt; 0.001)</td>
</tr>
<tr>
<td>Earnings vs Net cash flows</td>
<td>18.03</td>
<td>(&lt; 0.001)</td>
</tr>
<tr>
<td>Cash from operations vs Net cash flows</td>
<td>3.67</td>
<td>(&lt; 0.001)</td>
</tr>
</tbody>
</table>

The number of observations in the pooled regressions is 19,733 for quarterly, 27,308 for annual, and 5,175 for four-year. Observations for the quarterly interval are from 1980 to 1989, the annual interval from 1960 to 1989, and for the four-year interval from 1964 to 1989.

*For more detail on the test developed by Vuong (1989), see Appendix 2. Reported probabilities are from a two-tailed test.

(see Dechow, 1993). Therefore, the low explanatory power of cash flows does not appear to be driven solely by the choice and measurement of the cash flow variables.

A second concern is that the results are driven by the use of an inappropriate benchmark. If, as discussed in Section 2.3, the market fixates on earnings and ignores information in cash flows, then the association between earnings and stock returns could be biased upwards (while cash flow's association could be biased downwards). Sloan (1993b) documents that firms with unusually large (small) accruals tend to have lower (higher) accruals in following years. This in turn causes earnings to reverse and be lower (higher) in following years. He finds it takes up to three years before the accrual reversals disappear. Sloan finds a positive association between the magnitude of the predictable, accrual-induced reversal in earnings and stock returns. This suggests that annual stock returns will tend to overstate earnings' ability to reflect firm performance. To control for the effect of Sloan's findings on the results present here, returns cumulated from the beginning of year $t$ to the end of year $t + 3$ are used as the dependent
variable instead of annual returns. The tenor of the results does not change using this alternative four-year return metric. Earnings have more explanatory power than cash flows, even after controlling for the anomaly documented by Sloan (1993b).14

In summary, the results demonstrate that accruals improve the association of earnings with contemporaneous stock returns. Table 2 provides evidence consistent with cash flows suffering from matching problems since cash flows exhibit larger temporary components than earnings. Table 3 indicates that cash flows have a relatively lower association with stock returns than do earnings. Together, these results suggest that cash flows suffer from greater timing and matching problems than earnings. This indicates that the negative correlation observed between cash flows and accruals in Table 2 is not due solely to management 'arbitrarily' smoothing earnings. The results suggest that accruals are performing a useful role in mitigating timing and matching problems in cash flows, so that earnings better summarizes firm performance.

4.2. Cross-sectional predictions

This section provides tests of Hypotheses 3 and 4 and accrual components. First, the effect of aggregate accruals on the ability of earnings and net cash flows to measure firm performance is tested. Tests concerning the operating cycle are then performed. Finally, results for specific accrual components are presented.

4.2.1. The effect of the magnitude of aggregate accruals

Hypothesis 3 predicts that, when aggregate accruals are large in absolute value, net cash flows will be a relatively poor measure of firm performance. Table 5 provides results of a test to determine whether the ability of net cash flows to reflect firm performance declines as the absolute value of aggregate accruals $|\text{abs}(AA)|$ increases. In this test, all firm-period observations are ranked on the basis of $\text{abs}(AA)$, quintiles are then formed, and separate regressions of stock returns on earnings and stock returns on net cash flows are performed for each quintile. Quintile 1 contains firm-observations for which the magnitude of $\text{abs}(AA)$ is small, while quintile 5 contains firm-observations for which the magnitude of $\text{abs}(AA)$ is large. For firms that are in steady state, where $\text{abs}(AA)$ is small, earnings and net cash flows will have a similar association with stock

---

14The resulting $R^2$'s for regressions of annual earnings and cash from operations using this four-year return metric are 14.61 percent for earnings and 6.01 percent for cash from operations (the sample consists of 4,175 nonoverlapping firm-observations). When contemporaneous annual stock returns are used for this sample, the $R^2$ on earnings is 17.23 percent and 4.20 percent for cash from operations.
returns. However, in quintile 5, where \( \text{abs}(AA) \) is large, indicating more timing and matching problems with net cash flows, net cash flows relative to earnings are predicted to have a lower association with stock returns. Since accrual adjustments are expected to be relatively more important over short time intervals, the decline in \( R^2 \) is expected to be greatest over the quarterly and annual intervals.

As the tenor of the results is similar across all time intervals, the discussion highlighting the major findings in Table 5 will focus on the annual time interval. In quintile 1, for the subset of firm-years where \( \text{abs}(AA) \) is small and earnings and net cash flows are most similar, the \( R^2 \) on net cash flows is 16.20 and on earnings 16.84. However, when \( \text{abs}(AA) \) is large (quintile 5), net cash flows has an \( R^2 \) of 0.24 percent, while earnings has an \( R^2 \) of 21.98 percent. Thus, when earnings and cash flows differ by the greatest magnitude, earnings has a higher association with stock returns. Moving from quintile 1 down to quintile 5, there is a monotonic decline in the \( R^2 \) on net cash flows. In contrast, the \( R^2 \) on earnings shows no obvious decline across quintiles. Table 5 also reports the \( Z \)-statistic and probability from the Vuong test for each quintile. The \( Z \)-statistic is insignificant at conventional levels in quintile 1, but is significant and positive in favor of earnings in quintile 5. This is consistent with earnings relative to cash flows, explaining more of the variation in stock returns as accruals increase in magnitude.\(^{15}\)

