Stock Returns, Aggregate Earnings Surprises, and Behavioral Finance

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Abstract

We study the stock market's reaction to aggregate earnings news. Previous 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 are negatively correlated with concurrent earnings; over the last 30 years, stock prices increased 6.5% in quarters with negative earnings growth and only 1.9% 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, building on an extensive literature that analyzes the response to individual firms' earnings announcements (see Kothari, 2001, for a review). At the firm level, stock prices react positively to earnings news but require several quarters to fully reflect the information in earnings. Our goal is to test whether post-announcement drift extends to aggregate data and, more broadly, to understand the connection between stock returns and aggregate earnings surprises.

The paper explores two issues in particular. First, we test for post-announcement drift in market returns as a simple 'out-of-sample' test of recent behavioral models. Fama (1998, p. 304) describes post-announcement drift in firm returns as an 'anomaly above suspicion,' and Bernard and Thomas (1990), Barberis, Shleifer, and Vishny (1998), and Daniel, Hirshleifer, and Subrahmanyam (1998) all cite it as a prime example of investor irrationality. Our reading of the three behavioral theories suggests that, although they're motivated by firm-level evidence, the biases they describe should also affect aggregate stock returns. We don't view our study as a strict test of the models, as discussed further below, but our analysis is in the spirit of testing whether the theories can 'explain the big picture' (Fama, p. 291). More generally, establishing whether the same behavioral biases drive firm 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 literature in finance tests whether prices respond to cashflow news or discount-rate news. While research initially focused on cashflows, it is now recognized that discount-rate changes might explain a substantial fraction of price movements. Economists have tried to (1) find good proxies for discount rates, and (2) understand the connection between discount rates, business conditions, and cashflows (e.g., Campbell and Shiller, 1988; Fama and French, 1989; Fama, 1990; Campbell, 1991). Our tests provide direct evidence on the correlation between earnings surprises and discount rates. Further, we argue that the market's reaction to aggregate earnings news provides interesting indirect evidence.

Our initial tests mirror studies of firm-level returns and earnings. Bernard and Thomas (1990) show that firms' quarterly earnings changes are positively autocorrelated and that the pattern of autocorrelation helps explain post-announcement drift. They argue that investors don't fully 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 individual firms' earnings, yet we find no relation between aggregate returns and past earnings surprises. Thus, unlike in firm returns, there is no evidence of delayed reaction to aggregate earnings news. It is important to note that, although aggregate earnings changes are positively autocorrelated, they exhibit substantial volatility and appear to be quite unpredictable. From 1970 – 2000, the growth rate of seasonally-differenced quarterly earnings has a standard deviation of 18.6%, 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.

Our second main finding is that aggregate returns and contemporaneous earnings surprises are *negatively* correlated. Over the last 30 years, for example, stock prices increased 6.5% in quarters with negative earnings growth and only 1.9% otherwise (significantly different with a t-statistic of 2.6). In regressions, concurrent earnings explain roughly 5–10% of the variation in quarterly market returns and 10–20% of the variation in annual returns. The t-statistic on earnings is between –2.0 and –3.5 depending on how earnings are measured.

These results provide strong, albeit indirect, evidence that cashflows 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 an overall negative correlation with returns implies that earnings must also be positively correlated with expected returns. In fact, we find that earnings are strongly correlated with several discount-rate proxies, including changes in Tbill rates (+), the slope of the term structure (–), and changes in the yield spread between low- and high-grade corporate bonds (–). However, only the correlation with Tbill rates has the right sign and, together, the proxies can only partially explain the negative correlation between returns and earnings surprises.

The evidence suggests that discount-rate shocks not captured by our proxies explain a significant fraction of stock returns (see, also, Fama 1990; Campbell, 1991). Indeed, for the horizons we study, discount-rate shocks seem to swamp the cashflow news in aggregate earnings. The results are especially surprising because asset-pricing theories often predict that discount rates and cashflows (consumption) move in *opposite* directions. For example, the habit-formation model of Campbell and Cochrane (1999) and the heterogeneous-investor model of Chan and Kogan (2002) both predict that discount rates drop when the economy does well, contrary to our findings.

We should point out that a negative reaction to aggregate earnings is entirely consistent with a positive reaction to firm earnings (which we find in our sample). The economic story is simple. Firm earnings largely reflect idiosyncratic cashflow news, unrelated to discount rates. Aggregate earnings, in contrast, depend on macroeconomic conditions and correlate more strongly with presumably marketwide shocks to discount rates. Thus, the confounding effects of discount-rate changes show up only in aggregate returns. Put somewhat differently, cashflow news is largely idiosyncratic while discount-rate changes are common across firms. By a simple diversification argument, discount-rate shocks play a larger role at the aggregate level (see, also, Vuolteenaho, 2002). Our results provide a logically consistent picture of market behavior in which discount-rate changes explain an important fraction of aggregate stock market movements.

