Accounting Estimates:
Pervasive, Yet of Questionable Usefulness

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April 2005

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ABSTRACT

Estimates and projections are embedded in most financial statement items. These estimates potentially improve the relevance of financial information by providing managers the means to convey to investors forward-looking, inside information (e.g., on future collections from customers via the bad debt provision, or on expected assets' cash flows reflected in impairment charges). On the other hand, the quality of financial information is compromised by: (i) the increasing difficulty of making reliable forecasts in a fast-changing, often turbulent economy, and (ii) the frequent managerial misuse of estimates to manipulate financial data. Given the prevalence of estimates in accounting data, whether these opposing forces result in an improvement in the quality of financial information or not is arguably the most fundamental issue in accounting.

We examine in this study the contribution of accounting estimates embedded in accruals to the quality of financial information by focusing on the major use of this information by investors—the prediction of enterprise cash flows and earnings. Our extensive tests, reflecting both the statistical and economic significance of estimates, indicate that, by and large, accounting accruals and the estimates they embed do not improve the quality of financial information in terms of enhancing the prediction of enterprise performance. Accruals do not improve the prediction of cash flows, beyond that achieved by current cash flows, and improve only marginally the prediction of earnings. This latter improvement, however, appears to be economically insignificant. Thus, the objective difficulties of generating reliable estimates and projections in a volatile economy, and their frequent misuse by managers appear to offset the positive role of estimates in conveying forward looking information to investors.

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I. Introduction

Financial statement information, be it balance sheet items such as net property, plant and equipment, goodwill and other intangibles, accounts receivable and inventories, deferred taxes and contingent liabilities, or key income statement figures, such as revenues, pension expense, in-process R&D or the soon-to-be-expensed employee stock options is largely based on managerial estimates and projections. The economic welfare of the enterprise and the consequences of its operations as portrayed by quarterly and annual financial reports are therefore an intricate and ever changing web of facts and conjectures, where the dividing line between the two is largely unknown to information users. With the current move of accounting standard-setters in the U.S. and abroad toward increased fair-value measurement of assets and liabilities, the role of estimates and projections in financial reports will further increase.

We ask in this study: What is the effect of the multitude of managerial estimates embedded in accounting data on the usefulness of financial information? The answer is far from straightforward. On the one hand, estimates/projections are potentially useful to investors because they are the primary means for managers to convey credibly forward-looking proprietary information to investors[1]. Thus, for example, the bad debt provision, if estimated properly informs investors on expected future cash flows from customers, restructuring charges predict future employee severance payments and plant closing costs, and the capitalized portion of software development costs (SFAS 86) informs investors about development projects that passed

[1] We say "credibly" primarily because post Sarbanes-Oxley the firm's CEO and CFO have to certify that "…information contained in the periodic report fairly represents, in all material respects, the financial condition and results of operations of the issuer…"

successfully technological feasibility tests and are accordingly expected to enhance future revenues and earnings. This potential contribution of managerial estimates to investors' assessment of future enterprise cash flows underlies the oft-quoted statement by the Financial Accounting Standard Board (FASB) in its Conceptual Framework about the superiority of accruals earnings—practically all accruals are based on estimates—over the largely fact-based current cash flows in predicting future enterprise cash flows:

> Information about enterprise earnings based on accruals accounting generally provides a better indication of an enterprise's present and continuing ability to generate favorable cash flows than information limited to the financial aspects of cash receipts and payments (FASB, 1978, p. IX).

This enhancing effect of estimates on the usefulness of financial information is counteracted by two major factors:

(i) In the current volatile and largely unpredictable business environment, due to fast-changing market conditions (deregulation, privatization, emerging economies) and rapid technological changes, it is increasingly difficult to make reliable forecasts or projections (forward-looking estimates) of financial information. Consider, for example, the estimated future return on pension assets—a key component of the pension expense: This estimate is essentially a prediction of the long-term performance of capital markets. One wonders about the reliability of such an estimate, or rather a guess when made by managers, or even by market "experts".[2] Or, reflect on the generally large impairment charges of fixed assets and acquired intangibles (including

[2] Consider, for example, the 2001 pension footnotes of three financial institutions, Merrill Lynch, Bank of New York, and Charles Schwab, which report the following estimates of the expected returns on pension assets: 6.60%, 10.50%, and 9.00%, respectively (Zion, 2002). The wide range of estimates (6.6%-10.5%) of the long term performance of capital markets reflects the inherently large uncertainty (unreliability) of the pension expense estimate.

goodwill) mandated by SFAS 121: The determination of these charges requires managers to estimate future cash flows from tangible and intangible assets. In today's highly competitive and contested markets the reliability of asset cash flows forecasted over several years is obviously highly questionable. Accordingly, the numerous accounting estimates and projections underlying financial information introduce a considerable and unknown degree of noise, and perhaps bias to financial information, clearly detracting from their usefulness.[3]

(ii) Add to the above objective difficulties in generating reliable estimates the expected and frequently documented susceptibility of accounting estimates to managerial manipulation, and the potential adverse impact of estimates on the usefulness of financial information becomes real. Given that it is very difficult to "settle up" with manipulators of estimates—even if an estimate turns out *ex post* to be far off the mark, it is virtually impossible to prove that *ex ante* the estimate was intentionally manipulated—there are no effective disincentives for managers to manipulate accounting estimates and thereby manage financial information. Indeed, many of the Securities and Exchange Commission (SEC) enforcement cases alleging financial reporting manipulation concern misuse of estimates underlying accruals (e.g., Dechow et al., 1996).

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[3] A recent case in point *(Wall Street Journal,* August 4, 2004, p. c1): "Investors in Travelers have needed more than that red umbrella protection from what has been raining on them since the company was spun out from Citigroup in early 2002. Late last month, St. Paul Travelers Cos., … announced what Morgan Stanley termed a 'blockbuster reserve charge' of $1.625 billion. The charge was about twice as large as analysts have been expecting. The insurer contends that the charge stems largely from the need to reconcile differing accounting treatments at the two companies [Travelers and its acquisition—St. Paul Cos.]. It was just a "reserve valuation adjustment," the company said…. Sadly there seems to be little reason why Travelers' executives didn't anticipate problems with St. Paul's insurance methodologies… Mr. Benet [Travelers' CFO] said:…we recognized early on that there was a difference in some of the methodologies [to estimate reserves] that would have to be addressed." Thus, different accounting methodologies used to estimate the same reserves, all approved by auditors, yield a difference of $1.625 billion.

Thus, the impact of the numerous estimates and projections underlying accounting measurement and reporting rules on the usefulness of financial information is an open question, to be examined in this study. The relevance of this examination cannot be overstated. Accounting estimates and projections occupy much of Generally Accepted Accounting Principles (GAAP) and consume most of standard-setters' time and efforts. Just consider the major issues addressed by the FASB in recent years—financial instruments, employee stock options, fixed assets and goodwill impairment, and the valuation of acquired intangibles, to name a few—all require major estimates and forecasts in the process of accounting measurement and reporting. If these and other accounting estimates do not contribute significantly to the usefulness of financial information, the efforts of accounting regulators, and much more costly—the resources society devotes to the generation of estimates in the process of financial statement preparation and their auditing—are largely wasted. Worse yet, if financial information users are led by the estimates-based accounting information to misallocate resources, an additional dead-weight cost is imposed on society.

We perform in this study various empirical tests, broadly following the widespread practice of security and financial analysis—to use financial information to predict enterprise performance.[4] This predictive use of financial information is also a fundamental premise of the FASB's Conceptual Framework as indicated by the quote above. Future enterprise performance is commonly reflected by cash flows and earnings. Future cash flows are at the core of asset and liabilities accounting valuation rules. Thus, for example, asset impairment (SFAS 121) is determined by expected cash flows, and the useful lives of acquired intangibles (SFAS 142) are a function of future cash flows. More fundamentally, asset or enterprise cash flows are postulated

[4] There are, of course, other uses of financial data, such as in contracting arrangements, which are not aimed at predicting future enterprise performance.

by economic theory as the major determinants of their value. We admit at the outset to a certain degree of ambiguity about the specific definition of cash flows used by investors, and accordingly perform our tests with two widely-used and frequently prescribed cash flow constructs: cash from operations (CFO) and free cash flows (FCF). Much of prior related research focused on CFO. However, these cash flows are not sustainable since they abstract from the cost of long-lived assets, as reflected by the periodic charges for depreciation and amortization. Accordingly, we also examine free cash flows, defined as CFO minus capital expenditures. Free cash flows are central to many practitioners' valuation models, and play an important role in research too (e.g., FCF is the primary valuation variable in the valuation construct of Feltham and Ohlson, 1995).

Despite the prominence of cash flows in economic asset valuation models and in GAAP, there is no denying that many investors and analysts are using financial data to predict *earnings.* The underlying heuristics are somewhat obscured; perhaps investors predict earnings first, and derive future cash flow estimates from the predicted earnings. In any case, earnings prediction is prevalent in practice, and we therefore examine the usefulness of accounting estimates for the prediction of earnings, both operating and net income.

The focus of this study is on accounting estimates. However, many of the estimates underlying financial information are not disclosed in the financial reports.[5] We, therefore, focus in this study on accruals (accounting items constituting the difference between earnings and cash from operations), most of which are based on estimates. We, do however, distinguish between accruals which are only slightly or not at all affected by estimates (changes in working capital items excluding inventory), and accruals which are primarily based on estimates (most non-

[5] For example, General Electric reports in its revenue recognition footnote that various components of revenues derived from long-term projects are based on the estimated profitability of these projects. GE, however, does not break down total revenues into estimates and "facts."

working capital accruals). This enables us to draw sharper inferences on the effect of estimates on the usefulness of financial information.

Our examination of the contribution of estimates to the usefulness of financial information is primarily based on two sets of tests:

(i) Out-of-sample predictions of future enterprise cash flows and earnings based on: (a) current cash flows (the benchmark), (b) earnings, and (c) cash flows and various components of accruals. The focus of this analysis is on the improvement in the quality of predictions of future cash flows and earnings brought about by the addition of accruals (heavily based on estimates) to the predictors. These tests are a direct operationalization of the above-quoted FASB's postulate claiming the superiority of accruals earnings over cash flows *in predicting* future cash flows. We thus predict cash from operations, free cash flows, net income before extraordinary items and operating income over various horizons: one year ahead, second year ahead, aggregate years one and two ahead, and aggregate years one through three ahead.

(ii) Prediction tests provide for inferences on the statistical significance of differences in the quality of alternative predictors. It is, however, difficult to gauge economic significance from statistical significance. Accordingly, we perform extensive portfolio tests, where portfolios are constructed from predicted cash flows and earnings based on various predictors: primarily current cash flows and accruals. The abnormal returns on these portfolios, generated by alternative predictors, are evaluated for economic significance. The focus here is on comparing the returns on portfolios constructed from predictions based on current cash flows only (the benchmark), with returns on portfolios constructed from predictions based on current earnings or current cash flows plus various components of accruals. These portfolio returns inform on the *economic* significance of accruals in improving the usefulness of financial information to investors.

Our major findings, based on a sample of all nonfinancial Compustat firms with the required data—ranging from roughly 3,500 to 4,500 companies per year—and spanning the period 1988-2002,[6] are as follows:

(i) Accounting accruals, and the estimates they embed do not improve the prediction of future cash flows (both operating and free cash flows), compared with cash flow prediction based on current CFO only. Cash flow predictions based on current earnings only are substantially inferior to those generated by current CFO.