The results presented in Table 5 support Hypothesis 3. They demonstrate that cash flows are not a poor measure of firm performance per se. In steady-state firms, where the magnitude of accruals is small and cash flows and earnings are most similar, cash flows are a relatively useful measure of firm performance. However, when the magnitude of accruals increases, indicating that the firm has large changes in its operating, investment, and financing activities, cash flows suffer more severely from timing and matching problems. Therefore, as accruals increase in magnitude net cash flows' association with stock returns declines. Overall, the results are consistent with the hypothesis that accountants accrue revenues and match expenditures to revenues so as to produce a performance measure (earnings) that better reflects firm performance than realized cash flows.

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\(^{15}\)The coefficient on net cash flows and earnings decline across quintiles. If errors-in-variables problems increase across quintiles, then the size of the coefficient and \( R^2 \)'s will decrease (Maddala, 1988). However, the \( R^2 \) on earnings does not decrease across quintiles. Existing literature has identified determinants of cross-sectional variation in the coefficient on earnings (Kormendi and Lipe, 1987; Collins and Kothari, 1989; Easton and Zmijewski, 1989). An investigation revealed that proxies for expected return such as earnings to price ratio, leverage, market value to book value of equity and size (Fama and French, 1992) increase, while proxies for growth opportunities such as \( \text{R&D/assets} \) (Smith and Watts, 1992) decrease from quintile 1 to 5. Thus, economic determinants of the coefficient on earnings provide an explanation for the observed decline.
Table 5
Tests comparing the association of earnings and the association of net cash flows with stock returns across quintiles, where quintiles are formed based on the absolute value of aggregate accruals; quintile 5 contains firm-observations with the largest absolute value of aggregate accruals; $R_{it} = \alpha + \beta_{it}NCF_{it} + \epsilon_{it}$ and $R_{it} = \alpha + \beta_{it}E_{it} + \epsilon_{it}$

<table>
<thead>
<tr>
<th>Time interval</th>
<th>Net cash flows</th>
<th>Earnings</th>
<th>Vuong’s (1989) Z-statistic</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\beta_e$</td>
<td>Adj.$R^2$(%)</td>
<td>$\beta_e$</td>
<td>Adj.$R^2$(%)</td>
</tr>
<tr>
<td>Quarterly</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quintile 1</td>
<td>1.60</td>
<td>3.44</td>
<td>1.69</td>
<td>3.55</td>
</tr>
<tr>
<td>Quintile 2</td>
<td>1.09</td>
<td>1.88</td>
<td>1.44</td>
<td>2.82</td>
</tr>
<tr>
<td>Quintile 3</td>
<td>0.67</td>
<td>1.17</td>
<td>1.19</td>
<td>3.03</td>
</tr>
<tr>
<td>Quintile 4</td>
<td>0.26</td>
<td>0.32</td>
<td>1.24</td>
<td>4.69</td>
</tr>
<tr>
<td>Quintile 5</td>
<td>-0.08</td>
<td>0.15</td>
<td>0.61</td>
<td>4.96</td>
</tr>
<tr>
<td>Annual</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quintile 1</td>
<td>2.37</td>
<td>16.20</td>
<td>2.50</td>
<td>16.84</td>
</tr>
<tr>
<td>Quintile 2</td>
<td>1.89</td>
<td>12.23</td>
<td>2.18</td>
<td>15.44</td>
</tr>
<tr>
<td>Quintile 3</td>
<td>1.47</td>
<td>8.76</td>
<td>1.91</td>
<td>14.49</td>
</tr>
<tr>
<td>Quintile 4</td>
<td>1.03</td>
<td>6.51</td>
<td>1.56</td>
<td>14.82</td>
</tr>
<tr>
<td>Quintile 5</td>
<td>0.14</td>
<td>0.24</td>
<td>0.97</td>
<td>21.98</td>
</tr>
<tr>
<td>Four-year</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quintile 1</td>
<td>2.50</td>
<td>27.25</td>
<td>2.09</td>
<td>26.99</td>
</tr>
<tr>
<td>Quintile 2</td>
<td>1.96</td>
<td>18.45</td>
<td>1.83</td>
<td>22.66</td>
</tr>
<tr>
<td>Quintile 3</td>
<td>2.32</td>
<td>18.97</td>
<td>1.77</td>
<td>26.79</td>
</tr>
<tr>
<td>Quintile 4</td>
<td>1.73</td>
<td>8.99</td>
<td>1.51</td>
<td>23.84</td>
</tr>
<tr>
<td>Quintile 5</td>
<td>1.13</td>
<td>2.83</td>
<td>1.29</td>
<td>31.78</td>
</tr>
</tbody>
</table>

$R_{it}$ is the stock return adjusted for the CRSP value-weighted index for firm $i$ calculated over time interval $t$, where $t$ is equal to one quarter, one year, or four years. $E$ is earnings per share, $NCF$ is net cash flows per share, and abs(AA) is the absolute value of the aggregate accruals per share. All variables are scaled by beginning-of-period price. The four-year values are the cumulated one-year values per share (after adjusting for the number of common shares outstanding) scaled by beginning-of-period price. The total number of observations is 19,733 for quarterly, 27,308 for annual, and 5,175 for four-year. Observations for the quarterly interval are from 1980 to 1989, the annual interval from 1960 to 1989, and for the four-year interval from 1964 to 1989.

