Do Investors Fully Understand the Implications of the Persistence of Revenue and Expense Surprises for Future Prices?

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Abstract

This study documents that revenue surprises are more persistent than expense surprises, and investigates whether investors understand the implications of these differential persistence levels in setting future prices. Consistent with prior studies of the post-earnings-announcement-drift, this study shows that although investors understand the pattern of autocorrelations in earnings, revenue and expense surprises, they under-react to the levels of these autocorrelations, and also to the greater persistence of the revenue surprises than expense surprises. The study shows that rational investors can obtain significantly higher abnormal returns from a trading strategy that incorporates both revenue and expense surprises than an equivalent strategy that is based on earnings surprises alone. These results are robust to various controls, including the proportions of stock held by institutional investors, trading liquidity, and arbitrage risk. The study also shows that revenue surprises add significantly to abnormal returns beyond just earnings surprises when earnings have low persistence, when the correlation between earnings and operating cash flow is low, when firms are small and when the proportion of total accruals is low.

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The persistence of earnings surprises is one of the most important characteristics of earnings to investors – the more persistent is an earnings surprise the more it is expected to affect future dividends, cash flows, abnormal earnings, or any other metric used in security valuation. Thus, the disclosure of any information that can help investors improve their assessments of the persistence in earnings surprises should be relevant for investors in setting equilibrium prices. Virtually all firms have been disclosing information about revenues in their preliminary earnings releases, enabling investors to estimate not only the surprise in earnings but also the surprise in revenues and expenses. If revenue and expense surprises help investors better assess the persistence of earnings surprises, reporting both earnings and revenues in the preliminary earnings release should help investors in setting current and future prices. However, it is unclear whether investors understand fully the implications of the differential persistence in revenue and expense surprises for future prices.

Consistent with Ertimur et al. (2003), this study first documents that revenue surprises are more persistent than "expense" surprises, where the term "expense" refers to the difference between revenue and earnings, and includes not only operating expenses but also other non-operating gains or losses. Revenue surprises are likely to be more persistent than expense surprises because of the greater heterogeneity of expenses and the higher proportion of expenses that relate to non-recurring items.[1] Thus, investors can use the greater persistence of revenue surprises to better assess the persistence of earnings

surprises. For example, if a firm announces a positive earnings surprise that is accompanied by a positive revenue surprise, the likelihood of the earnings surprise to persist in the future is greater than if the positive earnings surprise is driven mostly by a surprise reduction in expenses.

The purpose of this study is to examine whether investors fully understand the differential persistence levels of revenue and expense surprises, and correctly use these surprises in setting future prices. Bernard and Thomas (1989, 1990), Ball and Bartov (1996) and Burstahler et al (2002) examine whether investors are able to incorporate the persistence of past quarterly earnings surprises in prices upon the announcement of current earnings, or under-react to a portion of the past earnings surprises. In particular, Bernard and Thomas (1989, 1990) suggest that investors ignore the autocorrelations of earnings surprises, leading to a post-earnings-announcement-drift in prices that is consistent with the pattern of the autocorrelations in past earnings surprises. Ball and Bartov (1996) show that investors' reactions to earnings announcements reflect correctly the pattern of autocorrelations in earnings surprises but not their magnitudes, leading to an under-reaction of about 50% of past surprises. Burgstahler et al (2002) show that investors do not completely incorporate the effects of special items in security prices four quarters after their disclosure, exhibiting an under-reaction even to the transitory special items, although a smaller under-reaction than that documented for earnings before special items. This study examines whether investors are able to assess correctly the differential persistence of revenue and expense surprises in setting security prices around the announcement of future earnings, or whether like Burgstahler et al (2002), investors under-react to the information in revenue and expense surprises.

[1] "Expenses" include gains or losses on disposition of long-term assets, restructuring charges, etc.

The results of this study show that revenue surprises are more persistent than expense surprises, and that investors set security prices by reacting differently to the contemporaneous revenue and expenses surprises, as well as those revenue and expense surprises from the immediately preceding quarter. However, investors are also shown to under-react to the revenue and expense surprises of the previous four quarters, implying that they not only incorporate improperly the autocorrelations of the earnings surprises, but also do not incorporate fully the individual (and different) autocorrelations of revenue and expense surprises. The study also shows that an investor can obtain significantly greater positive abnormal returns during the quarter after the earnings announcement when both earnings and revenue surprises are highly positive than if only the earnings surprise is highly positive. This result is consistent with investors who do not incorporate fully the implications of the persistence of revenue and earnings surprises in setting future prices.

This study is useful for investors who need to better utilize the information provided by firms in the preliminary earnings release about revenues and expenses according to their differential levels of persistence. The results of the study may be used by academics who study the effects of earnings surprises on current and future prices. It shows that separation into revenue and expense surprises enhances the information provided by the earnings surprise alone, and it uses information that is available to market participants on the preliminary earnings announcement date. Finally, the results of this study may be used in financial statement analysis to explicitly study the effects of current revenue and expense surprises on future earnings and returns.

The next section describes the prior literature and develops the hypotheses tested in this study. Section III describes the methodology and the samples. Section IV presents and discusses the results, and last section provides a summary and conclusions.

II. Prior Research and Motivation

The Persistence of Revenue and Expense Surprises:

Lipe (1986) is among the first studies to examine the differential levels of persistence of various earnings components and their implications for differential associations with market returns. However, he does not specifically examine the persistence of revenues, concentrating instead on gross profits and other expense components. To the extent that revenue and expense surprises have different persistence levels, they are expected to affect prices differently. However, early empirical evidence on whether the breakdown of earnings surprises into revenue and expense surprises provides incremental associations with returns beyond those conveyed by earnings has been ambiguous. Swaminathan and Weintrop (1991) document incremental information content of revenues beyond earnings for a sample of companies using Value Line forecasts of revenues and expenses. Most of the earlier studies, though, including Wilson (1986), Hopwood and McKeown (1985) and Hoskin et al. (1986), do not find incremental information content of revenues and expenses beyond earnings, although these studies do not use analyst forecasts to measure the surprise in revenues.

With the recent availability of analyst forecasts of revenues for many companies and quarters, Rees and Sivaramakrishnan (2001) study the incremental information

content of revenue surprises beyond earnings surprises using revenue forecasts collected by I/B/E/S. They find that the revenue response coefficient is statistically significant after controlling for the earnings surprise, but only in their rank regressions and not in their OLS regressions. Ertimur et al (2003) show that investors value more highly a dollar surprise in revenue than a dollar surprise due to a reduction of expenses, and that the breakdown into these two components adds information to market participants beyond the aggregate surprise in earnings. They also show that a dollar surprise in revenues is more valuable for growth firms than value firms, but that the difference between a dollar surprise in sales or expense reduction is smaller for value firms than for growth firms. Ertimur et al (2003) show that when the persistence of expense surprises is higher (relative to the persistence of revenues), the market reactions to expense surprises are also stronger, consistent with persistence as a driving factor in differential market reactions to revenue and expense surprises.

Jegadeesh and Livnat (2004) also show that abnormal returns around preliminary earnings announcement dates are related to contemporaneous earnings and revenue surprises, as well as to prior earnings and revenue surprises. They also show that revenue surprises can be used to earn abnormal returns in the six-month period after the preliminary earnings announcements. However, they do not investigate explicitly the differential persistence of revenue and expense surprises, as we do in this study, nor do they use analyst forecasts of revenues to construct portfolios after the earnings announcement period, as we do in this study.

The above studies indicate that revenue and expense surprises are expected to have different levels of persistence, which should be used by rational market participants in setting current and also future prices.

Investors' Under-reaction: The Post-Earnings-Announcement-Drift:

Many prior studies in accounting and finance, some as early as Ball and Brown (1968), Foster et al. (1984) and Bernard and Thomas (1989, 1990) document the existence of a post-earnings-announcement drift in stock returns. In particular, stock returns do not impound the surprise in announced earnings immediately upon the earnings disclosure; stock returns are associated with the surprise in earnings for up to a year afterwards, although most of the drift occurs around subsequent earnings announcements.[2] In his review of the drift literature, Kothari (2001) argues that the drift provides a serious challenge to the efficient markets hypothesis because it has survived rigorous testing for over 30 years and cannot be fully explained by other documented anomalies.

Bernard and Thomas (1989, 1990) provide a unique contribution to the drift literature by offering an explanation of the drift that is consistent with investors ignoring the pattern of autocorrelations in earnings surprises. In particular, quarterly earnings surprises exhibit a pattern of autocorrelations with the subsequent four quarterly surprises of {+,+,+,-}, where the first three autocorrelations decline monotonically, and the fourth is negative and almost as strong as the first autocorrelation. Bernard and Thomas (1990) also show that most of the drift in returns occurs around future quarterly announcements,

[2] For other drift-related studies see, e.g., Bartov (1992), Ball and Bartov (1996), and Bartov et al. (2000). See Abarbanell and Bernard (1992) on the relationship of the drift to analysts' forecasts. Evidence that analysts may not fully incorporate past information into their forecasts is available in Lys and Sohn (1990), Klein (1990), Abarbanell (1991), and Mendenhall (1991).

and that abnormal returns around the following four quarterly announcements follow a similar pattern of {+,+,+,-}, consistent with investors who ignore the implications of autocorrelations for future earnings surprises.

Ball and Bartov (1996) examine whether investors completely ignore the pattern of autocorrelations in earnings surprises, or whether investors understand this pattern but underestimate the magnitude of autocorrelations. Their research approach is to examine the association of the abnormal return around the announcement of quarterly earnings with the prior four quarterly earnings announcements, after controlling for the contemporaneous earnings surprise. They find that the coefficients on the previous four quarterly earnings surprise have the expected {-,-,-,+} pattern if investors are expected to react only to the unexpected portion of the contemporaneous earnings surprise, but also that the magnitudes of these coefficients are only about 50% of their theoretical levels given the observed autocorrelations in earnings surprises.

Burgstahler et al (2002) use the same methodology as Ball and Bartov (1996) to examine whether investors understand correctly the transitory nature of special items, and incorporate its lower persistence levels in setting future security returns. If special items are completely transitory and reflect one-time effects on earnings (such as settlements of legal cases) they should have no effects on the next three earnings surprises, and a complete reversal in the fourth quarter. If special items reflect inter-period transfer (such as restructuring charges or asset write-downs) they are expected to have small and negative effects in the immediately following three quarter, and more than a complete reversal in the following fourth quarter. Using the same structure as Ball and Bartov (1996), except that earnings in the previous four quarters are broken down to earnings

before special items and special items, Burgstahler et al (2002) show that market participants are able to distinguish the more transitory nature of special items from other earnings, but even then they only incorporate about 75% of the full implications of special items in prices. This is an improvement over the lower percentage of earnings before special items, where market participants only incorporate about 50% of the surprise in the four-quarters ago, but still not 100% of the much lower persistence in special items.

Recent studies of the drift convincingly demonstrate that the drift's strength is different for different subsets of firms in predictable and intuitively logical ways. For example, Bartov et al. (2000) show that the drift is smaller for firms with greater proportions of institutional investors, likely because institutional investors are more sophisticated and less liable to rely on the too-simplistic seasonal random walk model of earnings. Similarly, Mikhail et al. (2003) find that the drift is smaller for firms that are followed by experienced analysts, who tend to employ more sophisticated prediction models for earnings than just a seasonal random walk. Mendenhall (2003) shows that firms subject to lower arbitrage risks have smaller drifts, because arbitragers can exploit the arbitrage opportunities at lower arbitrage costs. Brown and Han (2000) find that for a selected sample of firms whose earnings generating process can be described by a simple AR1 model, there is a smaller drift for large firms than for small firms with a poorer information environment (measured by size, institutional holdings, and number of analysts following the firm). Thus, any attempt to specifically study the returns that one can obtain from trading on a drift needs to control for the factors that were shown to be associated with differential drift levels.