(ii) Accruals improve slightly the prediction of next year's net and operating income, but do not improve the prediction of second-year ahead income, suggesting that the improvement in next year's forecast is caused largely by the mechanical and quick reversal of accruals (Sloan, 1996) rather than by forward-looking information believed to be conveyed by accruals.

(iii) Our portfolio tests do not indicate that the accruals-induced improvement in next year's earnings prediction is economically meaningful. In fact, in practically all of our portfolio tests the model that uses current operating cash flows only to predict firm performance generates higher abnormal returns than models which add accruals to the prediction process used for the portfolio

[6] We start our sample period with 1988, since it is the first year with reported data on cash from operations.

formation. Furthermore, the portfolios constructed from predictions based on current cash flows only yield abnormal returns with generally lower *standard deviations* than the alternative portfolios which include earnings or accruals among the predictors. This enhances the superiority of the cash-flow-based portfolios over the earnings/accruals-based portfolios.

(iv) Our findings provide an interesting perspective on a perplexing phenomenon: while economic theory prescribes that asset values are determined by their future cash flows, financial analysts predominantly predict earnings. Why the almost universal "obsession" with earnings? Our prediction tests provide a clue to this conundrum. The returns on portfolios constructed from perfect prediction of earnings are indeed substantially higher than the returns on portfolios constructed from predicted cash flows. This is the case, however, only for perfect prediction. Given that earnings are substantially more volatile, and hence more difficult to predict than cash flows, the returns on portfolios constructed from actual, not perfect, predictions are indeed higher for cash flows than earnings. This may be ignored by some analysts.

The order of discussion is as follows: Section II relates our findings to available research, while Section III provides a link to, and a departure point from a substantial body of related research—in-sample examination of the usefulness of accruals. Section IV reports on our primary analysis—the out-of-sample prediction tests, and Section V provides the results of our portfolio analysis (economic significance). Section VI comments on the pervasiveness of earnings predictions, and Section VII concludes the study.

II. Relation to Available Research

Our study relates to several active research areas. Rather than provide a literature survey, we will comment on the relation between our study and various representative papers.

We are not familiar with empirical studies which assess the role of accounting *estimates* in the informativeness of financial information, but there is a substantial number of studies that examine the contribution of accruals to the prediction of future cash flows and other value indicators. These studies can be roughly classified into regression-based (in-sample) analyses, and out-of-sample prediction tests. An example of the former is the comprehensive work by Barth, Cram and Nelson (2001), who regress CFO on lagged values of CFO and components of accruals (primarily the changes in accounts receivable, inventories, and accounts payable, as well as depreciation & amortization and other accruals). The authors report (p. 27) that "each accrual component reflects different information relating to future cash flows…[and] is significant with the predicted sign in predicting future cash flows, incremental to current cash flows." Note that predictive ability is assessed in this and similar studies by the significance of the estimated accruals' coefficients and by the improvement in R^2.

An interesting extension of the regression strand is provided by Subramanyam and Venkatachalam (2004) who examine the relative explanatory power of earnings and cash flows with respect to an *ex post* measure of the intrinsic value of equity. This measure uses Ohlson's (1995) equity valuation framework and is based on *realized* values of earnings and book values. The authors argue that such measurement of equity values avoids the necessity to assume capital market efficiency, as in Dechow's (1994) study relating accruals to contemporaneous stock returns. Dechow documents a significant association between accruals and stock returns, but the implications of such association are questionable, given Sloan's (1996) findings of strong return reversals (market inefficiency) following extreme accruals. Subramanyam and Venkatachalam conclude that operating cash flows are more strongly associated with future cash flows than earnings, and that current earnings are more strongly associated with future earnings than cash flows. Regressing the *ex-post* equity measure on earnings and cash flows indicates that earnings exhibit a higher explanatory power than cash flows.

By and large, the in-sample regression studies suggest that accruals are associated with subsequent cash flows or contemporaneous equity values. But, as is argued in the next section, in-sample regressions are not prediction tests, and may even provide misleading inferences concerning prediction. We move, therefore, to out-of-sample tests.

An early and innovative out-of-sample prediction test is Finger (1994), who concludes from a sample of 50 companies with long historical data, that cash flow is marginally superior to earnings for short-term predictions and performs similar to earnings in long-term cash flow predictions. Other out-of-sample prediction tests (with the exception of Lorek and Willinger, 1996) generally corroborate Finger's finding that accruals do not contribute to the prediction of cash flows beyond current cash flows. Note that most previous studies, in- and out-of-sample, focus on the prediction of cash from operations, despite the fact that free cash flows (a measure included in our tests) is frequently used by analysts and investors.

Barth, Beaver, Hand and Landsman (2005) provide an interesting perspective on the usefulness of accruals. Using the valuation framework of Feltham and Ohlson (1995, 1996) they examine the ability to predict equity value of various disaggregations of earnings: aggregate earnings, cash flows and total accruals, as well as cash flows and four major components of accruals. The prediction methodology is out-of-sample in a particular sense: cross-sectional valuation models are run for each year (equity values regressed on contemporaneous earnings disaggregations), excluding each time a particular sample firm. The equity value of that firm is then predicted from the estimated coefficients of the models. Barth et al. (2005, p.5) "…find evidence of some reduction in mean prediction errors from disaggregating earnings into cash flows and total accruals, and some additional reduction from disaggregating total accruals into its four major components…median prediction errors generally support disaggregation of earnings only into cash flows and total accruals." Overall, the findings vary considerably by industry, and appear to indicate a more consistent success for the cash flows-and total accruals model than for the cash flows and disaggregated accruals model.

The substantial body of research on the accruals anomaly initiated by Sloan (1996) is tangentially related to our study. This research establishes that accruals are often misinterpreted by investors: Large (small) accruals firms are contemporaneously overvalued (undervalued) in capital markets, and these misvaluations are largely reversed within a couple of years. Notably, much of the accruals anomaly resides in small, thinly traded firms, which are unattractive to most institutional investors (Lev and Nissim, 2004), a fact that contributes significantly to the persistence of this anomaly. It is important to note that our focus in this study is different from the accruals anomaly research: We do not examine investors' perceptions of accruals, and the efficiency of such perceptions. Rather, we focus on the contribution of accruals and by implication of the embedded estimates to the primary role of financial information—assisting users in predicting the future performance of the enterprise. We thus do not assume market efficiency (an assumption implied in the contemporaneous studies mentioned above)—an imperative since Sloan's (1996) clear evidence of market inefficiency with regard to accruals. The documented short-term market inefficiencies documented by the accruals anomaly are, of course, worth noting, but they do not inform on the presumed role of accruals—to improve the prediction of enterprise performance. Stated differently, while *extreme* accruals are often misperceived contemporaneously by investors and corrected shortly thereafter, accruals in general, prevalent in every firm, may still enhance the multi-year prediction of firm performance. It is this fundamental role of accruals that is the main theme of our study.

The lack of focus of the accruals' usefulness research makes it very difficult to draw general conclusions. Some studies are in-sample, while others are out-of-sample. Some researchers relate accruals to contemporaneous variables (returns or equity values) whereas others to future values. Some predict cash flows while other predict equity values based on models using forecasted or realized residual earnings. Our contribution to extant research aims at providing some closure to the usefulness of accruals issue. First and foremost, our tests are representative out-of-sample predictions in the sense that they replicate what most investors actually do—predict, with no *ex post* information, various versions of future earnings and cash flows. The comprehensiveness of our predicted performance measures (two versions of earnings and two of cash flows), and the number of future periods examined (years t+1, t+2, and aggregate next two years and next three years) enable us, we believe, to draw general conclusions about the contribution of accruals. Furthermore, our study is the first to examine both the statistical and economic performance of the prediction models examined. Inferences from statistical significance are sometimes difficult to draw. Consider, for example, the Barth, Beaver, Hand and Landsman (2005, p.5) conclusion: "we find evidence of *some* reduction in mean prediction errors from disaggregating earnings…" (emphasis ours). While definitely interesting, this conclusion leaves open the important question of: how material is "some"? Is it, for example, sufficiently large to support the current move of the FASB and IASB toward increased reliance on estimates in financial reports (fair value, stock option expensing, etc.)?

Statistical significance coupled with economic significance, as provided below, allows for a comprehensive evaluation of the evidence. Finally, our study differs from others in the issue investigated. We focus on the role of *estimates* in improving financial information, rather than on accruals per se. True, given that many estimates are not reported separately, we use accruals in our tests for practical purposes, and comment occasionally on estimates. Yet, the focus on estimates—a fundamental and pervasive issue in accounting—is important in motivating further research on the issue.

III. A Link to In-Sample Studies and Departure Thereof

As a link to previous in-sample research and a point of departure we replicate and update the Barth, Cram and Nelson (2001) study (BCN hereafter). A major construct of this study is the cross-sectional regression of next year's cash from operations (CFO) on current year's CFO and the following accruals: the annual changes in accounts receivable, inventory, and accounts payable, along with depreciation, amortization, and the aggregate remaining "other accruals". All variables are scaled by current year's average total assets. BCN report that for the period 1987-1996, the coefficients of all the independent variables, except amortization, are statistically significant.

We extended the BCN analysis from 1996 to 2002, examined several robustness issues and comment below on our main findings:

(i) The BCN findings from regressing CFO on lagged values of CFO and accruals generally hold for the 1987-2002 period: The coefficients of CFO and the changes in accounts receivable, inventories and accounts payable, as well as depreciation are significant in every year. Practically all the yearly coefficients of the amortization component of accruals are insignificant, and five of the 16 coefficients of "other accruals" are also insignificant. The latter finding is interesting for our research focus, since most of "other accruals" (e.g., bad debt provision) are pure estimates. It is also interesting to note that the R^2 of the yearly regressions increases almost monotonically, from 0.36 in 1987 to 0.61 in 2002.

(ii) The regression results are quite sensitive to the deflator. BCN deflate all the variables by average total assets of the current year. When market value is the deflator, we find a certain increase in the number of insignificant annual coefficients. For example, four of the 16 annual coefficients of the inventories change are insignificant (only one insignificant when deflated by total assets), as are most of the coefficients of "other accruals."

(iii) As expected, regression results are somewhat weaker for year 2 CFO (not reported by BCN). For example, five of the 16 accounts receivable coefficients are insignificant, as are practically all the "other accruals" coefficients.

(iv) Replacing the dependent variable CFO with next year's free cash flows, or with, net income or operating income yields qualitatively similar results to those of CFO.

Thus, the BCN regression results hold well overtime. However, it is important to note that a regression analysis of a given variable on lagged values of that variable along with other data, as frequently conducted in accounting and finance research, is not an adequate test of predictive ability. As noted in Poon and Granger's (2003, p. 492) survey:

> "In all forecast evaluations, it is important to distinguish in-sample and out-of-sample forecasts. In-sample forecast, which is based on parameters estimated using all data in the sample, implicitly assumes parameter estimates are stable through time. In practice, time variation of parameter estimates is a critical issue in forecasting. A good forecasting model should be one that can withstand the robustness of an out-of-sample test, a test design that is closer to reality. In our analyses of empirical findings… we focus our attention on studies that implement out-of-sample forecasts."