*Vuong’s (1989) Z-statistic compares earnings and net cash flows as competing nonnested models. A significant positive Z-statistic indicates that net cash flow is rejected in favor of earnings (see Appendix 2). Reported probabilities for the Z-statistics are from a two-tailed test.

This suggests that management manipulation of accruals is of second-order importance and the first-order effect of the accrual process is to produce a summary measure that more closely reflects firm performance.
4.2.2. The effect of the length of the operating cycle

This section investigates Hypothesis 4. Hypothesis 4 predicts that the length of the operating cycle is an underlying determinant of the variability of working capital and hence cross-sectional variation in cash from operation's association with stock returns. To investigate this hypothesis, two proxies for the length of the operating cycle are calculated for the annual interval (see Bernstein, 1990, p. 104):

**Operating cycle**

\[
\frac{(AR_t + AR_{t-1})/2}{Sales/360} + \frac{(Inv_t + Inv_{t-1})/2}{Cost \ of \ goods \ sold/360},
\]

**Trade cycle**

\[
\frac{(AR_t + AR_{t-1})/2}{Sales/360} + \frac{(Inv_t + Inv_{t-1})/2}{Cost \ of \ goods \ sold/360} - \frac{(AR_t + AR_{t-1})/2}{Purchases/360},
\]

where \(AR\) is accounts receivable, \(Inv\) is inventory, and \(AP\) is accounts payable. The first component measures the number of days' sales in accounts receivable. The second component measures the number of days it takes to produce and sell the product. The third component of the trade cycle is the number of days credit obtained from suppliers.

Panel A of Table 6 provides descriptive statistics on firms' operating and trade cycles. A minimum of ten observations per firm is required to calculate each firm's operating and trade cycle. This results in a sample of 1,252 firms with 20,115 annual observations. It takes the average (median) firm in the sample 146 (138) days from taking delivery of inventory to produce the product to sell the product and receive the cash from the trade receivable. The average (median) trade cycle is 108 (101) days. Panel B of Table 6 analyzes firm-level and industry-level correlations between the length of the operating (trade) cycle and the variability of working capital. The data are aggregated by industry because measures of the operating cycle and trade cycle suffer from outlier problems. Industry values are obtained by estimating firm-specific changes in working capital, operating, and trade cycles and then taking the average of these firm-specific variables for the industry. The firm-level correlation between the length of the operating cycle and the variability of working capital requirements is 0.187. When the data is aggregated by two-digit SIC industry classification into 58 industries, the correlation increases to 0.405. Thus, in industries where the operating or trade cycle is long, working capital requirements also tend to be more volatile. This is consistent with the length of the operating cycle being an economic determinant of the volatility of working capital requirements. Cash from operations excludes short-term working capital accruals, therefore cash from operations are predicted to be a poor measure of firm performance in industries with long operating cycles.
Table 6
Descriptive statistics on the operating and trade cycles (measured in days) and Pearson correlations between the explanatory power of earnings or cash flows and the average length of the industry operating or trade cycle; annual observations 1960–1989

Panel A

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std. dev.</th>
<th>Lower quartile</th>
<th>Median</th>
<th>Upper quartile</th>
<th>Number of firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating cycle</td>
<td>146.02</td>
<td>72.99</td>
<td>96.35</td>
<td>138.03</td>
<td>184.62</td>
<td>1,252</td>
</tr>
<tr>
<td>Trade cycle</td>
<td>108.11</td>
<td>78.86</td>
<td>60.02</td>
<td>101.07</td>
<td>147.49</td>
<td>1,252</td>
</tr>
</tbody>
</table>

Panel B: Correlation between the absolute change in working capital and the length of the operating or trade cycle at the firm level (1,252 observations) and industry level (58 observations)

<table>
<thead>
<tr>
<th></th>
<th>Operating cycle</th>
<th>Trade cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm level correlations with abs(ΔWC)</td>
<td>0.187 (0.000)</td>
<td>0.163 (0.000)</td>
</tr>
<tr>
<td>Industry level correlations with abs(ΔWC)</td>
<td>0.405 (0.000)</td>
<td>0.450 (0.000)</td>
</tr>
</tbody>
</table>

Panel C: Correlation between the $R^2$ from 58 industry-specific regressions of stock returns on cash from operations or stock returns on earnings with the average industry operating or trade cycle

<table>
<thead>
<tr>
<th></th>
<th>Operating cycle</th>
<th>Trade cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R^2$ from cash from operations regressions</td>
<td>-0.483 (0.001)</td>
<td>-0.418 (0.001)</td>
</tr>
<tr>
<td>$R^2$ from earnings regressions</td>
<td>-0.083 (0.538)</td>
<td>-0.012 (0.926)</td>
</tr>
</tbody>
</table>