Hypotheses:

To develop the hypotheses, assume that revenue surprises and expense surprises have different persistence levels, and that autocorrelations beyond four quarters are negligible.[3] Formally, the prediction equations are:

$$SUS_t = a_{s0} + a_{s1}SUS_{t-1} + a_{s2}SUS_{t-2} + a_{s3}SUS_{t-3} + a_{s4}SUS_{t-4} + \varepsilon_{st} \quad (1)$$

$$SUX_t = a_{x0} + a_{x1}SUX_{t-1} + a_{x2}SUX_{t-2} + a_{x3}SUX_{t-3} + a_{x4}SUX_{t-4} + \varepsilon_{xt} \quad (2)$$

where SUS (SUX) is the standardized revenue (expense) surprise. Assume further that the preliminary announcement of earnings contains both earnings and revenues for the quarter, so investors can estimate the revenue and expenses surprise for the quarter. The vast majority of firms include revenues in the preliminary earnings announcement, and those that do not are likely to reveal it in the corporate communications with analysts and the public immediately afterwards. It is further assumed that the abnormal return induced by the preliminary earnings announcement is equal to the unexpected earnings surprise, after breaking it down to the unexpected revenue and expense surprises, or, formally,

$$CAR_t = b_0 + b_{s1}e_{st} + b_{x1}e_{xt} + \upsilon_t \quad (3)$$

where Car is the cumulative return centered on the announcement of earnings, and e_s (e_x) is the unexpected revenue (expense) surprise. Assuming that e_s (e_x) in Equation (3) is equal to ε_s (ε_x) from Equations (1) and (2), i.e., that investors recognize the time series properties of revenue and expense surprises, and use them to predict contemporaneous revenue and expense surprises, we obtain:

[3] Foster (1977) provides evidence that is consistent with earnings, revenues and expenses being generated by a seasonal process with autocorrelations among adjacent quarters. As we report in the sensitivity analysis section, the main results are not altered if we let expenses depend on revenues, as in cases of earnings management by real or accounting transactions, past revenues and past expenses. This makes the unexpected components of revenue and expense independent.

$$CAR_t = c_0 + b_{s1}SUS_t + b_{x1}SUX_t + \sum_{i=1}^{4} c_{si}SUS_{t-i} + \sum_{i=1}^{4} c_{xi}SUX_{t-i} + \upsilon_t \quad (4)$$

where $c_{si} = -b_{s1}a_{si}$ and $c_{xi} = -b_{x1}a_{xi}$ for i=1,..,4.

The methodology developed by Ball and Bartov (1996) and Burgstahler et al (2002) is to estimate Equations (1), (2), and (4) together and test whether the restrictions on the coefficients reduce the sum-of-squares significantly, usually referred to as a Mishkin (1983) test. Also, one can examine the estimated coefficient in (4) and the implied autocorrelations in the revenue and expense surprises from (4) with those estimated directly in the prediction equations (1) and (2). This study also tests that the coefficients on the revenue and expense surprises are equal, or that $b_{s1}=b_{x1}$, and $c_{si}=c_{xi}$ for i=1,..,4. Given the results of Ertimur et al (2003) and Swaminathan and Weintrop (1991), we expect that the revenue coefficients will be larger than the expense coefficients, because of the greater persistence in revenue surprises. Thus, the first hypothesis is:

H_1: The cumulative abnormal return centered on the preliminary earnings announcement date is equally associated with contemporaneous and prior revenue and expense surprises.

To be consistent with prior studies, we also test whether market participants adequately incorporate the implications of the persistence in the revenue and expense surprises in setting future prices. This is done through the ratio of the implied autocorrelation from (4) to the actual autocorrelation in (1) and (2), and Mishkin (1983) tests. Thus, the second hypothesis is:

H_2 : The ratio of implied to actual autocorrelations is 100%, and the Mishkin (1983) statistics are insignificantly different from zero.

The above tests assume the structure of Equations (1)-(4). Like Burgstahler et al (2002), this study also tests directly the cumulative abnormal returns that can be obtained by investing in a portfolio of firms that had both earnings and revenue surprises in the same direction, which require no assumptions about the structure of autocorrelations and the relationship between earnings surprises and returns. In particular, we estimate the returns obtained on a hedge portfolio that holds long positions in firms falling into the top deciles of earnings and revenue surprises and short positions in firms falling into the bottom deciles of earnings and revenue surprises. We then compare these returns to those obtained on a hedge portfolio that uses only the earnings surprises. If the breakdown of revenue and expense surprises is beneficial to investors, the first hedge portfolio returns (using both earnings and revenue surprises) should be significantly larger than those obtained on the second hedge portfolio (using only earnings surprises). This leads to the third hypothesis:

H_3: The post-earnings announcement abnormal returns on a hedge portfolio that uses extreme earnings surprises have the same mean as the abnormal returns on a hedge portfolio that uses both extreme earnings and revenue surprises.

It should be noted that it is not clear a priori whether a hedge portfolio using both revenue and earnings surprises should have greater post-earnings announcement abnormal returns than a hedge portfolio using only earnings surprises. If investors are

able to properly interpret the earnings surprise by using the revenue surprise at the time of the earnings announcement as indicated by Ertimur at al. (2003), then a stronger market reaction at the time of the preliminary earnings announcement may imply a weaker post-earnings announcement drift. However, if the market under-reaction that causes the drift is induced by a proportion of investors who ignore the earnings and revenue surprises, then a stronger initial market reaction during the preliminary earnings announcement implies also a stronger subsequent drift. The evidence in Livnat and Mendenhall (2004) is consistent with the second scenario, which leads us to expect a stronger drift to a hedge portfolio based on both earnings and revenue surprises than revenue surprises alone.

The methodology to test these hypotheses is described in the next section.

III. Methodology and Sample

Estimation of the Earnings, Revenue, and Expense Surprises (SUE, SUS, SUX):

Most prior studies of the drift use the historical SUE as the basis for classifying firms into sub-groups according to their earnings surprise. The typical approach is to estimate expected earnings from a seasonal random walk model, where SUE is defined as actual earnings minus expected earnings, scaled by the standard deviation of forecast errors during the estimation period, or by market value of equity. This study uses the same methodology as Burgstahler et al (2002), where the SUE is equal to earnings (Compustat quarterly item 8, income before extraordinary items) in period t minus earnings in period t-4, scaled by market value of equity at the beginning of the quarter (Compustat quarterly item 61 times Compustat quarterly item 14, both from the end of

the prior quarter). The revenue surprise is estimated in an analogous manner, where revenues are Compustat quarterly item 2. To ease the comparability of revenue and expense coefficients in the tables, SUX is defined as the **negative** expense, i.e., as earnings minus revenues, also scaled by market value of equity at the beginning of the quarter.

The main advantage of using the historical SUE is that it can be estimated for any firm in the Compustat database, regardless of its size or analyst following. However, there are a few problems with this approach. Unlike the Compustat annual database, which is not restated to reflect subsequent corrections made by the firm to the previously reported original data, the Compustat quarterly database is continuously restated to reflect such restatements. Thus, using the historical SUE to estimate the earnings surprise may introduce a bias when the information is subsequently restated due to such events as mergers, acquisitions, divestitures, corrections of errors, etc. The researcher may estimate a surprise that was not actually available to market participants at the time of its disclosure. A further problem with the historical SUE is that reported earnings may be affected by special items that investors and analysts have not included in their predictions. Note that both of these problems are likely to cause stronger biases in the extreme SUE deciles, where most of the abnormal market reactions occur.

Mendenhall (2003) provides an alternative approach to estimate SUE, where the surprise is based on actual earnings minus the mean analyst forecast of earnings, scaled by the dispersion of analyst forecasts. The main advantage of this approach is that it is based on actual earnings as reported by the firm originally, not including any subsequent restatements of the original data, and adjusted for special items. The main problem of this

approach is that it is limited to firms that are followed by analysts, introducing a potentially significant sample-selection bias. A further problem with this approach for the current study is that sales forecasts by analysts have been collected by I/B/E/S only since 1997 (a few are available in 1996), and even then not by all brokers and not for all firms for which earnings forecasts are available. To mitigate the concerns of the historical SUE from Compustat, this study also uses analyst forecasts to estimate SUE, SUS and SUX.

Similar to Mendenhall (2003), for each quarter t and firm j, all quarterly forecasts made by analysts during the 90-day period before the disclosure of actual earnings constitute the non-stale, relevant forecast group.[4] The earnings SUE is defined as actual earnings per share (EPS) from I/B/E/S minus the mean analyst forecast of EPS in the group, scaled by the standard deviation of forecasts included in the group. Like Mendenhall (2003), firm-quarters with fewer than two forecasts in the group are deleted, and the standard deviation of EPS is set to 0.01 if it is equal to zero.

Since analyst sales forecasts in I/B/E/S are available for fewer firms, and even then many firm-quarters have only one available analyst forecast in the 90-day period before the disclosure of earnings, the sales surprise is defined differently. It is defined as actual sales from I/B/E/S minus the mean analyst forecast of sales in the group, scaled by actual sales from I/B/E/S. The analyst forecast sales SUS (Standardized Unexpected Sales) is calculated even if only one analyst forecast of sales is available in the I/B/E/S database.

Because the analyst forecast data comprises of earnings per share and total sales, and because the time series of available data is short, this study uses the analyst forecast data only in tests of the third hypothesis, the comparison of hedge portfolio returns.

Sample Selection:

The selection criteria used in this study for each quarter t are as follows:

1. The date on which earnings are announced to the public is reported in Compustat for both quarter t and quarter t+1 (returns are cumulated through the next earnings announcement date to test the third hypothesis).
2. The number of shares outstanding and the price per share are available from Compustat as of the end of quarter t-1. These are used to calculate the market value of equity as of quarter t-1. The study requires that the market value of equity in the previous quarter exceed $10 million.
3. The book value of equity at the end of quarter t-1 is available from Compustat and is positive.
4. The firm's shares are traded on the NYSE, AMEX, or NASDAQ.
5. Daily returns are available in CRSP from one day before quarter t's earnings announcement through the announcement date of earnings for quarter t+1.
6. Data are available to assign the firm into one of the six Fama-French portfolios based on size and B/M.
7. Both sales SUS and earnings SUE can be calculated for the current quarter. Tests of the first hypothesis require data availability for the prior four quarters.
8. The absolute value of SUE, SUS and SUX must be less than one. This ensures that we do not have surprises that are larger than the market value of the firm, which occur in extremely unusual circumstances.

[4] This group includes only the most recent forecast made by a specific analyst within this period.

Assignment to SUE, SUS and SUX Deciles:

Because the SUE and SUS have distributions with extreme observations at the tails, most drift studies classify firms into 10 portfolios sorted according to their SUE, and the analysis is performed on the portfolio rank (between zero and nine), where the ranks are divided by nine, and 0.5 is subtracted. The interpretation of the slope coefficient in the regression of abnormal returns on the SUE decile rank is equivalent to a return on a hedge portfolio that holds the most positive SUE decile long and shorts the most negative SUE decile. The intercept in the regression is roughly equal to the average CAR in the entire sample.