A dramatic example of misplaced inferences drawn on the basis of regression analysis has been recently provided by Goyal and Welch (2004):

> "Attempts to predict stock market returns or the equity premium have a long tradition in finance. For example, as early as 1920, Dow (1920) explored the role of dividend ratio. Nowadays, a typical specification regresses an independent lagged predictor on the stock market rate of return, or as we shall do, on the equity premium…The most prominent variables explored in the literature are: The dividend-price ratio and the dividend yield; the earnings price ratio and dividend-earnings ratio; the interest and inflation rates; the book-to-market ratio; the aggregate net issuing activity…we posit that a real-world investor would not have had access to any ex-post information either to construct variables or to the entire-sample gamma regression coefficients. An investor would have had to estimate the prediction equation only with data available strictly before or at the prediction point, and then make an *out-of-sample* prediction. Therefore, instead of running one single *in-sample* regression… we must run rolling forecasting regressions…" (pp.1-2).

When Goyal and Welch compare the in- and out-of-sample results they conclude:

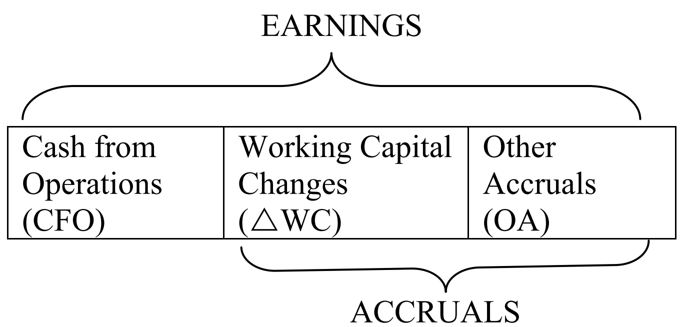
> "Altogether, we find our evidence sobering: we could not identify a single variable that would have been of solid and robust use to a real-world investor (who did not have access to ex-post information). Our diagnostic shows that any presumed equity premium forecasting ability [claimed by the numerous regression studies cited by Goyal and Welch] was a mirage… most variables are just *worse* than the prevailing historical equity premium average as a predictor, …In sum, despite good *in-sample* predictive ability for many of these variables, most had consistently poor or zero *out-of-sample* forecasting ability. (They were essentially noise.)" (pp. 2-3).

This is indeed an important lesson motivating our primary analysis which focuses on out-of-sample prediction tests.

IV. <u>Out-of-Sample Predication Tests</u>

1. <u>Preliminaries</u>

We use several prediction constructs, primarily to distinguish between accruals which are strongly affected by estimates and those which are largely based on facts. At one extreme of the accruals disaggregation we classify all the accruals in the "operations" section of the cash flow statement into working capital changes (△WC) and "other accruals" (OA):



Working capital changes (△WC), perhaps with the exception of inventory, are generally not strongly impacted by estimates whereas many "other accruals" components are in fact pure estimates (e.g., depreciation and amortization, bad debt provision, in-process R&D).

At the other end of the accruals disaggregation we separate out the change in inventory (△INV) from the aggregate change in working capital items, given the evidence (e.g., Thomas and Zhang, 2002) that much of the accruals anomaly resides in inventory, probably due to intentional and unintentional misestimations of this item. We further breakout depreciation and amortization (D&A) and deferred taxes (DT) from other accruals because this identification of individual accruals is possible from Compustat data over the entire sample period. This disaggregation is depicted thus:

EARNINGS

CFO	△WC* (minus inventory)	△Inventory (△INV)	Dep. & Amortization (D&A)	Def. Taxes (DT)	Other Accruals (OA*)

ACCRUALS

The various components of accruals, along with cash from operations (CFO)[7] depicted in the two exhibits above are the independent variables in the estimation models underlying our predictions. We add to these variables the cash flow statement figure of capital expenditures since: (i) the dependent variables in our models are *future* cash flows or earnings, which are affected to some extent by current investment (capital expenditures), and (ii) future free cash flow (CFO minus capital expenditures) is a dependent variable in our analysis, while current CFO is among the regressors; having current capital expenditures as an additional regressor achieves correspondence between the dependent and independent variables. Table 1 provides summary statistics and correlation matrix for out test variables.

Our prediction tests take the following general form. We predict two versions of cash flows and two constructs of earnings (cash from operations and free cash flows, as well as net income before extraordinary items and operating income) in years t+1 and t+2, as well as in aggregate years t+1 & t+2, and t+1 through t+3. We use five alternative prediction models with the following independent variables: current year CFO only—the benchmark model. Alternatively, the predictors are net income only; CFO plus the change in working capital items

[7] We measure CFO as in Barth et al. (2001), namely net cash flow from operating activities, adjusted for the accrual portion of extraordinary items and discontinued operations.

(ΔWC); CFO plus ΔWC and all other accruals (OA); and the most disaggregated model—CFO, the aggregate change in working capital items minus inventories, the change in inventories, depreciation & amortization, the change in deferred taxes, and all other operating accruals. The purpose is to examine whether the gradual addition of components of accruals to current cash flows improves the prediction of future cash flows or earnings. Our five prediction models contain an increasingly finer partition of accruals. Thus, the increase in the number of accrual components should, in general, enhance the quality of prediction (from model 1 to 5), since the individual components of accruals are allowed to have different effects (multiples) on the predicted values.

The following examples of the prediction of free cash flows (FCF) will clarify our prediction procedures.

A. Prediction of next year's free cash flows, FCF (t+1)

(a) Benchmark Model using CFO only (example for 1989):

Estimate cross-sectionally:

$$FCF(88) = \alpha + \beta CFO(87) + \varepsilon$$

Predict: $EFCF(89) = \alpha + \beta CFO(88)$, using the above estimated coefficients.

Error: $FCF(89) - EFCF(89)$.

Here we predict 1989 free cash flows from current (1988) cash from operations (and capital expenditures): First we regress cross-sectionally free cash flows of 1988 on CFO in 1987, and obtain the estimated coefficients α and β. Those coefficients are then used to predict *firm specific* free cash flows (EFCF) in 1989, using the firm's actual CFO of 1988 and the previously estimated coefficients. In the third stage, a prediction error is determined by comparing the firm's actual 1989 FCF with the predicted one. The same procedure is repeated for every firm and sample year.

(b) Restricted Accruals Model:

Estimate cross-sectionally:

$$FCF(88) = \alpha + \beta_1 CFO(87) + \beta_2 DWC(87) + \beta_3 OA(87) + \varepsilon$$

Prediction and error determination as in (a) above.

Here we predict 1989 free cash flows from CFO, capital expenditures, DWC (aggregate change in working capital items), and OA (all other accruals). First, a cross-sectional regression of 1988 free cash flows is run on the 1987 values of CFO, DWC, and OA, yielding coefficients $\alpha, \beta_1, \beta_2,$ and β_3. Then, firm specific 1989 free cash flows are predicted, using the four estimated coefficients and the 1988 actual values of CFO, DWC, and OA. Finally, these 1989 FCF predictions (EFCF) are compared with the 1989 actual free cash flows to determine the prediction error. The same procedure is repeated for each firm and sample year.

(c) Expanded Accruals Model:

Estimate cross-sectionally:

$$FCF(88) = \alpha + \beta_1 CFO(87) + \beta_2 \Delta WC^*(87) + \beta_3 \Delta INV(87) + \beta_4 D\&A(87) \\ + \beta_5 DT(87) + \beta_6 OA^*(87) + \varepsilon$$

Prediction and error determination as in (a).

Here we predict 1989 free cash flows from 1988 CFO, capital expenditures, and the disaggregated set of accruals (see second diagram at the beginning of this Section). Once more, we run a cross-sectional regression of 1988 FCF on the 1987 values of the independent variables, estimating the α and $\beta_1, \ldots \beta_6$ coefficients (and a β_7 coefficient for 1987 capital expenditures). The firm-specific 1989 free cash flows are predicted using these coefficients, and the actual values of the independent variables in 1988. Computation of the 1989 FCF prediction error follows.

B. Prediction of year 2 free cash flows, FCF (t+2)

(d) Benchmark Model (example for 1991)

Estimate: $FCF(89) = \alpha_1 + \beta_1 CFO(87) + \varepsilon$

Predict: $EFCF(91) = \alpha_1 + \beta_1 CFO(89)$

Error: $FCF(91) - EFCF(91)$

This is the prediction of free cash flows in t+2. It follows the earlier procedure with one difference: Here the cross-sectional estimate (first equation) and the forecast (second equation) involve a two-year lag (e.g., FCF in 1989 regressed on CFO of 1987). Same procedure is performed for each firm and sample year. The expanded prediction models incorporating accruals follow steps (b) and (c), above.

We also predict free cash flows for aggregate t+1 plus t+2, and t+1 through t+3. These predictions are based on the procedures describes above, except that aggregated future free cash flows are substituted for single year free cash flows as left-hand variables in the various models. The procedure demonstrated above for FCF is also used to predict cash from operations (CFO) in t+1, t+2, and aggregated future years, and to predict *earnings* in t+1, t+2 and aggregated future years. Two versions of earnings—net income before extraordinary items (NI) and operating income (OI) are predicted. The various prediction models for earnings are identical to those of free cash flows described above, except that earnings in t+1 and t+2 are substituted for FCF in those years. To summarize, we perform predictions of two versions of cash flows and two versions of earnings from current values of CFO, current values of NI, and CFO plus various combinations of accruals.

An important note: The cross-sectional regression estimates described above—the first phase of the prediction process —are performed within 2-digit SIC industry groups. This makes the implicit assumption of constancy of coefficients across firms reasonably tenable.

To evaluate the quality of predictions, we compute two summary measures of prediction errors derived from the firm- and year-specific estimated errors: the median prediction error (MEDE), indicating the bias in the forecasts, and the absolute error (ABSE) which abstracts from the sign of the error. The firm-specific prediction error in a given year is computed as the realized value of cash flow or earnings minus the predicted cash flow or earnings, divided by average total assets in year t.

2. Prediction results

Table 2, summarizes our main out-of-sample findings. Recall: We predict four key performance indicators: cash from operations (CFO); free cash flows, defined as CFO minus capital expenditures (FCF); net income before extraordinary items (NI); and operating income (OI). There are four prediction horizons: next year, second year ahead, aggregate next two years, and aggregate next three years. Five prediction models are examined (they were discussed and demonstrated above), where the predictive (independent) variables are: (1) CFO only—the benchmark model, (2) NI only, (3) CFO and the aggregate annual change in working capital items ($\triangle$WC), (4) CFO and the change in working capital items ($\triangle$WC), as well as all other accruals combined (OACC), and (5) our most disaggregated model: CFO, $\triangle$WC minus inventories, the change in inventories, depreciation and amortization, deferred taxes, and all remaining accruals. Current capital expenditures is included as an additional variable in each of the five models. We report in the Table summary statistics for the pooled absolute error (ABSE) of each of the five models, the median error, or bias (MEDE), and mean R^2s from annual regressions of actual values of future cash flows or earnings on predicted values. We have also computed the sample mean errors and root mean square errors. Results from these two indicators are very similar to those reported in the Table (we comment in the text on the occasional differences). Below are the main inferences we draw from Table 2, and additional analysis:

1. Prediction of cash flows. Considering the prediction of *next year's* cash from operations (CFO) and free cash flows (FCF)—left two triplets of columns in Table 2—we note that neither the predictions derived from net income (second line), nor the three predictions based on CFO and various combinations of accruals outperform our benchmark—the predictions based on current cash from operations only (top line). This is the case for both the absolute and median error measures. Thus, for example, predicting next year's CFO (left three columns in top panel of Table 2), the mean absolute error (ABSE) and median errors (MEDE) of the model based on CFO only (top line) are: 0.062 and 0.002, respectively. In contrast, the median errors of all the four alternative models are larger than that of CFO only, whereas the absolute error of the earnings model (second line) is higher, 0.069, and the ABSEs of the three accrual models are negligibly lower than that of the CFO model (0.060-0.061 vs.0.062)[8]. The same holds for the prediction of next year's free cash flow (second triplet of columns from left of top panel). Here the rounded ABSE of the most disaggregated accruals model (0.069) is equal to that of the CFO only model, yet the latter is statistically smaller (at the 0.05 level) than the former.

