Stock Returns, Aggregate Earnings Surprises, and Behavioral Finance

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Abstract

We study the stock market's reaction to aggregate earnings news. Prior research shows that, for individual firms, stock prices react positively to earnings news but require several quarters to fully reflect the information in earnings. We find a substantially different pattern in aggregate data. First, returns are unrelated to past earnings, suggesting that prices neither underreact nor overreact to aggregate earnings news. Second, aggregate returns correlate negatively with concurrent earnings; over the last 30 years, for example, stock prices increased 5.7% in quarters with negative earnings growth and only 2.1% otherwise. This finding suggests that earnings and discount rates move together over time, and provides new evidence that discount-rate shocks explain a significant fraction of aggregate stock returns.

1. Introduction

This paper studies the stock market's reaction to aggregate earnings news. Prior research shows that stock prices for individual firms react positively to earnings accouncements but require several quarters to fully reflect the information in earnings, an empirical finding often referred to as 'post-earnings announcement drift' (see Kothari, 2001, for a literature review). Our goal is to test whether post-earnings announcement drift shows up in aggregate data and, more broadly, to understand the connection between market returns and aggregate earnings surprises.

The motivation for our study is two-fold. First, the paper provides a simple 'out-of-sample' test of recent behavioral theories. Bernard and Thomas (1990), Barberis, Shleifer, and Vishny (1998), and Daniel, Hirshleifer, and Subrahmanyam (1998) all cite post-earnings announcement drift as a prime example of the type of irrational price behavior predicted by their models. Our reading of the theories suggests that, although they are motivated by firm-level evidence, the biases they describe should also affect aggregate returns. While we do not view our paper as a strict test of the models, our analysis is in the spirit of asking whether the theories can 'explain the big picture' (Fama 1998, p. 291). More generally, establishing whether the same behavioral biases affect firm-level and aggregate returns should help theorists refine models of price formation.

Second, we study the market's reaction to aggregate earnings news to better understand the connections among earnings, stock prices, and discount rates. A large empirical literature tests whether stock prices move in response to cashflow news or discount-rate news but the importance of each remains poorly understood (see, e.g., Campbell and Shiller, 1988; Fama and French, 1989; Fama 1990; Campbell, 1991; Cochrane, 1992; Vuolteenaho, 2002; Hecht and Vuolteenaho, 2003; Lettau and Ludvigson, 2004). Our tests provide direct evidence on the correlation between aggregate earnings growth and movements in discount rates. Further, we argue that the market's reaction to aggregate earnings news provides interesting indirect evidence.

Our initial tests mirror studies of post-earnings announcement drift in firm returns. Bernard and Thomas (1990) show that, at the firm level, price drift matches the autocorrelation structure of quarterly earnings: positive for three quarters then negative in the fourth. They argue that investors do not understand the time-series properties of earnings (see also Barberis, Shleifer, and Vishny, 1998). Our first key result is that aggregate earnings are more persistent than firm earnings but there is no evidence of post-announcement drift in aggregate returns. It is useful to note that, although aggregate earnings growth is positively autocorrelated, it is quite volatile and appears to be contain a large unpredictable component. From 1970 – 2000, the growth rate of seasonally-differenced quarterly earnings has a standard deviation of 17.8%, about half of which can be explained by a simple time-series model of earnings growth (as measured by the regression R^2). Earnings surprises seem to be large, so our tests should have reasonable power to detect post-earnings announcement drift.

Second, and perhaps more surprising, we find that aggregate returns and contemporaneous earnings growth are *negatively* correlated. For our main Compustat sample from 1970 – 2000, stock returns are 5.7% in quarters with negative earnings growth and only 2.1% otherwise (significantly different with a t-statistic of 2.0). In regressions, concurrent earnings explain roughly 5–10% of the variation in quarterly returns and 10–20% of the variation in annual returns, with t-statistics between –2.4 and –3.7 depending on how earnings are measured. We find similar results using data for the S&P 500 (and its predecessors) going back to the 1930s.

These results provide strong, albeit indirect, evidence that earnings and discount rates move together. Mechanically, returns must be explained by either cashflow news (with a positive sign) or expected-return news (with a negative sign; see Campbell, 1991). Earnings surprises are positively related to cashflows, so the market will react negatively to earnings news only if good earnings are associated with higher discount rates. In fact, we find that earnings growth is strongly correlated with several discount-rate proxies, including changes in Tbill rates (+), changes in the slope of the term structure (–), and changes in the yield spread between low- and high-grade corporate bonds (–). But only the correlation with Tbill rates has the right sign and, together, the proxies only partially explain why prices react negatively to earnings news.

The evidence suggests that discount-rate shocks that are not captured by our proxies explain a significant fraction of stock returns (see also Campbell and Shiller, 1988; Fama 1990; Campbell, 1991). Indeed, for the horizons we study, discount-rate news actually swamps the cashflow news in aggregate earnings. The negative reaction to good earnings is especially surprising since theoretical models often predict that discount rates drop, not increase, when the economy does well [examples include the habit-based model of Campbell and Cochrane (1999) and the heterogeneous-investor model of Chan and Kogan (2002)]. Our results complement Lettau and Ludvigson's (2004) evidence that expected returns and expected dividend growth move together.

We should point out that a negative reaction to aggregate earnings is entirely consistent with a positive reaction to firm earnings, which we confirm in our sample. The economic story is simple. Aggregate earnings fluctuate with discount rates because both are tied to macroeconomic conditions, while firm earnings primarily reflect idiosyncratic cashflow news. As a result, the confounding effects of discount-rate changes show up only in aggregate returns. Put differently, cashflow news is largely idiosyncratic while discount-rate changes are common across firms. By a simple diversification argument, discount-rate effects play a larger role at the aggregate level (see, also, Vuolteenaho, 2002; Yan, 2004). In short, our evidence suggests that common variation in discount rates explains an important fraction of aggregate stock market movements.

The paper proceeds as follows. Section 2 provides background for our tests. Section 3 describes the data and the time-series properties of aggregate earnings. Section 4 studies the simple relation between returns and earnings, and Section 5 explores the correlations among returns, earnings, and other macroeconomic variables. Section 6 concludes.

2. Background: Theory and evidence

Our study relates to three areas of research: (1) empirical research on the stock market's reaction to earnings announcements; (2) a growing behavioral asset-pricing literature; (3) research on the correlations among stock prices, business conditions, and discount rates. This section reviews the literature and compares our tests to prior studies. A key point is that studies of post-announcement drift, as well as recent behavioral theories, emphasize predictability in individual firm returns. Our study of aggregate price behavior provides a natural extension of this research.

2.1. Post-earnings announcement drift

Many studies find predictable returns after earnings announcements (e.g., Ball and Brown, 1968; Watts, 1978; Foster, Olsen, and Shevlin, 1984; Bernard and Thomas, 1989). Firms' stock prices react immediately to earnings reports, continue to drift in the same direction for three quarters, then partially reverse in quarter four. To illustrate, Bernard and Thomas (1990) study earnings announcements from 1974 – 1986. They rank stocks quarterly based on unexpected earnings and track returns on the top and bottom deciles for the subsequent two years. Over the first three quarters, the top decile outperforms the bottom decile by 8.1% after adjusting for risk, with abnormal returns concentrated around earnings announcements. Chan, Jegadeesh, and Lakonishok (1996) further show that post-earnings announcement drift is distinct from price momentum.

2.2. Behavioral finance

Post-announcement drift is broadly consistent with behavioral models in which prices react slowly to public news. Bernard and Thomas (1990) offer one version of the underreaction model, arguing that prices do not fully incorporate the information in earnings. Empirically, seasonally-differenced quarterly earnings are persistent, with average autocorrelations of 0.34, 0.19, 0.06, and –0.24 at lags 1 – 4 in their sample. Bernard and Thomas suggest that investors ignore this autocorrelation pattern and are thus surprised by predictable changes in earnings. The price response to earnings announcements aligns closely with this prediction: a portfolio that is long good-news stocks and short bad-news stocks, based on quarterly earnings, has abnormal returns of 1.32%, 0.70%, 0.04%, and –0.66% at the four subsequent quarterly earnings announcements.

Barberis, Shleifer, and Vishny (BSV 1998) propose a similar model to explain price anomalies. They assume that earnings follow a random walk but that investors believe earnings alternate between two regimes, one in which earnings mean revert and one in which earnings trend. The model is designed to capture two cognitive biases identified by psychological research, the representative heuristic ('the tendency of experimental subjects to view events as typical or representative of some specific class') and the conservatism bias ('the slow updating of models in the face of new evidence'). In this model, BSV show that investors tend to underreact to earnings news in the short run (i.e., a single report) but overreact to a string of positive or negative news.

Daniel, Hirshleifer, and Subrahmanyam (DHS 1998) offer a third model in which investors underreact to public news, motivated by different psychological biases: overconfidence and attribution bias. Overconfidence implies that investors tend to overweight the value of their private information, and attribution bias implies that investors generally attribute success to superior skill but failure to bad luck. Together, these biases imply that prices will overreact to private signals but underreact to public ones (or, if public news confirms investors' private information, attribution bias will lead to continued overreaction). For our purposes, DHS predict short-run continuations after earnings announcements followed by long-run reversals.

2.3. Aggregate price behavior

The studies above focus on individual stock returns, but pervasive biases should also show up in aggregate returns. Indeed, BSV and DHS both discuss market returns in motivating their models. Bernard and Thomas do not say whether their ideas apply to aggregate returns, but it seems reasonable to argue that if investors don't understand the earnings process for individual firms, they won't get it right at the aggregate level either. Thus, a simple extension of the existing literature is to ask if market returns are predictable from aggregate earnings surprises. This question, in fact, provides a natural out-of-sample test of the behavioral theories. DHS argue that 'to deserve consideration a theory should be parsimonious, explain a range of anomalous patterns in different contexts, and generate new empirical predictions' (p. 1841). We interpret our tests in precisely this spirit. If a theory explains both firm and aggregate returns, we are more confident that it captures a pervasive phenomenon. If a theory explains one but not the other, we can reject it as a general description of prices.

To be sure, our empirical tests recognize that firm and aggregate price behavior could differ for a number of reasons:

Earnings predictability. According to the naïve-investor story of Bernard and Thomas, any difference in the autocorrelation of firm and aggregate earnings should lead to differences in price behavior. However, we show below that earnings autocorrelations are similar at the firm and aggregate levels, though aggregate earnings are somewhat more persistent. The greater persistence of aggregate earnings suggests that post-announcement drift should be stronger in market returns. At the same time, our evidence suggests that firm earnings contain a transitory component that gets diversified away at the market level. If investors understand that aggregate earnings are a more reliable signal of value, they might underreact less to aggregate earnings news.

Public vs. private information. DHS emphasize that investors respond differently to private and public signals. Firm-level and aggregate earnings are both public information, so investors should underreact to both (at least in the short run).

Limits to arbitrage. Many asset-pricing anomalies appear to be strongest in stocks with high trading (i.e., arbitrage) costs. That finding suggests that trading costs might be an important determinant of post-announcement drift, so any difference between these costs at the firm and aggregate levels could lead to different price behavior. The existence of options and futures for market indices would seem to reduce transactions costs and short-selling restrictions, thus mitigating aggregate post-announcement drift. However, exploiting patterns in aggregate returns can be quite risky. Levered or short positions in the market necessitate holding systematic risk, while trading strategies based on firm-level earnings generally do not (e.g., Chan, Jegadeesh, and Lakonishok, 1996). This difference would tend to accentuate post-announcement drift in aggregate returns.