The paper proceeds as follows. Section 2 provides further background for our study. Section 3 describes the data and the time-series properties of aggregate earnings, and Section 4 studies the simple relation between returns and earnings. 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 reaction to firms' earnings announcements; (2) a growing behavioral asset-pricing literature; (3) research on the correlation 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 that stock returns are predictable 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 but continue to drift in the same direction for three quarters, then partially reverse in quarter four. Bernard and Thomas (1990), for example, study earnings announcements from 1974 – 1986. They rank stocks each quarter based on unexpected earnings and track returns on the top and bottom deciles for the subsequent two years. Over three quarters, the top decile outperforms the bottom decile by 8.1% after adjusting for risk, with abnormal returns concentrated around future earnings announcements. Chan, Jegadeesh, and Lakonishok (1996) 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 investors react slowly to public news. Bernard and Thomas (1990) offer one version of the underreaction model, arguing that investors don't understand the time-series properties of 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 consequently 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 overweight the value of their private information, and attribution bias implies that investors attribute success to superior skill but failure to bad luck. These biases together imply, according to DHS, that prices will overreact to private signals but underreact to public ones (if public news confirms private information that was received earlier, attribution bias also leads 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 patterns in market returns to help motivate their models. Bernard and Thomas don't say whether their ideas should apply to aggregate returns, but it seems reasonable to argue that investors, who can't understand the earnings process for individual firms, 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 provides a natural out-of-sample test of behavioral theories since the theories were motivated largely by firm-level evidence. 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. Under the 'naïve investor' story of Bernard and Thomas, differences in the autocorrelation of firm and aggregate earnings should lead to differences in price behavior. Empirically, however, we find that the autocorrelations are similar: aggregate earnings changes are somewhat more persistent, yet earnings surprises appear to be large and volatile. 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 firms' 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. The earnings anomaly is stronger for small firms, which tend to have higher trading costs. This finding suggests that arbitrage costs might be an important determinant of post-announcement drift. Thus, any difference between arbitrage costs at the firm and aggregate levels could lead to differences in price behavior. The existence of options and futures for market indices would seem to reduce transactions costs and short-selling restrictions, mitigating any 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. Unexpected returns must be explained by news about either cashflows or expected returns (Campbell, 1991). In an efficient market, expected returns are the same as discount rates, and it seems likely that discount-rate changes are more important for aggregate returns: 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).

Changes in discount rates complicate the return-earnings association. Fama and French (1989) argue that discount rates fluctuate over the business cycle, which suggests they will be correlated with aggregate earnings (see, also, Campbell, 1991). A negative correlation between earnings and discount rates would increase the contemporaneous return-earnings relation but reduce any lead-lag effects (i.e., without underreaction, earnings would be negatively related to future returns). A positive correlation between earnings and discount rates 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 spread between low- and high-grade bonds. Our hope is to better measure the marginal impact of an earnings surprise and to provide evidence on the correlations among earnings, prices, discount rates, and business conditions.

3. Aggregate earnings, 1970 – 2000

In this section, we describe the data and explore the time-series behavior of firm and aggregate 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 December fiscal year ends. As explained below, we scale earnings changes by either 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 earnings changes for the overall market using three methods: 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 value (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, beginning with per share numbers.[1] For descriptive purposes, we also calculate earnings yield and return on equity, E/P and E/B, in a similar fashion.

In constructing the sample, we drop approximately 40% of the firms on Compustat because their fiscal years do not end in December. We also exclude stocks with prices below $1 per share and the top and bottom 0.5% of the firms ranked by dE/P each quarter. These data restrictions are designed to reduce the impact of very small stocks and extreme observations. They are most important for the equal-weighted series and have much less impact on the aggregate and value-weighted series. The average number of stocks per quarter is 2,423, compared to an average of about 6,000 stocks on CRSP and Compustat for the same period. But even though we keep only 40% of all firms, the sample represents more than 90% of total market capitalization.

3.2. Summary statistics

Table 1 reports summary statistics for quarterly earnings, and Figures 1 and 2 (on the next two pages in the text) plot the time series of earnings levels and changes. Table 1 also reports average returns for CRSP equal- and value-weighted indices along with corresponding numbers for the sample firms.

[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.

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 a December fiscal year-end 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).