Moving to the second year ahead cash flow predictions, and aggregate two, and three-years ahead predictions (bottom three panels of Table 2), it is clear that the addition of various accruals components to CFO does not improve substantially the forecasts of future CFO or FCF,

[8] Note, however, that despite the very small difference between the mean ABSEs of models 1 and 5 (0.062 vs. 0.061), the difference is statistically significant at the 0.05 level (see asterisk on 0.061).

neither in terms of ABSE or MEDE[9]. Interestingly, cash flow predictions based on net income (second line in each panel) are invariably the worst of the five models examined.

Conclusions: Neither earnings, nor combinations of accruals systematically improve the prediction of cash flows (CFO or FCF) over the predictions based on current CFO only. This finding starkly contradicts the FASB's conceptual stipulation that "Information about enterprise earnings…generally provides a better indication of an enterprise's present and continuing ability to generate favorable cash flows than information limited to the financial aspects of cash receipts and payments." (FASB, 1978, p. IX).

2. Prediction of earnings. The two triplets of columns to the right of Table 2 report error statistics for net (NI) and operating income (OI). Given the evidence on the strong and quick reversal of accruals (Sloan, 1996), it is not surprising that accruals do improve the prediction of *next year's* earnings. Thus, for example, the ABSEs of predicting next year's NI and OI from CFO only are 0.071 and 0.069, respectively, whereas the corresponding statistics for the predictions based on the most disaggregated accruals (bottom line) are 0.065 and 0.062, respectively. These differences are statistically significant at the 0.01 level. Somewhat surprisingly, accruals don't improve the median error, though they do improve the mean error (not reported). It thus appears that accruals lead to a certain reduction in extreme prediction errors (reflected by the mean error). Overall, however, significant prediction error differences at the third decimal point (e.g., 0.065 vs. 0.071 for net income) are not overly impressive.

Moving to year 2 earnings predictions, the accruals-generated improvement evident in year t+1 predictions largely vanishes. Both the ABSE and MEDE of the four accruals models

[9] Note that in the aggregate two- and three-years ahead CFO prediction the ABSE of model 5, while very close to that of model 1, is significantly smaller than model 1, while the reverse is true for FCF predictions.

are essentially identical to the prediction quality measures of the model based on CFO only[10]. Aggregate two- and three-years ahead prediction errors are slightly lower for the accruals-based models than for the benchmark (CFO only) model, reflecting the accruals-related improvement in the prediction of one-year ahead earnings.

Conclusions: Accruals do improve the prediction of next year's earnings (NI and OI) relative to CFO-based predictions. Beyond one year, however, accruals do not contribute materially to the prediction of net or operating income. It appears, therefore, that the contribution of accruals to earnings prediction is primarily due to the short-term and mechanical reversal of accruals, rather than to the forward-looking information which is often attributed to accruals.

3. Focus on estimates. Comparison of models 3 and 4, where the difference is the non-working capital accruals (OACC), does not indicate a significant difference in predictive ability. Thus, the non-working capital accruals (e.g., depreciation and amortization, bad debt provision, in-process R&D), mostly entirely based on estimates—the focus of this study—do not improve the prediction of either earnings or cash flows.

4. The quality of our predictions models. Our prediction models are admittedly simple—they obviously abstract from many of the complexities underlying accruals. Nevertheless, the R^2s in Table 2—derived from annual regressions of actual values (future cash flows or earnings) on predicted values—are quite large. Thus, for example, for next year's predictions (top panel of Table 2) the R^2 range is 0.28-0.55. As expected, the R^2s drop for second

[10] In terms of statistical significance of the mean ABSE: for year 2 net income predictions, the CFO-based model is statistically superior to the disaggregated accruals model, whereas for year 2 operating income the reverse is true. However, despite the statistically significant differences, it is clear that the prediction quality of the five models in year 2 is virtually identical.

year predictions, yet they are still in the reasonable range of 0.20-0.32. Thus, despite their simplicity, our prediction models perform reasonably well.

5. Robustness: trimming extreme prediction errors. We applied several procedures to cope with large prediction errors, such as trimming the top and bottom 1% or 2% of the error distributions. The resulting summary prediction errors (not reported) are very similar to those of Table 2. As expected, the trimmed ABSE and MEDE are substantially smaller than those of Table 2, and the R^2s are larger, yet the above conclusions equally apply to the trimmed errors.[11] Thus, outliers do not affect our inferences.

6. Robustness: classification by size of accruals. Since the focus of this study is on accruals, or more precisely on the estimates underlying accruals, we classified the sample firms into three groups by the size of accruals. Specifically, for each sample year we ranked the firms by the size of accruals (scaled by total assets), and then formed three groups: the top 25% of firms (high accruals), the middle 50% of firms (medium accruals), and the bottom 25% (low accruals). We then generated cash flow and earnings predictions for each of the three accruals groups in the same manner used for the total sample.

The findings for all three accruals groups are essentially the same as those for the total sample: accruals do not improve materially the prediction of cash flows (either CFO or FCF),[12] and improve slightly the prediction of next year's earnings. We note a systematic pattern in the accruals classification: for the firms in the medium accruals category (middle 50% of the accruals ranking), the average ABSEs are substantially lower and the R^2s higher, than the corresponding statistics of firms with large or low accruals. Thus, for example, predicting next

[11] With trimmed errors the ABSE differences between the CFO-based and the accruals models for predicting one year ahead FCF, second year ahead NI, and years one and two ahead FCF become insignificant.
[12] The exception: For the 25% of the sample firms with high accruals, the ABSE of model 5 (CFO plus disaggregated accruals) is significantly lower than the ABSE of model 1 for both CFO and FCF in year 1.

year's net income, the ABSE range of the firms in the top accruals quartile is 0.078-0.083 (for the five prediction models), while the corresponding ABSE range for the medium accruals firms is 0.043-0.45. Thus, accruals, both high and low, adversely affect the performance of all our prediction models.

7. Robustness: Industry effects. To examine whether the contribution of accruals to the prediction of cash flows and earnings varies across industries, we focus on 2-digit SIC groups with more than 600 firm-year observations during 1988-2002. (This requirement reduces the sample size by about 20%.) We then run the out-of-sample prediction analysis for each of the 21 industries with the required number of observations.

This analysis identified several industries where accruals did not improve even the prediction of next year's earnings, relative to predictions based on CFO only: oil and gas (SIC#13), printing and publishing (27), fabricated metals (34), eating and drinking places (58), and health services (80). It is difficult, however, to find a common denominator for these industries. In addition, we note the expected difference in the predictive performance of all the five models due to stability of demand conditions: for industries with stable demand, such as electric and gas utilities, the ABSEs were very low (range: 1.9-2.1%), while for volatile industries, such as software, the ABSEs of all the models were relatively high (range: 9.9-10.8%). Thus, the predictive impact of accruals does not appear to vary significantly across industries.

8. Robustness: Temporal changes. To examine for temporal changes in the contribution of accruals to the prediction of cash flows and earnings, we split the sample period into two: 1988-1994 and 1995-2002, and compare the models' performance across the two subperiods. The main finding standing out in the temporal analysis is the deterioration in predictive

performance of all the five models in the recent period (1995-2002) relative to the early one (1988-1994). Thus, for example, the ABSEs range of our five models for the prediction of next year's net income in the 1988-1994 period is 4.6 to 5.4%, whereas the corresponding ABSEs range for the recent period is 7.6%-8.2%. For the prediction of aggregate net income in the next three years, the ABSE of the models in the early period is 21% and in the recent period—30%. This significant decrease in prediction performance is undoubtedly caused by the general increase in business volatility (e.g., Campbell et al., 2001), as well as by the increased manipulation of earnings via accruals. The latter cause (manipulation) is supported by the fact that the deterioration in the predictive performance of our models is substantially smaller for cash flows than for earnings prediction (e.g., for aggregate three years prediction of CFO, the ABSEs of the five models in the early period are 17%, increasing to only 20% in the latter period). As for the contribution of accruals to the prediction of earnings—it is smaller in the recent period than in the early one, likely reflecting once more the management of earnings via accruals which has increased substantially in the 1990s (e.g., Lev and Nissim, 2004).

9. Additional tests. The cross-sectional estimation of parameters in the first stage of our predictions (demonstrated in the beginning of this section) uses *current values* of cash flows and accruals. We have also experimented with a cross-sectional estimate using the last three years of data on CFO, NI and accruals. The predictive quality of this estimation is slightly inferior to that based on current data (and reported in Table 2).

While we believe that the inclusion of capital expenditures in our prediction models is justified, it may raise concerns (e.g., perhaps capital expenditures detract from the predictive performance of accruals). Accordingly, we re-performed our predictions without capital expenditures in the estimation models. None of our conclusions stated above is affected by the exclusion of capital expenditures.

Taken together, our out-of-sample prediction tests indicate that accruals, either combined or disaggregated, do not improve the prediction of cash flows (from operations or free cash flows), and improve slightly the prediction of next year (but not subsequent years') earnings. This short-term predictive improvement appears to be primarily driven by the reversal of accruals (Sloan, 1996), rather than by important forward-looking information inherent in the estimates (e.g., pension expense, warranty provisions) underlying accruals.

V. Economic Significance: Portfolio Tests

Poon and Granger (2003, p. 491) note: "Instead of striving to make some statistical inference, [prediction] model performance could be judged on some measures of economic significance." Our out-of-sample tests (Table 2) indicate a few instances—particularly the prediction of next year's earnings—where accruals improve slightly the predictions based on current cash flows only. To gauge the *economic significance* of the contribution of accruals, and by implication of accounting estimates to the usefulness of financial information we perform a series of portfolio tests focusing on the incremental returns generated by the accruals-based prediction models.

Essentially, we predict cash flows (CFO and FCF) and earnings (NI and OI) in years t+1, t+2, and the aggregate subsequent two years, using the procedures described in Section IV. That is, we perform competing predictions of subsequent cash flows and earnings based on five models: current CFO only, NI only, and alternatively on three models of CFO plus various components of accruals[13]. We then use the predicted values of cash flows and alternatively of earnings to form portfolios. Specifically, for each sample year we rank the firms on expected (predicted) cash flows or earnings (four rankings, two for cash flows and two for earnings) scaled by average total assets in year t. We then form ten portfolios from each annual ranking and compute risk-adjusted (size & book-to-market adjusted) returns from holding these portfolios over several future periods. In assessing the performance of the various predictors (CFO, NI, component of accruals), we primarily focus on a zero-investment strategy going long (investing) in the top portfolio (the 10% of firms with the largest (scaled) predicted cash flows or earnings), and shorting the bottom portfolio (10% of firms with the lowest expected cash flows or earnings). The abnormal returns on these zero-investment portfolios will indicate the economic contribution to investors of the accounting estimates embedded in accruals. Thus, if estimates are indeed useful to investors then portfolios constructed on the basis of cash flows *and* accruals information should consistently outperform those formed on the basis of current cash flows only.