Industry operating cycles, trade cycles, and abs(ΔWC) are calculated by (i) averaging the time-series of firm-specific values, (ii) taking the average of the firm-specific values across two-digit SIC classifications. The $R^2$s for earnings are obtained by performing separate regressions of returns (adjusted for the CRSP value-weighted market return) on earnings for each of 58 two-digit SIC industry classifications. The $R^2$s for cash from operations are obtained in a similar manner. Cash from operations and earnings are on a per-share basis and scaled by beginning-of-period price. The abs(ΔWC) is the absolute value of the change in noncash working capital per share scaled by beginning-of-period price.

$$\text{Operating cycle} = \left( \frac{AR_t + AR_{t-1}}{\text{Sales}/360} \right) + \left( \frac{(Inv_t + Inv_{t-1})/2}{\text{Cost of goods sold}/360} \right).$$

$$\text{Trade cycle} = \left( \frac{AR_t + AR_{t-1}}{\text{Sales}/360} \right) + \left( \frac{(Inv_t + Inv_{t-1})/2}{\text{Cost of goods sold}/360} \right) - \left( \frac{AP_t + AP_{t-1}}{\text{Purchases}/360} \right).$$
Panel C of Table 6 investigates whether cash from operations' association with stock returns declines as the length of the operating (trade) cycle increases. This is tested by (i) obtaining the $R^2$s from 58 separate regressions of stock returns on cash from operations performed for each industry and (ii) determining the correlation between the length of the industry's operating (trade) cycle and the $R^2$s. The same procedure is then performed for earnings. The results indicate that there is a negative correlation of $-0.483$ between the length of the operating cycle and the $R^2$ from the cash from operation's regressions. However, no obvious decline in the $R^2$ on earnings is observed as the length of the operating cycle increases. The correlation for earnings is an insignificant $-0.083$. Similar results are documented for the trade cycle for both cash from operations and earnings. These results are consistent with the length of the operating cycle being an important economic determinant of the size of the change in firms' working capital requirements and hence the ability of cash flows to measure firm performance. The results suggest that accruals mitigate this problem in earnings. This suggests that accruals play a relatively more important role in firms with long operating cycles. The evidence in panel C supports Hypothesis 4. Earnings better reflects firm performance than cash from operations for firms in industries with long operating cycles.\(^\text{16}\)

4.2.3. Evaluation of accrual components

The final tests examine subsets of accruals. Table 7 decomposes operating accruals ($OA$), into the change in working capital ($\Delta WC$) and long-term operating accruals ($LTOA$). As the results are similar across all time intervals, only the annual interval will be discussed. If working capital accruals mitigate short-term matching problems in cash flows, then cash from operations' association with stock returns is predicted to decline as the absolute value of the change in working capital, $\text{abs}(\Delta WC)$, increases. However, if long-term operating accruals only indirectly mitigate matching problems in cash flows, then a decline in cash from operations' association with stock returns is not predicted as the $\text{abs}(LTOA)$ increases. Table 7 performs identical tests to those reported in Table 5. Observations are first ranked on the basis of $\text{abs}(OA)$, quintiles are then formed, and separate regressions of stock returns on earnings and stock returns on cash from operations are performed for each quintile. Quintile 1 contains observations for which the magnitude of $\text{abs}(OA)$ is small, while quintile 5 contains observations for which the magnitude of $\text{abs}(OA)$ is large. The observations

\(^{16}\)The analysis was also conducted on a firm basis for 1,252 firms that had at least ten observations. The correlation between the firm-specific $R^2$s for cash from operations and the operating cycle is $-0.109$ (probability = 0.000) and the trade cycle $-0.084$ (probability = 0.002). For earnings, the correlation between the firm-specific $R^2$s and the operating cycle is 0.049 (probability = 0.078) and the trade cycle 0.080 (probability = 0.005).
Table 7
Tests comparing the association of earnings and the association of cash from operations with stock returns across quintiles, where quintiles are formed based on (i) the absolute value of all operating accruals, abs(OA), (ii) the absolute value of the change in working capital, abs(dWC), and (iii) the absolute value of long-term operating accruals, abs(LTOA); quintile 5 contains firm-observations with the largest absolute value of the accrual measure.