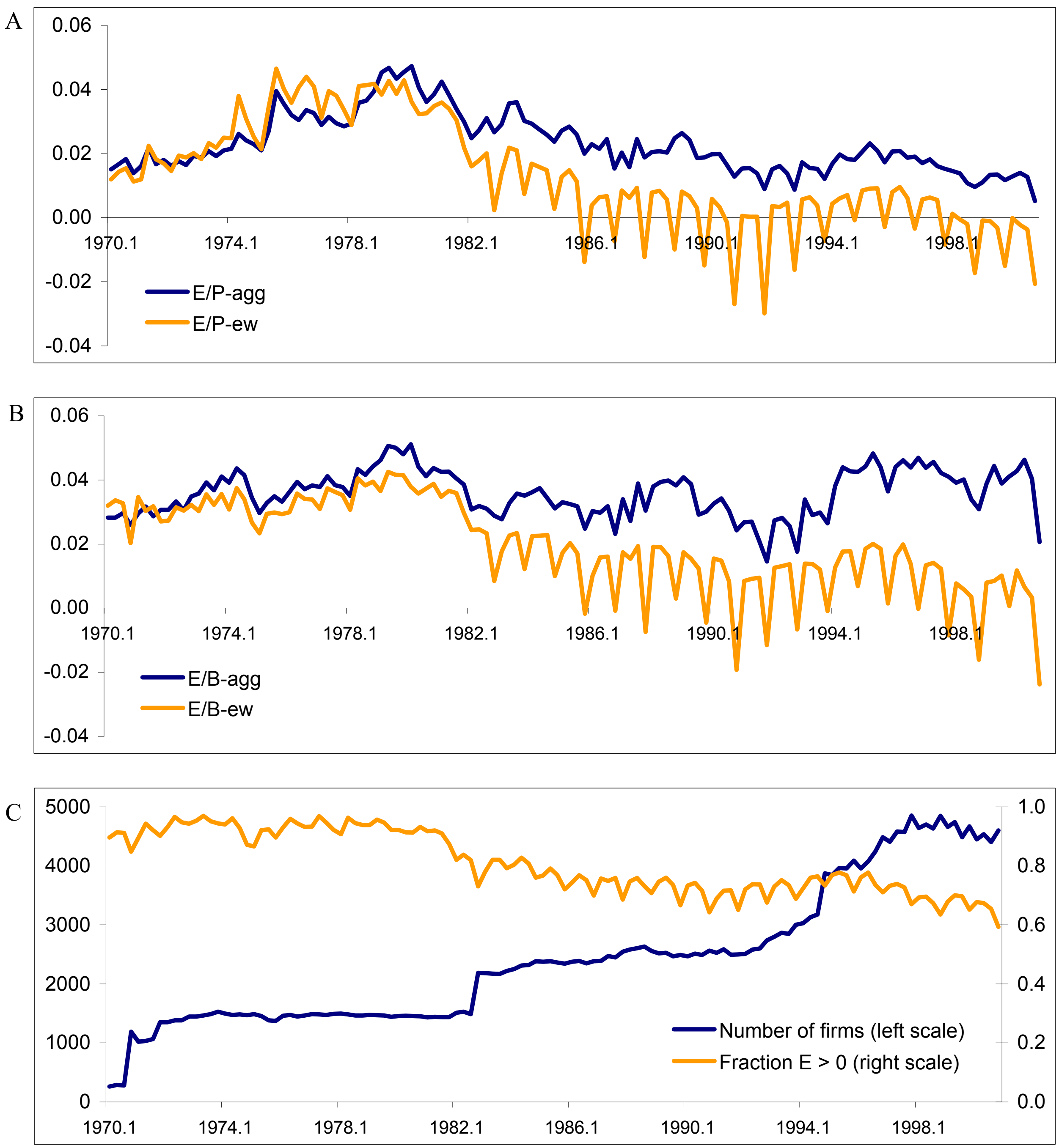
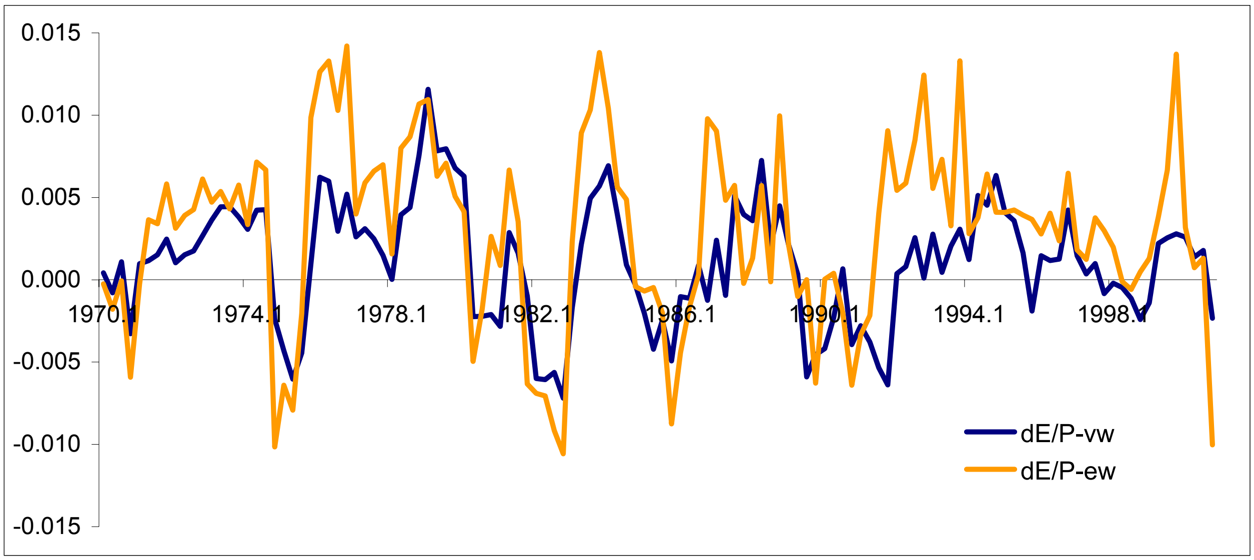


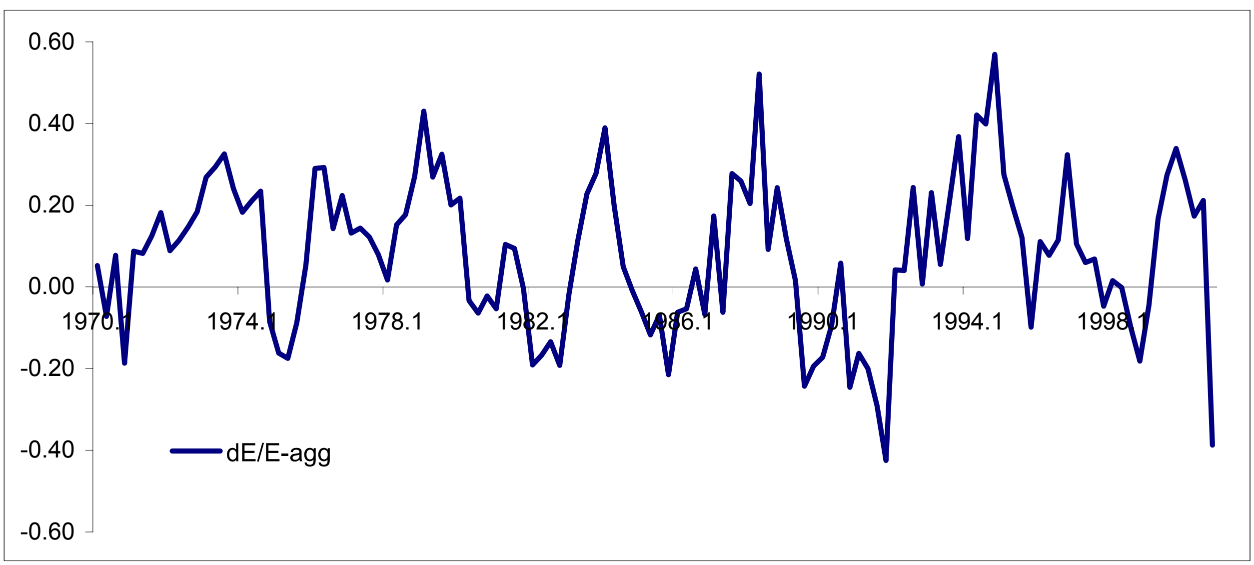
Figure 2
Change in quarterly earnings, 1970 – 2000

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 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. Panel B 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 firms in the sample. The sample consists of firms with 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