Figure 1, Panel A presents the size and B/M (book-to-market)-adjusted returns on the zero-investment (hedge) portfolios constructed from the prediction of next year's *free cash flows* (FCF). The 12-month portfolio returns relate to year t+1[14]. (Recall, ten portfolios are constructed from the yearly ranking of firms on predicted next year's FCF, scaled by average total assets of year t. The zero-investment strategy is long on the top portfolio (large predicted FCF) and short on the bottom portfolio.)[15] The left bar of Figure 1, Panel A portrays the return from a *perfect prediction* of next year's FCF. Thus, if you knew the value of next year's FCF for

[13] Here, as in the prediction models of Section IV, current year capital expenditures are included in all the models.
[14] The return cumulation starts with the fifth month of t+1.
[15] The returns presented in Figures 1-4 are averages for the years 1989-2002, for stocks with the necessary data during the sample period.

each sample firm, and invested in the zero-investment portfolio, your average 12 months abnormal annual return over the sample period (1989-2002) would have been a whopping 30%. The five bars to the right of Panel A indicate the abnormal returns to portfolios constructed from the five prediction models detailed in the left column of Table 2.[16] Thus, the second from left bar indicates that the hedge portfolio constructed from next year's FCF predictions based on current CFO only yields 11.2% over a 12-month holding period. It is evident that the abnormal returns on the portfolio predicted from earnings only (third from left bar), and on the three portfolios based on prediction models including CFO and various combinations of accruals are lower than the CFO only returns. For example, the abnormal return on the portfolio constructed from FCF predictions based on CFO and the most disaggregated accruals (right-most bar) is 8.7% vs. 11.2% for the CFO only. Panel B of Figure 1 presents the 36-month holding period abnormal returns from the zero-investment portfolios considered in Panel A. Once more, the portfolio constructed from predicted FCF in the following year based on current CFO only (second bar from left) generates the highest three-year abnormal return (21.9%) of the five portfolios. Model 4 portfolio (predictors: CFO, ΔWC, OACC) comes closest with 21.7% return. Interestingly, in both panels, the portfolios constructed from FCF predictions based on net income only (third from left bar) generate significantly lower returns than the other portfolios examined.

The two panels of Figure 1 portray abnormal returns on portfolios constructed from the prediction of next year's free cash flows. We have also experimented with portfolios constructed from the prediction of year t+2 free cash flows. The holding periods for these portfolios are the same 12 months starting with the fifth month of year t+1, and 36 months starting on the same

[16] The five portfolios to the right of Figure 1 are constructed from FCF prediction models which are respectively based on: (1) CFO; (2) net income; (3) CFO and ΔWC; (4) CFO, ΔWC and other accruals; and finally (5) CFO, ΔWC (minus inventory), Δ Inventory, depreciation and Amortization, Deferred Taxes, and remaining accruals.

date. The abnormal returns on these portfolios (not reported) are qualitatively similar to those of Figure 1. In particular, in no case did portfolios constructed from free cash flows predictions based on earnings or on CFO and accruals generate higher returns than those based on current CFO only.

Finally, to overcome the possible limitations in restricting the cash flow predictions to single years, we forecast *aggregate* t+1 and t+2 free cash flows, using the procedures described in section IV. We then form portfolios based on these two-year FCF predictions (generated by the five prediction models) and present the abnormal returns in Figure 2. Results of this test are essentially the same as in Figures 1: Portfolios constructed from FCF predictions based on current CFO only consistently yield higher abnormal returns than portfolios where earnings, or combinations of CFO and accruals serve as the predictors. Notably, for the portfolios in Figures 1and 2, the CFO-based portfolio (second from left bar) has not only the highest return, but also the lowest *standard deviation* of returns of the five portfolios. Thus, for example, in Figure 2, Panel A, the standard deviation of the 11.4% mean return of model 1 (CFO only) is 4.5%, while that of Model 5 (CFO and disaggregated accruals) is 5.4%. Similarly, in Figure 1, Panel A, the corresponding standard deviations are 3.7% and 4.5%, separately. Accordingly, the "Sharpe Ratio" (mean return divided by standard deviation)—a widely used measure of portfolio performance, accounting for both risk and return—is decidedly higher for the CFO-based portfolios than the Sharpe ratios of portfolios predicted from earnings or accruals.

Figures 1 and 2 present abnormal returns on portfolio constructed from predicted free cash flows. The performance of portfolios constructed from the prediction of *cash from operations* (CFO) in t+1, t+2, and aggregate t+1 and t+2 (not tabulated), is very similar to the free cash flow portfolios portrayed in Figures 1and 2. Essentially, when current CFO is the only predictor of future CFOs (Model 1), the consequent abnormal returns are in all cases higher than the returns on portfolios derived from Models 2-5, where earnings, or CFO and combinations of accruals were the predictors.[17]. Thus, the portfolio tests for both cash flow versions, FCF and CFO, are consistent with the predictive superiority of cash from operations over accruals demonstrated in Table 2. But what about portfolios constructed from predicted earnings? Table 2 data indicate that accruals improve slightly the prediction of next year's net and operating income. Does this improvement translate to superior portfolio performance?

Figures 3 and 4 present abnormal returns on portfolios constructed from the predictions of *net income* in year t+1 (Figure 3), and aggregate income in years t+1 and t+2 (Figure 4). (The returns from portfolios based on the prediction of net income in year t+2—not reported—follow closely the pattern in Figure 3.) Surprisingly, Model 1 (second bar from left) in Figure 3—where net income predictions are based on CFO only—generates higher abnormal returns in both panels than the four models where next year's net income is predicted from current net income (third bar from left), or from CFO and components of accruals (three bars to the right). Thus, for example, in Panel A (12-month holding period), the CFO-based portfolio yields 6.9% (standard deviation – 4.4%), whereas Model 5 portfolio (predicted from CFO and the most disaggregated accruals) yields 2.1% only (5.6% standard deviation). Obviously, the small predictive improvement brought about by the accruals (Table 2, previous section) does not translate to an economically meaningful incremental return. Figure 4—portfolios constructed from predicted aggregate income in the next two years—conveys the by now familiar message: The prediction model using current CFO only generates portfolios whose returns are higher and in most cases with lower standard deviation than portfolios generated from prediction models using earnings,

[17] The only exception are the portfolios based on the prediction of aggregate next two years of CFO. For the 36-month holding period the return on Model 1 (CFO only) is 14.3%, while the return on model 5 (CFO and aggregated accruals) is 15.5%.

or CFO and components of accruals. Finally, the returns on portfolios constructed from the prediction of *operating income* (not reported) follow closely the patterns evident in Figures 3-4.

Summarizing the portfolio tests, we note that the occasional improvements in the prediction of next year's earnings brought about by accruals (Table 2) do not translate to superior portfolio returns. In practically all cases examined, the returns on portfolios constructed from predictions of either earnings or cash flows, based on current cash from operations only were higher, and often with a lower volatility than returns on portfolios constructed from prediction models using earnings or accruals.

Given the surprising outcome of the portfolio tests, we subjected them to a battery of robustness checks.

(i) Reflection of the accruals anomaly? This anomaly documents a unique pattern of stock returns: extreme accruals are negatively associated with subsequent returns. Is this phenomenon affecting our portfolio tests? To address this question we classified the sample firms in each year to high, medium, and low accruals firm: top 25%, middle 50%, and bottom 25% of the yearly ranking by accruals scaled by total assets. (This is the same classification used in the prediction tests reported in Section IV.) We then performed the portfolio analysis for each of the three accruals groups.

The accruals indeed affect substantially the returns on the various portfolios, but the *relative performance* of the portfolios constructed from our five prediction models (CFO only, NI only, CFO and various combinations of accruals) is, with the exception of high accruals firms, essentially the same as that portrayed in Figures 1-4. For example, Figure 5 portrays the abnormal returns on portfolios constructed from predictions of next year's net income. The three panels of Figure 5 present the portfolio performance of low accruals, medium accruals, and high accrual firms, respectively. It is evident that the portfolio returns decrease inversely with the size of accruals (e.g., Model 1—CFO only—return in Panel A is 17%, while the same model returns only 2% in Panel C, the high accruals firms). Clearly, high accruals detract from the quality of earnings, thereby adversely affecting the earnings predictions underlying the portfolio construction in Figure 5. Whereas the relative performance of the five prediction models in Panels A and B is very similar to that portrayed in Figures 1-4, Panel C—high accruals firms—is an exception: Portfolios constructed from earnings prediction based on current earnings, or on CFO and combinations of accruals generate higher returns than the CFO only portfolio (second from left bar in Panel C). This is also the case for portfolios based on next year's prediction of CFO, FCF, and OI.[18] Apparently, accruals are useful for short-term investment decisions involving high accruals firms.

(ii) Temporal changes. Examination of the year-by-year (1990-2002) hedge portfolio returns does not reveal particular trends. There are, however, certain notable observations: The 1999 abnormal returns generated by all the five models examined are negative. The returns for the portfolio formation year 1999 are computed over 2000-2001, the burst of the bubble years. It is not clear, however, why the *abnormal* (size and book-to-market) returns should be negative. Perhaps related to those negative 1999 returns are the abnormal returns for the years 2000 and 2001 (computed over 2001 and 2002) which are positive and relatively large for all portfolios, declining in 2002 (return accumulation in 2003). There are, however, no particular years during 1990-2001 which drive our portfolio results in Figures 1-4.

[18] Beyond one year, and consistent with our main findings, portfolios constructed from cash flows or earnings predictions based on CFO only yield equal or higher returns than portfolios using earnings or accruals in the prediction process.

(iii) Individual deciles and quintiles. The portfolio returns in Figures 1-4 are based on a zero-investment strategy: long in the top decile of predicted cash flows or earnings, and short in the bottom decile. Basing the zero-investment portfolios on quintiles (top and bottom) rather than on deciles does not change our conclusions. Also, an individual examination of the top decile (long) or bottom decile (short) underlying Figures 1-4 does not reveal a particular contribution of either decile to the hedge portfolio returns.

VI. A Comment on the Pervasiveness of Earnings Forecasts

A perennial question is: Why are financial analysts predicting firms' earnings more frequently than cash flows? Doesn't economic theory prescribe that cash flows, rather than earnings determine equity values? A clue can be found in our portfolio analysis. Compare Figures 2 and 4, portraying abnormal returns on portfolios constructed from the predictions of free cash flows (FCF) and net income (NI) in the next two years, respectively. A perfect prediction of FCF (left bar of Figure 2) yields 34% for a 12-month holding period, whereas a perfect prediction of net income (Figure 4) yields an astounding 60% abnormal return. For a 36-month holding period (Panels B) the return differential narrows, but is still larger by 11% for net income than cash flow. Similar differential returns hold for portfolios based on predicted cash from operations vs. operating income.