Shocks to discount rates. Price movements must reflect either changes in expected cashflows or changes in expected returns (Campbell, 1991). In an efficient market, the latter correspond to changes in discount rates, which, we suspect, will be relatively more important at the aggregate level. Discount rates should be strongly correlated across stocks, largely driven by business conditions, while cashflows are likely to have a larger idiosyncratic component. A simple diversification argument suggests, therefore, that discount-rate news will make up a larger portion of market returns. Empirically, Vuolteenaho (2002) estimates that cashflow news accounts for the bulk of individual stock returns, while Campbell suggests that it represents less than half of overall market returns (see, also, Campbell and Shiller, 1988; Fama and French, 1989; Fama, 1990).

Movements in discount rates complicate the return-earnings association. A negative correlation between earnings and shocks to discount rates would increase the contemporaneous return-earnings relation but reduce any lead-lag effects (i.e., in the absence of underreaction, earnings would be negatively related to future returns because they are negatively related to discount rates). A positive correlation between earnings and discount-rate news would have the opposite effect. We attempt to control for discount rates using several proxies suggested in the literature, including interest rates, the slope of the term structure, and the yield spread between low- and high-grade bonds. Our hope is to measure the marginal impact of an earnings surprise and to provide evidence on the connections among earnings, prices, discount rates, and business conditions.

3. Aggregate earnings, 1970 – 2000

This section describes the data and explores the time-series behavior of earnings. Our tests focus on quarterly earnings, though we also use annual data to check robustness.

3.1. The data

The primary earnings sample includes all NYSE, Amex, and NASDAQ stocks on the Compustat Quarterly file from 1970 – 2000. The tests use seasonally-differenced quarterly earnings, dE, defined as earnings in the current quarter minus four quarters prior. Earnings are measured before extraordinary items and discontinued operations, and, to ensure that fiscal quarters are aligned, the sample is restricted to firms with March, June, September, or December fiscal-year ends. As explained below, we scale earnings changes by lagged earnings (E), book equity (B), or price (P). Hence, firms must have earnings this quarter and book equity, price, and earnings four quarters prior.

We calculate market-wide earnings changes in three different ways, referred to as 'aggregate,' 'value weighted,' and 'equal weighted.' The aggregate series is simply the cross-sectional sum of earnings changes for all firms in the sample. It is then scaled by the sum of lagged market equity (dE/P-agg), lagged book equity (dE/B-agg), or lagged earnings (dE/E-agg) for the same group of firms. Equal- and value-weighted earnings changes, dE/P-ew and dE/P-vw, are calculated instead as averages of firm-level ratios, using per share numbers.[1] For descriptive purposes, we calculate earnings yield and return on equity, E/P and E/B, in a similar fashion.

In constructing the sample, we drop roughly 25% of Compustat firms because their fiscal quarters don't match calendar quarters. We also exclude stocks with prices below $1 and the top and bottom 0.5% of firms ranked by dE/P each quarter. These exclusions are most important for the equal-weighted series, for which small stocks and extreme outliers can have a big impact. The average number of stocks per quarter is 3,288, compared to an average of about 6,000 stocks on CRSP and Compustat for the same period. The sample represents about 90% of total market value.

3.2. Summary statistics

Table 1 reports summary statistics for quarterly earnings, and Figures 1 and 2 (in the text) plot earnings levels and changes from 1970 – 2000. For descriptive purposes, Table 1 also compares returns for the earnings sample with CRSP index returns. Our main regressions use the CRSP value-weighted index, but the results are similar using the sample's returns.[2] From Table 1, the earnings sample has an average value-weighted return of 3.22% and an average equal-weighted return of 3.53%, somewhat lower

[1] The value-weighted series dE/P-vw is nearly identical to the aggregate series dE/P-agg (correlation of 0.992). The only difference is that dE/P-vw begins with per share numbers, while dE/P-agg is based on a firm's total earnings and market cap. They differ when shares outstanding changes during the year.

[2] Stock returns come from CRSP. We do not require firms in the earnings sample to have CRSP data, so the return statistics, as well as later tests that use firm returns, represent a slightly smaller subset of firms. On average, 3,018 firms have return data, compared with 3,288 firms in the earnings sample. Results throughout the paper are similar if we restrict the tests to only firms on CRSP.

Figure 1
Profitability, 1970 – 2000

This figure shows corporate profitability from 1970 – 2000. Earnings are measured quarterly before extraordinary items. Panels A and B show earnings scaled by the market value (E/P) and book value (E/B) of equity. Panel C shows the number of firms in the sample and the fraction with positive earnings. Profitability is measured two ways: The aggregate numbers, labeled '-agg', equal the sum of the numerator divided by the sum of the denominator for firms in the sample. The equal-weighted numbers, labeled '-ew,' are simple averages of firm ratios. The sample consists of firms on Compustat with March, June, September, or December fiscal year-ends and with earnings, book equity, share price, and shares outstanding data, excluding stocks with price < $1 and, subsequently, the top and bottom 0.5% of firms ranked by E/P (Panel A) or E/B (Panel B).

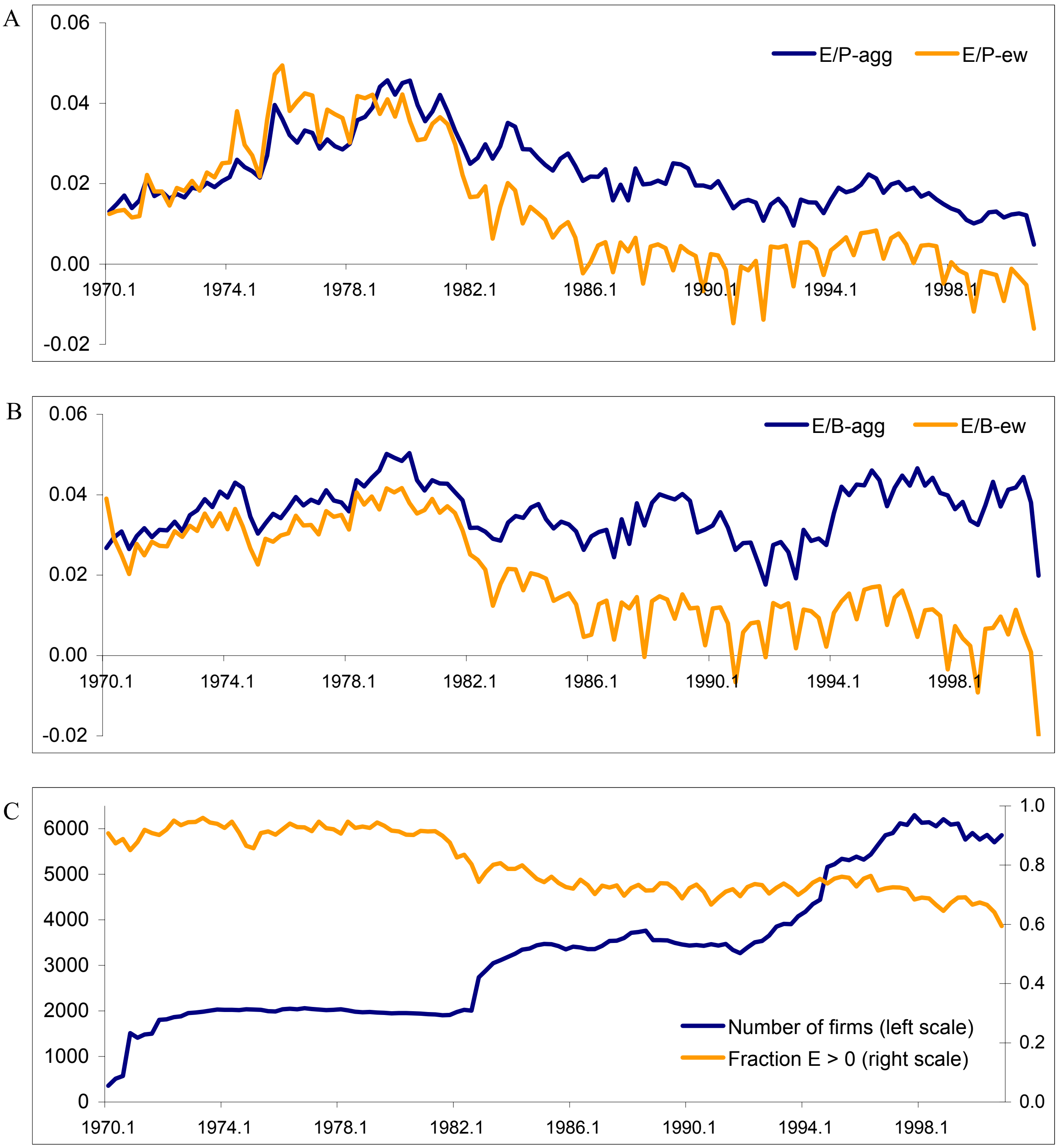
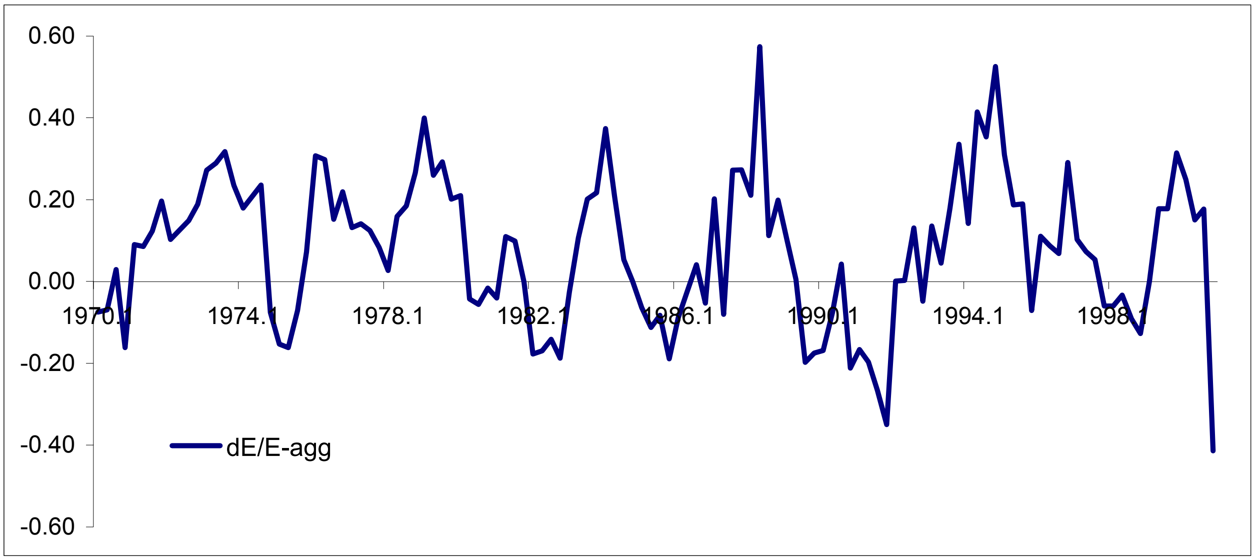