<table>
<thead>
<tr>
<th></th>
<th>Quarterly</th>
<th></th>
<th></th>
<th>Annual</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>adj. R²'s (%)</td>
<td>abs(OA)</td>
<td>abs(dWC)</td>
<td>abs(LTOA)</td>
</tr>
<tr>
<td>Quintile 1</td>
<td>4.07</td>
<td>1.98</td>
<td>0.01</td>
<td>4.31</td>
</tr>
<tr>
<td>Quintile 2</td>
<td>2.11</td>
<td>1.64</td>
<td>0.02</td>
<td>3.04</td>
</tr>
<tr>
<td>Quintile 3</td>
<td>1.01</td>
<td>1.74</td>
<td>0.05</td>
<td>3.14</td>
</tr>
<tr>
<td>Quintile 4</td>
<td>0.04</td>
<td>0.41</td>
<td>0.04</td>
<td>4.34</td>
</tr>
<tr>
<td>Quintile 5</td>
<td>0.01</td>
<td>0.16</td>
<td>0.01</td>
<td>4.28</td>
</tr>
<tr>
<td></td>
<td></td>
<td>14.99</td>
<td>7.72</td>
<td>2.24</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12.06</td>
<td>8.69</td>
<td>2.21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10.81</td>
<td>8.24</td>
<td>2.34</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.67</td>
<td>7.34</td>
<td>3.17</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.01</td>
<td>0.79</td>
<td>4.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>46.68</td>
<td>27.19</td>
<td>11.18</td>
</tr>
<tr>
<td></td>
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<td>32.78</td>
<td>26.06</td>
<td>7.88</td>
</tr>
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<td></td>
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<td>34.06</td>
<td>23.20</td>
<td>10.17</td>
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<td></td>
<td></td>
<td>12.37</td>
<td>19.01</td>
<td>18.04</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.00</td>
<td>2.25</td>
<td>8.86</td>
</tr>
</tbody>
</table>

Observations are ranked based on the absolute value operating accruals, and quintiles are then formed. A regression of stock return on earnings or stock returns on cash from operations is performed for each quintile. Operating accruals are then decomposed into the absolute value of the change in working capital, abs(dWC), and the absolute value of long-term operating accruals, abs(LTOA), and the same procedure is performed separately for abs(dWC) and abs(LTOA). $R_u$ is the stock return adjusted for the CRSP value-weighted index for firm $i$ calculated over the time interval $t$, where $t$ is equal to one quarter, one year, or four years, $E$ is earnings per share, and CFO is cash from operations per share. All variables are scaled by beginning-of-period price. The four-year values are cumulated one-year values per share (after adjusting for the number of common shares outstanding) scaled by beginning-of-period price. The total number of observations is 19,733 for quarterly, 27,308 for annual, and 5,175 for four-year. Observations for the quarterly interval are from 1980 to 1989, the annual intervals from 1960 to 1989, and for the four-year interval from 1964 to 1989.
are then ranked on \( \text{abs}(\Delta WC) \), and regressions are again performed for each quintile. Quintile 1 now contains observations for which the magnitude of \( \text{abs}(\Delta WC) \) is small. Finally, the observations are ranked on \( \text{abs}(LTOA) \), and regressions are performed for each quintile, with quintile 1 containing observations for which the magnitude of \( \text{abs}(LTOA) \) is small.

The results in Table 7 indicate that, as \( \text{abs}(OA) \) increases in magnitude, cash from operations' association with stock returns declines. The \( R^2 \) declines from 14.99 percent in quintile 1 to 0.01 percent in quintile 5. However, the \( R^2 \) on earnings shows no obvious decline and actually increases from 15.78 percent in quintile 1 to 20.47 in quintile 5. These results are consistent with those reported for aggregate accruals in Table 5. They suggest that operating accruals, as a group, are important for mitigating timing and matching problems in cash from operations. When observations are ranked based on \( \text{abs}(\Delta WC) \), the \( R^2 \) on cash from operations is 7.72 percent in quintile 1 and declines to 0.79 percent in quintile 5. Whereas the \( R^2 \) on earnings is 14.24 percent in quintile 1 and increases to 18.19 percent in quintile 5. Therefore, cash from operations' association with stock returns also declines as the magnitude of working capital accruals increases. Thus, this subset of accruals is important for mitigating timing and matching problems in cash from operations. In contrast, as \( \text{abs}(LTOA) \) increases, cash from operations exhibits no obvious decline in its association with stock returns. The \( R^2 \) is 2.24 percent in quintile 1 and increases to 4.00 percent in quintile 5. These results are consistent with long-term operating accruals playing a less important role than working capital accruals in mitigating timing and matching problems in cash from operations.\(^{17}\)

Table 8 examines special items. Special items are, by definition, one-time charges that induce temporary component in earnings. They are predicted to reduce earnings' association with stock returns over short intervals. The sample is split into two, those firms reporting special items and those that do not. The second sample is provided for comparative purposes because results are reported without removing the extreme 1 percent of observations. Special items cause unusual earnings numbers so that many observations for the 'with special items sample' are from the extreme percentiles. Earnings before tax is reported in the table so that both special items and earnings are measured on a consistent basis. The results indicate that over the quarterly and annual intervals special items reduce earnings' association with stock returns. The \( R^2 \) is 0.92 (6.34) percent for earnings and 2.96 (9.34) percent for earnings before special items over

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\(^{17}\) When outliers are included, similar results are reported in Tables 5 and 7. Table 7 was also replicated using annual cash from operations as reported in FAS 95. The \( R^2 \)'s show a similar decline across quintiles when ranked on \( \text{abs}(\Delta WC) \). However, the decline is not monotonic since quintile 4 exhibited a higher \( R^2 \) than quintile 1.
Table 8
Tests comparing the association of earnings before taxes and the association of earnings before special items and taxes with stock returns over different measurement intervals