Our later tests use the CRSP index returns as our market proxy, but results are similar using returns on the sample firms. From Table 1, the average value-weighted return for the earnings sample is 3.26%, close to the average of 3.34% for the CRSP value-weighted index (correlation of 0.988). The average equal-weighted return for the earnings sample is 3.42%, somewhat lower than the average return of 3.82% for the CRSP equal-weighted index (correlation of 0.990). The difference in returns is most likely due to our exclusion of low priced stocks and extreme earnings observations.[2]

Table 1 and Figures 1 and 2 reveal several interesting facts. First, profitability from 1970 – 2000 has been fairly high. Average quarterly E/B (return on equity) is 4.14% for the value-weighted index and 1.94% for the equal-weighted index, implying annual E/B of around 8–16%. This range is quite broad but brackets plausible estimates of the equity cost of capital. Figure 1 shows that aggregate earnings yield, E/P-agg, declined throughout the 1980s and 1990s, dropping from about 4% to about 1% quarterly. Aggregate E/B also declined in the early 1980s but has since remained stable or even increased. Thus, the bull market of the 1980s and 1990s, not an increase in reporting conservatism, seems to explain most of the drop in aggregate earnings yield.

Second, small stocks have much worse earnings performance than large stocks after 1980 (see also Fama and French, 1995). In Figure 1, equal-weighted E/P and E/B are always below the aggregate series in the 1980s and 1990s. The equal-weighted indices 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 the fraction of firms with negative earnings increases from less than 10% in 1970 to about 40% in 2000. In untabulated results, we find little evidence that the time-series patterns can be attributed to the expansion of the sample in 1982 (the sample jumps from 1,490 to 2,188 firms at the end of 1982; see panel C). Firms existing prior to 1982 have earnings performance that is similar to newly-added firms.

[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, 2,216 firms have return data, compared with 2,423 firms in the earnings sample. Results throughout the paper are similar if we restrict the tests to only firms on CRSP.

Third, aggregate earnings exhibit substantial variability through time. Figure 2 plots seasonally-differenced quarterly earnings, dE, scaled by either lagged price (Panel A) or lagged earnings (Panel B). Our tests focus primarily on price-scaled measures because many firms have negative earnings, so we can't meaningfully scale by earnings for individual firms. We *can* calculate an aggregate growth rate (sum of dE divided by sum of lagged E) since aggregate earnings are positive throughout the sample. (As indicated in Table 1, portfolio earnings become negative if we look only at small stocks or only at high book-to-market stocks. We also note that aggregate net income – after extraordinary items and discontinued operations – becomes negative in 1993.)

Figure 2 shows that earnings are quite volatile, with growth rates often more than +/–20%. The time-series properties appear to be stable over the sample, and seasonal differencing does a good job eliminating seasonality in earnings. In Panel A, the scaled-price series dE/P-ew and dE/P-vw are highly correlated with each other and with the earnings growth rate in Panel B (see, also, Table 2). The equal-weighted series is most volatile. Earnings volatility will be important for our later tests because, in the regressions, power hinges on the variability of the independent variable (i.e., for a given slope coefficient, 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 are both higher for low-B/M stocks when we scale by book equity, consistent with the standard value vs. growth dichotomy. But because growth is priced so highly, 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. With the exception of the equal-weighted series, our various measures of market-level earnings changes are highly correlated with each other (see Table 2). We focus on dE/B-agg, dE/P-vw, and dE/P-ew in the remainder of the paper because their results are representative. Table 3 reports simple autocorrelations for lags 1 – 5 and multiple regression estimates including all lags together:

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

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

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 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.

Our estimates of firm-level autocorrelations are remarkably similar to those reported in prior research, notwithstanding differences in estimation methods, time periods, and data requirements (see, for example, Bernard and Thomas, 1990, table 1). From panel A, simple autocorrelations are positive at the first three lags and negative at the fourth lag: 0.38, 0.22, 0.08, and –0.28, respectively. All four are highly significant, with t-statistics greater than five in absolute value. In comparison, Bernard and Thomas 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-level earnings are more persistent than firm-level earnings but the pattern of autocorrelations is quite similar. Estimates for dE/B-agg are representative: 0.68, 0.53, 0.25, and 0.02 at the first four lags, with t-statistics of 9.72, 6.50, 2.69, and 0.16, respectively. The equal-weighted series dE/P-ew is somewhat less persistent and exhibits a small amount of reversal at lags 4 and 5. 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 don't fully understand the autocorrelation of quarterly earnings. In particular, post-announcement drift should be stronger in aggregate returns since aggregate earnings are more persistent.

In some of our 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 towards zero. If investors believe earnings follow a seasonal random walk, the earnings change equals the earnings surprise. 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. For the three earnings series, adding lags 2 – 5 increases the R^2 from an average of 0.45 to an average of 0.50. We later consider the possibility that stock returns also contain information about anticipated earnings.

4. The reaction to earnings surprises

This section explores the market's reaction to aggregate earnings surprises. Our tests mirror studies of post-announcement drift in firm returns. We confirm price drift for individual firms in our sample but find a substantial different pattern 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. Both measure the contemporaneous return-earnings association: The market learns much about a firm's performance during the measurement quarter, k = 0 (see, e.g., Ball and Brown, 1968; Foster, 1977). But earnings announcements clearly convey information to the market, so k = 1 can also be considered contemporaneous. 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, 0.53 and 0.58, are largest, not surprisingly, and close to 30 standard errors above zero. But the market also reacts strongly in quarters k = 2 and k = 3, with slopes of 0.20 (t-statistic of 10.7) and 0.09 (t-statistic of 5.24), 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 in Table 3. However, unlike Bernard and Thomas (1990), we do not observe reversals at lags 4 or 5 to match the negative autocorrelation of earnings at these lags. The difference in our results might be attributable to our use of quarterly returns rather than 3-day announcement returns, as in Bernard and Thomas.

Panel B shows tests for aggregate returns. We report results when CRSP value-weighted returns are regressed on dE/B-agg, dE/P-ew, and dE/P-vw, using either the simple earnings change or the forecast error from an AR1 model. 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 to the predictions of behavioral models. We discuss these results below.