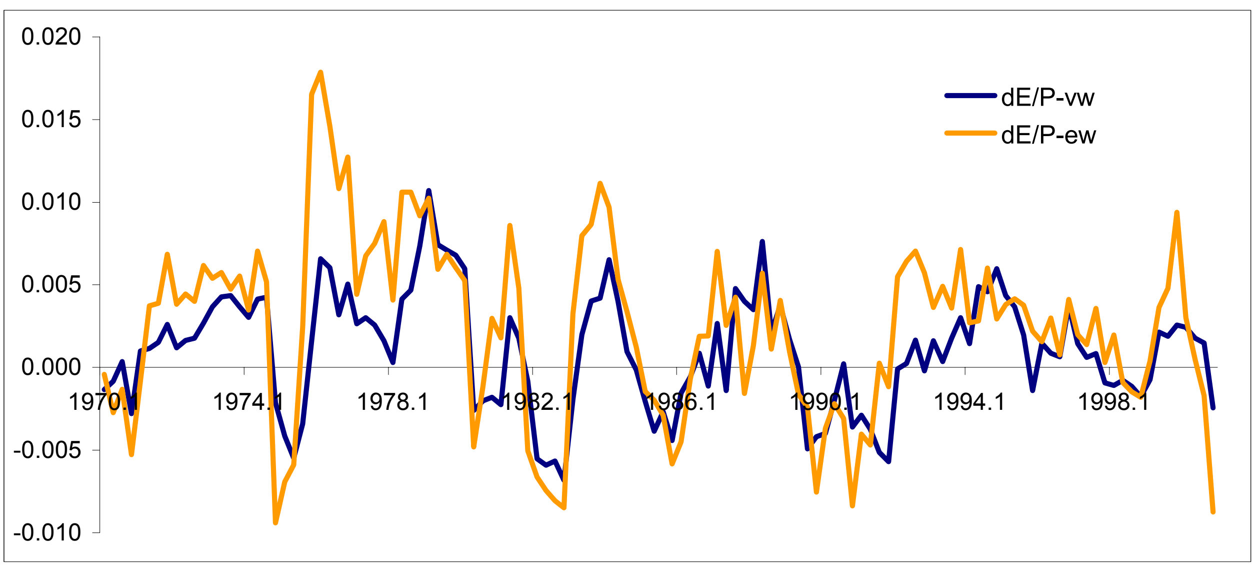
Figure 2
Change in quarterly earnings, 1970 – 2000

This figure shows seasonally-differenced quarterly earnings for U.S. firms from 1970 – 2000. Earnings are measured before extraordinary items. Seasonally-differenced earnings, dE, are earnings this quarter minus earnings four quarters ago. Panel A shows the growth rate of aggregate quarterly earnings, dE/E-agg, defined as the sum of dE divided by the sum of earnings four quarters ago for firm in the sample. Panel B shows dE divided by market value (P) at the end of quarter –4; the ratio is calculated firm-by-firm and then averaged; dE/P-vw is a value-weighted average and dE/P-ew is an equal-weighted average. The sample consists of firms with March, June, September, or December fiscal-year ends and with earnings, book equity, share price, and shares outstanding data on Compustat, excluding stocks with price below $1 and, subsequently, the top and bottom 0.5% of firms ranked by dE/P.

Panel A



Panel B



than corresponding CRSP index returns of 3.34% and 3.82%. The difference is most likely due to our exclusion of firms with very low prices and extreme earnings. The return series are highly correlated, 0.991 for the two value-weighted series and 0.993 for the equal-weighted series.

Table 1 and Figures 1 and 2 reveal several interesting facts. First, profitability since 1970 has been fairly high. Average quarterly return on equity, E/B, is 4.13% for the value-weighted index and 1.90% for the equal-weighted index, implying annual E/B of around 8–16%. This range is quite broad but brackets plausible estimates of the cost of capital. Figure 1 shows that aggregate E/B declined in the early 1980s but has since remained stable or even increased. In contrast, aggregate earnings yield, E/P-agg, declined throughout the 1980s and 1990s, dropping from about 4% to about 1% quarterly. Comparing Panels A and B, the bull market of the 1980s and 1990s, not a decrease in profitability, seems to explain most of the drop in aggregate earnings yield.

Second, small stocks have much lower profitability than large stocks after 1980 (see also Fama and French, 1995). In Figure 1, equal-weighted E/P and E/B, which weight small firms heavily, show a large decline in 1982 and subsequently a striking degree of fourth-quarter seasonality. Neither pattern is pronounced in the aggregate series. Panel C shows that firms with negative earnings increase from less than 10% of the sample in 1970 to about 40% of the sample in 2000. In untabulated results, we find little evidence that the patterns can be attributed to the expansion of the sample in 1982 (the sample jumps from 2,007 to 2,738 firms at the end of 1982; see panel C). Firms existing prior to 1982 have earnings performance that is similar to newly-added firms.

Third, aggregate earnings exhibit substantial variability through time. Figure 2 plots the growth rate of quarterly earnings in Panel A and earnings changes scaled by lagged price in Panel B. We cannot calculate growth rates for individual firms, since earnings are often negative, so most of our tests focus on the price-scaled series. We can calculate an aggregate growth rate (sum of dE divided by sum of lagged E) because aggregate earnings are positive throughout the sample. (Aggregate *net income* becomes negative in 1993 but earnings before extraordinary items do not; also, as the table indicates, portfolio earnings become negative for subsamples of small and high book-to-market stocks.)

Figure 2 shows that earnings are quite volatile, with growth rates often more than +/–20%. The time-series properties appear to be stable during the sample and seasonal differencing does a good job eliminating seasonality in earnings. The scaled-price series in Panel B, dE/P-ew and dE/P-vw, are highly correlated with each other and with the earnings growth rate in Panel A (see, also, Table 2). The equal-weighted series appears to be most variable. Earnings volatility will be important for our later tests because, in the regressions, power hinges on the magnitude of earnings surprises (i.e., for a given slope, higher earnings volatility implies greater power).

Finally, Table 1 reports statistics for the top and bottom terciles of stocks ranked by size and B/M. Comparing large and small firms, earnings *levels* are higher for large stocks but earnings *growth* is higher for small stocks. Comparing low-B/M and high-B/M firms, earnings levels and growth rates are both higher for low-B/M stocks when we scale by book equity, consistent with the standard value vs. growth dichotomy. Growth is priced so highly, however, that the price-scaled measures, E/P and dE/P, actually look as good or better for high-B/M stocks.

3.3. Autocorrelations

Table 3 explores the autocorrelation of seasonally-differenced quarterly earnings. Firm-level results, in Panel A, are estimated for price-scaled earnings changes, while market-level results, in Panel B, are estimated for dE/B-agg, dE/P-vw, and dE/P-ew. Our aggregate tests focus on dE/B-agg, dE/P-vw, and dE/P-ew because their results are representative and, as shown in Table 2, all the aggregate series are highly correlated with each other. Table 3 reports simple autocorrelations for lags 1 – 5 and multiple regression estimates including all lags together:

$$dE/S_t = a + b_k\, dE/S_{t-k} + e_t, \tag{1}$$

$$dE/S_t = a + b_1\, dE/S_{t-1} + b_2\, dE/S_{t-2} + \ldots + b_5\, dE/S_{t-5} + e_t, \tag{2}$$

where S is either the market value (P) or book value (B) of equity. Firm-level autocorrelations come from Fama-MacBeth regressions: we estimate a cross-sectional slope each quarter and report the time-series average of the estimates. Market-level estimates come from simple time-series regressions. For firm-level data, we prefer cross-sectional regressions because they facilitate statistical tests and a firm can be included as long as it has at least one valid observation.

The firm-level autocorrelations are remarkably similar to the findings of prior research, notwithstanding differences in samples and estimation methods. From panel A, simple autocorrelations are positive at the first three lags and negative at the fourth: 0.34, 0.18, 0.05, and –0.29, respectively. All four are highly significant, with t-statistics greater than five in absolute value. In comparison, Bernard and Thomas (1990) report autocorrelations of 0.34, 0.19, 0.06, and –0.24 for the first four lags, estimated as the average slope in firm-level time-series regressions (using firms with a minimum of ten quarterly earnings observations from 1974 to 1986).

From Panel B, market-wide earnings are more persistent than firm earnings but the pattern of autocorrelations is quite similar. Estimates for dE/B-agg are representative: 0.70, 0.55, 0.30, and 0.03 at the first four lags, with t-statistics of 10.21, 6.90, 3.28, and 0.37, respectively. Comparing Panels A and B, firm earnings seem to contain a transitory, idiosyncratic component that gets diversified away at the market level. The results suggest that aggregate returns should be well suited for testing Bernard and Thomas' (1990) story that investors do not understand the autocorrelation of quarterly earnings. In particular, post-announcement drift should be stronger in aggregate returns, according to their theory, since aggregate earnings are more persistent.

In some tests, we would ideally like to have an estimate of the market's earnings surprise, potentially different from the true surprise. Any component of earnings anticipated by investors would not affect current returns and would bias our slope estimates toward zero. If investors believe earnings follow a seasonal random walk, earnings surprises are the same as earnings changes. If investors are rational, then at a minimum we should take out the component of the earnings change that is predictable based on past earnings. We use an AR1 model for this purpose because Table 3 indicates that it does a good job picking out the predictable component: in multiple regressions, few of the autocorrelations beyond lag 1 are significant and the increase in R^2 is modest (adding lags 2 – 5 increases the R^2 from an average of 0.51 to an average of 0.56 for the three earnings series). We later consider the possibility that earnings are predictable using past returns, too.

4. The reaction to earnings surprises

This section explores the market's reaction to aggregate earnings surprises, mirroring studies of post-earnings announcement drift in firm returns. We verify drift for individual firms in our sample but find substantially different results in aggregate data.

4.1. Quarterly returns and earnings

In Table 4, we regress firm returns (Panel A) and market returns (Panel B) on current and past earnings changes:

$$R_{t+k} = \alpha + \beta \, dE/S_t + e_{t+k}, \tag{3}$$

where R_{t+k} is return for quarter t+k and dE/S_t is seasonally-differenced earnings for quarter t scaled by either the market value (S = P) or book value (S = B) of equity. Returns vary from k = 0 to k = 4 quarters in the future. Here, k = 0 refers to the quarter for which earnings are measured and k = 1 refers to the quarter in which firms typically report earnings. These quarters both measure the contemporaneous return-earnings association: The market learns much about a firm's performance during the measurement quarter, k = 0, but earnings announcements clearly convey information to the market as well (see, e.g., Ball and Brown, 1968; Foster, 1977). A few firms may announce earnings more than three months after fiscal year-end, in which case k = 2 will also reflect the market's reaction to new information. This effect should be small in recent years.

Panel A reports Fama-MacBeth regressions for individual firms. Like prior studies, we find that returns in quarters 0 through 3 have a strong positive association with earnings. The slopes for the measurement and announcement quarters, 0.61 and 0.65, are largest and more than 30 standard errors above zero. The market also reacts strongly in quarters k = 2 and k = 3, with slopes of 0.22 (t-statistic of 12.8) and 0.11 (t-statistic of 6.1), respectively. Thus, investors appear to underreact to earnings news, leading to post-announcement drift. The declining slopes for lags 2 – 4 line up with the declining autocorrelation in earnings, as observed by Bernard and Thomas (1990). This suggests that investors do not understand earnings' persistence.

Panel B shows results for aggregate returns. We report estimates when CRSP value-weighted returns are regressed on dE/B-agg, dE/P-ew, and dE/P-vw, using either the simple earnings change, the forecast error from an AR1 model ('Surprise 1'), or the forecast error from a model that includes lagged earnings and lagged annual returns ('Surprise 2'). The last measure uses past returns to take out more of the anticipated component of earnings.[3] The panel shows two striking results: (i) the contemporaneous relation between returns and earnings is significantly negative; and (ii) past earnings have little power to predict future returns – if anything, the predictive slopes are negative, opposite the predictions of behavioral models. We discuss these findings below.