It stands to reason that the substantially higher returns to a perfect prediction of net, or operating income relative to cash flows tempts analysts and investors to predominantly forecast earnings over cash flows. This, however, is true for a perfect prediction only. In reality, it is much more difficult to predict earnings than cash flows. Givoly and Hayn (2000), among others, document that earnings volatility is about three times higher than cash flow volatility, rendering the prediction of the former substantially more challenging than that of the latter[19]. Thus, when the uncertainty of the prediction is accounted for, investors may be better off attempting to base investment decisions on predicted cash flows than on earnings. This is consistent with the abnormal returns of the five portfolios based on *imperfect* predictions portrayed in Figures 1-4, which are substantially larger for the portfolios constructed from cash flow predictions (Figures 1 and 2), than those constructed from earnings predictions (Figures 3-4). The difference between perfect foresight and actual prediction is here as elsewhere striking.

VII. Concluding Remarks

Managerial estimates and projections are pervasive in accounting measurement and valuation procedures, affecting to an unknown (by investors) degree practically all income statement and balance sheet items. The contribution of estimates and projections to the quality of financial data is increasingly challenged in the fast-changing and turbulent business environment which makes it very difficult to generate reliable projections. The quality of financial information is further compromised by the fact that estimates are easy to manipulate with impunity and indeed such manipulation is rampant. On the other hand, estimates/projections are the major means by which managers can impart relevant and forward-looking information to investors. Herein lies arguably the most fundamental accounting question: What is the contribution of accounting estimates to the quality and informativeness of financial information?

We investigate this question by focusing on accounting accruals, where most of the estimates/projections are embedded, and—following widespread investment practice as well as the FASB's emphasis on the predictive objective of financial information—we assess the

[19] Earnings manipulation and honest misestimates of accruals, reversing over time, are probably the major contributors to the high volatility of earnings.

relevance of accruals to the quality of financial information by evaluating their contribution to the prediction of both cash flows and earnings over various horizons. Our battery of tests, consisting of both prediction and portfolio analyses, indicate that accruals, in groups or by individual components, do not contribute appreciably to the prediction of cash flows, yet do improve somewhat the prediction of the next year's net and operating income beyond current operating cash flows. However, our portfolio tests, indicating economically significant improvement, fail to register any improvement in investment performance brought about by accruals, except for a particular case related to high accruals firms. This is obviously a sobering finding for both financial information users and accounting standard-setters.

The major implication we draw from our findings is the urgent need to enhance the reliability of accounting estimates. This issue, however, is sparsely discussed by researchers and accounting regulators, and we are not aware of any policy actions aimed at enhancing the reliability of estimates/projections. There are, however, several promising proposals in the literature which, in our opinion, deserve further attention and development. One such proposal was recently advanced by Ijiri (2002) who calls for a separation by income statement line items of forecasts (estimates) from facts. Such a separation will provide users with an important *reliability* indicator of major income statement items (e.g., compare the case where 5% of revenues are based on estimates with the much more uncertain case where 25% of revenues are based on estimates).

Lundholm (1999) notes that under current GAAP accrual estimates for a given period are rarely compared with subsequent realizations, and managers, therefore, do not face the consequences of serious intentional or unintentional misestimates. To enhance the reliability of estimates, Lundholm proposes a requirement for an *ex post* report on the accuracy of prior estimates. It is highly likely that the specter of investors and board members focusing on large and consistent estimation errors (e.g., the warranty provision was below the actual warranty costs in every quarter of the last two years) will provide managers with strong *ex ante* disincentives to manipulate the estimates, and motivate them to spend more resources on improving the reliability of estimates.

Finally, Lev and Zarowin (1999), and Lev, Ryan and Wu (2005) take the reconciliation of estimates with *ex post* realizations a step further by proposing that in case of large discrepancies, previous financial reports should be revised like the routine revisions of macro-economic data. Such a revision will correct/improve the historical record of financial information, which has been shown to affect investors' decision (e.g., Barth, Elliott and Finn, 1999).

Advancing the above, or alternative proposals will hopefully improve the reliability of accounting estimates thereby considerably enhancing the usefulness of financial information.

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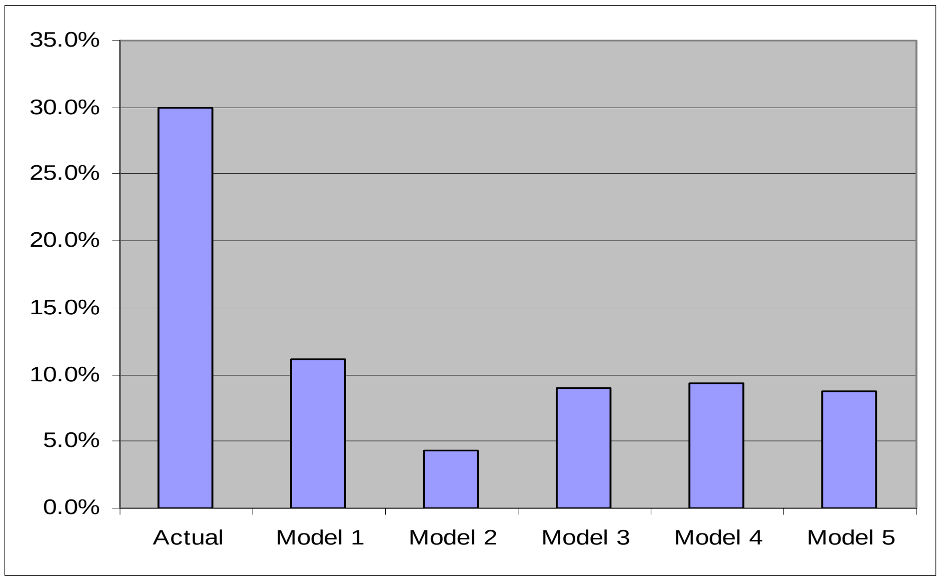
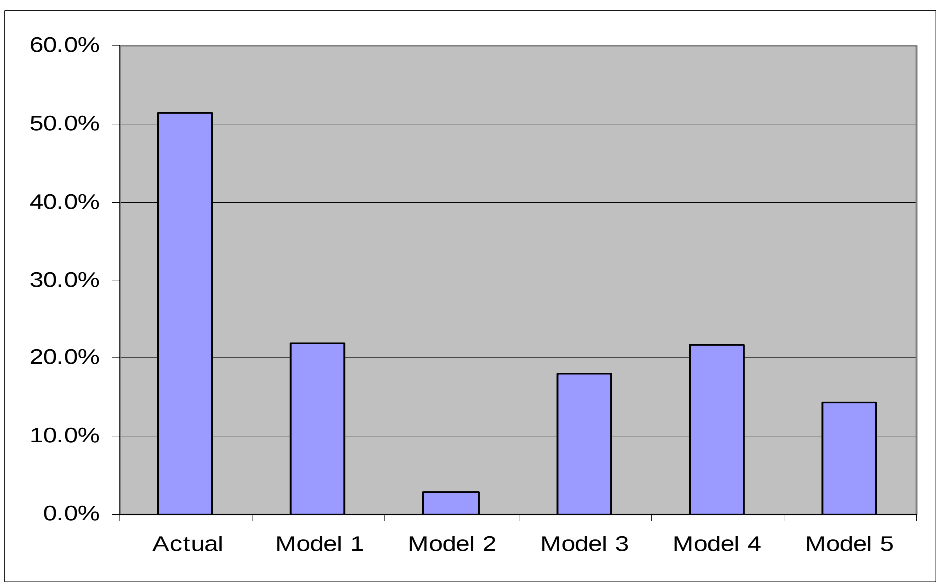
Figure 1
Abnormal (Size and B/M Adjusted) Returns To Hedged Investment
Based On Predicted Free Cash Flows in Year T+1.

Panel A: 12 Months Ahead



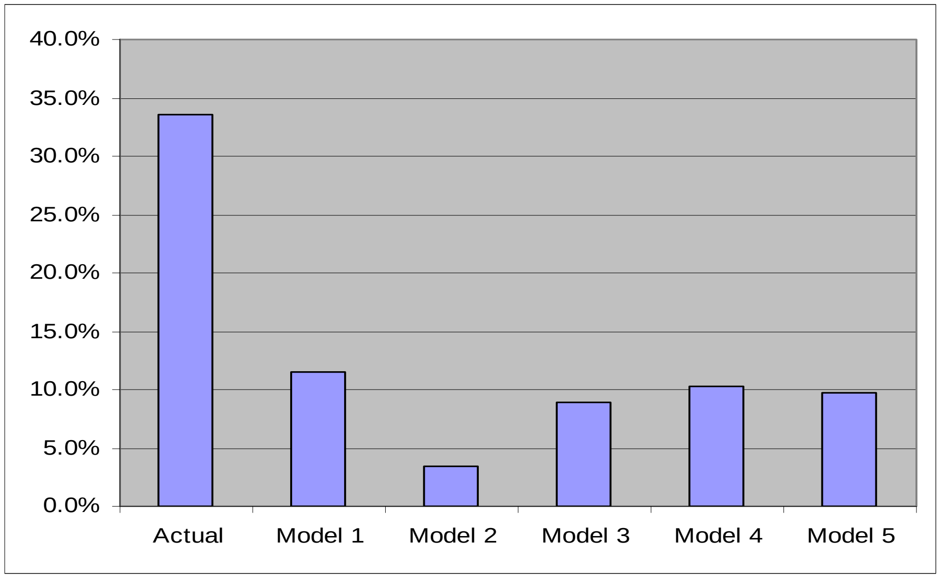
Panel B: 36 Months Ahead



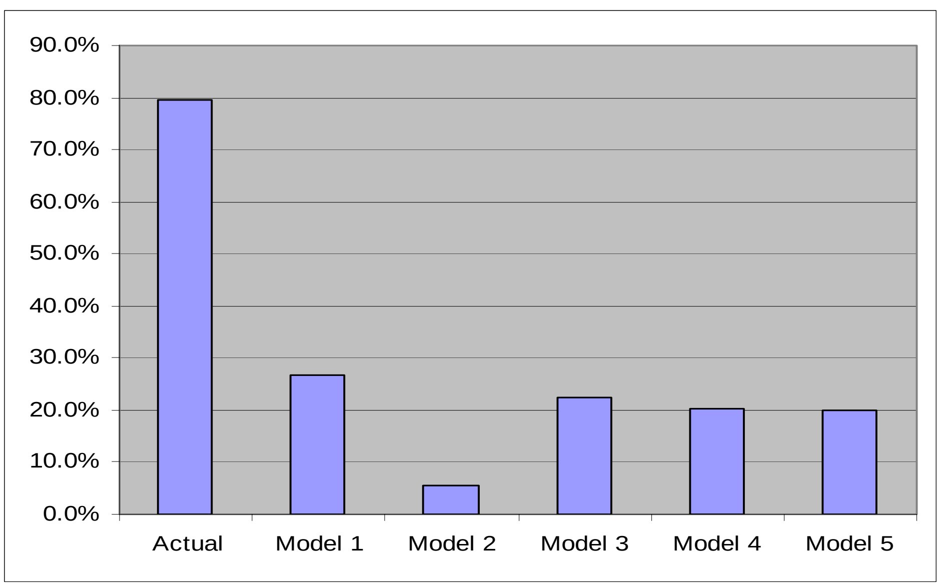
Note: The left bar ("Actual") presents the return to a perfect prediction of free cash flows. Models 1 through 5 correspond to the five models in the left column of Table 2.