Most researchers rely on Bernard and Thomas (1990), who report that the drift is insensitive to the assignment of firms into a SUE decile using the current quarter's SUE values, instead of using SUE cutoffs from quarter t-1. This may introduce a potential look-ahead bias, because it is assumed that the entire cross-sectional distribution of SUE is known when a firm announces its earnings for quarter t. As Bernard and Thomas (1990) show, this look-ahead bias is insignificant, so this study uses the contemporaneous cut-off points to classify firms into deciles. This study further assigns a firm into a quarter t based on calendar quarters, instead of fiscal quarters, to ensure communality of economic conditions. Thus, a firm-quarter is assigned to calendar quarter t if the month of the fiscal quarter's end falls within that calendar quarter. For example, the first calendar quarter of 1999 will include all firm-quarters with a fiscal quarter-end of January 1999, February 1999, and March 1999.

Like Burgstahler et al (2002), this study first replicates the analysis of Ball and Bartov (1996) which uses SUE decile ranks, but then continues by using what Burstahler

et al (2002) term SUE scores, i.e., the SUE values as explained before, and not the ranks of the SUE deciles. This should not have a significant effect on the results of this study because of the elimination of observations where the absolute value of SUE, SUS or SUX is greater than one.

Cumulative Abnormal Returns (CAR):

The daily abnormal return is calculated as the raw daily return from CRSP minus the daily return on the portfolio of firms with the same size (the market value of equity as of June) and book-to-market (B/M) ratio (as of December). The daily returns (and cut-off points) on the size and B/M portfolios are obtained from Professor Kenneth French's data library, based on classification of the population into six (two size and three B/M) portfolios.[5] The daily abnormal returns are summed over the relevant period, which is the window (-1,1) for the first two hypotheses, where day zero is the current quarter's preliminary earnings date. For the third hypothesis, abnormal returns are cumulated from two days after the current quarter's earnings announcement date through one day after the date of the following quarterly earnings announcement. Consistent with prior studies, the top and bottom 0.5% of the CARs are deleted from the sample.

Institutional Holdings:

Consistent with Bartov et al. (2000), regression results to test the third hypothesis are controlled for the potential effects of institutional holdings. The first step is to aggregate the number of shares held by all managers at the end of quarter t-1, as reported on all 13-f filings made for firm j, which are included in the Thomson Financial database maintained by WRDS. This number of shares is divided by the number of shares outstanding at the end of quarter t-1 for firm j to obtain the proportion of outstanding

shares held by sophisticated investors. Consistent with Bartov et al. (2000), firms are ranked according to the proportion of institutional holdings and are assigned to 100 groups. The study subtracts from the rank (a number between 0 and 99) 49.5, to obtain an average institutional holding score of zero. It is expected that the drift should be smaller for firms with a larger proportion of institutional holders; i.e., a negative association is expected between CAR and the proportion of institutional holdings.

Arbitrage Risk:

Consistent with Mendenhall (2003), arbitrage risk is estimated as one minus the squared correlation between the monthly return on firm j and the monthly return on the S&P 500 Index, both obtained from CRSP. The correlation is estimated over the 60 months ending one month before the calendar quarter-end. The arbitrage risk is the percentage of return variance that cannot be attributed to (or hedged by) fluctuations in the S&P 500 return. The study sorts the arbitrage risk into 100 groups according to magnitude, and subtracts 49.5 from the group rank. Mendenhall (2003) shows that the drift is smaller when the arbitrage risk is smaller, so a positive association is expected between CAR and the arbitrage risk.

Trading Volume:

Trading volume has been used by prior studies of the drift as a control in the association between the CAR and SUE. It is expected that a higher trading volume may reduce the costs of arbitrage and therefore is expected to have a negative association with CAR. To estimate trading volume, the average monthly trading volume (in dollars) is obtained from CRSP for the same period as that used to estimate the arbitrage risk. The average monthly trading volume is then divided by the market value of equity at the end

[5] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

of the last month in the quarter. Firms are assigned to 100 portfolios according to the above proportion, and assigned a score which equals the rank minus 49.5. This ensures that the average firm has a trading volume score of zero.

Statistical Tests:

Most of the prior drift studies rely primarily on regression analysis, where the dependent variable is the cumulative abnormal return (CAR) and the independent variables are the SUE scores. Other control variables are also used for the subsequent quarter cumulative returns. To test the first two hypotheses, we estimate the system of regression equations (1), (2) and (4) simultaneously using a Seemingly Unrelated Regression (SUR) method, and test for the effects of non-linear restrictions on the estimated coefficients using the MODEL procedure in SAS. The χ^2 statistic is used to test whether the autocorrelations have the same value in the prediction and pricing equations, as in Mishkin (1983). Tests for the equality of revenue and expense coefficients in the pricing equation (4) are performed in the same manner. To assess the significance of individual regression coefficients, this study uses a quarterly cross-sectional regressions to estimate the average coefficients and their standard errors in a methodology similar to that of Fama and MacBeth (1973). For tests of abnormal returns in the subsequent quarter, the independent variables are entered as interactive variables with the SUE scores, consistent with prior studies.

Another approach for testing the incremental effect of the sales surprise beyond the earnings surprise is based on the incremental returns that a hedge portfolio can earn. Consider first an earnings hedge portfolio that consists of long positions in all firms with a SUE quintile rank of 4 (the top 20% of SUE) and short positions in the bottom 20% of

the SUE distribution. This hedge portfolio is reconstituted every quarter, depending on the quarterly SUE. An alternative hedge portfolio is a subset of the above portfolio, where the short positions are of firms with **both** earnings (SUE) and sales (SUS) surprises in the bottom 20% of the distribution, and long positions in firms with **both** earnings and sales surprises at the top 20% of their distributions. This portfolio is also reconstituted every quarter. The mean difference in returns between these two portfolios over all available quarters can be used to test the incremental average return due to utilization of the revenue surprise in addition to the earnings surprise. To the extent that the revenue surprise helps in identifying firms that have more persistent earnings surprises, the subsequent CAR for such firms should be significantly larger than for all firms with a SUE in the top or bottom 20% of the distribution.

Sample Period:

The initial sample contains 210,794 observations (firm-quarters), with 1,677 observations in the first quarter of 1987 and 4,707 observations in the third quarter of 2002. The study also includes 453 observations in the last quarter of 2002, mostly for firms with fiscal quarter ending early in that calendar quarter. The analyst forecasts sample includes 13,313 observations, with 415 observations in the third quarter of 1998 and 1,500 observations in the third quarter of 2002. A small number of the observations are omitted in various tests due to missing data.

Table 1 provides summary statistics about the two samples. As can be seen, the mean earnings SUE is negative for the historical sample, although the median earnings surprise is positive. The mean SUE is much larger for the analyst forecasts sample, likely because of the different construction of the measure and the more recent time period. In

contrast, the mean sales SUS is positive, as is the median when estimated from historical data (Panels A), but the mean is negative when estimated from analyst forecasts of sales (Panel B).

(Insert Table 1 about here)

The mean percentage of shares held by institutions is 35% for our historical SUE sample, compared with the 41% reported by Bartov et al. (2000), who use only NYSE and AMEX firms; the current study uses NASDAQ firms, too. Note that the mean proportion of institutional holdings is much higher in Panel B (58%), as is intuitively expected because analysts tend to write research reports about firms that are of more interest to institutional holders. The mean arbitrage risk reported in Table 1 is around 86%, which implies that the mean R^2 in regressions of the stock return on the S&P 500 Index is about 14%, consistent with results reported in prior studies. The average monthly dollar trading volume as a proportion of market value of equity is about 91% for the historical SUE sample, and much higher at 208% for the analyst forecast sample, as can be expected. It is also evident from the table that the historical SUE sample has a wide distribution of firms in terms of size (market value of equity at the end of the previous quarter), and that the subset of firms that are followed by analysts have larger market values. Finally, the mean CAR in the subsequent quarter is negative at –1.3% for the historical sample, and –0.1% in the analyst forecasts sample. This may reflect the different time periods for the two samples. The mean current quarter's announcement CAR in the window (-1,1) is much smaller at 0.1% for the historical sample, but is 0.5% for the analyst forecasts sample. The tests we provide below will be of relative performance, so the non-zero mean CAR should not affect our conclusions.

IV. Results

Table 2 presents the replication of Ball and Bartov (1996) in our historical sample. The main differences between this study and their study are the sample periods and the definition of SUE. Thus, a better comparison is to Burgstahler et al (2002), which is much closer to the definition and sample period covered in this study. Panel B of Table 2 provides the same analysis but on the raw SUE values instead of the decile ranks as in Ball and Bartov (1996). Ball and Bartov (1996, Table 1, p. 326) report {0.443, 0.133, 0.054, -0.215} in the prediction equation, compared with this study of {0.371, 0.128, 0.60, -0.252}, which is also very similar to the Burgstahler et al (2002, Table 3, p. 602) results for earnings before special items of {0.360, 0.132, 0.046, -0.218}. The table also provides estimates of the coefficients on the pricing equation that are similar to those of Burgstahler et al (2002), with remarkable close ratios of the implied coefficient in the pricing equation to the actual coefficient in the prediction equation of {53%, 75%, 130%, 45%} in this study and {41%, 72%, 139%, 26%} in Burgstahler et al (2002). Note also that the Mishkin test-statistics in this study and those in Burgstahler et al (2002) are also very close and provide the same conclusions.

(Insert Table 2 about here)

In Panel B, the study replicates Ball and Bartov (1996) and the Burgstahler et al (2002) studies with two differences. First, it uses the raw score of SUE instead of the transformed SUE decile rank. Second, coefficients and their t-statistics represent the average of 64 quarterly cross-sectional estimations and their associated t-statistics. This reduces the t-statistics as compared to Panel A which is based on pooled time-series

cross-sectional data, and may be overstated. The main conclusions from Panel A of Table 2 remain intact in Panel B. Market participants seem to understand the autocorrelation structure of earnings surprises but ignore its magnitude. The Mishkin test-statistics indicate that both the immediately preceding quarter and the same quarter of the preceding year (t-4) are significantly different in the prediction and the pricing equations.

Table 3 provides the estimation of the system of Equations (1), (2), and (4), where the earnings surprise is broken down into its revenue and expenses surprises. The prediction equation for the revenue surprise has a higher adjusted-R^2, and the first autocorrelation is higher for the revenue surprise than for the expense surprises. This is consistent with a greater persistence in revenue than in expense surprises. The table also indicates that the response coefficients to the contemporaneous revenue and expense surprises in the pricing equation are different from each other with 16.609 for the revenue surprise and 10.543 for the expense surprise. This is consistent with prior studies such as Ertimur et al (2003). Note that the tests of equality of the coefficients reported at the bottom of the table, constructed from the 64 quarterly cross-sectional estimations, indicate that these response coefficients are significantly different from each other. The table also shows that three of the prior quarterly revenue surprises have significant coefficients in the pricing equation as compared to only two of the prior expense surprises, indicating again the potential superiority of revenue surprises in predicting future stock returns. Results at the bottom of the table indicate that the revenue surprise in the immediately preceding quarter is more strongly associated with returns around the current quarterly announcement than the expense surprise in that quarter, consistent with the higher first autocorrelation in the prediction equation. Finally, note that both the ratio

of the implied to actual coefficients and the Mishkin test-statistics indicate that the revenue and expense surprises of the immediately preceding quarter and the same quarter of the prior year are understated by investors in the pricing equation, indicating that the documented under-reaction to prior earnings surprises in these quarters hold for both the revenue and expense components of the earnings surprises.