Contemporaneous relation. Regardless of which earnings measure we use, market returns in the announcement quarter, k = 1, correlate negatively with earnings news. For simple earnings changes, the slopes range from –3.39 to –5.43 with t-statistics between –2.38 and –2.60. These estimates are likely conservative since any measurement error in earnings surprises should attenuate the slopes. Indeed, if we take out the component of the earnings change predicted by an AR1 model, the slopes for dE/B-agg and dE/P-vw more than double and their t-statistics jump to –3.7 and –3.6. We find similar results if we remove the component of earnings predicted by past returns. The negative announcement effect is surprising and contrasts strongly with firm-level evidence.

Economically, the slope estimates for k = 1 are fairly large: earnings explain 4–9% of quarterly returns. The standard deviation of earnings surprises from an AR1 model equals 0.42% for dE/B-agg, 0.37% for dE/P-ew, and 0.23% for dE/P-vw. Thus, a two-standard-deviation positive shock to earnings maps into a 4–6% decline in prices in the announcement quarter using the point estimates in Table 4. Historically, if earnings changes for any of the measures were in the bottom quartile of their distributions

[3] We experimented with different return intervals and found that annual returns do a good job summarizing the information in past prices. In the forecasting regression, the slope on lagged earnings is close to the first-order autocorrelation reported in Table 3 and the slope on returns has a t-statistic of 2.07 for dE/B-agg, 3.47 for dE/P-ew, and 3.17 for dE/P-vw. The R^2s are slightly higher than for a simple AR1 model.

from 1970 – 2000, the CRSP index return was about 7%. If earnings changes were in the top quartile, the CRSP index was essentially flat, increasing by about 1%.

Campbell (1991) shows that unexpected returns can be decomposed, mechanically, into cashflow news and expected-return, or discount-rate, news. Thus, the price impact of earnings is determined by its covariance with each component. If good earnings performance is accompanied by an increase in the discount rate, and if the latter swamps the cashflow news in earnings, then the overall correlation between earnings and returns can be negative.[4]

A positive correlation between earnings and discount rates is possible but contradicts standard intuition about business-cycle variation in the risk premium. Standard intuition suggests that discount rates decrease when the economy does well (e.g., Fama and French, 1989; Cochrane and Campbell, 1999; Chan and Kogan, 2002). A counter-argument is that earnings are likely to be positively related to inflation and interest rates: earnings might convey information about inflation, leading to higher interest rates, or inflation might lead to higher earnings in the short run if revenues respond more quickly to inflation than (historical) accounting costs. If so, the slope on earnings surprise in Table 4 will absorb the strong negative reaction to inflation documented by Fama and Schwert (1977) and Fama (1981). We later explore the correlations among earnings, business conditions, and discount rates, and attempt to disentangle cashflow and discount-rate effects.

We also note that a negative reaction to aggregate earnings is entirely consistent with a positive reaction to firm earnings. To illustrate, consider a simple model of returns in which (i) earnings surprises perfectly capture cashflow news and (ii) discount-rate changes are driven by macroeconomic conditions and are therefore common across firms. In this case:

$$UR_i = (dE_i + dE_M) - dr_M, \quad (4)$$

where UR_i is the firm's unexpected return, dE_i is the firm-specific earnings surprise, dE_M is the systematic

[4] We take it for granted that earnings and cashflows are positively correlated. Table 3 suggests that aggregate earnings shocks are permanent – earnings changes are positively autocorrelated for several quarters and show no sign of long-term reversal – and, as such, should eventually lead to higher dividends (Lintner, 1956; Campbell and Shiller, 1988b). We also emphasize that our results pertain to relatively short-run earnings surprises, i.e., quarterly and annual. In the long run, prices and earnings should move together.

earnings surprise, and dr_M is discount-rate news (positive if discount rates go up). Discount-rate shocks are assumed to be entirely macroeconomic, so dE_i is uncorrelated with both aggregate earnings and discount rates. Market returns equal the cross-sectional average of (4), $UR_M = dE_M - dr_M$. In this model, the covariance between firm returns and earnings is:

$$cov(UR_i, dE_i + dE_M) = var(dE_i) + cov(UR_M, dE_M). \quad (5)$$

The first term is the covariance between returns and firm-specific earnings, which is necessarily positive. The second term is the covariance between aggregate returns and earnings. It is clear that the firm-level covariance can be positive, dominated by idiosyncratic cashflow shocks, even if the aggregate covariance is negative, dominated by discount-rate effects.

Returns and past earnings. The second key result in Panel B is that earnings have little power to predict future market returns – that is, there is no evidence of post-earnings announcement drift in aggregate data. The slopes for k = 2, 3, and 4 are close to zero and predominately negative, opposite the predictions of behavioral models. Only the slopes on dE/P-ew show modest significance with t-statistics between –0.74 and –1.58 at lag 2 and t-statistics between –1.62 and –2.74 at lag 4. The results are inconsistent with underreaction to aggregate earnings news.

We emphasize that the contrast between firm and aggregate price behavior is not explained by differences in the time-series properties of earnings. Table 3 shows that market earnings are actually more persistent than firm earnings. Thus, the aggregate results do not support Bernard and Thomas' (1990) hypothesis that investors ignore the autocorrelation structure of earnings. We should also point out that the relation between earnings and discount-rate changes implied by our k = 1 slopes should make it easier to find post-announcement drift in returns. In particular, if earnings and discount-rate shocks are positively related, as discussed earlier, earnings would be positively correlated with future returns even in the absence of any underreaction.

4.2. Robustness checks

The aggregate results are rather surprising, so it seems worthwhile to consider a few robustness checks. The bottom line is that we find similar results for: (i) alternative definitions of earnings; (ii) each of the decades 1970s, 1980s, and 1990s; (iii) annual regressions; (iv) S&P 500 earnings going back to the 1930s; and (v) size portfolios.

Alternative earnings variables. In addition to the three earnings series shown in Table 4, we also ran regressions with aggregate dE scaled by past market value and past earnings (these series were described earlier). The results are quite similar to those in Table 4. For example, in regressions with aggregate earnings growth, dE/E, the t-statistics are –1.69 and –2.47 for k = 0 and 1, and between –1.00 and –0.30 for the remaining lags. We find similar but somewhat weaker results if we use net income in place of earnings before extraordinary items.

Subperiods. To check whether the results are driven by one or two observations, or by returns at the end of the sample, we repeat the tests for each of the decades 1970s, 1980s, and 1990s. Again, the results are similar to those in Table 4. The slope coefficients on earnings changes are generally negative at all lags but not individually significant given the short sample in each decade. The coefficients on earnings *surprises* are more significant. For example, using surprises measured for dE/B-agg, the t-statistic at k = 1 equals –1.95 for 1970 – 1979, –2.62 for 1980 – 1989, and –2.05 for 1990 – 2000. Estimates for the other series are also negative, but not as significant. We never find evidence of post-announcement drift in aggregate returns.

Annual returns and earnings. Table 5 replicates the analysis using annual data. It shows (i) the time-series properties of earnings for individual firms and for the market; and (ii) regressions of returns on current and past earnings surprises. The variable definitions and data requirements are like those for the quarterly tests except that the sample is restricted to firms with December fiscal-year ends (to make sure their fiscal years align). Annual returns are measured from May to the following April to control for delays in earnings announcements.

The time-series properties of annual earnings are consistent with prior studies (e.g., Ball and Watts, 1972; Brooks and Buckmaster, 1976). At the firm level, earnings changes partially reverse over the subsequent 2 – 3 years. The autocorrelations are modest, at most –0.23, but the t-statistics are as high as –7.58 in the multiple regression. In contrast, we can't reject that aggregate earnings are a random walk. Earnings changes are positively autocorrelated at lag 1 and negatively autocorrelated at lags 2 and 3, but none of the estimates is significant. Of course, with only 31 years of data, the autocorrelations are estimated imprecisely. We cannot reject that the autocorrelations are all zero, but neither can we confidently reject that they are about –0.2 or –0.3.

The return regressions on the right-hand side of Table 5 largely reinforce our quarterly results. At the firm level, returns and contemporaneous earnings are positively related but, surprisingly, there is no evidence of delayed reaction to earnings news. A simple underreaction story predicts a positive slope on lagged earnings, while Bernard and Thomas's (1990) naïve expectations model predicts a negative slope to match the autocorrelation structure of earnings. It would be interesting to understand better why post-earnings announcement drift does not show up at annual horizons.

The market-level regressions also match our quarterly results. Annual market returns are contemporaneously negatively correlated with all three earnings measures, defined using either the simple earnings change or residuals from an AR1 regression (which makes little difference). The adjusted R^2s are substantial, between 10% and 18%, and the t-statistics range from –2.27 to –2.57 even though we have only 31 annual observations. Further, lagged earnings exhibit no predictive power for future annual returns. This result is consistent with both market efficiency or Bernard and Thomas's (1990) naïve expectations story, since market earnings are not highly autocorrelated. Overall, the results confirm inferences from quarterly regressions.

S&P 500 index. The tests above use Compustat data for two main reasons: (i) to allow an easy comparison between firm and aggregate results, and (ii) to ensure the quality and timing of accounting information. At the same time, Compustat restricts us to a fairly short sample, 1970 – 2000. To check whether this period is special, we repeat the tests using earnings on the S&P 500 (and its predecessors) going back to 1936, the earliest year for which we have quarterly earnings data. We regress CRSP returns on either the earnings growth rate, dE/E, or the earnings change scaled by lagged market value, dE/P. The data come from various issues of Standard and Poor's *Analyst's Handbook*.

As shown in Table 6, the results for 1970 – 2000 are very similar to our earlier estimates. The slopes on dE/P at lags 0 and 1 are –5.00 and –4.78 (t-statistics of –2.28 and –2.16), compared with estimates in Table 4 of –5.16 and –5.43. More important, the negative reaction to earnings news shows up out-of-sample from 1936 – 1969 and in all of the time periods we consider. Prior to 1970, the negative price reaction is delayed, appearing most strongly at lags 1 and 2. This suggests that earnings news used to reach the market more slowly, perhaps because quarterly reports were less common (quarterly reports were required by NYSE in 1939 and by the SEC in 1970; see Leftwich, Watts, and Zimmerman, 1981). The slopes for k = 2 are especially strong, with t-statistics between –2.10 and –2.42 for the various series. After 1956, when the index expanded to 500 firms, the slopes on earnings changes dE/E and dE/P are significant for k = 0 and k = 1, with t-statistics between –1.94 and –2.55, and negative but not significant for the remaining lags. In short, the negative reaction to aggregate earnings news is not unique to either our time period nor our sample of firms.

Size portfolios. As a final check, Table 7 repeats the analysis separately for big and small stocks, defined as the top and bottom terciles of firms ranked by market equity (we return now to our main Compustat sample). Earnings autocorrelations, in the left columns, have the same patterns as our earlier estimates. At the firm level, autocorrelations are positive at lags 1 – 3 and negative at lag 4 for both small and large stocks. Estimates for the two groups are similar but small stocks' earnings are somewhat less persistent. The same conclusion holds when we aggregate earnings for the portfolios. The large-stock portfolio has, for the various earnings series, first-order autocorrelations around 0.72 and second-order autocorrelations around 0.55, compared with 0.66 and 0.40 for the small-stock portfolio. Overall, the time-series properties are similar to those for the entire market.

The right-hand columns show return regressions for the two groups. Panel A shows Fama-MacBeth estimates for individual firms within each group and Panel B shows time-series estimates for portfolios. At the firm level, returns are positively related to both concurrent and past earnings. Prices initially react most strongly for large firms, with point estimates of 1.00 and 0.83 for k = 0 and k = 1 (t-statistics of 22.8 and 19.4), compared with slopes of 0.37 and 0.45 for small stocks. The stronger reaction for large firms is rather surprising because (i) the earnings processes for the two groups are quite similar, and (ii) we expect investors to have better prior information about large firms' earnings. Post-announcement drift is about the same for small and large stocks, which again is surprising since the groups differ in many dimensions that might affect the market's reaction to earnings news, including average profitability, liquidity, and earnings volatility.