<table>
<thead>
<tr>
<th></th>
<th>Earnings before tax</th>
<th>Earnings before tax and special items</th>
<th>Vuong's (1989) Z-statistic</th>
<th>Number of observations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adj. $R^2$ (%)</td>
<td>Adj. $R^2$ (%)</td>
<td>[Z-statistic] (probability)</td>
<td></td>
</tr>
<tr>
<td><strong>Sample of firm-observations with special items</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quarterly</td>
<td>0.92</td>
<td>2.96</td>
<td>[2.14] (0.03)</td>
<td>2,535</td>
</tr>
<tr>
<td>Annual</td>
<td>6.34</td>
<td>9.34</td>
<td>[2.77] (0.01)</td>
<td>5,832</td>
</tr>
<tr>
<td>Four-year</td>
<td>34.48</td>
<td>33.95</td>
<td>[−0.73] (0.47)</td>
<td>2,083</td>
</tr>
<tr>
<td><strong>Sample of firm-observations with no special items</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quarterly</td>
<td>1.31</td>
<td></td>
<td></td>
<td>18,181</td>
</tr>
<tr>
<td>Annual</td>
<td>18.70</td>
<td></td>
<td></td>
<td>22,815</td>
</tr>
<tr>
<td>Four-year</td>
<td>41.07</td>
<td></td>
<td></td>
<td>3,369</td>
</tr>
</tbody>
</table>

Stock returns are adjusted for the CRSP value-weighted index and calculated over the time interval $t$, where $t$ is equal to one quarter, one year, or four years. Earnings before tax and earnings before tax and special items are on a per-share basis and scaled by beginning-of-period price. The four-year values are the cumulated one-year values per share (after adjusting for the number of common shares outstanding) scaled by beginning-of-period price. Observations for the quarterly interval are from 1980 to 1989, the annual intervals from 1960 to 1989, and for the four-year interval from 1964 to 1989.

"Vuong's (1989) Z-statistic compares earnings before tax and special items and earnings before tax as competing nonnested models. A significant positive Z-statistic indicates that earnings before tax is rejected in favor of earnings before special items. These results suggest that special items reduce the ability of earnings to measure firm performance over short measurement intervals. However, over the longer four-year interval the impact of special items is less severe and there is no difference in explanatory power.

These findings are consistent with Elliott and Shaw (1988), who show over a two-day return window when write-offs are announced that the coefficient on the write-offs is smaller than for other components of earnings. It is also consistent with Givoly and Hayn (1992), who find that nonrecurring items have less information content than other components of earnings, and DeAngelo, DeAngelo, and Skinner (1992), who find that excluding special items improves current earnings' ability to predict future earnings. The results in Table 8 are consistent with special items being an accrual that does not improve earnings' ability to measure firm performance. Hence, although aggregate accruals
improve earnings' ability to measure of firm performance, the results in Tables 7 and 8 suggests that the importance varies with the extent that the accrual component mitigates timing and matching problems in cash flows.

5. Conclusion

This paper hypothesizes that one role of accounting accruals is to provide a measure of short-term performance that more closely reflects expected cash flows than do realized cash flows. The results are consistent with this prediction. First, over short measurement intervals earnings are more strongly associated with stock returns than are realized cash flows. In addition, the ability of realized cash flows to measure firm performance improves relative to earnings as the measurement interval is lengthened. Second, earnings have a higher association with stock returns than do realized cash flows in firms experiencing large changes in their working capital requirements and their investment and financing activities. Under these conditions, realized cash flows have more severe timing and matching problems and are less able to reflect firm performance.

This paper also predicts that although accruals improve earnings' association with stock returns, certain accruals are less likely to mitigate timing and matching problems in realized cash flows. Evidence is presented indicating that long-term operating accruals play a less important role in this respect. In addition, the inclusion of special items in earnings is shown to reduce earnings' association with stock returns over short intervals. However, this does not imply that special items should be excluded from earnings from continuing operations. If it is desirable that management are held accountable for such charges, then it is important to include special items in earnings.

The contribution made by this paper is to document benefits of accrual accounting. In particular, the paper helps explain why earnings are more often reported to investors and specified in contracts than cash from operations or net cash flows. The approach taken here differs from that adopted in previous research. This paper assumes that realized cash flows are a more 'primitive' performance measure than earnings. The value added by accountants is in accruing cash receipts and disbursements so as to attain a more useful measure of firm performance over short measurement intervals. Therefore, the set of existing accruals are expected, on average, to improve earnings' ability to measure firm performance. The results demonstrate that isolating the conditions under which earnings and realized cash flows are expected to differ by the greatest magnitude provides more powerful tests of the usefulness of accounting accruals. Overall, the evidence suggests that accruals play an important role in improving the ability of earnings to reflect firm performance.

The paper also provides new insights into two branches of existing research. First, recent research has documented inter-industry variation in the association
between realized cash flows and stock returns (e.g., Biddle and Seow, 1992). This paper identifies underlying determinants of this variation. In particular, the strength of the association between realized cash flows and stock returns is shown to be negatively related to the length of the operating cycle at the industry level. Second, this paper contributes to the long-window analysis performed by Easton, Harris, and Ohlson (1992). They show that the association between earnings and stock returns improves over longer measurement intervals. This result is consistent with earnings' suffering from timing and matching problems over short measurement intervals. The evidence in this paper indicates that realized cash flows suffer more greatly than earnings in this respect and that accruals help to mitigate these problems.