(Insert Table 3 about here)

The results in Table 3 indicate that investors under-react to revenue and expense surprises, and that the breakdown of earnings surprises into revenue and expense surprises is particularly important for the immediately adjacent quarter, where our tests of the coefficients in the pricing equation show that for quarter t-1 the coefficients of the revenue and expense surprises are significantly different. It is also apparent from the table that the quarter t-1 have a significant under-reaction, as indicated by both the ratio of implied to actual coefficient and the Mishkin test-statistics. Thus, it seems logical to infer that a trading strategy that involves the construction of a portfolio according to both revenue and expense surprises may yield higher abnormal returns in the immediately subsequent quarter than a strategy that uses only the earnings surprise. This is essentially the process followed by Collins and Hribar (2000) in testing whether the returns to a SUE strategy can be enhanced by selecting a subset of the firms in the extreme earnings surprises portfolios which also have accruals that are likely to drive future earnings surprises in the same direction. For example, they show that the abnormal returns on a strategy that holds long (short) positions in firms with both highly positive (negative) earnings surprises and low (high) accruals are greater than those on a strategy that only uses highly positive and negative earnings surprises. Note, however, that their strategy

uses information about earnings and operating cash flows, but cash flows are typically not disclosed in the preliminary earnings release. In contrast, our strategy of splitting the earnings surprise into revenue and expense surprises can be implemented from the time of the preliminary earnings announcement.

Table 4 in this study is similar in structure to Table 3 of Collins and Hribar (2000). It shows the cumulative abnormal returns to a portfolio that falls into the top (bottom) quintile of the earnings surprise and the top (bottom) quintile of the revenue surprise. The middle three quintiles are collapsed into one portfolio. The table reports the cumulative abnormal returns from two days after the earnings announcement until one day following the next quarterly earnings announcement. Consistent with prior studies of the post-earnings announcement drift, when one moves down the column (higher and more positive earnings surprises in the current quarter) the CAR over the next quarter is higher. However, consistent with the greater persistence of the revenue surprises, there are higher positive abnormal returns (1.61%) for firms that were assigned to the top quintile of both earnings and revenue surprises than those that were placed just in the top earnings surprises (0.84%). Note that although the revenue surprises show monotonically increasing abnormal returns for the entire population (-2.19% in the bottom 20%, -1.15% for the middle 60% and -0.6% for the top 20%), this monotonic relationship is not present in the bottom quintile of earnings surprises. The top quintile of revenue surprises in that group of poor earnings performers experience a negative return of -3.24% whereas the bottom quintile of revenue surprises experienced a negative return of only -2.77%. This seems to be inconsistent with the persistence explanation provided above. The next table sheds some more light on this phenomenon. Note also that the returns are in the right

direction for the analyst forecast sample in Panel B and much stronger than those reported for the historical sample in Panel A. The bottom quintile of earnings surprises has a negative abnormal return of –2.77% when firms also belong to the bottom quintile of revenue surprises, but have a positive return of 1.29% when firms also belong to the top quintile of revenue surprises. Similarly, when firms fall into the top quintile of earnings surprises and the bottom quintile of revenue surprises they have an average abnormal return of 0.21%, but when they fall into the top quintile on both earnings and revenue surprises they average a 2.17% abnormal return.

(Insert Table 4 around here)

Table 5 is a replication of Panel A of Table 4 based on the historical Compustat data, but is disaggregated into growth and value firms, where growth (value) firms have a ratio of book to market value of equity as of the end of the previous quarter below (above) the median. Panel A of Table 5 provides the results for growth firms and Panel B for value firms. For both groups, the average abnormal return on firms that fall into the top quintile of both earnings and revenue surprises is higher than that for firms that fall into the top earnings surprise quintile but also to the bottom quintile of revenue surprises. In contrast, Panel A of Table 5 shows that for growth firms that fall into both the bottom quintiles of earnings and revenue surprises, the average abnormal return is –1.99%, and is lower than –1.59% when growth firms fall into the bottom earnings surprise quintile but to the top revenue surprise quintile. Panel B, which displays the information for value firms, shows that the average returns on firms that fall into the bottom quintile of both earnings and revenue surprises is –3.08%, higher than the average of –3.80% for value firms that fall into the bottom quintile of earnings surprises but to the top quintile of

revenue surprises. One possible reason for the large negative returns in the case of value firms is that when firms have disappointing earnings on top of high levels of revenue surprises, market participants assume that the firms slashed sales prices in an attempt to gain market share, which may not be the optimal strategy for these firms. In contrast, growth firms with disappointing earnings but high revenue surprises may indicate to investors that they can develop demand for their products, and that future profitability may increase to reflect economies of scale and scope. Another explanation may be related to the "stickiness" of SG&A and other costs, which Anderson et al (2003a and 2003b) show are maintained at high levels in spite of declining sales if management expects sales to increase in the future. Thus, investors in firms with low earnings and low revenue surprises may expect (like management) that future revenues will increase, and therefore the negative price reactions are less strong than if earnings decline but revenues increase.

(Insert Table 5 about here)

Table 6 provides the results of regressing CAR in the subsequent quarter on the transformed earnings decile SUE rank, DSUE; on both the earnings decile rank DSUE and its interaction with the transformed revenue decile rank, DSUS; as well as on these two variables along with control variables for institutional holdings, arbitrage risk, and trading volume. Consistent with prior studies, the control variables are converted to their percentile rank and transformed to have a mean of zero, and then interacted with the earnings surprise. These regressions are repeated for the historical Compustat firms and the analyst forecast samples. In addition to the standard pooled regression results, the table reports results that are based on separate quarter-by-quarter regressions that are summarized using a Fama and MacBeth (F-M) (1973) methodology. Due to the smaller

number of quarters for the analyst forecast (of sales) sample (1998-2002), the F-M results for this sample should be interpreted with caution. Note that the number of observations is different in the results of the regression with the control variables because of observations missing data on any of the control variables.

(Insert Table 6 about here)

As can be seen in Panel A of Table 6 for the historical sample, the coefficient on the earnings decile SUE rank (DSUE) has the predicted positive sign and is statistically different from zero. It is also similar in magnitude to that reported by Bartov et al. (2000). Note that the intercept in the regressions is close to the mean abnormal return reported in Table 1, consistent with the transformation of the variables in the regression to have a mean of zero. The slope coefficient of 4.353 on the earnings surprise transformed decile rank implies that abnormal returns on holding long (short) positions in the top (bottom) earnings surprises can earn abnormal returns of 4.4% per quarter. When the transformed revenue decile rank is added into the regression as an interactive term with earnings, the slope coefficient on the interactive revenue surprise variable is also positive, significantly different from zero and equals about 3.4% per quarter. This magnitude implies that a trading strategy based on short (long) positions in the bottom (top) decile of revenue surprises, after following a similar strategy for the earnings surprise decile, can improve the abnormal return during the subsequent quarter by about 3.4%, or about 14% annually. This is an economically meaningful increase in abnormal returns beyond those that can be earned by using the earnings SUE alone. The same conclusions are obtained after controlling for the proportion of stock held by institutions (negatively associated with CAR, as expected), arbitrage risk (positively associated with CAR, as expected), and

trading volume (negatively associated with CAR, as expected), albeit with a smaller additional abnormal return for revenue surprise of about 1.85% per quarter. Thus, the earnings drift can be enhanced if the revenue surprises are used to improve the selection of firms into the hedge earnings and revenue portfolio.

Panel B provides the results of these regressions for the sample of firms with analyst forecasts of both earnings and sales. The regressions for this sample indicate an earnings surprise drift of about 2.3% per quarter for the 1998-2002 period, and a similar drift of 2.2% per quarter to a revenue surprise strategy. When the two are combined into one strategy, the incremental revenue surprise coefficient is negative and insignificantly different from zero. The results are insignificant when the control variables are included in the regressions. However, there are substantially fewer observations in Panel B.

Table 7 presents average quarterly abnormal returns that can be obtained on a hedge portfolio that holds long (short) positions in firms at the top (bottom) quintile of earnings surprises, termed "Earnings-Based-Hedge Portfolio", and on a hedge portfolio that holds long (short) positions in firms that fall into the top (bottom) quintile of **both** earnings and revenue surprises, termed "Earnings-and Sales-Based-Hedge Portfolio". The table also provides statistics about the quarterly differences between the abnormal returns on these two portfolios, which allow statistical tests of the superiority of using both revenue and earnings surprises in construction of hedge portfolios over just earnings surprises. As can be seen in Panel A of Table 4, based on the 64 observed quarters, the mean earnings-based hedge portfolio yields an average quarterly drift of 3.76%, with an associated significance level of 0.001. However, the earnings- and revenue-based hedge portfolio yields a higher return of 4.48% quarterly, also significantly different from zero,

and the difference between this portfolio return and the return on the earnings-based hedged portfolio is about 0.7% per quarter, which is significantly different from zero at a 0.010 significance level. Panel B, for surprises based on analyst forecasts and only 18 quarters, shows an even larger difference; a 3.7% return on the earnings-based portfolio and a 6.62% return on the earnings and revenue hedge portfolio, with a mean difference of 2.94% per quarter, which is statistically different from zero at a 0.057 significance level. Note that the significant improvement in the performance of the earnings and revenue hedge portfolio over the earnings hedge portfolio comes at a cost—this portfolio has substantially fewer firms on average than the earnings-based hedge portfolio: 587 firms as compared to 1,319 firms in Panel A, and 95 vs. 288 in Panel B. Thus, the improvement in the performance of the earnings and sales hedge portfolio comes from an elimination of firms with conflicting earnings and sales signals, which tend to reduce the drift for the earnings-based hedge portfolio, likely because of the greater persistence of earnings when revenues point out a similar surprise as that of earnings.

(Insert Table 7 about here)

Figure 1 presents graphically the cumulative abnormal returns for each of the 64 quarters covered in Table 7 (first quarter of 1987 through the last quarter of 2002), for hedge portfolios that are based on earnings, earnings and revenues and the differences in those two. In each case the hedge portfolio consists of long (short) positions in the top (bottom) quintile of the surprises. As can be seen in Figure 1A, and consistent with prior studies, the earnings strategy yields mostly positive returns, with only three (small) negative quarterly returns. Figure 1B shows that the earnings and revenues strategy yields more negative quarterly returns (eight of the 64 quarters), but also larger abnormal

positive returns, which explains its superiority. Figure 1C shows the return difference between the earnings and revenues strategy and the earnings-only strategy. In about one third of the quarters the earnings-only strategy dominates the earnings and revenues strategy, but the number as well as the magnitude of positive differences in returns tilt the balance in favor of the earnings and revenue strategy.

(Insert Figure 1 about here)

Table 8 provides similar statistics to those reported in Table 7 for various sub-samples. The first classification is into growth (below median ratios of book to market value and equity at the end of the preceding quarter) and value (above median). The average return difference when both earnings and revenues surprises are used than when just earnings surprises are used is more than double for growth companies than for value companies. Consistent with our observation in Table 5, most of the returns for both growth and value companies are derived from the long positions and not from the short positions. This is comforting given the potential difficulties and restrictions that are applicable to short positions. The next classification shows that the benefits from using both revenue and expense surprises are significant for small (below median in market value of equity as of the end of the preceding quarter) but not for large firms. This is consistent with information about better information environments for large firms (See, for example, Brown and Han, 2001).