The portfolio-level tests, in panel B, suggest interesting differences across groups. Large stocks provide stronger evidence that portfolio returns and concurrent earnings are negatively correlated. The slopes for the large-stock portfolio are significantly negative for both k = 0 and k = 1, with t-statistics between –1.89 and –2.97, while the slopes for small stocks are significantly negative only at k = 1. In terms of a lead-lag relation, small stocks provide the only evidence that portfolio earnings predict (negatively) future returns. The slopes at lags 2 – 4 are all negative, with significance at lag 4 for two earnings measures, dE/B-agg and dE/P-ew (t-statistics of –1.90 and –2.36). These results are generally consistent with our market-level regressions.

The portfolio evidence suggests several conclusions. First, earnings are most persistent for the large-stock portfolio, yet the market reacts most negatively to its earnings news. This combination is puzzling if interpreted from a cashflow-news perspective; it suggests that large-stock earnings are more strongly correlated with discount rates. Second, the small-stock portfolio provides the most reliable evidence of market inefficiency, in that earnings changes predict returns four quarters in the future. The negative relation seems to indicate market overreaction, except that the contemporaneous relation between returns and earnings is flat. None of the portfolio results line up with behavioral theories, either Bernard and Thomas' (1990) naïve-investor model or an underreaction story.

5. Earnings, business conditions, and discount rates

The tests above establish two key results: (i) aggregate stock returns and earnings are contemporaneoulsy negatively correlated; and (ii) earnings surprises contain little information about future returns. To better understand these results, we now explore the relations among earnings, business conditions, and discount rates. We are particularly interested in whether movements in discount-rate proxies can explain the contemporaneous return-earnings association.

5.1. Framework

Campbell (1991) provides a convenient framework for thinking about the relations among returns, earnings surprises, and discount rates. In particular, he shows that returns R_t can be decomposed into three components:

$$R_t = r_t + \eta_{d,t} - \eta_{r,t}, \tag{6}$$

where r_t is the expected return for period t, $\eta_{d,t}$ is the shock to expected dividends, and $\eta_{r,t}$ is the shock to expected returns.[5] The last component has a negative sign because an increase in expected returns reduces the current price. To think about the market's reaction to earnings news, assume that we have a good proxy for *unexpected* earnings, dE_t, so that we can ignore any covariance with r_t. Eq. (6) then implies that earnings' covariance with returns is:

$$\text{cov}(dE_t, R_t) = \text{cov}(dE_t, \eta_{d,t}) - \text{cov}(dE_t, \eta_{r,t}). \tag{7}$$

The first term is positive as long as earnings and cashflow news are positively related. But the overall covariance can be negative, as we find in the data, if earnings surprises are also positively correlated with shocks to expected returns.

In an efficient market, expected returns are the same as discount rates. Thus, our empirical results suggest that strong earnings are associated with an increase in discount rates (see also Lettau and Ludvigson, 2004). A simple explanation might be that strong earnings imply higher interest rates. The negative price impact of an increase in the real interest rate is clear, but Modigliani and Cohn (1979) argue that purely nominal changes in interest rates affect prices because investors mistakenly discount real earnings at nominal rates [see Nissim and Penman (2003) and Campbell and Vuolteenaho (2004) for recent evidence]. On the other hand, finance theory suggests that the risk premium should be

[5] Formally, $\eta_{d,t} = \sum_{k=0}^{\infty} \rho^k \Delta E_t d_{t+k}$ and $\eta_{r,t} = \sum_{k=1}^{\infty} \rho^k \Delta E_t h_{t+k}$, where ΔE_t is the change in expectation from t – 1 to t, d_t is the log dividend growth rate, h_t is the log stock return, and ρ is a number close to one determined by the asset's average dividend yield. The decomposition is only approximate.

countercyclical and, thus, negatively related to earnings, opposite the effect implied by our regressions. Countercyclical movements in the equity premium might arise if investors try to smooth consumption (e.g., Lucas, 1978) or if aggregate risk aversion varies over the business cycle (e.g., Cochrane and Campbell, 1999; Chan and Kogan, 2002).[6] We attempt to isolate these effects by including discount-rate proxies in the regressions. Our hope is to measure the marginal impact of an earnings surprise after controlling for discount-rate effects.

5.2. Earnings and macroeconomic conditions

Table 8 reports correlations among earnings, macroeconomic growth, and several discount-rate proxies. Macroeconomic growth is measured by GDP, industrial production, and personal consumption. The discount-rate proxies include the 1-year Tbill rate, the yield spread between 10-year and 1-year Tbonds (TERM), and the yield spread between low-grade and high-grade corporate debt (DEF). Fama and French (1989) show that DEF and TERM capture movements in expected stock and bond returns over the business cycle. We exclude valuation ratios, like dividend yield, from our set of proxies because they are tied mechanically to prices and we wish to test whether the proxies can explain price changes. Finally, we include the University of Michigan's consumer sentiment index. The variables are all measured as annual changes or growth rates ending in the quarter that earnings are measured; we later consider quarterly changes in the variables.

Panel A shows simple correlations between earnings and the macro variables. Not surprisingly, earnings are strongly related to the real activity measures, GDP, IPROD, and CONS. Earnings are most closely tied to industrial production, with correlations between 0.60 and 0.75 for the various earnings series. The estimates for GDP and CONS are somewhat lower and, in unreported tests, we find that IPROD subsumes the correlation with the other two variables.

[6] This is not to say that pro-cyclical variation in the discount rate is impossible. Cochrane (2001), for example, observes that discount rates should covary positively with expected growth rates (i.e., be pro-cyclical) if investors have constant relative risk aversion greater than one (see, also, Yan, 2004). The intuition is that, when growth rates are high, investors naturally want to consume more today and, in equilibrium, have to be induced to save through higher rates of return.

The behavior of discount rates is more important for our purposes. Earnings are strongly positively correlated with ΔTBILL (estimates between 0.32 and 0.61) and negatively correlated with ΔTERM and ΔDEF (estimates between –0.33 and –0.64). The correlation with ΔTBILL suggests that higher earnings are indeed associated with higher discount rates. But the correlations with ΔTERM and ΔDEF have the wrong sign if, as Fama and French (1989) find, TERM and DEF are positively related to the equity premium. It is interesting that DEF, a proxy for bankruptcy risk, is most closely tied to the performance of smaller stocks, measured by the equal-weighted earnings series. Also, earnings are weakly positively related to consumer sentiment. Separate tests show that ΔSENT is positively related to returns (0.39 in quarterly data), so its correlation with earnings has the wrong sign for explaining why the market reacts negatively to earnings news.

Multiple regressions. Our tests below ask whether changes in discount rates can explain the correlation between returns and earnings. An easy way to do this is to break earnings into a component related to discount-rate news and an orthogonal component by first regressing earnings on the discount-rate proxies. We then include both components in the second-stage return regression. In the second-stage regression, the slope on the orthogonal component is identical to the slope on earnings if we directly include ΔTBILL, ΔTERM, and ΔDEF in the regression; the two-stage approach simply eases the presentation and interpretation of the results.

Table 8, panel B, shows the first-stage regression of earnings on the discount-rate proxies and an AR1 term (to soak up residual autocorrelation remaining after controlling for discount rates). ΔTBILL and ΔDEF are both highly significant and drive out any correlation between earnings and ΔTERM. Like the simple correlations, the slopes on ΔTBILL are significantly positive except in regressions with the equal-weighted earnings series (for that series, dE/P-ew, the slope becomes marginally significant if we drop ΔTERM from the regression). The slopes on DEF are all significantly negative. Collectively, the three discount-rate proxies explain about 40% of the volatility in earnings changes, or between 50% and 60% together with the AR1 term.

In the tests below, we modify the first-stage regression slightly to obtain the fitted value and residual used in the return regressions. In particular, we have to take a stand on when to measure changes in the discount-rate proxies. The regressions just described use annual changes measured over the same interval as the earnings change (from t-4 to t). Most of the annual change is known prior to t and, in an efficient market, should have little impact on subsequent returns. Therefore, a better choice might be to use the quarterly change in the quarter for which earnings are measured, or in the quarter during which earnings are announced. We find similar results using all three specifications. In the reported tests, we use changes in the discount-rate proxies *in the quarter that earnings are measured*. The estimates from the first-stage are generally consistent with those in Table 8. TBILL and DEF both drop in significance, while the AR1 term becomes relatively more important.

5.3. Returns, earnings, and discount rates

Table 9 reports the second-stage regressions of returns on current and past earnings surprises. The projection of earnings on the discount-rate proxies and AR1 term is labeled 'Fitted dE/S' and the orthogonal component is labeled 'Residual dE/S.' The slope on Residual dE/S measures the marginal impact of an earnings surprise after controlling for discount rates.

The table shows that our discount-rate proxies partially explain why the market reacts negatively to good earnings news: the slopes on Residual dE/S are typically less negative, or more positive, than the corresponding slopes in Table 4. But the most important finding is that returns in the announcement quarter, k = 1, remain negatively correlated with earnings news, with t-statistics on Residual dE/S between –1.93 and –3.17. Table 9 also provides no evidence of post-earnings announcement drift in aggregate returns. Thus, our discount-rate proxies do not eliminate the negative reaction to earnings news or change our conclusions about post-announcement drift.

Alternative specifications for discount-rate changes, in the first-stage regressions that provide Residual dE/S, give similar results. If we measure ΔTBILL, ΔTERM, and ΔDEF in the announcement rather than measurement quarter, the t-statistics on Residual dE/S for k = 1 are –3.33, –1.90, and –3.05 for the three earnings series. If we instead use annual changes in TBILL, TERM, and DEF, as shown in Table 8, the t-statistics for k = 1 are –2.33, –1.65, and –2.23.

Annual returns. Table 10 repeats the analysis using annual returns and earnings. In unreported first-stage regressions, only Tbill rates are significant when used together with TERM, DEF, and an AR1 term (like returns, the discount-rate proxies are lagged four months relative to annual earnings). ΔTBILL alone explains more than 50% of annual earnings changes. For this reason, we use ΔTBILL as the only proxy for discount-rate news in Table 10.

The table shows two key results. First, movements in interest rates largely explain the negative reaction to earnings news in annual data. The slopes on Residual dE/S for lag 0 are roughly one standard error below zero, compared with t-statistics around –2.5 using raw earnings changes (see Table 5). Thus, prices seem to react negatively to annual earnings news because high earnings are tied to high interest rates. But the point estimates on Residual dE/S remain negative, so ΔTBILL does not fully remove the discount-rate effects in earnings.

Second, earnings are positively correlated with returns in the subsequent year (k = 1). The slope is positive for all three earnings series, and significant for both dE/B-agg (t-statistic of 1.78) and dE/P-vw (t-statistic of 2.25). The estimate for dE/P-vw is economically quite large. A two-standard-deviation increase in Residual dE/P-vw (2 × 0.84%), maps into a 13.1% increase in expected return. Residual dE/P-vw explains more than 10% of the variation in next year's return. These results provide the first evidence that aggregate prices underreact to earnings news, but the results are also consistent with our argument that high earnings are associated with higher discount rates. We also note that the significance of the k = 1 slopes is rather tenuous. For example, the slopes on Residual dE/S are not significant if we include ΔTERM and ΔDEF in the first-stage regression; the t-statistics drop to 1.30, 0.82, and 1.30 for the three earnings series.