Contemporaneous relation. Regardless of which earnings measure we use, market returns in the announcement quarter, k = 1, correlate negatively with earnings surprises. For simple earnings changes, the slopes range from –3.33 to –5.23 with t-statistics between –2.41 and –2.60. Measurement error in the earnings surprise would attenuate the slopes, so these estimates are actually conservative. Indeed, if we take out the component of the earnings change predictable from an AR1 model, the slopes for dE/B-agg and dE/P-vw nearly double and their t-statistics jump to about –3.4. We also observe negative slopes for the earnings measurement quarter, k = 0, but the estimates are not significant if we take out the AR1 component. This suggests that the k = 0 earnings change picks up the announcement effects of the prior quarter's earnings. The negative reaction in the announcement quarter is surprising and contrasts strongly with the positive reaction to firm earnings.

The slope estimates for k = 1 are economically large. Earnings explain 4–8% of quarterly returns. The standard deviation of earnings surprises from an AR1 model equals 0.45% for dE/B-agg, 0.43% for dE/P-ew, and 0.25% for dE/P-vw. Thus, a two-standard-deviation positive shock to earnings maps into a 3% – 6% decline in prices in the announcement quarter (using the slope estimates in Table 4). Historically, if earnings changes for any of the measures were in the bottom quartile of their distributions 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 plus 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.[3]

A positive correlation between earnings and discount rates is possible, though it contradicts standard intuition about movements in discount rates over the business cycle. The standard intuition is 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

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

higher interest rates, or inflation might simply lead to higher earnings in the short run since revenues should respond more quickly to inflation than (historical) accounting costs. In either case, the slope on earnings surprise in Table 4 will absorb the strong negative reaction to unexpected inflation (Fama and Schwert, 1977; Fama, 1981; Kaul, 1987). 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 the negative reaction to aggregate earnings is entirely consistent with a positive reaction to firm earnings. Discount-rate effects should be more important for aggregate returns because they are largely to be driven by macroeconomic conditions. To illustrate, consider a simple model of returns in which earnings surprises perfectly capture cashflow news:

$$UR_i = (dE_i + dE_M) - dr_M, \tag{4}$$

where UR_i is the firm's unexpected return, dE_i is the firm-specific earnings surprise, dE_M is the aggregate earnings surprise, and dr_M is discount-rate news (positive if discount rates go up). Market returns equal the cross-sectional average of (4), $UR_M = dE_M - dr_M$. Firm-specific earnings are uncorrelated with both aggregate earnings and discount-rate shocks, assumed to be entirely macroeconomic (i.e., common across firms). From (4), it is clear that the covariance between firm returns and earnings can be positive, dominated by idiosyncratic cashflow shocks, even though the aggregate covariance is negative, dominated by discount-rate shocks. In particular, the firm-level covariance is:

$$\text{cov}(UR_i, dE_i + dE_M) = \text{var}(dE_i) + \text{cov}(UR_M, dE_M). \tag{5}$$

The first term is the covariance between returns and firm-specific earnings, which is fnecessarily positive in this model. The second term is the covariance between aggregate returns and earnings, equal to $\text{var}(dE_M) - \text{cov}(dr_M, dE_M)$. The firm-level covariance can clearly be positive even if the aggregate covariance is negative.

Returns and past earnings. The second key result in Table 4, panel B, is that past earnings have little power to predict future returns – that is, there is no evidence of post-announcement drift in aggregate data. In regressions with earnings *changes*, the slopes for k = 2 – 4 are close to zero and always negative. In fact, there is modest evidence that the slopes for dE/P-ew are significantly negative. In regressions with earnings *surprises* from an AR1 regression, the slopes are again close to zero and often negative. For dE/P-ew, the slope at lag 4 is significant, with a t-statistic of –2.43. These 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 are inconsistent with Bernard and Thomas' (1990) hypothesis that investors ignore the autocorrelation structure of earnings changes. 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, earnings would be positively correlated with future returns even in the absence of any underreaction.

4.2. Robustness

The results in Table 4 are striking, so it is probably worthwhile to consider a few robustness checks. The bottom line is that we get similar results for: (i) alternative definitions of earnings changes; (ii) each of the decades 1970s, 1980s, and 1990s; (iii) annual regressions; and (iv) subsets of stocks sorted by size and B/M ratios. We also note that firm-level and aggegate tests use the same sample of firms, so their differences cannot be attributed to differences in the data.

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, using the aggregate earnings growth rate, dE/E-agg, the t-statistic is –1.85 for k = 0, –2.54 for k = 1, and between –1.0 and 0.0 for the remaining lags. We also get similar results using net income in place of earnings before extra-ordinary items (this series is negative in one quarter during the sample, so we cannot construct a continuous growth rate series).

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 for k = 1 is –2.07 for 1970 – 1979, –2.41 for 1980 – 1989, and –1.83 for 1990 – 2000. Estimates for the other series are also negative, but not as significant. There is never evidence of post-announcement drift in aggregate returns.

Annual return-earnings relation. 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. We use the same variable definitions and impose similar data requirements as in the quarterly tests. 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). For individual firms, earnings changes partially reverse over the subsequent 2 or 3 years. The autocorrelations are modest relative to those for quarterly earnings, but the statistical significance is strong, with t-statistics between –3.27 and –7.72 in the multiple regression. In contrast, aggregate earnings are close to a random walk. Earnings changes are positively autocorrelated at lag 1 and negative autocorrelated at lags 2 and 3, but the estimates aren't significant at conventional levels. Again, the evidence suggests that firm earnings contain a transitory component that is diversified away at the aggregate level. Of course, with only 31 years of data, we have limited power in the market-level regressions. 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 returns-earnings regressions, in the right-hand columns of Table 5, confirm our quarterly results. At the firm-level, returns and contemporaneous earnings are positively related, consistent with much evidence in the accounting literature. Interestingly, however, 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 in annual data.