(Insert Table 8 about here)

Table 8 shows that that when earnings are less persistent, as measured by the first autocorrelation of the previous eight scaled quarterly earnings surprises, the hedge

portfolio based on both earnings and revenues yields higher abnormal returns than when earnings are more persistent. This is intuitively expected because revenues can help investors better assess the earnings surprise when it is less persistent. Similarly, when there is low correlation between earnings and operating cash flows, i.e., when earnings is of lower quality, the revenue surprises can help assess the earnings surprise and the hedge strategy based on both earnings and revenue surprises dominates the strategy based on earnings alone. In contrast, when earnings have a high proportion of accruals to sales in the most recent four quarters, the revenue surprises do not add much information beyond that inherent in earnings surprises, as compared to a low proportion of accruals, when the revenue surprises add significantly to the interpretation of the earnings surprises. Note that we use the absolute value of accruals to sales in calculating the proportion of accruals to sales, so this is not due to the familiar accruals reversal anomaly of Sloan (1996). Finally, revenue surprises help obtain higher abnormal returns when the proportion of informed investors (institutional holdings) is low or when arbitrage risk is high. Whether the firm has high or low trading volume does not seem to affect the improvement in abnormal returns from using revenue surprises in addition to earnings surprises.

Table 9 reports regression results similar to those in Table 6 for three sub-periods: observations during the years 1987-1994, 1995-1998, and 1999-2002. The sample observations are all based on the historical Compustat database. The earnings drift is present and significant in all three sub-periods; there is no indication in the table that the earnings SUE effect is reduced in the most recent period. Notice that the period 1999-2002 includes periods of both severe market increases and decreases. The incremental

effect of revenue surprises is present and statistically different from zero in all three sub-periods. The results for the earnings and sales SUE are present in all three sub-periods after controlling for institutional holdings, arbitrage risk, and trading volume, except for the pre-1995 period where the effect is positive but insignificantly different from zero. Thus, the documented results of this study are not driven by any sub-period, and they are consistent in different market conditions, including market increases, declines, and periods that span both.

(Insert Table 9 about here)

Sensitivity Analysis:

1. Equations (1) and (2) which describe the autocorrelations among revenue and expense surprise may yield error terms that are correlated. This may affect the unexpected earnings in the pricing equation (3), which is assumed a linear combination of the individual unexpected revenue and expense surprises. An alternative is to make the two errors terms orthogonal by assuming that the expense surprise is a linear function of both prior revenue and expense surprises. Thus, the unexpected expense surprise is independent of the prior revenue surprises. The model is more complex to estimate, and derivation of the implied coefficients is dependent on the autocorrelations of the expense surprise with prior revenue surprises. The main results reported in Table 3 are true for this derivation. In particular, the revenue and expense coefficients in the pricing equation are different for the current and the immediately preceding quarter. The

implied coefficients and the Mishkin test-statistics indicate that there is under-reaction to the revenue and expense surprises of quarters t-1 and t-4.

2. The main results of Table 3 are insensitive to the elimination of loss firms. In particular, the revenue and expense coefficients in the pricing equation are different for the current and the immediately preceding quarter. The implied coefficients and the Mishkin test-statistics indicate that there is under-reaction to the revenue and expense surprises of quarters t-1 and t-4.

3. It may be argued that the return results for the following quarter may not be a new findings caused by the greater persistence of revenues, but the same accruals phenomenon documented by Collins and Hribar (2000). It should be noted that accruals are typically not known at the time of the preliminary earnings announcement, unless the firm releases net operating cash flow at that time. Otherwise, investors must wait for the Form 10-Q to learn about accruals. In contrast, information about revenues is available at the preliminary earnings announcement date, so it can be used by investors immediately. However, to find out whether the results in Table 4 are due to the accruals anomaly, this study estimates total accruals for the quarter and the previous quarter. Total accruals is defined as earnings before extraordinary items and discontinued operations minus net operating cash flows, and as in Sloan (1996), modified for quarterly data, before cash flow data are available. Total accruals are scaled by average total assets at the beginning and end of the quarter. As expected from Collins and Hribar (2000), there is a clear accruals effect with firms in the lowest (highest) quintile having a CAR of 0.07% (-2.44%) for the following quarter. Curiously,

there is also an accruals effect, where accruals are measured in the prior quarter and therefore known on the preliminary earnings announcement date, with firms in the lowest (highest) quintile having a CAR of -0.11% (-2.03%) for the following quarter.[6] The results also indicate a clear revenue effect beyond the accrual effect. For example, for the highest quintile of earnings surprise and the lowest accruals quintile, the CAR on the lowest (highest) revenue quintile is 0.46% (3.22%). Similarly, for the highest quintile of earnings surprise and the highest accruals quintile, the CAR on the lowest (highest) revenue quintile is now negative (positive) -2.66% (0.41%). As expected, the lowest CAR of -5.27% is obtained for firms in the lowest quintile of earnings, highest quintile of accruals and the lowest quintile of revenues. Similar results are obtained when accruals in the previous quarter are used to classify firms. Thus, the revenue surprise provides a better interpretation of the persistence of the earnings surprise, even after controlling for the effects of current (and not yet known) accruals or accruals of the previous quarter.

4. The regression results in Table 6 for the historical sample are repeated for companies with market values in excess of $100 million at the previous quarter's end, to assess the effect of removing smaller companies with poorer information and trading environments. The incremental effect of revenue surprises is still positive and significantly different from zero, although it is positive but insignificantly different from zero when the control variables are introduced.

[6] The mean for the sample is -1.25%, so the CAR of -0.11% is better than the sample mean.

5. The results of the study are qualitatively similar for a sub-sample of firms with more than one analyst forecast of sales, although significance levels decline somewhat.

V. Summary and Conclusions

This study documents that the persistence of revenue surprises is higher than the persistence of expense surprises, where expenses include non-operating gains and losses, special items, etc. It then shows that investors do not fully apply the implications of the differential persistence levels between revenue and expense surprises in setting future prices. Results in this study show that while investors set security prices treating the revenue and expense surprises differently in the current quarter and the immediately preceding quarter, they also under-react to the actual levels of persistence, a phenomenon that was previously documented for earnings surprises by Bernard and Thomas (1989, 1990), Ball and Bartov (1996) and Burgstahler et al (2002). The study also shows that an investment strategy that is based on selecting securities into a hedge portfolio with both extreme earnings and revenue surprises yields significantly higher abnormal returns over the following quarter than a similar strategy based on extreme earnings surprises alone. These results are robust to previously documented effects such as level of institutional holdings, arbitrage risk and trading volume.

The combined evidence in this study has implications for academics and practitioners. Research efforts to understand and investigate under-reactions of

investors to accounting information, its causes, and its effects should take into account such characteristics as the persistence of earnings, the separate revenue and expense surprises, and other variables that can affect earnings persistence. Practitioners who base their portfolio decisions (among other things) on the earnings surprise should take into account the revenue surprises and consider whether and how much it confirms the earnings surprise. Finally, fundamental security analysis in academe and practice may have to incorporate detailed analysis of a firm's prior persistence of revenues and expenses to assess their potential effects on security prices, which can be done on the date of the preliminary earnings release.

References

Abarbanell, J., 1991. Do analysts' earnings forecasts incorporate information in prior stock price changes? Journal of Accounting and Economics 14, 147-165.

Abarbanell, J., Bernard, V., 1992. Tests of analysts' overreaction/underreaction to earnings information as an explanation for anomalous stock price behavior. Journal of Finance 47, 1181-1207.

Anderson, M., R. Banker and S. Janakiraman, 2003, "Are selling, general and administrative costs "sticky"?", Journal of Accounting Research 41, pp. 47-63.

Anderson, M., R. Banker, R. Huang and S. Janakiraman, 2003, "Value Implications of Changes in SG&A Costs When Costs are Sticky", Working Paper, University of Texas at Dallas.

Ball, R. and Brown, P., 1968. An empirical evaluation of accounting income numbers. Journal of Accounting Research 6, pp. 159–177.

Ball, R., and Bartov, E., 1996. How naïve is the stock market's use of earnings information? Journal of Accounting and Economics 21, 319-337.

Bartov, E., 1992. Patterns in unexpected earnings as an explanation for post-announcement drift. The Accounting Review 67, 610-622.

Bartov, E., Radhakrishnan, S., Krinsky, I., 2000. Investor sophistication and patterns in stock returns after earnings announcements. The Accounting Review 75, 43-63.

Bernard, V., Thomas, J., 1989. Post-earnings-announcement drift: delayed price response or risk premium? Journal of Accounting Research 27, 1-48.

Bernard, V., Thomas, J., 1990. Evidence that stock prices do not fully reflect the implications of current earnings for future earnings. Journal of Accounting and Economics 13, 305-340.

Brown, L. and Han, J., 2000. Do stock prices fully reflect the implications of current earnings for future earnings for AR1 firms?. Journal of Accounting Research 38, pp. 149–164.

Burgstahler, David, James Jiambalvo and Terry Shevlin, 2002, Do Stock Prices Reflect the Implications of Special Items for Future Earnings?, Journal of Accounting Research 40:3, June 2002, pp. 585–612.

Collins, Daniel W. and Paul Hribar, 2000, Earnings-Based and Accrual-Based Market Anomalies: One effect or Two Effects?, Journal of Accounting and Economics, 29, 101-123.

Ertimur, Y., J. Livnat and M. Martikainen, 2003, Differential Market Reactions to Revenue and Expense Surprises, Review of Accounting Studies, 8:2-3, June/September, pp. 185-211.

Fama, E. F. and James D. MacBeth, 1973 Risk, return, and equilibrium: Empirical tests, Journal of Political Economy, 81, 607-636.

Foster, George, 1977, "Quarterly Accounting Data: Time Series Properties and Predictive-Ability Results", *The Accounting Review,* (52:1), 1-21.

Foster, G., Olsen, C., Shevlin, T., 1984. Earnings releases, anomalies and the behavior of security returns. The Accounting Review 59, 574-603.

Hopwood, W. and James McKeown. "The Incremental Information Content of Interim Expenses over Interim Sales." *Journal of Accounting Research*, 23 (1985), pp. 161-174.

Hoskin, Robert E., Hughes, John S., Ricks, William E. and Lawrence D. Brown. "Evidence on the Incremental Information Content of Additional Firm Disclosures Made Concurrently with Earnings/Discussion." *Journal of Accounting Research*, 24 (1986), pp. 1-36.

Jegadeesh, Narasimhan and Joshua Livnat, 2004. "Revenue Surprises and Stock Returns". Working paper, Emory University and New York University.

Klein, A., 1990. A direct test of the cognitive bias theory of share price reversals. Journal of Accounting and Economics 13, 155-166.

Kothari, S.P., 2001. Capital markets research in accounting, Journal of Accounting and Economics 31, 105-231.

Lipe, Robert C., "The Information Contained in the Components of Earnings." *Journal of Accounting Research*, 24:(1986, Supplement), pp.37-68.

Lys, T., Sohn, S., 1990. The association between revisions of financial analysts' earnings forecasts and security price changes. Journal of Accounting and Economics 13, 341-363.

Livnat, Joshua and R. Mendenhall, 2004. "Why Is the Post-Earnings-Announcement-Drift Larger for Surprises Calculated from Analyst Forecasts?", Working paper, New York University.

Mendenhall, R., 1991. Evidence on the possible under-weighting of earnings-related information. Journal of Accounting Research 29, 170-179.

Mendenhall, R., 2003. Arbitrage Risk and Post-Earnings-Announcement Drift, Journal of Business, Forthcoming.

Mikhail, Michael B., Beverly R. Walther and Richard H. Willis, 2003, The effects of experience on security analyst underreaction, Journal of Accounting and Economics 35, 101-116.

Rees, Lynn and K. Sivaramakrishnan. "Valuation Implications of Revenue Forecasts." Unpublished manuscript, Texas A&M University, June 2001.