This paper raises several avenues for future research. The results presented here suggest that cash flows and accruals exhibit strong negative correlation. In addition, accruals exhibit strong negative autocorrelation. Future research on earnings management can incorporate the implications of these findings in modeling the nondiscretionary component of accruals. Another avenue for future research is to explore the reasons for earnings' superiority over cash flows in more detail. For example, to what extent is it due to earnings achieving a better match between the inflows and outflows associated with economic activities? Alternatively, to what extent is it due to earnings facilitating the more timely recognition of economic activities? Finally, future research can investigate additional cross-sectional determinants of accruals. This will improve our understanding of the circumstances in which accruals play a more important role in producing earnings as a summary measure of firm performance.

Appendix 1: Cash flows and earnings

This appendix examines the types of accruals made to net cash flows to obtain cash from operations and earnings. The basic accounting equation can be stated as Assets = Liabilities + Stockholders' equity. Assets can be divided into cash (CASH) and noncash assets, and shareholders' equity into contributed capital (CC) and retained earnings (RE). Liabilities can be separated into current liabilities (CL) and long-term liabilities (LTL), while noncash assets can be separated into current noncash assets (CNA) and long-term noncash assets (LTNA). Since the balance sheet equation holds at every point in time, it must also hold between points in time:

$$\Delta\text{CASH} + \Delta\text{CNA} + \Delta\text{LTNA} = \Delta\text{CL} + \Delta\text{LTL} + \Delta\text{CC} + \Delta\text{RE}.$$ 

The change in retained earnings is equal to revenues (R) less expenses (EX) less dividends (D), while the change in long-term liabilities can be separated into those affecting cash ($\Delta\text{LTL}_c$) and those not affecting cash ($\Delta\text{LTL}_{nc}$), and the
change in long-term assets can be separated into those affecting cash ($\Delta LTNA_c$) and those not affecting cash ($\Delta LTNA_{nc}$). Substituting and rearranging, the change in the cash balance, net cash flows ($NCF$), can be reexpressed in terms as the net change all other balance sheet accounts:

$$NCF = R - EX + \Delta CL - \Delta CNA + \Delta LT_{nc} - \Delta LTNA_{nc}$$

Earnings Changes in Changes in long-term working capital accounts (e.g., depreciation, gains and losses, and special items)

Thus, the difference between earnings ($E$) and net cash flows ($NCF$) is equal to the net change in the balance of all noncash accounts ($AA$) and measures all the adjustments made when using the accrual basis of accounting. This is termed 'aggregate accruals' in the paper:

$$E - NCF = AA = \Delta CNA - \Delta CL + \Delta LTNA_{nc} - \Delta LT_{nc} + \Delta LTNA_c - \Delta LT_{ec} - \Delta CC + D.$$ 

The difference between earnings ($E$) and cash from operations ($CFO$) each period is equal to all operating accruals ($OA$), these can be decomposed into the change in working capital ($\Delta WC = \Delta CNA - \Delta CL$) and long-term operating accruals ($LTOA = \Delta LTNA_{nc} - \Delta LT_{nc}$):

$$E - CFO = OA = \Delta WC + LTOA.$$ 

Appendix 2: Nonnested model selection

The research question addressed in this paper is: which measure, earnings or cash flows, is a 'better' estimate of firm performance as reflected in stock returns? Therefore cash flows and earnings are set up as competing (nonnested) models to explain stock returns. A recent development in model selection techniques is Vuong (1989). Vuong has provided a likelihood ratio test for model selection to
test the null hypothesis that the two models are equally close to explaining the 'true data generating process' against the alternative that one model is closer. The difference between the Vuong test and other nonnested tests (such as the encompassing approach discussed by Mizon and Richard, 1986) is that Vuong has derived the distribution of the likelihood ratio statistic assuming under the null that neither model is 'true'. Thus, Vuong's test statistic allows both models to have explanatory power, but provides direction concerning which of the two is closer to the 'true data generating process'. Therefore, the Vuong test allows rejection of cash flows in favor of earnings in situations where ambiguous results would otherwise be obtained.

Consider regressing stock returns on earnings (time subscripts are excluded):

$$R_i = \alpha_E + \beta_E E_{Ei} + \varepsilon_{Ei}, \quad \varepsilon_{Ei} \sim \text{iid} N(0, \sigma^2_E).$$

(A.1)

This implies that $R_i$ are independently and normally distributed with mean $\alpha_E + \beta_E E_{Ei}$ and a common variance $\sigma^2_E$. The joint density of the observations is

$$f(R_1, \ldots, R_n) = \prod_{i=1}^{n} \left( \frac{1}{2\pi \sigma^2_E} \right)^{1/2} \exp \left[ -\frac{1}{2\sigma^2_E} (R_i - \alpha_E - \beta_E E_i)^2 \right].$$

(A.2)