The market-level regressions align closely with our quarterly results. Annual 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 –2.55 even though we have only 31 annual observations. Further, lagged earnings exhibit no predictive power for future annual returns. This result is potentially consistent with 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.

Small and large firms; value and glamour stocks. As a final check, Tables 6 and 7 repeat the analysis for the top and bottom terciles of stocks ranked, separately, by size and B/M. The simple autocorrelations in Table 6 have the same patterns as our earlier estimates. For individual firms, earnings changes within every subgroup are positively autocorrelated at lags 1 – 3 and negatively autocorrelated at lags 4 and 5. The estimates are nearly the same for all groups. Differences emerge when we aggregate earnings for the portfolios. Earnings changes are most persistent for the large-stock portfolio, with a first-order autocorrelation around 0.7 compared with roughly 0.4–0.5 for other portfolios. The equal-weighted earnings series for the low-B/M portfolio exhibits a strong seasonal, reflected in an anomalous autocorrelation at lag 4 of 0.53 (t-statistic of 6.98). With that as the main exception, the patterns in Table 6 are similar to evidence for the entire market.

Table 7 shows return regressions for the four groups of stocks. 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 for every group. Prices initially react most strongly for large firms, with point estimates of 0.91 and 0.77 for k = 0 and k = 1 (t-statistics of 18.0 and 16.1), compared with slopes between 0.30 and 0.50 for the other groups. The stronger reaction for large firms is rather surprising because (i) the earnings processes for the different groups are quite similar (Table 6, panel A), and (ii) we expect investors to have better prior information about large firms' earnings. Post-announcement drift is similar for all groups, 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. There is no evidence in our data that post-announcement drift is strongest in smaller or riskier firms.

The portfolio-level tests, in panel B, suggest interesting differences across groups. The large portfolio, and to a less extent the high-B/M portfolio, provides the most reliable evidence that portfolio returns and concurrent earnings are negatively correlated. The slopes for the large portfolio are significantly negative for both k = 0 and k = 1, with t-statistics between –1.94 and –2.71. In terms of a lead-lag relation, the small portfolio provides the only evidence that earnings predict future returns. The slope at lag 4 is significantly negative for two earnings measures, dE/P-ew and dE/P-vw, with t-statistics of –3.07 and –2.36. The t-statistics for the other portfolios are almost always between –1 and 1. These results are generally consistent with our market-level regressions.

The portfolio-level evidence suggests several conclusions. First, earnings are most persistent for the large-stock portfolio (Table 6), yet the market reacts most negatively to its earnings news (Table 7). This combination is puzzling from a cashflow-news perspective; it suggests that large-stock earnings are most 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. It is also consistent with Bernard and Thomas' (1990) naïve-expectations model since earnings changes are weakly negatively autocorrelated at this lag. The problem for their story is that none of our other results line up with it.

5. Earnings surprises, business conditions, and discount rates

The tests above establish two key results: (i) aggregate stock returns and concurrent earnings surprises are 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.[4] The last component has a negative sign because an increase in expected returns reduces the current price. Assume for the moment that we have a good proxy for unexpected earnings, dE_t, which implies 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. 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 equal discount rates. Thus, our empirical results suggest that unexpectedly high earnings are associated with higher discount rates. A simple story is that earnings are positively related to inflation and, hence, interest rates. On the other hand, economic intuition suggests that the risk premium should be countercyclical (Fama and French, 1989). If so, we expect earnings and discount rates to be negatively, not positively, related. Countercyclical movements in the equity

[4] 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 stock's average dividend yield. The decomposition is only approximate.

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). 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 rates.

5.2. Earnings and macroeconomic conditions

Table 8 reports correlations among aggregate earnings changes, real measures of economic activity, and several discount-rate proxies. The real activity variables include the growth rates of GDP, industrial production, and personal consumption. The discount-rate proxies include 1-year Tbill rates, the yield spread between 10-year Tbonds and 1-year Tbills (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 their movements are mechanically tied to prices (and we wish to test whether the proxies explain price changes). Finally, we include the University of Michigan's consumer sentiment index. The macroeconomic series come from the St. Louis Federal Reserve web site. 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 seasonally-differenced quarterly earnings and the macroeconomic variables. Not surprisingly, earnings are strongly correlated with 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 regressions, we find that IPROD subsumes the correlation with the other two variables.

For our purposes, the correlation between earnings and the discount-rate proxies is more important. Aggregate earnings are positively correlated with changes in Tbill rates. The estimates are close to 0.60 for the value-weighted earnings series and 0.35 for the equal-weighted series. The correlation is in the right direction, in the sense that higher earnings seem to be associated with higher discount rates. In contrast, earnings are negatively correlated with ΔTERM and ΔDEF. These correlations 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, as measured by the equal-weighted earnings series. Also, earnings are positively correlated with consumer sentiment, although the correlations are relatively weak (it is not significant for dE/P-vw). In unreported results, we find that ΔSENT is positively related to returns (0.39 in quarterly data). Thus, its correlation with earnings has the wrong sign for explaining the negative return-earnings association.

Multiple regressions. Our tests below ask whether the discount-rate proxies explain the correlation between returns and earnings. An easy way to do this test is to break earnings into two components, one 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 return regression. In the second-stage return regression, the slope on the orthogonal component is identical to the slope on earnings in a regression that directly includes ΔTBILL, ΔTERM, and ΔDEF; 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. We include an AR1 term to soak up any residual autocorrelation remaining after controlling for discount rates. The regressions show that ΔTBILL and ΔDEF subsume the 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 methods. 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.

Discount rate levels vs. changes. The discussion above focuses on the correlation between earnings and discount-rate *changes*, or shocks. It is also possible that earnings are correlated with the ex ante level of discount rates. The distinction between the two is critical, as seen most easily using eq (6): $R_t = r_t + \eta_{d,t} - \eta_{r,t}$. Here, r_t is the ex ante discount rate and $\eta_{r,t}$ captures the price effect of a discount-rate shock. To explain a negative correlation with returns, earnings could either be negatively correlated with discount-rate levels or positively correlated with discount-rate shocks. The economic interpretation of our results clearly depends on which is true.