Sloan, Richard R., 1996, "Do Stock Prices Fully Reflect Information in Accruals and Cash Flows about Future Earnings?, The Accounting Review, 71:3, July, 289-315.

Swaminathan, Siva and Joseph Weintrop. "The Information Content of Earnings, Revenues, and Expenses." *Journal of Accounting Research,* 29(1991), pp. 418-27.

Wilson, GP. "The Relative Information Content of Accruals and Cash Flows – Combined Evidence at the Earnings Announcement and Annual Report Release Day." *Journal of Accounting Research,* 24(1986), pp. 165-200.

Table 1
Summary Statistics

Variable	N	Mean	Std Dev	10th Pctl	25th Pctl	50th Pctl	75th Pctl	90th Pctl
Panel A: Historical SUE								
Earnings Surprise SUE	207232	-0.001	0.061	-0.028	-0.006	0.002	0.007	0.022
Sales Surprise SUS	206881	0.028	0.115	-0.045	-0.002	0.016	0.051	0.120
Expense Surprise SUX	206846	-0.029	0.119	-0.124	-0.052	-0.016	0.001	0.043
Market Value of Equity (t-1)	208807	1819	10573	23	54	177	719	2742
Book/Market Value of Equity	208807	0.645	0.524	0.178	0.320	0.539	0.824	1.192
CAR- Subsequent Quarter (%)	208807	-1.269	21.330	-25.949	-12.788	-1.429	9.915	23.347
CAR (-1,1) – Current Quarter (%)	208807	0.144	6.887	-7.344	-3.052	-0.048	3.233	7.920
Proportion of Institutional Holdings	203071	0.353	0.243	0.051	0.145	0.321	0.538	0.700
Average Trading Volume	141402	0.906	3.974	0.068	0.205	0.431	0.877	1.856
Arbitrage Risk	142968	0.860	0.137	0.658	0.790	0.902	0.968	0.993
Panel B: Analyst Forecast Earnings and Sales								
Earnings SUE	12997	1.171	3.951	-0.992	-0.126	0.730	2.121	4.330
Sales SUS	12997	-0.363	17.269	-0.074	-0.021	0.008	0.042	0.096
Market Value of Equity (t-1)	12997	7921	28005	160	395	1109	4020	14617
Book/Market Value of Equity (t-1)	12997	0.463	0.500	0.109	0.200	0.354	0.580	0.882
CAR- Subsequent Quarter (%)	12997	-0.133	26.232	-32.932	-14.332	0.594	14.943	31.251
CAR (-1,1) – Current Quarter (%)	12997	0.509	9.001	-10.417	-4.459	0.470	5.650	11.496
Proportion of Institutional Holdings	12901	0.583	0.228	0.249	0.427	0.611	0.756	0.852
Average Trading Volume	8771	2.081	6.573	0.376	0.595	1.056	2.086	4.150
Arbitrage Risk	8877	0.858	0.106	0.711	0.797	0.880	0.940	0.977
Number of Earnings Forecasts	12997	8.212	6.179	2	4	6	11	17
Number of Sales Forecasts	12997	2.606	2.866	1	1	2	3	5

Notes:

1. In Panel A, earnings, revenue and expense surprises are calculated from the Compustat quarterly database. Earnings (sales) SUE (SUS) is actual earnings (sales) minus earnings (sales) in the same quarter of the previous year, scaled by market value at the end of the preceding quarter. The expense surprise is the earnings surprise minus the revenue surprise.
2. In Panel B, the earnings surprise is calculated from I/B/E/S as the actual I/B/E/S EPS minus the mean analyst forecast during the 90-day period before the disclosure of earnings, scaled by the dispersion of analyst forecasts. Earnings SUE is calculated only if at least two analysts provide earnings forecasts for the firm. The sales surprise is also calculated from I/B/E/S as the actual I/B/E/S sales minus the mean forecast of sales during the 90-day period before the disclosure of earnings, scaled by the actual I/B/E/S sales. The sales SUS is calculated even if only one analyst provided a sales forecast.
3. Market (book) value of equity is as of the end of the previous quarter and is based on Compustat data.
4. The proportion of institutional holdings as of the previous quarter's end is obtained by summing all shares held by managers, as reported in 13-f filings with the SEC, and dividing by total shares outstanding as of the end of the previous quarter.
5. Arbitrage risk is one minus the squared correlation between the 60 monthly returns on the stock and those on the S&P 500 Index, ending one month before the quarter-end.
6. Trading volume is the average monthly dollar value of shares traded during the 60 months ending one month before the quarter-end, divided by the market value of equity at the end of the same month.
7. CAR-Subsequent Quarter is the abnormal return on a stock, cumulated from two days after an earnings announcement through the day after the next quarterly earnings announcement. The abnormal return is the raw return minus the average return on a same size-B/M portfolio (six portfolios), as provided by Professor French.
8. CAR – Current Quarter is the abnormal return on a stock, cumulated from one day before the earnings announcement of the current quarter through the day after the announcement. The abnormal return is the raw return minus the average return on a same size-B/M portfolio (six portfolios), as provided by Professor French.

Table 2
Replication of Ball and Bartov (1996)

Panel A: Replication Using Ranks of SUE

	Prediction Equation			Pricing Equation					
Variable	Predicted Sign	Actual Coeff.	t-stat	Predicted Sign	Actual Coeff.	t-stat	Implied Coeff.	Ratio	Mishkin
Intercept		0.347	220.3		0.053	1.4			
SUEt				+	**4.144**	**75.8**			
SUEt-1	+	**0.371**	**170.2**	-	**-0.820**	**-14.5**	0.198	53%	**175.6**
SUEt-2	+	**0.128**	**54.9**	-	**-0.400**	**-7.0**	0.096	75%	**5.3**
SUEt-3	+	**0.060**	**25.7**	-	**-0.325**	**-5.7**	0.078	130%	1.7
SUEt-4	-	**-0.252**	**-115.3**	+	**0.471**	**8.6**	-0.114	45%	**112.5**
Adjusted R^2		0.232			0.030				
N		196136							

Panel B: Replication Using Scores

	Prediction Equation			Pricing Equation					
Variable	Predicted Sign	Actual Coeff.	t-stat	Predicted Sign	Actual Coeff.	t-stat	Implied Coeff.	Ratio	Mishkin
Intercept		-0.001	-1.3		**0.157**	**4.8**			
SUEt				+	**12.355**	**21.4**			
SUEt-1	+	**0.168**	**20.1**	-	-0.247	-0.5	0.035	21%	**27.97**
SUEt-2	+	**0.095**	**10.4**	-	**-0.567**	-1.6	0.053	57%	2.47
SUEt-3	+	**0.048**	**6.8**	-	**-0.964**	**-2.6**	0.069	158%	0.95
SUEt-4	-	**-0.380**	**-21.4**	+	**1.995**	**4.4**	-0.168	46%	**50.19**
Adjusted R^2		0.134			0.008				
N		196136							

Notes:

1. The table replicates the results of Ball and Bartov (1996) using our sample. In Panel A, SUE is the decile rank of the scaled earnings surprise. The earnings surprise is quarterly earnings minus quarterly earnings in the same quarter of the preceding year, scaled by the market value of equity at the end of the prior quarter end. Panel B uses SUE itself.
2. The dependent variable in the prediction equation is SUE_t. The dependent variable in the pricing equation is CAR (-1,1), the abnormal return on a stock cumulated from one day before the earnings announcement of the current quarter through the day after the announcement. The abnormal return is the raw return minus the average return on a same size-B/M portfolio (six portfolios), as provided by Professor French.
3. The coefficients and t-statistic in Panel A are based on pooled time-series, cross-sectional data. In Panel B, the coefficients and t-statistics are from the quarterly cross-sectional regressions in a Fama and MacBeth (1973) manner.
4. The implied coefficient is the actual coefficient in the pricing equation, divided by the negative of the contemporaneous SUE coefficient. The ratio is the implied coefficient divided by the coefficient in the prediction equation. It is calculated from the pooled time-series, cross-sectional data.
5. Entries in the Mishkin column represent the χ^2-statistic to test that the implied coefficient is equal to the coefficient in the prediction equation, as in Mishkin (1983).
6. Bold figures are significant at levels below 5%.

Table 3
Breakdown of Earnings Surprises into Revenue and Expense Surprises

	Prediction Equations			Pricing Equation					
Variable	Predicted Sign	Actual b	t-stat	Predicted Sign	Actual b	t-stat	Implied Coeff.	Ratio	Mishkin
Intercept		**0.015**	**13.2**		0.064	1.9			
SUSt				+	**16.609**	**26.7**			
SUSt-1	+	**0.475**	**37.7**	-	**-2.908**	**-5.4**	0.201	42%	**177.9**
SUSt-2	+	**0.135**	**17.8**	-	-0.748	-1.8	0.061	45%	**11.9**
SUSt-3	+	**0.077**	**13.4**	-	**-1.192**	**-2.8**	0.069	93%	0.1
SUSt-4	-	**-0.222**	**-30.4**	+	**1.991**	**4.5**	-0.127	58%	**18.2**
R-Sq		0.427							
Intercept		**-0.016**	**-16.0**						
SUXt				+	**10.453**	**19.8**			
SUXt-1	+	**0.405**	**34.5**	-	0.081	0.2	0.025	6%	**154.4**
SUXt-2	+	**0.167**	**19.9**	-	-0.700	-2.0	0.079	47%	**8.2**
SUXt-3	+	**0.096**	**14.8**	-	**-1.006**	**-2.5**	0.084	90%	0.1
SUXt-4	-	**-0.240**	**-27.9**	+	**1.593**	**3.6**	-0.161	68%	**5.1**
R-Sq		0.340			0.014				
N		195318							
Test of Sales-Expense						**t-stat.**			
t				+		**20.9**			
t-1	+	**13.2**		-		**-11.7**			
t-2	+	**-6.8**		-		-0.2			
t-3	+	**-4.2**		-		-0.7			
t-4	-	**4.6**		+		1.7			

Notes:

1. The table reports the estimation of Equations 1, 2 and 4. SUS (SUX) is quarterly revenues (expenses) minus quarterly revenues (expenses) in the same quarter of the preceding year, scaled by the market value of equity at the end of the prior quarter end.
2. The dependent variable in the prediction equations is the current quarter SUS $(SUX)_t$. The dependent variable in the pricing equation is CAR (-1,1), the abnormal return on a stock cumulated from one day before the earnings announcement of the current quarter through the day after the announcement. The abnormal return is the raw return minus the average return on a same size-B/M portfolio (six portfolios), as provided by Professor French.
3. The coefficients and t-statistic are from the quarterly cross-sectional regressions in a Fama and MacBeth (1973) manner.
4. The implied coefficient is the actual coefficient in the pricing equation, divided by the negative of the contemporaneous SUS or SUX coefficient. The ratio is the implied coefficient divided by the coefficient in the prediction equation. It is calculated from the pooled time-series, cross-sectional data.
5. Entries in the Mishkin column represent the χ^2-statistic to test that the implied coefficient is equal to the coefficient in the prediction equation, as in Mishkin (1983).
6. The t-statistics at the bottom of the table test that the SUS coefficient is the same as the SUX coefficient in the prediction or pricing equation. It is based on the quarterly cross-sectional regressions as in Fama and MacBeth (1973).
7. Bold figures are significant at levels below 5%.