Discount-rate levels vs. changes. The tests above focus on *changes* in discount rates, but the ex ante *level* of discount rates might also fluctuate with earnings. The distinction is important, as seen in eq.

(6): $R_t = r_t + \eta_{d,t} - \eta_{r,t}$. The discount-rate level, r_t, enters with a positive sign but the discount-rate shock, $\eta_{r,t}$, enters with a negative sign. Thus, to explain a negative correlation with returns, earnings could be negatively correlated with discount-rate levels or positively correlated with discount-rate shocks. The interpretation of our results clearly depends on which is true.

We believe the results tell us principally about discount-rate shocks for several reasons. First, if dE_t is a good proxy for *unexpected* earnings, it must be uncorrelated with anything known prior to t, including r_t. Our evidence in Section 3 suggests, in fact, that a large fraction of dE_t is probably unexpected: dE_t is quite volatile and time-series models explain only half of its variability. Moreover, when we remove the predictable component to get a better proxy for unexpected earnings, the negative correlation with returns becomes stronger (Table 4). This suggests that unexpected earnings – which can only be correlated with $\eta_{r,t}$ – drive our results.

Second, dE_t explains a large fraction of quarterly and annual returns: 4% to 9% of quarterly returns and 10% to 18% of annual returns (see Tables 4 and 5). The explanatory power seems too large to be driven by the ex ante level of discount rates. We noted earlier, for example, that quarterly returns are roughly 7% when earnings growth is poor (bottom quartile) but only 1% when earnings growth is strong (top quartile). In our view, the large difference in returns more likely reflects the arrival of new information during the quarter rather than differences in ex ante expected returns – again, consistent with our focus on discount-rate shocks, not levels.

Finally, we directly test whether the level of discount rates is important by including in the regressions the lagged values of TBILL, TERM, and DEF. In the first-stage earnings regressions, lagged TBILL, TERM, and DEF have little correlation with dE after controlling for contemporaneous changes in the variables and the AR1 term; the three level variables are never significant and add almost nothing to the regression R^2. Not surprisingly, then, the second-stage return regressions are also very similar to those reported in Table 9. In sum, the ex ante level of discount rates seems unlikely to explain the negative correlation between returns and earnings.

6. Conclusions

The overall message from our analysis is, in some ways, quite simple: the market's reaction to aggregate earnings differs dramatically from its reaction to firm earnings. Taking all of the results together, we find little evidence that prices react slowly to aggregate earnings news. Recent behavioral theories that explain post-earnings announcement drift in firm returns do not seem to describe aggregate prices. We leave it to the reader to judge whether the results should be viewed as a rejection of the theories or simply evidence that they apply only at the firm level. At a minimum, our results suggest that recent behavioral models are incomplete because they provide little guidance for understanding why firm and aggregate price behavior should differ.

Our results also provide new evidence on the connections among prices, earnings, discount rates, and business conditions. The strong negative reaction to aggregate earnings news suggests that discount rates rise when earnings are unexpectedly high – an effect that actually dominates the cashflow news in quarterly and annual earnings. In fact, we find that earnings are strongly correlated with changes in several proxies for discount rates, including Tbill rates, the term spread, and the default spread. However, these variables only partially explain the market's negative reaction to earnings news, which suggests that discount-rate shocks not captured by our proxies explain a significant fraction of returns (see also Fama 1990; Campbell, 1991; Cochrane, 1992). The results are generally inconsistent with theoretical models which predict that discount rates and cashflows should move in opposite directions (e.g., Campbell and Cochrane, 1999; Chan and Kogan; 2002).

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Table 1
Summary statistics, quarterly returns and earnings, 1970 – 2000

This table summarizes U.S. stock returns and earnings from 1970 – 2000. The variables are measured quarterly for each portfolio; the table reports the time-series average and standard deviation of each variable (in percent, except for N). N is the number of firms in the portfolio. EW and VW are equal- and value-weighted returns. E is earnings before extraordinary items; dE is seasonally-differenced earnings, equal to earnings this quarter minus earnings four quarters ago. P is the market value of equity and B is the book value. The denominator in all ratios is lagged four quarters. The portfolio values are measured three ways: The 'Aggregate' numbers equal the sum of the numerator divided by the sum of the denominator for firms in the portfolio. The 'Equal weighted' and 'Value weighted' numbers are instead averages of firm-level ratios, beginning with per share numbers. The sample consists of firms with a March, June, September, or December fiscal-year end and with earnings, book equity, share price, and shares outstanding data on Compustat, excluding stocks with price below $1 and, subsequently, the top and bottom 0.5% of firms ranked by dE/P. 'Small' and 'Large' are the bottom and top terciles of stocks ranked by market value; 'Low B/M' and 'High B/M' are the bottom and top terciles of stocks ranked by B/P.

		Returns		Aggregate					Value weighted			Equal weighted		
	N	VW	EW	E/P	E/B	dE/P	dE/B	dE/E	E/P	E/B	dE/P	E/P	E/B	dE/P
CRSP														
avg.	6,062	3.34	3.82	--	--	--	--	--	--	--	--	--	--	--
std. dev.	1,686	8.79	12.60	--	--	--	--	--	--	--	--	--	--	--
Sample														
avg.	3,288	3.22	3.53	2.27	3.58	0.14	0.23	7.84	2.07	4.13	0.10	1.34	1.90	0.25
std. dev.	1,505	8.59	12.07	0.89	0.66	0.37	0.57	17.77	0.83	0.69	0.34	1.57	1.29	0.54
Small														
avg.	1,093	3.73	4.24	0.67	0.18	0.35	0.30	--	0.60	0.38	0.45	0.32	0.10	0.66
std. dev.	499	14.80	15.36	2.25	2.09	0.84	0.79	--	2.13	2.04	0.79	2.27	2.05	0.93
Large														
avg.	1,092	3.20	3.21	2.24	3.75	0.13	0.23	7.20	2.10	4.29	0.09	2.00	3.39	0.06
std. dev.	498	8.40	9.73	0.85	0.66	0.34	0.56	16.58	0.80	0.74	0.33	0.96	0.75	0.35
Low B/M														
avg.	1,094	2.90	2.30	1.73	5.39	0.16	0.49	10.66	1.66	5.57	0.14	0.69	2.12	0.42
std. dev.	499	9.50	13.93	0.70	0.92	0.21	0.72	15.95	0.67	1.00	0.20	1.45	2.42	0.34
High B/M														
avg.	1,093	4.27	4.71	2.83	2.14	0.13	0.07	--	2.51	2.14	0.07	1.28	1.06	0.23
std. dev.	499	9.10	12.23	1.59	0.90	1.03	0.78	--	1.49	0.86	1.01	2.08	1.13	1.15

Table 2
Correlations, changes in quarterly earnings, 1970 – 2000

This table reports correlations among various measures of seasonally-differenced quarterly earnings, 1970 – 2000. Earnings, E, are measured before extraordinary items. Seasonally-differenced earnings, dE, are scaled by either lagged earnings, lagged market capitalization (P), or lagged book equity (B). Earnings are combined in three ways to get earnings changes for the market portfolio: Aggregate numbers, identified by '-agg', equal the sum of the numerator divided by the sum of the denominator for all sample firms. Equal- and value-weighted numbers, identified by '-ew' and '-vw,' are averages of firm ratios. The sample consists of firms with a March, June, September, or December fiscal-year end and with earnings, book equity, share price, and shares outstanding data on Compustat, excluding stocks with price below $1 and, subsequently, the top and bottom 0.5% of firms ranked by dE/P.

	dE/P-agg	dE/B-agg	dE/E-agg	dE/P-vw	dE/P-ew
dE/P-agg	1	0.938	0.914	0.992	0.783
dE/B-agg		1	0.988	0.943	0.726
dE/E-agg			1	0.923	0.707
dE/P-vw				1	0.775
dE/P-ew					1

Table 3
Autocorrelation of quarterly earnings, 1970 – 2000

This table reports autocorrelations of seasonally-differenced quarterly earnings, 1970 – 2000. Panel A reports estimates for individual firms, obtained from Fama-MacBeth cross-sectional regressions. Panel B reports estimates for the market portfolio, obtained from time-series regressions. Earnings, E, are measured before extraordinary items. Seasonally-differenced earnings, dE, are scaled by either lagged market equity (P) or lagged book equity (B). Earnings changes for the market portfolio are measured three ways: dE/B-agg equals the sum of dE divided by the sum of B for firms in the sample; dE/P-ew and dE/P-vw are equal- and value-weighted averages of firm dE/P ratios (the ratio is calculated for each firm, then averaged). The sample consists of firms with a March, June, September, or December fiscal-year end and with earnings, book equity, share price, and shares outstanding data on Compustat, excluding stocks with price below $1 and, subsequently, the top and bottom 0.5% of firms ranked by dE/P. Bold denotes estimates that are significant at a two-sided 10% level or stronger.

		Simple regressions			Multiple regressions		
	Lag	Slope	T-stat	Adj. R^2	Slope	T-stat	Adj. R^2
Panel A: Individual firms							
dE/P	1	**0.34**	20.01	--	**0.36**	19.04	--
	2	**0.18**	16.50	--	**0.12**	15.13	
	3	**0.05**	5.32	--	**0.05**	8.33	
	4	**-0.29**	-20.75	--	**-0.42**	-25.94	
	5	**-0.10**	-8.12	--	**0.14**	13.77	
Panel B: Aggregate							
dE/B-agg	1	**0.70**	10.21	0.46	**0.66**	6.48	0.53
	2	**0.55**	6.90	0.28	**0.34**	2.93	
	3	**0.30**	3.28	0.08	-0.14	-1.15	
	4	0.03	0.37	-0.01	**-0.38**	-3.37	
	5	-0.04	-0.37	-0.01	0.16	1.62	
dE/P-ew	1	**0.74**	11.61	0.52	**0.79**	8.36	0.55
	2	**0.48**	5.84	0.22	0.05	0.40	
	3	**0.20**	2.25	0.03	-0.09	-0.74	
	4	-0.03	-0.36	-0.01	**-0.24**	-2.05	
	5	-0.10	-1.04	0.00	0.12	1.27	
dE/P-vw	1	**0.75**	12.23	0.55	**0.76**	8.12	0.59
	2	**0.53**	6.88	0.28	0.17	1.47	
	3	**0.27**	3.03	0.06	-0.15	-1.28	
	4	0.02	0.25	-0.01	**-0.24**	-2.08	
	5	-0.09	-0.96	-0.00	0.10	1.08	

Table 4
Quarterly returns and earnings, 1970 – 2000

This table reports the slope estimate, t-statistic, and adjusted R^2 when quarterly stock returns are regressed on seasonally-differenced quarterly earnings:

$R_{t+k} = \alpha + \beta\ dE/S_t + e_{t+k}$,

where dE is seasonally-differenced earnings and S is either the market value (P) or book value (B) of equity. Earnings are before extraordinary items. R_{t+k} varies from k = 0 to k = 4 quarters in the future (k = 0 is the quarter for which earnings are measured; k = 1 is the quarter that earnings are typically announced). Panel A reports estimates for individual firms, obtained from Fama-MacBeth regressions. Panel B reports estimates for the market portfolio, obtained from time-series regressions. The market return is the CRSP value-weighted index. dE/B-agg equals the sum of dE divided by the sum of B for all firms in the earnings sample; dE/P-ew and dE/P-vw are equal- and value-weighted averages of firm dE/P ratios. The earnings sample consists of firms with a March, June, September, or December fiscal-year end and with earnings, book equity, share price, and shares outstanding data on Compustat, excluding stocks with price < $1 and, subsequently, the top and bottom 0.5% of firms ranked by dE/P. Bold denotes estimates that are significant at a two-sided 10% level or stronger.