We believe the results tell us principally about earnings' correlation with discount-rate shocks, not levels. First, to the extent that dE_t equals *unexpected* earnings, it must be uncorrelated with r_t. The time-series properties of earnings suggest, in fact, that a large fraction of dE_t is probably unexpected: it is quite volatile and time-series models explain only half of its variability (Table 3). Moreover, if we take out the predictable component to get a better proxy for unexpected earnings, the negative correlation with returns becomes stronger (Table 4). This suggests that the unexpected component – which can only be correlated with discount-rate shocks – drives the results.

Also, earnings surprises explain a substantial fraction of quarterly and annual returns: 4% to 8% of quarterly returns and 10% to 20% of annual returns (see Tables 4 and 5). The explanatory power seems too large to be driven by the ex ante discount rate. We noted earlier, for example, that stock prices increase 6.5% in quarters with negative earnings growth and only 1.9% otherwise. The large spread, in our view, simply cannot be attributed to higher ex ante expected returns in quarters with negative earnings growth; instead, it seems much more likely to reflect the arrival of new information during the quarter – again, consistent with our focus on discount-rate shocks, not levels.

Finally, we directly test whether the ex ante level of our discount-rate proxies is important. In particular, we modify the first-stage regressions (dE regressed on changes in the discount-rate proxies) to include lagged values of TBILL, TERM, and DEF. The lagged variables are known at the beginning of the earnings measurement quarter. In the modified regressions, lagged TBILL, TERM, and DEF have little correlation with dE after controlling for contemporaneous changes in the variables and the AR1 term; the t-statistics on the lagged levels are between –1.14 and 0.93. Also, including the lagged levels has little impact on the second-stage return regressions (described below). For robustness, we also test whether lagged changes in the proxies might be important, where the change is measured over the three quarters prior to the earnings quarter (i.e., we break the annual change in Table 8 into a three-quarter change prior to the quarter and a contemporaneous quarterly change). In the first-stage regressions, lagged changes are, in fact, significantly correlated with dE; the slope on lagged ΔDEF is significantly negative, with t-statistics around –3.0, and the slope on ΔTBILL is marginally positive, with t-statistics between 0.0 and 2.0. However, as detailed below, our key results in the second-stage return regressions are unaffected. In short, we recognize that discount-rate levels could be important, but the evidence suggests that discount-rate shocks are more likely to explain our results.

5.3. Returns, earnings, and discount rates

Table 9 reports the second-stage regressions of market returns on current and past earnings changes. As discussed above, earnings changes are broken into two components. The first is the projection of earnings on the discount-rate proxies and AR1 term ('Fitted dE/S'), and the second is the orthogonal component ('Residual dE/S'). The slope on Residual dE/S measures the marginal impact of an earnings surprise.

The table shows that the discount-rate proxies only partially explain why the market reacts negatively to good earnings news. Returns in the earnings measurement quarter, k = 0, are positively correlated with Residual dE/S, but only the slope for the equal-weighted earnings series is significant. More striking, returns in the announcement quarter, k = 1, remain negatively correlated with earnings. The slope on Residual dE/S is significant for both dE/B-agg and dE/P-vw, with t-statistics of –2.97 and –2.84. We find similar results for alternative specifications of the discount-rate shock. For example, the t-statistics at k = 1 are –3.12. –1.53, and –2.86 for dE/B-agg, dE/P-ew, and dE/P-vw, respectively, if the first-stage regressions use ΔTBILL, ΔTERM, and ΔDEF in the announcement quarter (rather than the measurement quarter).[5] Thus, the discount-rate proxies do not fully explain the negative correlation between returns and earnings.

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

Table 10 shows two key results. First, in annual data, movements in discount rates seem to explain the concurrent return-earnings association. The slope estimates 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 (Table 5). Thus, prices seem to react negatively to higher annual earnings because they come with higher interest rates. But the point estimates on Residual dE/S remain negative, which suggests that the effects of discount-rate news are not fully removed.

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 1.80) and dE/P-vw (t-statistic of 2.29). The estimate for dE/P-vw is economically quite large. A two-standard-deviation

[5] If the first-stage regressions use annual changes in TBILL, TERM, and DEF, as shown in Table 8, the t-statistics are –2.11, –1.14, and –1.97, respectively. If we separately include the prior three-quarter change and contemporaneous quarterly change, the t-statistics are –2.11, -1.01, and –1.94, respectively.

increase in Residual dE/P-vw (2×0.86), maps into a 13.3% increase in expected return. In fact, Residual dE/P-vw explains more than 11% of the variation in next year's return. These results provide the first evidence that aggregate prices might underreact to earnings news. However, the results are also consistent with our argument that high earnings are associated with higher discount rates. In this interpretation, earnings move with discount-rate changes not captured by our proxies.[6]

6. Conclusions

The overall message from our analysis is, in some ways, quite simple: the market's reaction to aggregate earnings is much different than the 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 returns. 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 behavioral models are incomplete: they provide little guidance to understand why firm and aggregate price behavior should differ. Put differently, despite recent attempts, we still do not have behavioral models that provide a general description of price behavior.

Our results also provide interesting evidence on the connections among prices, earnings, discount rates, and business conditions. We find a strong – economically and statistically – negative price reaction to aggregate earnings news. This finding suggests that unexpectedly high earnings are associated with higher discount rates, at least over the fairly short horizons we study. Aggregate earnings are strongly correlated with macroeconomic conditions, including measures of real activity and proxies for discount rates (Tbill rates, the term spread, and the default premium). However, the discount-rate proxies only partially explain the market's negative reaction to earnings news. Thus, the results suggest that discount-rate shocks not captured by our proxies explain a significant fraction of returns (see, also, Fama 1990;

[6] We should 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 1.29, 0.86, and 1.31 for the three earnings series).