Table 4
Distribution of Abnormal Returns in the Subsequent Quarter

Panel A: Historical SUE and SUS

			Sales Surprises			
			Bottom 20%	**Middle 60%**	**Top 20%**	**Total**
Earnings Surprise	**Bottom 20%**	**CAR (%)**	-2.77	-2.88	-3.24	-2.88
		N	19587	15540	6206	41333
		Significance	0.001	0.001	0.001	0.001
	Middle 60%	**CAR (%)**	-2.18	-1.22	-1.64	-1.40
		N	15355	89974	18838	124167
		Significance	0.001	0.001	0.001	0.001
	Top 20%	**CAR (%)**	-0.45	0.61	1.61	0.84
		N	6405	18633	16308	41346
		Significance	0.142	0.001	0.001	0.001
	Total	**CAR (%)**	-2.19	-1.15	-0.60	-1.25
		N	41347	124147	41352	206846
		Significance	0.001	0.001	0.001	0.001

Panel B: Analyst Forecast Earnings and Sales Surprises

			Sales Surprises			
			Bottom 20%	**Middle 60%**	**Top 20%**	**Total**
Earnings Surprise	**Bottom 20%**	**CAR (%)**	-2.42	0.02	1.29	-0.67
		N	893	1372	322	2587
		Significance	0.013	0.983	0.416	0.223
	Middle 60%	**CAR (%)**	-0.91	-0.76	-0.04	-0.65
		N	1414	4944	1460	7818
		Significance	0.18	0.033	0.953	0.024
	Top 20%	**CAR (%)**	0.21	2.20	2.17	1.97
		N	284	1498	810	2592
		Significance	0.9	0.001	0.028	0.001
	Total	**CAR (%)**	-1.31	-0.06	0.81	-0.13
		N	2591	7814	2592	12997
		Significance	0.014	0.844	0.135	0.563

Notes:

1. In Panel A, earnings and revenue surprises are calculated from the Compustat quarterly database. Earnings (sales) SUE (SUS) is actual earnings (sales) minus earnings (sales) in the same quarter of the previous year, scaled by market value at the end of the preceding quarter.
2. In Panel B, the earnings SUE is calculated from I/B/E/S as the actual I/B/E/S EPS minus the mean analyst forecast during the 90-day period before the disclosure of earnings, scaled by the dispersion of analyst forecasts. Earnings SUE is calculated only if at least two analysts provide earnings forecasts for the firm. Sales SUS is also calculated from I/B/E/S as the actual I/B/E/S sales minus the mean forecast of sales during the 90-day period before the disclosure of earnings, scaled by the actual I/B/E/S sales. The sales surprise SUS is calculated even if only one analyst provided a sales forecast.
3. CAR-Subsequent Quarter is the abnormal return on a stock, cumulated from two days after an earnings announcement through the day after the next quarterly earnings announcement. The abnormal return is the raw return minus the average return on a same size-B/M portfolio (six portfolios), as provided by Professor French.
4. Firms are independently assigned to groups according to the earnings or revenue surprise in each quarter.

Table 5
Distribution of Abnormal Returns in the Subsequent Quarter Growth and Value Firms

Panel A: Growth Firms

			Sales Surprises			
			Bottom 20%	**Middle 60%**	**Top 20%**	**Total**
Earnings Surprise	**Bottom 20%**	**CAR (%)**	-1.99	-2.08	-1.59	-1.99
		N	5531	6798	1590	13919
		Significance	0.001	0.001	0.016	0.001
	Middle 60%	**CAR (%)**	-1.48	0.78	-0.74	-0.84
		N	6073	56466	8515	71054
		Significance	0.001	0.001	0.001	0.001
	Top 20%	**CAR (%)**	0.23	1.12	2.58	1.55
		N	1662	9040	5825	16527
		Significance	0.729	0.001	0.001	0.001
	Total	**CAR (%)**	-1.48	-0.67	0.39	-0.61
		N	13266	72340	15930	101500
		Significance	0.001	0.001	0.037	0.001

Panel B: Value Firms

			Sales Surprises			
			Bottom 20%	**Middle 60%**	**Top 20%**	**Total**
Earnings Surprise	**Bottom 20%**	**CAR (%)**	-3.08	-3.50	-3.80	-3.33
		N	14056	8742	4616	27414
		Significance	0.001	0.001	0.001	0.001
	Middle 60%	**CAR (%)**	-2.64	-1.95	-2.38	-2.16
		N	9282	33508	10323	53113
		Significance	0.001	0.001	0.001	0.001
	Top 20%	**CAR (%)**	-0.69	0.13	1.07	0.37
		N	4743	9593	10483	24819
		Significance	0.041	0.524	0.001	0.007
	Total	**CAR (%)**	-2.53	-1.83	-1.11	-1.87
		N	28081	51843	25422	105346
		Significance	0.001	0.001	0.001	0.001

Notes:

1. Earnings and revenue surprises are calculated from the Compustat quarterly database. Earnings (sales) SUE (SUS) is actual earnings (sales) minus earnings (sales) in the same quarter of the previous year, scaled by market value at the end of the preceding quarter.
2. Growth (Value) firms are firms with below (above) median book to market value of equity as of the prior quarter-end.
3. CAR-Subsequent Quarter is the abnormal return on a stock, cumulated from two days after an earnings announcement through the day after the next quarterly earnings announcement. The abnormal return is the raw return minus the average return on a same size-B/M portfolio (six portfolios), as provided by Professor French.
4. Firms are independently assigned to groups according to the earnings or revenue surprise in each quarter.

Table 6
Regression Results: CAR in Subsequent Quarter on Earnings and Sales Surprises With Control Variables

Panel A: Historical SUE and SUS	Intercept	DSUE Earnings	DSUS Sales	Institnl. Holding	Arbitrg. Risk	Trading Volume	N	R-Sqr.	Signf.
Expected sign		+	+	-	+	-			
Earnings only	**-1.249**	**4.353**					206846	**.004**	**0.001**
Significance (t-stat)	**0.001**	**0.001**							
Earnings and sales	**-1.370**	**4.390**	**3.377**				206846	**0.005**	**0.001**
Significance (t-stat)	**0.001**	**0.001**	**0.001**						
Earnings, Sales and Controls	**-1.325**	**4.356**	**1.850**	**-0.024**	**0.023**	**-0.041**	137365	**0.006**	**0.001**
Significance (t-stat)	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**			
Earnings, Sales and Controls (F-M)	**-1.407**	**4.480**	**1.861**	**-0.029**	**0.020**	**-0.036**			
Significance (F-M t-stat)	**0.001**	**0.001**	**0.027**	**0.004**	**0.040**	**0.001**			
Panel B: Analyst Forecast Earnings and Sales Surprises									
Earnings only	-0.133	**2.316**					12996	**0.001**	**0.001**
Significance (t-stat)	0.563	**0.001**							
Sales only	-0.133		**2.240**				12996	**0.001**	**0.001**
Significance (t-stat)	0.563		**.001**						
Earnings and sales	-0.109	**2.314**	-0.710				12996	**0.001**	**0.002**
Significance (t-stat)	0.648	**0.001**	0.703						
Earnings, Sales and Controls	**0.543**	1.401	-1.402	0.000	-0.010	0.008	8709	0.001	0.470
Significance (t-stat)	**0.040**	0.059	0.510	0.998	0.702	0.749			
Earnings, Sales and Controls (F-M)	1.821	4.385	-2.954	0.011	0.000	0.008			
Significance (F-M t-stat)	0.144	0.108	0.172	0.729	0.988	0.847			

Notes:

1. Panel A includes all firm-quarters where both earnings and sales surprises are calculated from the Compustat quarterly database. Earnings (sales) SUE (SUS) is actual earnings (sales) earnings (sales) in the same quarter of the preceding year, scaled by the market value of equity at the end of the preceding quarter.
2. Panel B includes all firm-quarters where the earnings SUE is calculated from I/B/E/S as the actual I/B/E/S EPS minus the mean analyst forecast during the 90-day period before the disclosure of earnings, scaled by the dispersion of analyst forecasts. Earnings SUE is calculated only if at least two analysts provide earnings forecasts for the firm. Sales SUS is also calculated from I/B/E/S as the actual I/B/E/S sales minus the mean forecast of sales during the 90-day period before the disclosure of earnings, scaled by the actual I/B/E/S sales. The sales SUS is calculated even if only one analyst provided a sales forecast.
3. Earnings (sales) DSUE (DSUS) is the decile rank of the earnings (sales) SUE (SUS), scaled to fall between -0.45 and 0.45. The table entries for DSUS represent the interaction between DSUE and DSUS.
4. The proportion of institutional investors is obtained by summing all shares held by managers, as reported in 13-f filings with the SEC, and dividing by total shares outstanding at the end of the previous quarter. It is assigned its percentile rank minus 49.5 and interacted with the earnings DSUE.
5. Arbitrage risk is one minus the squared correlation between the 60 monthly returns on the stock and those on the S&P 500 Index, ending one month before the quarter-end. It is assigned its percentile rank minus 49.5 and interacted with the earnings DSUE.
6. Trading volume is the average monthly dollar value of shares traded during the 60 months ending one month before the quarter-end, divided by the market value of equity at the end of the same month. It is assigned its percentile rank minus 49.5 and interacted with the earnings DSUE.
7. CAR is the abnormal return on a stock, cumulated from two days after an earnings announcement for quarter t through the day after the earnings announcement for quarter t+1. The abnormal return is the raw return minus the average return on a same size-B/M portfolio (six portfolios), as provided by Professor French.
8. The table reports results of a pooled firm-quarter regressions, as well as quarter-by-quarter regressions summarized according to the methodology of Fama and MacBeth (1973), denoted by F-M in the table.
9. Bold figures represent entries that are statistically different from zero at the 10% significance level or better.

Table 7
Hedge Portfolio Returns

	Earnings-Based Hedge Portfolio (1)	Earnings- and Sales-Based Hedge Portfolio (2)	Difference (2-1)
Panel A: Historical SUE and SUS (64 quarters)			
CAR(%)	**3.759**	**4.475**	**0.716**
Standard Deviation of CAR	2.506	3.669	2.143
t-statistic	12.00	9.76	2.67
Significance level	**0.001**	**0.001**	**0.010**
Average number of firms	1319	587	
Panel B: Analyst Forecast SUE and SUS (18 quarters)			
CAR(%)	**3.678**	**6.617**	**2.939**
Standard Deviation of CAR	6.585	9.233	6.094
t-statistic	2.37	3.04	2.05
Significance level	**0.030**	**0.007**	**0.057**
Average number of firms	288	95	

Notes:

1. Panel A includes all firm-quarters where both earnings and sales surprises are calculated from the Compustat quarterly database. Earnings (sales) SUE (SUS) is actual earnings (sales) earnings (sales) in the same quarter of the preceding year, scaled by the market value of equity at the end of the preceding quarter.
2. Panel B includes all firm-quarters where the earnings SUE is calculated from I/B/E/S as the actual I/B/E/S EPS minus the mean analyst forecast during the 90-day period before the disclosure of earnings, scaled by the dispersion of analyst forecasts. Earnings SUE is calculated only if at least two analysts provide earnings forecasts for the firm. Sales SUS is also calculated from I/B/E/S as the actual I/B/E/S sales minus the mean forecast of sales during the 90-day period before the disclosure of earnings, scaled by the actual I/B/E/S sales. The sales SUS is calculated even if only one analyst provided a sales forecast.
3. CAR is the abnormal return on a stock, cumulated from two days after an earnings announcement for quarter t through the day after the earnings announcement for quarter t+1. The abnormal return is the raw return minus the average return on a same size-B/M portfolio (six portfolios), as provided by Professor French.
4. The hedge portfolio assumes long positions in the top 20% and short positions in the bottom 20% of firms sorted according to SUE, in column (1), and both SUE and SUS, in column (2).
5. Bold figures represent entries that are statistically different from zero at the 10% significance level or better.