		Earnings change [a]			Earnings surprise 1 [a]			Earnings surprise 2 [a]		
	k	Slope	T-stat	Adj. R^2	Slope	T-stat	Adj. R^2	Slope	T-stat	Adj. R^2
Panel A: Individual firms										
dE/P	0	**0.61**	32.83	--	**0.49**	28.47	--	**0.50**	28.67	--
	1	**0.65**	30.76	--	**0.67**	33.80	--	**0.67**	34.23	--
	2	**0.22**	12.78	--	**0.22**	12.93	--	**0.22**	13.77	--
	3	**0.11**	6.10	--	**0.12**	6.90	--	**0.11**	7.51	--
	4	0.01	0.52	--	**0.03**	1.81	--	**0.04**	2.30	--
Panel B: Aggregate										
dE/B-agg	0	**-2.35**	-1.70	0.02	-0.37	-0.19	0.03	0.05	0.03	0.04
	1	**-3.39**	-2.38	0.04	**-7.19**	-3.70	0.09	**-6.87**	-3.39	0.06
	2	-0.35	-0.25	-0.01	1.13	0.56	-0.01	1.54	0.73	-0.01
	3	-0.99	-0.71	-0.00	-0.25	-0.12	-0.01	0.42	0.20	-0.01
	4	-1.12	-0.79	0.00	-2.65	-1.31	-0.00	-2.11	-0.98	-0.01
dE/P-ew	0	-1.42	-0.96	-0.00	2.68	1.27	0.05	3.16	1.47	0.05
	1	**-3.84**	-2.60	0.05	**-5.06**	-2.42	0.05	**-4.48**	-2.01	0.04
	2	-2.31	-1.58	0.01	-2.00	-0.94	0.00	-1.68	-0.74	0.01
	3	-1.70	-1.16	0.00	0.74	0.35	0.01	1.74	0.77	0.04
	4	**-2.74**	-1.89	0.02	**-4.22**	-1.98	0.02	-3.76	-1.62	0.03
dE/P-vw	0	**-5.16**	-2.27	0.03	-2.79	-0.82	0.03	-1.48	-0.43	0.05
	1	**-5.43**	-2.38	0.04	**-11.67**	-3.57	0.08	**-11.29**	-3.27	0.07
	2	-0.94	-0.42	-0.01	1.16	0.34	-0.01	2.13	0.59	-0.01
	3	-1.62	-0.72	-0.00	-1.64	-0.48	-0.01	-0.37	-0.10	-0.01
	4	-1.08	-0.48	-0.01	-3.79	-1.11	-0.00	-2.49	-0.68	-0.01

[a] 'Earnings change' is the actual value of dE/S, 'Earnings surprise 1' is the forecast error from an AR1 model, and 'Earnings surprise 2' is the forecast error when dE/S is regressed on lagged dE/S and lagged annual returns. In the latter two cases, the fitted value and forecast error from the forecasting regression are both included in the second-stage return regression; the adj. R^2 measures the joint explanatory power of both variables.

Table 5
Annual returns and earnings, 1970 – 2000

This table reports autocorrelations of annual earnings changes (left panel) and slope estimates from the following regression (right panel):

$R_{t+k} = \alpha + \beta\ dE/S_t + e_{t+k}$,

where R_t is the annual return ending in April of year t+1, dE_t is the earnings change from t-1 to t, and S is either the market value (P) or book value (B) of equity. Earnings are before extraordinary items. R_{t+k} varies from k = 0 to k = 2 years in the future (when k = 0, returns and earnings are contemporaneous). Panel A reports estimates for individual firms, obtained from Fama-MacBeth cross-sectional regressions. Panel B reports estimates for the market portfolio, obtained from time-series regressions. The market return is the CRSP value-weighted index. dE/B-agg equals the sum of dE divided by the sum of B for all firms in the earnings sample; dE/P-ew and dE/P-vw are equal- and value-weighted averages of firm dE/P ratios. The earnings sample consists of firms with a December fiscal-year end and with earnings, book equity, share price, and shares outstanding data on Compustat, excluding stocks with price < $1 and, subsequently, the top and bottom 0.5% of firms ranked by dE/P.

		Earnings autocorrelations						$R_{t+k} = \alpha + \beta\ dE/S_t + e_{t+k}$					
		Simple regressions			Multiple regressions			Earnings change[a]			Earnings surprise[a]		
	k	Slope	T-stat	Adj. R^2	Slope	T-stat	Adj. R^2	Slope	T-stat	Adj. R^2	Slope	T-stat	Adj. R^2
Panel A: Individual firms													
dE/P	0							**0.66**	21.59	--	**0.72**	20.56	--
	1	**-0.16**	-5.58	--	**-0.23**	-7.58	--	0.04	1.39	--	0.04	1.43	--
	2	**-0.10**	-2.76	--	**-0.18**	-4.99		-0.00	-0.04	--	-0.01	-0.20	--
	3	-0.03	-1.50	--	**-0.06**	-3.05		0.02	0.64	--	0.01	0.47	--
Panel B: Aggregate													
dE/B-agg	0							**-3.64**	-2.41	0.14	**-3.81**	-2.49	0.16
	1	0.18	0.98	-0.00	0.17	0.88	0.02	1.60	0.99	-0.00	1.31	0.77	-0.02
	2	-0.13	-0.69	-0.02	-0.10	-0.51		1.59	0.96	-0.00	0.98	0.57	-0.02
	3	-0.31	-1.69	0.06	-0.27	-1.37		1.72	1.04	0.00	1.42	0.84	-0.05
dE/P-ew	0							**-3.38**	-2.41	0.14	**-3.36**	-2.27	0.10
	1	0.20	1.11	0.01	0.24	1.14	-0.05	0.36	0.24	-0.03	-0.08	-0.05	-0.04
	2	-0.09	-0.45	-0.03	-0.11	-0.50		1.59	1.03	0.00	1.16	0.71	-0.05
	3	-0.14	-0.71	-0.02	-0.09	-0.44		0.85	0.54	-0.03	0.18	0.11	-0.07
dE/P-vw	0							**-5.44**	-2.57	0.16	**-5.41**	-2.58	0.18
	1	0.08	0.44	-0.03	0.06	0.32	-0.03	2.78	1.23	0.02	2.64	1.15	-0.02
	2	-0.13	-0.71	-0.02	-0.12	-0.58		1.27	0.54	-0.03	0.76	0.32	-0.06
	3	-0.26	-1.37	0.03	-0.24	-1.21		1.65	0.71	-0.02	1.14	0.49	-0.07

[a] 'Earnings change' is the actual value of dE/S and 'earnings surprise' is the forecast error from an AR1 model. In the latter case, the return regression is estimated including a lag of dE/S in the regression; the adj. R^2 measures the joint explanatory power of the two lags.

Table 6
S&P 500: Quarterly returns and earnings, 1936 – 2000

This table reports the slope estimate and t-statistic when quarterly stock market returns are regressed on the S&P 500's seasonally-differenced quarterly earnings:

$R_{t+k} = \alpha + \beta\ dE/S_t + e_{t+k}$,

where dE is seasonally-differenced earnings and S is either lagged earnings (E, in panel A) or lagged market value (P, in panel B) of the S&P 500 and its predecessors (the index was expanded to 500 firms in 1957). The regression is estimated over four sample periods: 1936 – 2000, 1957 – 2000, 1970 – 2000, and 1936 – 1969. The market return is the CRSP value-weighted index, varying from k = 0 to k = 4 quarters in the future (k = 0 is the quarter for which earnings are measured; k = 1 is the quarter that earnings are typically announced). Bold denotes estimates that are significant at a two-sided 10% level.

		Earnings change[a]				Earnings surprise[a]			
	k	1936 –2000	1957 –2000	1970 –2000	1936 –1969	1936 –2000	1957 –2000	1970 –2000	1936 –1969
Panel A: Earnings growth, dE/E									
Slope	0	-0.03	**-0.06**	**-0.06**	-0.00	0.02	-0.03	-0.04	**0.06**
	1	**-0.06**	**-0.08**	**-0.07**	**-0.06**	**-0.06**	**-0.11**	**-0.12**	-0.03
	2	**-0.04**	-0.01	-0.01	**-0.06**	-0.04	0.01	0.02	**-0.08**
	3	-0.02	-0.03	-0.02	-0.02	-0.01	-0.03	-0.01	-0.00
	4	-0.03	-0.02	-0.02	-0.03	-0.04	-0.03	-0.03	-0.04
T-stat	0	-1.12	-1.94	-1.72	-0.04	0.73	-0.75	-0.84	1.68
	1	-2.85	-2.33	-1.91	-2.18	-2.24	-2.58	-2.64	-0.93
	2	-1.73	-0.39	-0.18	-2.31	-1.48	0.13	0.42	-2.42
	3	-0.93	-0.93	-0.63	-0.68	-0.25	-0.82	-0.28	-0.00
	4	-1.22	-0.51	-0.58	-1.13	-1.40	-0.73	-0.69	-1.25
Panel B: Earnings changes scaled by lagged price, dE/P									
Slope	0	-1.39	**-4.82**	**-5.00**	0.20	0.49	-2.84	-3.51	2.10
	1	**-2.70**	**-4.95**	**-4.78**	-1.83	-2.21	**-7.23**	**-8.35**	-0.07
	2	**-2.15**	-1.36	-0.93	**-2.85**	**-2.56**	0.04	0.89	**-4.01**
	3	-1.03	-2.21	-1.74	-0.69	-0.78	-4.01	-2.83	0.12
	4	-0.94	-0.09	-0.11	-1.30	-1.71	-1.20	-1.03	-1.97
T-stat	0	-1.18	-2.49	-2.28	0.14	0.32	-1.10	-1.19	1.21
	1	-2.30	-2.55	-2.16	-1.34	-1.45	-2.77	-2.91	-0.04
	2	-1.82	-0.69	-0.43	-2.10	-1.67	0.01	0.30	-2.31
	3	-0.87	-1.13	-0.80	-0.50	-0.51	-1.52	-0.96	0.07
	4	-0.79	-0.04	-0.05	-0.94	-1.11	-0.45	-0.35	-1.12

[a] 'Earnings change' is the actual value of dE/S and 'earnings surprise' is the forecast error from an AR1 model. In the latter case, the return regression is estimated including a lag of dE/S in the regression; the adj. R^2 measures the joint explanatory power of the two lags.

Table 7
Size portfolios: Quarterly returns and earnings, 1970 – 2000

This table splits the sample into large and small portfolios, defined as the top and bottom terciles of firms ranked by market equity. The left panel reports autocorrelations of seasonally-differenced quarterly earnings and the right panel reports slope estimates from $R_{t+k} = a + b\ dE/S_t + e_{t+k}$, where R_{t+k} is the quarterly return (k = 0 is the quarter for which earnings are measured), dE is seasonally-differenced quarterly earnings, and S is either the market value (P) or book value (B) of equity. Panel A shows estimates for individual firms and Panel B shows estimates for portfolios. Portfolio earnings are measured three ways: dE/B-agg equals the sum of dE divided by the sum of B for firms in the portfolio; dE/P-ew and dE/P-vw are equal- and value-weighted averages of firm dE/P ratios. The sample consists of firms with a March, June, September, or December fiscal-year end and with earnings, book equity, share price, and shares outstanding data on Compustat, excluding stocks with price < $1 and, subsequently, the top and bottom 0.5% of firms ranked by dE/P.