Figure 2
Abnormal Returns To Hedged Investment
Based On Predicted Aggregate Free Cash Flows in Years T+1 Plus T+2

Panel A: 12 Months Ahead



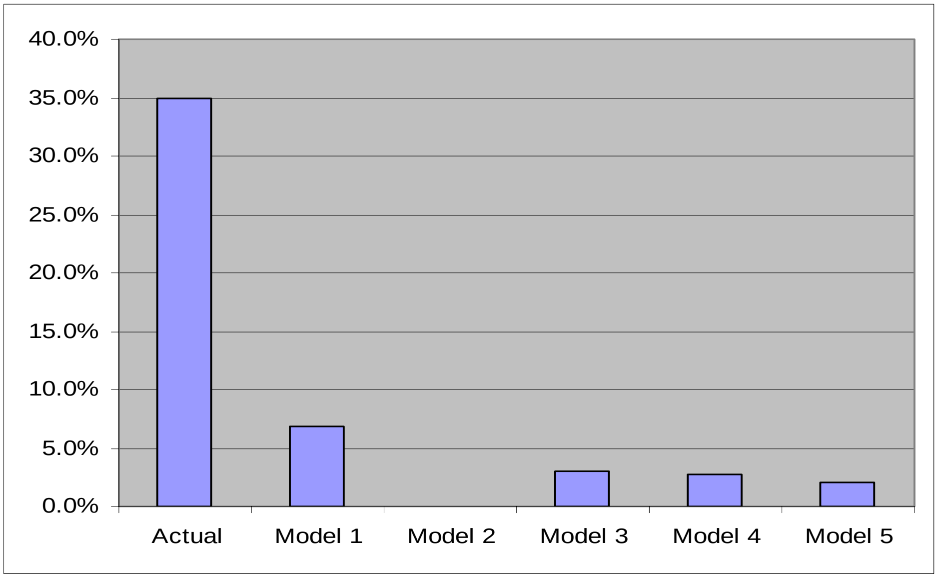
Panel B: 36 Months Ahead



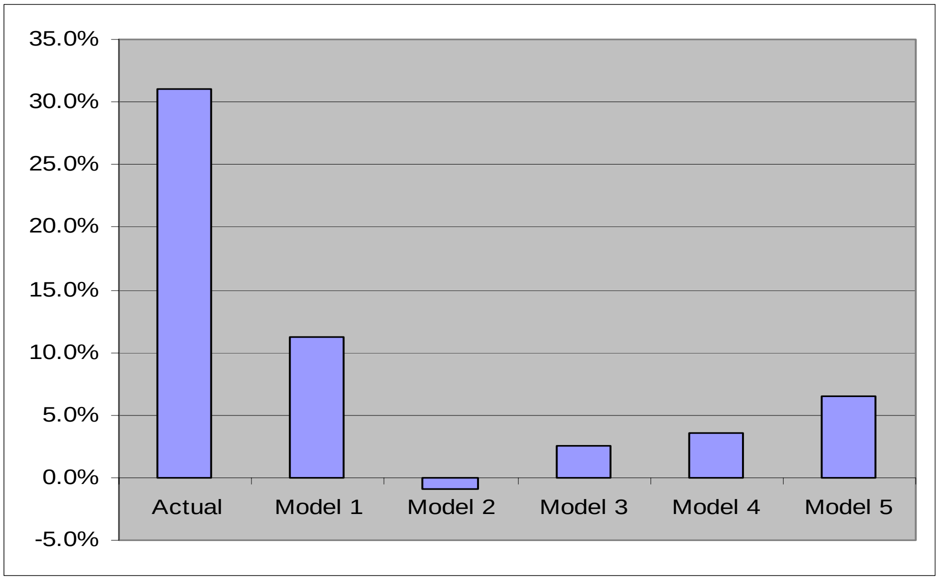
Note: See Figure 1.

Figure 3
Abnormal Returns To Hedged Investment
Based On Predicted Net Income In Year T+1

Panel A: 12 Months Ahead



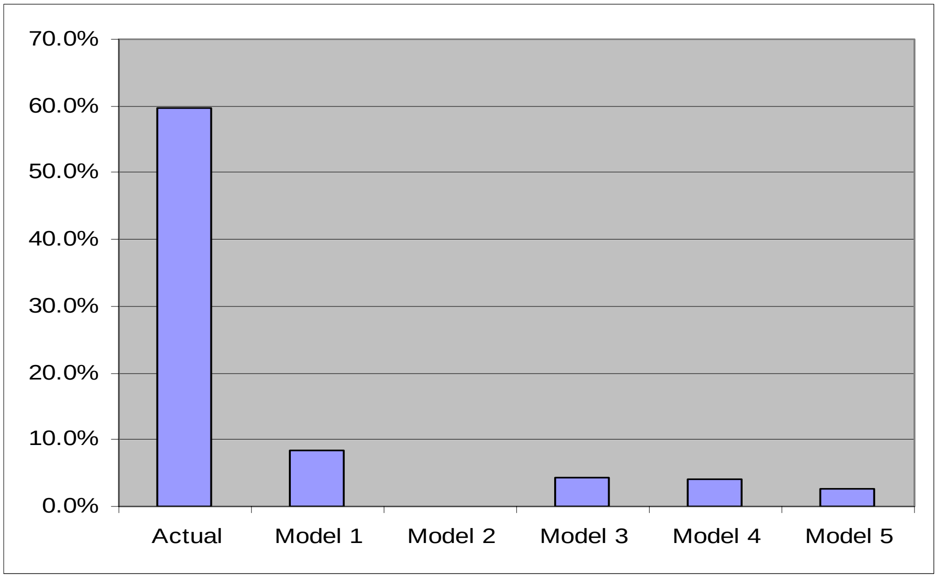
Panel B: 36 Months Ahead



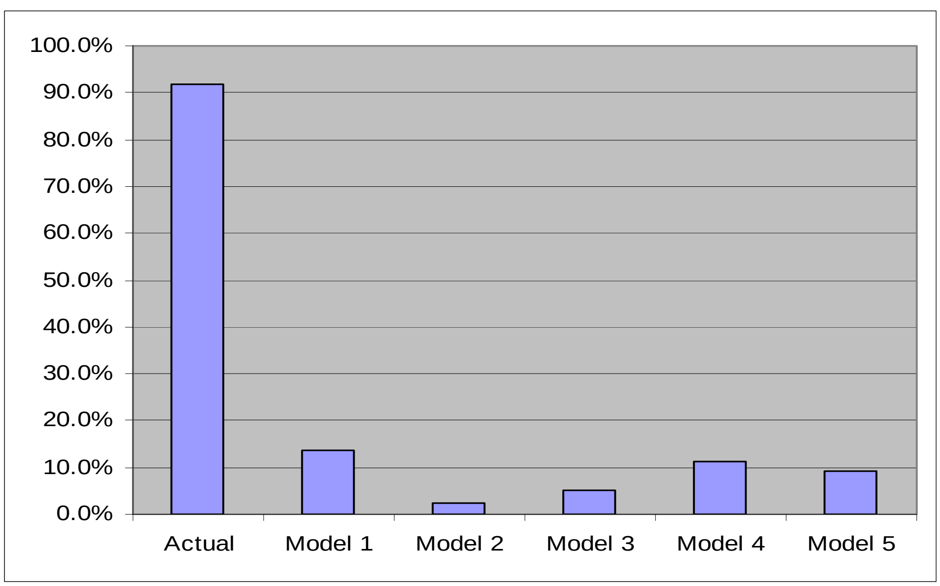
Note: The left bar ("Actual") presents the return to a perfect prediction of net income. Models 1 through 5 correspond to the five models in the left column of Table 2.

Figure 4
Abnormal Returns To Hedged Investment
Based On Predicted Aggregate Net Income in Years T+1 and T+2

Panel A: 12 Months Ahead



Panel B: 36 Months Ahead.

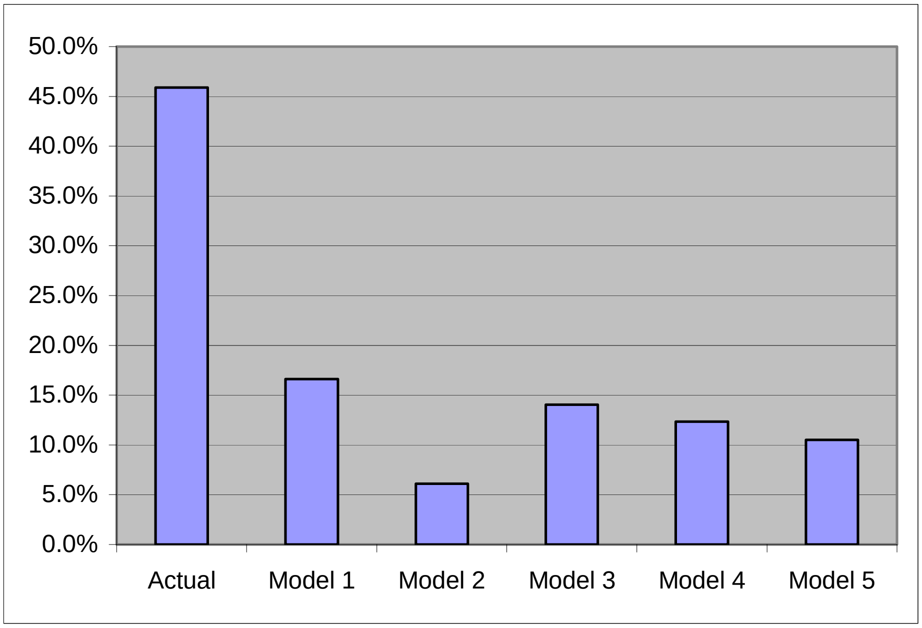


<u>Note</u>: See Figure 1.