The log-likelihood function $L(\alpha, \beta, \sigma^2)$ is

$$\log L(R_E) = \sum_{i=1}^{n} \log L(R_{Ei})$$

$$= \sum_{i=1}^{n} \left[ -\frac{1}{2} \log (2\pi \sigma^2_E) - \frac{1}{2\sigma^2_E} (R_i - \alpha_E - \beta_E E_i)^2 \right].$$

(A.3)

When maximizing $L$ with respect to $\alpha$, $\beta$, and $\sigma^2$, the maximum likelihood estimators of $\alpha$ and $\beta$ are the same as the least squares estimators of $\alpha$ and $\beta$. Substituting $\hat{\alpha}_E$ and $\hat{\beta}_E$ for $\alpha_E$ and $\beta_E$ we can see that, for each $i$, $R_i - \hat{\alpha}_E - \hat{\beta}_E E_i = \varepsilon_{Ei}$, while the maximum likelihood estimate of $\sigma^2_E$ is $(RSS_E/n)$, where $RSS_E$ is the residual sum of squares from the regression of stock returns on earnings.

A similar log-likelihood function can be obtained for cash from operations:

$$\log L(R_{CFO}) = \sum_{i=1}^{n} \log L(R_{Ci})$$

$$= \sum_{i=1}^{n} \left[ -\frac{1}{2} \log (2\pi \sigma^2_C) - \frac{1}{2\sigma^2_C} (R_i - \alpha_C - \beta_C CFO_i)^2 \right].$$

(A.4)

---

18 The encompassing approach is based on the idea that a model can be considered superior to rival models if it can account for the salient features of rival models. The procedure is done in two steps. First, one model is assumed to be true and the test involves determining if the null model can be rejected in the direction of the alternative. The second step is to do the same procedure in reverse (i.e., assume under the null that the second model is true and determine if the null model can be rejected in the direction of the alternative). The problem with this approach is that ambiguous results are obtained when both models reject each other or neither model rejects the alternative (see Maddala, 1988, pp. 443–447).
Again, the maximum likelihood estimate for $\sigma^2$ is $(RSS_c/n)$ and $e_{ci} = R_i - \delta_c - \beta_c CFC_i$. Substituting $e_{Ei}$ for $R_i - \delta_E - \beta_E E_i$ in Eq. (A.3) and similarly substituting $e_{ci}$ for $R_i - \delta_c - \beta_c CFC_i$ in Eq. (A.4), and obtaining estimates of $\sigma^2$ and $\delta^2$, we can determine which of the two models explains relatively more of the dependent variable. This is done by first forming a likelihood ratio test comparing cash flows to earnings:

\[
LR = \log \left( \frac{L(R_E)}{L(R_{CFC})} \right) = \log [L(R_E)] - \log [L(R_{CFC})] - \frac{n}{2} (\log(\hat{\sigma}^2) - \log(\hat{\delta}^2)) + \frac{n}{2} \sum_{i=1}^{n} \left( \frac{1}{\hat{\sigma}^2} (e_{ci})^2 - \frac{1}{\hat{\delta}^2} (e_{ci})^2 \right).
\] (A.5)

An estimate of the variance, $\omega^2$, of $LR$ is given by (see, Vuong, 1989, eq. 4.2):

\[
\hat{\omega}^2 = \frac{1}{n} \sum_{i=1}^{n} \left( \frac{1}{2} \log(\hat{\delta}^2) - \frac{1}{2} \log(\hat{\delta}^2) + \frac{1}{2} (e_{ci})^2 - \frac{1}{2} \frac{e_{ci}}{\sigma^2} - \frac{1}{2} \frac{(e_{Ei})^2}{\delta^2} \right) - \left( \frac{1}{n} LR \right)^2.
\] (A.6)

The statistic is then formed as:

\[
Z = \frac{1}{\sqrt{n} \hat{\omega}} LR,
\] (A.7)

which tends in distribution to a standard normal random variable. This test is directional in the sense that, if the $Z$-statistic is positive and significant, the test indicates that earnings is the model of choice, whereas if the $Z$-statistic is negative and significant, the opposite conclusion can be drawn. In the case at hand a simpler approach to estimating the $Z$-statistic is available. After substituting (A.3) and (A.4) into (A.5) we can obtain, for each observation $i$,

\[
LR_i = \log [L(R_{Ei})] - \log [L(R_{Ci})] = \frac{1}{2} \log \left( \frac{RSS_c}{n} \right) + \frac{1}{2} \log \left( \frac{RSS_E}{n} \right) + \frac{n}{2RSS_c} (e_{ci})^2 - \frac{n}{2RSS_E} (e_{Ei})^2.
\]

Simplifying we can obtain $m_i$ for each observation,

\[
m_i = \frac{1}{2} \log \left( \frac{RSS_c}{RSS_E} \right) + \frac{n}{2} \left( \frac{RSS_c}{RSS_{CE}} - \frac{RSS_E}{RSS_{CE}} \right) (e_{ci})^2 - \frac{n}{2} (e_{Ei})^2.
\] (A.8)
t-statistic from the regression by \( ((n - 1)/n)^{1/2} \). Note that a positive Z-statistic implies that the residuals produced by the cash from operations' regression are larger in magnitude than those from the earnings regression. Hence, a positive and significant Z-statistic indicates that earnings is the model of choice.

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