		Earnings autocorrelations						$R_{t+k} = \alpha + \beta\ dE/S_t + e_{t+k}$					
		Small stocks			Large stocks			Small stocks			Large stocks		
	Lag	Slope	T-stat	Adj. R^2	Slope	T-stat	Adj. R^2	Slope	T-stat	Adj. R^2	Slope	T-stat	Adj. R^2
Panel A: Individual firms													
dE/P	0							**0.37**	26.51	--	**1.00**	22.79	--
	1	**0.32**	15.85	--	**0.38**	19.42	--	**0.45**	25.97	--	**0.83**	19.37	--
	2	**0.16**	12.32	--	**0.23**	14.62	--	**0.18**	12.32	--	**0.21**	4.58	--
	3	**0.04**	3.25	--	**0.11**	7.06	--	**0.06**	3.93	--	**0.13**	2.91	--
	4	**-0.35**	-18.26	--	**-0.23**	-12.38	--	0.01	0.42	--	0.01	0.32	--
Panel B: Portfolios													
dE/B-agg	0							2.67	1.58	0.01	**-2.53**	-1.89	0.02
	1	**0.64**	8.27	0.36	**0.72**	10.78	0.49	**-4.14**	-2.33	0.04	**-2.93**	-2.14	0.03
	2	**0.41**	4.56	0.14	**0.53**	6.71	0.27	-1.50	-0.82	-0.00	-0.18	-0.13	-0.01
	3	**0.18**	1.84	0.02	**0.30**	3.34	0.08	-0.74	-0.40	-0.01	-1.14	-0.86	-0.00
	4	-0.03	-0.32	-0.01	0.06	0.60	-0.01	**-3.47**	-1.90	0.02	-1.37	-1.02	0.00
dE/P-ew	0							1.43	0.99	-0.00	**-4.37**	-2.06	0.03
	1	**0.68**	9.92	0.44	**0.71**	10.74	0.48	-1.49	-1.01	0.00	**-6.29**	-2.97	0.06
	2	**0.36**	4.12	0.12	**0.55**	7.06	0.29	-0.63	-0.42	-0.01	-2.13	-1.01	0.00
	3	0.07	0.73	-0.00	**0.28**	3.10	0.07	-0.61	-0.94	-0.01	-1.75	-0.83	-0.00
	4	-0.14	-1.50	0.01	0.04	0.39	-0.01	**-2.73**	-1.90	0.02	-1.22	-0.58	-0.01
dE/P-vw	0							1.56	0.92	-0.00	**-5.25**	-2.34	0.04
	1	**0.68**	9.71	0.43	**0.74**	12.07	0.54	**-3.04**	-1.76	0.02	**-4.63**	-2.04	0.03
	2	**0.40**	4.59	0.14	**0.52**	6.65	0.26	-0.97	-0.56	-0.01	-0.69	-0.31	-0.01
	3	0.11	1.22	0.00	**0.28**	3.14	0.07	-0.58	-0.34	-0.01	-1.81	-0.82	-0.00
	4	-0.11	-1.15	0.00	0.04	0.47	-0.01	-2.80	-1.63	0.01	-1.34	-0.60	-0.01

Table 8
Earnings and the macroeconomy, 1970 – 2000

This table reports correlations between seasonally-differenced quarterly earnings and various macroeconomic series. Panel A shows simple correlations and Panel B shows regression coefficients (t-statistics in parentheses). E is earnings before extraordinary items; dE is seasonally-differenced earnings, scaled by either the market value (P) or book value (B) of equity: dE/B-agg equals the sum of dE divided by the sum of B for firms in the sample; dE/P-ew and dE/P-vw are equal- and value-weighted averages of firm dE/P ratios. TBILL is the 1-year Tbill rate. TERM is the yield spread between 10-year Tbonds and 1-year Tbills. DEF is the yield spread between Baa- and Aaa-rated corporate bonds. SENT is consumer sentiment from the University of Michigan Survery Research Center. GDP and CONS are per-capita growth rates of gross domestic product and personal consumption, respectively. IPROD is growth in industrial production. The prefix 'Δ' denotes four quarter changes in the variables. The earnings sample consists of firms with a March, June, September, or December fiscal-year end and with earnings, book equity, share price, and shares outstanding data on Compustat, excluding stocks with price below $1 and, subsequently, the top and bottom 0.5% of firms ranked by dE/P.

	Nominal dE			Real dE[a]		
	dE/B-agg	dE/P-ew	dE/P-vw	dE/B-agg	dE/P-ew	dE/P-vw
Panel A: Correlations						
ΔTBILL	0.579	0.395	0.610	0.491	0.322	0.505
ΔTERM	-0.469	-0.363	-0.532	-0.464	-0.366	-0.535
ΔDEF	-0.325	-0.526	-0.360	-0.420	-0.635	-0.488
ΔSENT[b]	0.185	0.392	0.124	0.243	0.437	0.196
GDP[a]	0.475	0.574	0.566	0.607	0.668	0.681
IPROD	0.605	0.670	0.656	0.677	0.751	0.754
CONS[a]	0.363	0.490	0.444	0.485	0.603	0.535
Panel B: $dE_t = \alpha + \beta\, \Delta TBILL_t + \gamma\, \Delta TERM_t + \lambda\, \Delta DEF_t + \rho\, dE_{t-1} + \varepsilon$						
ΔTBILL	**0.09**	0.03	**0.04**	**0.06**	0.02	**0.02**
	(3.29)	(1.16)	(2.80)	(2.36)	(0.87)	(1.78)
ΔTERM	0.03	0.01	-0.01	0.02	-0.00	-0.02
	(0.65)	(0.16)	(-0.26)	(0.35)	(-0.04)	(-0.75)
ΔDEF	**-0.32**	**-0.36**	**-0.20**	**-0.36**	**-0.45**	**-0.24**
	(-3.38)	(-3.63)	(-3.87)	(-3.82)	(-4.64)	(-4.72)
dE_{t-1}	**0.51**	**0.57**	**0.55**	**0.54**	**0.49**	**0.55**
	(6.49)	(7.36)	(8.00)	(7.00)	(6.13)	(8.30)
Adj. R^2	0.54	0.56	0.64	0.54	0.58	0.64
Adj. R^2 without AR1	0.38	0.37	0.44	0.36	0.45	0.44

[a] Real dE/B and dE/P are calculated using inflation-adjusted earnings, book values, and market values. GDP and CONS are measured as nominal or real growth rates corresponding to the definition of dE/B and dE/P. TBILL, TERM, and DEF are always nominal rates.

[b] ΔSENT is available from 1979 – 2000.

Table 9
Controlling for discount rates: Quarterly returns and earnings, 1970 – 2000

This table reports slope estimates when quarterly stock returns are regressed on seasonally-differenced earnings broken into two components:

$R_{t+k} = \alpha + \beta \text{ Fitted}(dE/S_t) + \gamma \text{ Residual}(dE/S_t) + e_{t+k}$,

where dE is seasonally-differenced earnings, S is either the market value (P) or book value (B) of equity, and the two components of dE/S are obtained from the regression:

$dE/S_t = \alpha + \beta\ \Delta TBILL_t + \gamma\ \Delta TERM_t + \lambda\ \Delta DEF_t + \rho\ dE/S_{t-1} + \varepsilon_t$.

Fitted(dE/S_t) is the fitted value from this regression and Residual(dE/S_t) is the residual. The variables ΔTBILL, ΔTERM, and ΔDEF are 1-quarter changes in the variables, measured in the quarter of earnings measurement. Earnings are before extraordinary items. R_{t+k} varies from k = 0 to 4 quarters in the future (k = 0 is the quarter for which earnings are measured). R_t is the return on the CRSP value-weighted index. dE/B-agg equals the sum of dE divided by the sum of B for all firms in the earnings sample; dE/P-ew and dE/P-vw are equal- and value-weighted averages of firm dE/P ratios. The earnings sample consists of firms with a March, June, September, or December fiscal-year end and with earnings, book equity, share price, and shares outstanding data on Compustat, excluding stocks with price < $1 and, subsequently, the top and bottom 0.5% of firms ranked by dE/P. Bold denotes estimates that are significant at a two-sided 10% level or stronger.

		Fitted dE/S		Residual dE/S		
	k	Slope	T-stat	Slope	T-stat	Adj. R^2
dE/B-agg	0	**-6.29**	-3.39	1.87	0.96	0.08
	1	-1.50	-0.83	**-6.66**	-3.17	0.07
	2	-2.25	-1.21	2.61	1.21	0.01
	3	-1.22	-0.65	-0.52	-0.24	-0.01
	4	0.11	0.06	-2.50	-1.15	-0.01
dE/P-ew	0	**-5.92**	-3.32	**5.65**	2.51	0.11
	1	**-3.80**	-2.11	**-4.48**	-1.93	0.05
	2	**-3.06**	-1.68	-0.69	-0.29	0.01
	3	**-3.41**	-1.87	1.34	0.57	0.02
	4	-1.71	-0.93	**-4.30**	-1.81	0.02
dE/P-vw	0	**-9.24**	-3.24	1.15	0.32	0.07
	1	-2.79	-1.00	**-10.91**	-3.06	0.06
	2	-3.13	-1.10	3.30	0.90	0.00
	3	-1.25	-0.44	-1.99	-0.54	-0.01
	4	0.47	0.16	-3.28	-0.89	-0.01

Table 10
Controlling for discount rates: Annual returns and earnings, 1970 – 2000

This table reports the slope estimates, t-statistics, and adjusted R^2 when annual stock returns are regressed on earnings changes broken into two components:

$R_{t+k} = \alpha + \beta$ Fitted(dE/S_t) + γ Residual(dE/S_t) + e_{t+k},

where R_t is the annual return ending in April of year t+1, dE is the earnings change from year t-1 to t, and S is either the market value (P) or book value (B) of equity. The two components of dE/S are obtained from the regression:

$dE/S_t = \alpha + \beta\, \Delta TBILL_t + \varepsilon$.

Fitted(dE/S_t) is the fitted value from this regression and Residual(dE/S_t) is the residual. ΔTBILL is the annual change in one-year Tbill rates ending in April of t+1. Earnings are before extraordinary items. R_{t+k} varies from k = 0 to 3 years in the future (k = 0 is the contemporaneous return). R_t is the return on the CRSP value-weighted index. dE/B-agg equals the sum of dE divided by the sum of B for all firms in the earnings sample; dE/P-ew and dE/P-vw are equal- and value-weighted averages of firm dE/P ratios. The earnings sample consists of firms with a December fiscal-year end and with earnings, book equity, share price, and shares outstanding data on Compustat, excluding stocks with price < $1 and, subsequently, the top and bottom 0.5% of firms ranked by dE/P. Bold denotes estimates that are significant at a two-sided 10% level or stronger.

		Fitted dE/S		Residual dE/S		
	k	Slope	T-stat	Slope	T-stat	Adj. R^2
dE/B-agg	0	**-4.28**	-2.02	-2.33	-1.01	0.10
	1	-0.86	-0.38	**4.44**	1.78	0.04
	2	2.06	0.86	0.38	0.15	-0.05
	3	1.00	0.43	1.51	0.60	-0.06
dE/P-ew	0	**-4.22**	-2.03	-2.14	-1.06	0.10
	1	-0.61	-0.26	1.08	0.49	-0.06
	2	2.05	0.87	0.65	0.30	-0.04
	3	1.05	0.46	-0.27	-0.13	-0.07
dE/P-vw	0	**-5.90**	-2.04	-4.14	-1.26	0.11
	1	-1.20	-0.40	**7.80**	2.25	0.10
	2	2.97	0.91	-1.75	-0.47	-0.04
	3	1.43	0.44	0.63	0.17	-0.07