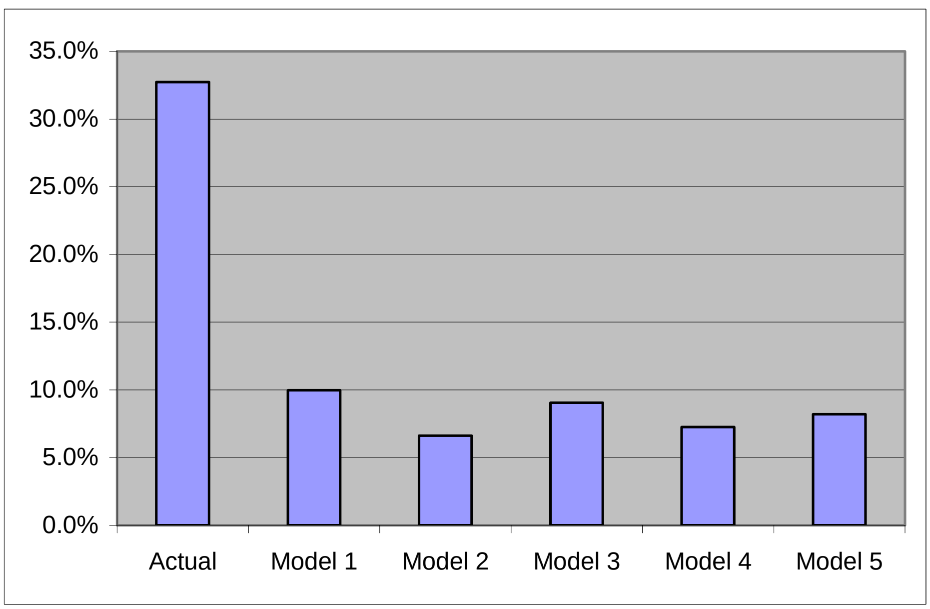
Figure 5

Twelve-Month Abnormal Returns To Hedged Investment
Based On Predicted Net Income in Year T+1 For Sub-samples of Firms
With Low, Medium, and High Accruals

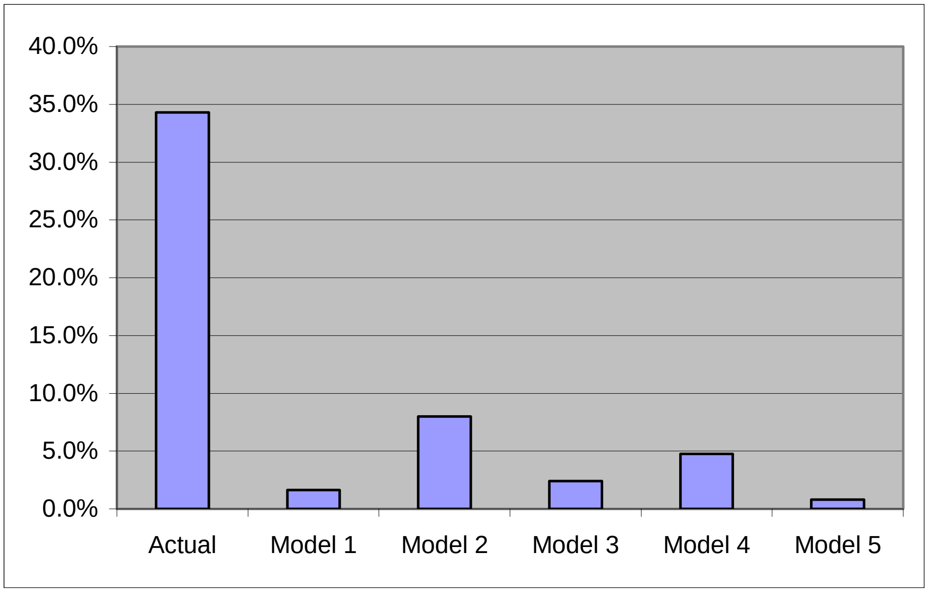
Panel A. Low Accruals Sub-sample (Lowest Quartile)



Panel B. Medium Accruals Sub-sample (Medium 2 Quartiles)



Panel C. High Accruals Sub-sample (Highest Quartile)



Note: The figures are constructed in the same way as Figures 1-4, except that here we report 12-month abnormal returns to hedge portfolio strategies based on sub-samples with different levels of accruals. The sample is divided into quartiles based on the yearly distribution of total accruals. Panel A (Panel C) uses the lowest (highest) quartile, while Panel B uses the middle two quartiles.

Table 1
Sample Descriptive Statistics

Panel A: Distributional Statistics

Variable	Mean	Std. Dev.	Q3	Median	Q1
NI	0.016	0.149	0.086	0.042	0.000
CFO	0.065	0.128	0.135	0.079	0.020
FCF	-0.009	0.141	0.066	0.013	-0.055
OI	0.070	0.146	0.141	0.086	0.030
ΔWC	-0.026	0.087	0.013	-0.014	-0.055
ΔWC*	-0.013	0.073	0.017	-0.007	-0.037
ΔINV	-0.013	0.051	0.001	0.000	-0.019
D&A	0.056	0.041	0.067	0.048	0.033
CAPEX	0.075	0.081	0.090	0.053	0.030
DT	-0.001	0.019	0.003	0.000	-0.003
OA	0.075	0.085	0.090	0.057	0.036
OA*	0.020	0.074	0.019	0.003	0.000
ACCR	0.049	0.121	0.094	0.045	-0.001

Panel B: Pearson (Spearman) Correlations Above (Below) the Diagonal

Variable	NI	CFO	FCF	OI	ΔWC	ΔWC*	ΔINV	D&A	CAPEX	DT	OA	OA*	ACCR
NI		0.631	0.553	0.880	-0.211	-0.160	-0.130	-0.233	0.037	0.036	-0.585	-0.550	-0.565
CFO	0.549		0.823	0.683	0.422	0.319	0.261	0.103	0.153	0.038	-0.030	-0.101	0.284
FCF	0.454	0.789		0.601	0.381	0.270	0.262	-0.077	-0.436	0.001	-0.119	-0.093	0.192
OI	0.883	0.570	0.474		-0.222	-0.167	-0.139	-0.193	0.036	0.047	-0.286	-0.232	-0.362
ΔWC	-0.233	0.415	0.403	-0.229		0.808	0.545	0.050	0.005	-0.047	-0.018	-0.037	0.710
ΔWC*	-0.136	0.336	0.300	-0.137	0.794		-0.054	-0.008	0.036	-0.076	-0.066	-0.052	0.537
ΔINV	-0.212	0.181	0.228	-0.203	0.476	0.005		0.096	-0.042	0.028	0.064	0.012	0.439
D&A	-0.122	0.238	-0.016	-0.079	0.101	0.039	0.118		0.298	-0.027	0.513	0.041	0.398
CAPEX	0.155	0.245	-0.272	0.165	-0.037	0.020	-0.119	0.413		0.059	0.160	0.003	0.116
DT	0.089	0.072	0.001	0.087	-0.061	-0.093	0.018	0.012	0.084		0.042	-0.194	-0.004
OA	-0.276	0.173	-0.024	-0.114	0.019	-0.044	0.101	0.664	0.286	0.123		0.850	0.691
OA*	-0.279	-0.036	-0.020	-0.122	-0.033	-0.046	0.022	0.034	-0.031	-0.196	0.574		0.572
ACCR	-0.378	0.432	0.302	-0.260	0.745	0.556	0.425	0.442	0.123	-0.006	0.580	0.330	

Notes: the variables are defined as follows (Compustat data item number in parentheses):

NI:	Net income, defined as income before extraordinary items (#18)
CFO:	Cash flow from operations (#308) less the accrual portion of extraordinary items and discontinued operations reported on the statement of cash flows (#124)
FCF:	Free cash flows, defined as CFO - CAPEX
OI:	Operating income after depreciation (#178)
ACCR:	Total accruals, defined as CFO – NI
ΔWC:	Change in working capital per the statement of cash flows, namely the sum of the following items: change in accounts receivable (#302), change in inventory (#303), change in accounts payable and accrued liabilities (#304), change in accrued income taxes (#305), change in other assets and liabilities (#307)
ΔINV:	Change (decrease) in inventory per the statement of cash flows (#303)
ΔWC*:	Change in working capital excluding inventory per the statement of cash flows, ΔWC – ΔINV
D&A:	Depreciation and amortizations per the statement of cash flows (#125)
DT:	Deferred taxes per the statement of cash flows (#126)
OA:	Other accruals, calculated as CFO – NI – ΔWC
OA*:	Net other accruals, defined as CFO – NI – ΔWC – D&A – DT
CAPEX:	Capital expenditures per the statement of cash flows (#128)

Panel A presents the distributional statistics of the primary pooled sample for the prediction of t+1 net income, which includes 38,464 firm-year observations that spans 1988 and 2002. Our sample sizes vary slightly for different target variables, and to certain degree for different forecasting horizons.

Panel B presents the Pearson (Spearman) correlations among the key variables above (below) the diagonal. All correlations are significant at the 0.05 level.

Table 2
Out-of-Sample Predictions of Cash Flows and Earnings by Current Cash Flows, Earnings, and Combinations of Accruals.

PREDICTION MODEL	CASH FROM OPERATIONS			FREE CASH FLOWS			NET INCOME			OPERATING INCOME		
VARIABLES	ABSE	MEDE	R^2	ABSE	MEDE	R^2	ABSE	MEDE	R^2	ABSE	MEDE	R^2
						ONE YEAR AHEAD						
CFO	.062	.002	.42	.069*	.007	.36	.071	.008	.33	.069	.002	.40
NI	.069	.005	.30	.074	.009	.28	.067	.009	.42	.066	.005	.46
CFO, △WC	.060	.004	.46	.068	.008	.39	.066	.009	.44	.062	.005	.54
CFO, △WC, OACC	.061	.004	.45	.068	.008	.38	.064	.008	.46	.061	.005	.55
CFO, DISACC	.061*	.004	.44	.069	.007	.36	.065*	.008	.45	.062*	.004	.54
						SECOND YEAR AHEAD						
CFO	.069	.002	.29	.075*	.009	.21	.079*	.008	.20	.079	.002	.26
NI	.073	.005	.21	.077	.012	.17	.080	.010	.22	.080	.005	.26
CFO, △WC	.068	.004	.31	.074	.010	.23	.078	.010	.25	.076	.005	.32
CFO, △WC, OACC	.068	.004	.31	.075	.010	.22	.079	.009	.25	.076	.005	.32
CFO, DISACC	.069	.003	.30	.076	.010	.20	.080	.008	.23	.078*	.004	.30
						YEARS ONE AND TWO AHEAD						
CFO	.121	.002	.42	.132*	.017	.34	.145	.004	.31	.154	-.007	.35
NI	.134	.008	.30	.142	.023	.27	.141	.011	.37	.151	.002	.38
CFO, △WC	.117	.005	.46	.131	.020	.37	.137	.009	.39	.141	.000	.45
CFO, △WC, OACC	.118	.005	.45	.132	.019	.36	.136	.009	.41	.142	.000	.45
CFO, DISACC	.119*	.004	.45	.134	.018	.34	.138*	.008	.40	.144*	.000	.44
						YEARS ONE, TWO AND THREE AHEAD						
CFO	.194	-.005	.40	.244*	.028	.25	.269	-.004	.20	.288	-.031	.25
NI	.213	-.001	.28	.255	.033	.19	.268	.004	.22	.289	-.022	.26
CFO, △WC	.189	-.000	.43	.244	.031	.26	.262	.002	.25	.276	-.021	.32
CFO, △WC, OACC	.190	.000	.43	.248	.032	.24	.264	.003	.25	.280	-.022	.31
CFO, DISACC	.192*	-.000	.41	.254	.031	.22	.269	.001	.24	.284*	-.020	.30

Notes:
The five prediction models are based on the following predictors: cash from operations (CFO); net income before extraordinary items (NI); CFO and the change in working capital items (ΔWC); CFO, ΔWC, and all other operating accruals (OACC); CFO and disaggregated accruals (DISACC): change in working capital items minus inventory, change in inventory, depreciation and amortization, deferred taxes, all other operating accruals. The five prediction models include current capital expenditures as an additional predictor.

The reported mean Absolute Errors (ABSE) are for the pooled sample. Asterisk indicates statistical significance (at the 0.05 level or better) of model 1 (CFO) compared with model 5 (CFO and DISACC).

The reported Median Error (MEDE) is the median error from the pooled sample.

The reported R^2 are the averages of the adjusted R^2s from the yearly regressions of actual values (of cash flows or earnings) on predicted values over the period 1988 – 2002.