Table 8
Hedge Portfolio Returns – Various Sub-Samples

Sub-sample	Earning Return	Earnings & Revenue Return	Difference Return	Difference Signif.	Short Positions Difference Return	Short Positions Difference Signif.	Long Positions Difference Return	Long Positions Difference Signif.
Growth (Below-median B/M)	3.52	4.73	**1.21**	**0.009**	0.08	0.752	**1.13**	**0.002**
Value (Above-median B/M)	3.75	4.25	**0.50**	**0.071**	-0.15	0.371	**0.65**	**0.005**
Large (Above-median size)	2.57	2.50	-0.07	0.872	-0.10	0.739	0.03	0.923
Small (Below-median size)	4.47	5.38	**0.90**	**0.003**	0.00	0.986	**0.90**	**0.001**
Low Earnings Persistence	3.98	5.13	**1.15**	**0.003**	0.28	0.218	**0.87**	**0.002**
High Earnings Persistence	3.63	4.29	**0.66**	**0.035**	0.01	0.948	**0.65**	**0.008**
Low Correlation of Earnings and OCF	3.39	4.48	**1.09**	**0.002**	0.09	0.603	**1.00**	**0.000**
High Correlation of Earnings and OCF	4.17	4.58	0.42	0.237	-0.15	0.480	**0.57**	**0.051**
Low Proportion of Accruals	3.94	5.06	**1.12**	**0.002**	0.22	0.385	**0.90**	**0.000**
High Proportion of Accruals	3.69	3.89	0.20	0.582	**-0.35**	**0.052**	0.55	0.100
Low Institutional Holdings	4.37	5.20	**0.83**	**0.010**	-0.02	0.895	**0.85**	**0.002**
High Institutional Holdings	2.80	3.35	0.56	0.132	0.05	0.864	**0.51**	**0.031**
Low Volume	4.16	4.96	**0.80**	**0.026**	0.02	0.914	**0.78**	**0.005**
High Volume	3.11	3.25	**0.81**	**0.043**	0.05	0.825	**0.76**	**0.011**
Low Arbitrage Risk	3.17	3.65	0.49	0.205	-0.19	0.335	**0.68**	**0.025**
High Arbitrage Risk	4.62	5.78	**1.15**	**0.000**	0.21	0.342	**0.94**	**0.000**

Notes:

1. The table includes average quarterly cumulative abnormal returns on a hedge portfolio that holds long (short) positions in firms that fall into the top (bottom) quintile of earnings surprises for the column marked "Earnings" and both earnings and revenue surprises for the column marked "Earnings & Revenue" from the first quarter of 1987 through the last quarter of 2002.
2. The column marked Difference reports the CAR on the hedge portfolio that uses both earnings and revenues minus the hedge portfolio that uses only earnings. Short Positions relate to the bottom quintile. Long Positions to the top quintile. Significance is assessed through a t-test of the difference CAR across the 64 quarters.
3. Growth (value) firms are those with below-median (above-median) ratio of book to market value of equity as of the end of the preceding quarter.
4. Small (Large) consists of firms with below (above) median market value of equity as of the end of the receding quarter.
5. Low (High) earnings persistence is below (above) median autocorrelation in earnings surprises scaled by market value of equity at the end of the preceding quarter. Earnings surprise is quarterly earnings minus quarterly earnings in the same quarter of the previous year. The autocorrelation is estimated over the preceding eight quarters.
6. Low (High) correlation of earnings and OCF is below (above) median correlation between earnings and operating cash flow, estimated over the eight previous quarters.
7. Low (high) proportion of accruals is below (above) median absolute value of total accruals divided by sales, averaged over the previous four quarters. Total accruals are income before extraordinary items and discontinued operations minus net operating cash flow, in quarters after 1988 and estimated as in Sloan (1996) prior to 1988. The proportion of institutional investors is obtained by summing all shares held by managers, as reported in 13-f filings with the SEC, and dividing by total shares outstanding at the end of the previous quarter. Low (High) represent below (above) median.
8. Arbitrage risk is one minus the squared correlation between the 60 monthly returns on the stock and those on the S&P 500 Index, ending one month before the quarter-end. Low (High) represent below (above) median
9. Trading volume is the average monthly dollar value of shares traded during the 60 months ending one month before the quarter-end, divided by the market value of equity at the end of the same month. . Low (High) represent below (above) median
10. CAR is the abnormal return on a stock, cumulated from two days after an earnings announcement for quarter t through the day after the earnings announcement for quarter t+1. The abnormal return is the raw return minus the average return on a same size-B/M portfolio (six portfolios), as provided by Professor French.
11. Bold figures represent entries that are statistically different from zero at the 10% significance level or better.

Table 9
Regression Results—CAR on Earnings and Sales Surprises
Various Sub-Periods

	Intercept	DSUE Earnings	DSUS Sales	Institnl. Holding	Arbitrg. Risk	Trading Volume	N	R-Sqr.	Signf.
Observations Before 1995									
Expected sign		+	+	-	+	-			
Earnings only	**-1.618**	**4.555**					74258	**0.006**	**0.001**
Significance (t-stat)	**0.001**	**0.001**							
Earnings and sales	**-1.683**	**4.575**	**1.719**				74258	**0.006**	**0.001**
Significance (t-stat)	**0.001**	**0.001**	**0.005**						
Earnings, Sales and Controls	**-1.841**	**4.639**	0.767	**-0.025**	0.018	**-0.027**	52384	**0.008**	**0.001**
Significance (t-stat)	**0.001**	**0.001**	0.268	**0.018**	0.079	**0.002**			
Observations in 1995-1998									
Earnings only	**-1.647**	**3.579**					64997	**0.003**	**0.001**
Significance (t-stat)	**0.001**	**0.001**							
Earnings and sales	**-1.742**	**3.596**	**2.689**				64997	**0.003**	**0.001**
Significance (t-stat)	**0.001**	**0.001**	**0.001**						
Earnings, Sales and Controls	**-1.792**	**3.469**	**2.257**	-0.011	**0.043**	**-0.044**	39396	**0.004**	**0.001**
Significance (t-stat)	**0.001**	**0.001**	**0.011**	0.351	**0.001**	**0.001**			
Observations in 1999-2002									
Earnings only	**-0.461**	**4.876**					67591	**0.004**	**0.001**
Significance (t-stat)	**0.001**	**0.001**							
Earnings and sales	**-0.667**	**4.965**	**5.971**				67591	**0.005**	**0.001**
Significance (t-stat)	**0.001**	**0.001**	**0.001**						
Earnings, Sales and Controls	**-0.325**	**4.826**	**2.773**	**-0.039**	0.011	**-0.055**	45586	**0.005**	**0.001**
Significance (t-stat)	**0.004**	**0.001**	**0.005**	**0.003**	0.463	**0.001**			

Notes:

1. The table is based on all firm-quarters where both earnings and sales surprises are calculated from the Compustat quarterly database. Earnings (sales) SUE (SUS) is actual earnings (sales) minus earnings (sales) in the same quarter of the preceding year, scaled by the market value of equity at the end of the preceding quarter.
2. Earnings (sales) DSUE (DSUS) is the decile rank of the earnings (sales) SUE (SUS), scaled to fall between -0.45 and 0.45. The table entries for DSUS represent the interaction between DSUE and DSUS.
3. The proportion of institutional investors is obtained by summing all shares held by managers, as reported in 13-f filings with the SEC, and dividing by total shares outstanding at the end of the previous quarter. It is assigned its percentile rank minus 49.5 and interacted with the earnings DSUE.
4. Arbitrage risk is one minus the squared correlation between the 60 monthly returns on the stock and those on the S&P 500 Index, ending one month before the quarter-end. It is assigned its percentile rank minus 49.5 and interacted with the earnings DSUE.
5. Trading volume is the average monthly dollar value of shares traded during the 60 months ending one month before the quarter-end, divided by the market value of equity at the end of the same month. It is assigned its percentile rank minus 49.5 and interacted with the earnings DSUE.
6. CAR is the abnormal return on a stock, cumulated from two days after an earnings announcement for quarter t through the day after the earnings announcement for quarter t+1. The abnormal return is the raw return minus the average return on a same size-B/M portfolio (six portfolios), as provided by Professor French.
7. The table reports results of a pooled firm-quarter regression.
8. Bold figures represent entries that are statistically different from zero at the 10% significance level or better.

Figure 1
Cumulative Abnormal Returns for 64 Quarters (87/3-02/12)

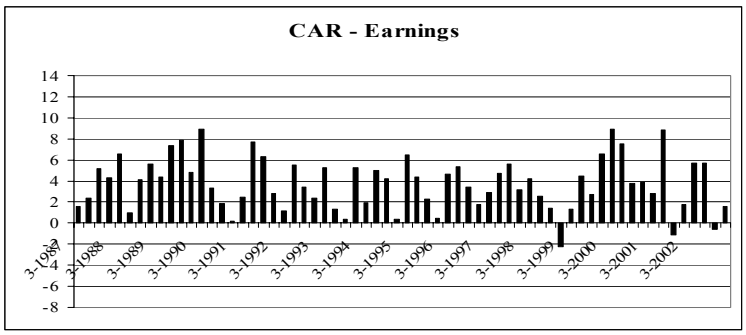

Figure A

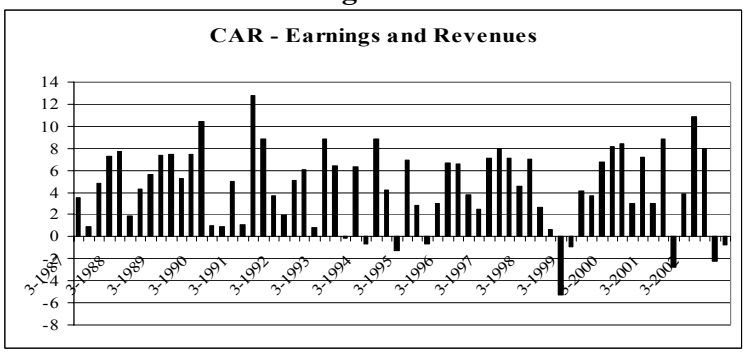

Figure B

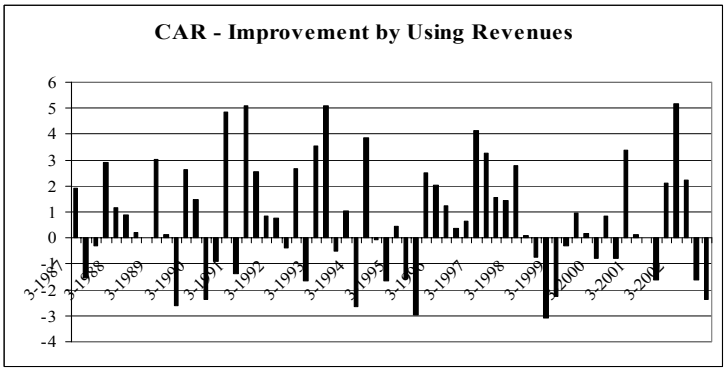

Figure C

Notes:

1. The graphs display the quarterly cumulative abnormal returns on a hedge portfolio that holds long (short) positions in the top (bottom) quintile of earnings surprises in Figure A, earnings and revenue surprises in Figure B, and the difference between those in Figure C.
2. CAR is the abnormal return on a stock, cumulated from two days after an earnings announcement for quarter t through the day after the earnings announcement for quarter t+1. The abnormal return is the raw return minus the average return on a same size-B/M portfolio (six portfolios), as provided by Professor French.