Campbell, 1991). The evidence is inconsistent with asset-pricing models which say 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 corporate earnings from 1970 – 2000. The variables are measured quarterly for each portfolio; the table reports the time-series average and standard deviation of the portfolio numbers (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 averages of firm ratios; the ratio is calculated for each firm, then averaged. The 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 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.	2,423	3.26	3.42	2.29	3.59	0.15	0.25	8.26	2.10	4.14	0.10	1.30	1.94	0.30
std. dev.	1,163	8.38	11.40	0.91	0.72	0.39	0.59	18.58	0.84	0.72	0.36	1.68	1.41	0.55
Small														
avg.	808	3.48	3.85	1.22	0.60	0.42	0.39	--	0.48	0.33	0.56	0.04	-0.12	0.86
std. dev.	388	14.10	14.81	2.98	2.62	1.18	1.14	--	2.44	2.40	0.90	2.79	2.64	1.13
Large														
avg.	808	3.24	3.22	2.32	3.76	0.14	0.25	7.90	2.14	4.30	0.10	2.07	3.45	0.08
std. dev.	388	8.22	9.22	0.88	0.71	0.37	0.58	17.60	0.81	0.77	0.35	0.94	0.77	0.38
Low B/M														
avg.	808	2.89	2.35	1.78	5.42	0.17	0.54	12.11	1.71	5.58	0.16	0.63	2.07	0.60
std. dev.	388	9.52	13.34	0.71	0.88	0.23	0.73	16.69	0.68	1.05	0.22	1.55	2.55	0.69
High B/M														
avg.	808	4.31	4.43	3.27	2.36	0.19	0.11	--	2.56	2.19	0.09	1.22	1.10	0.22
std. dev.	388	8.91	11.72	1.70	0.94	1.13	0.81	--	1.49	0.88	1.02	2.40	1.34	1.21

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

This table reports correlations among various measures of seasonally-differenced aggregate quarterly earnings, 1970 – 2000. 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, identified by '-agg', equal the sum of the numerator divided by the sum of the denominator for firms in the sample. Equal- and value-weighted numbers, identified by '-ew' and '-vw,' are averages of firm ratios. The 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 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	0.935	0.910	0.992	0.713
dE/B-agg		1	0.986	0.940	0.670
dE/E-agg			1	0.920	0.658
dE/P-vw				1	0.713
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. 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. Aggregate earnings changes 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 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.

		Simple regressions			Multiple regressions		
	Lag	Slope	T-stat	Adj. R^2	Slope	T-stat	Adj. R^2
Panel A: Individual firms							
dE/P	1	0.38	18.48	--	0.40	18.39	--
	2	0.22	14.58	--	0.14	11.20	
	3	0.08	5.67	--	0.06	6.47	
	4	-0.28	-16.82	--	-0.42	-22.83	
	5	-0.11	-7.03	--	0.16	12.93	
Panel B: Aggregate							
dE/B-agg	1	0.68	9.72	0.43	0.64	6.33	0.50
	2	0.53	6.50	0.25	0.32	2.72	
	3	0.25	2.69	0.05	-0.19	-1.57	
	4	0.02	0.16	-0.01	-0.27	-2.34	
	5	-0.07	-0.78	-0.00	0.10	0.98	
dE/P-ew	1	0.64	8.81	0.39	0.61	6.33	0.43
	2	0.40	4.62	0.14	0.11	1.05	
	3	0.14	1.49	0.01	0.00	0.01	
	4	-0.15	-1.62	0.01	-0.30	-2.76	
	5	-0.21	-2.26	0.03	0.04	0.40	
dE/P-vw	1	0.73	11.54	0.52	0.73	7.75	0.57
	2	0.52	6.65	0.26	0.22	1.93	
	3	0.23	2.55	0.04	-0.22	-1.92	
	4	-0.00	-0.03	-0.01	-0.18	-1.62	
	5	-0.12	-1.30	0.01	0.07	0.80	

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 = 5 quarters in the future (k = 0 is the quarter for which earnings are measured; k = 1 is the quarter that earnings are announced). 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. Bold denotes estimates that are significant at a two-sided 10% level or stronger.

		Earnings change[a]			Earnings surprise[a]		
	k	Slope	T-stat	Adj. R^2	Slope	T-stat	Adj. R^2
Panel A: Individual firms							
dE/P	0	**0.53**	26.94	--	**0.42**	22.63	--
	1	**0.58**	28.70	--	**0.61**	29.92	--
	2	**0.20**	10.66	--	**0.20**	10.84	--
	3	**0.09**	5.24	--	**0.11**	6.82	--
	4	0.00	0.03	--	0.02	1.20	--
Panel B: Aggregate							
dE/B-agg	0	**-2.42**	-1.82	0.02	-0.52	-0.30	0.03
	1	**-3.33**	-2.46	0.04	**-6.33**	-3.49	0.08
	2	-0.26	-0.19	-0.01	0.55	0.29	-0.01
	3	-0.72	-0.53	-0.01	-0.04	-0.02	-0.01
	4	-0.98	-0.73	0.00	-2.06	-1.09	-0.01
dE/P-ew	0	-1.30	-0.90	0.00	1.54	0.85	0.04
	1	**-3.75**	-2.60	0.05	**-3.70**	-2.04	0.05
	2	**-2.81**	-1.97	0.02	-3.03	-1.65	0.01
	3	-1.36	-0.95	0.00	1.15	0.63	0.03
	4	**-3.14**	-2.23	0.03	**-4.48**	-2.43	0.03
dE/P-vw	0	**-4.98**	-2.31	0.03	-2.59	-0.83	0.04
	1	**-5.23**	-2.41	0.04	**-10.10**	-3.34	0.07
	2	-0.80	-0.37	-0.01	0.51	0.16	-0.01
	3	-1.34	-0.63	-0.01	-1.41	-0.45	-0.01
	4	-0.90	-0.42	-0.01	-3.05	-0.97	-0.01

[a] Earnings change is the actual value of dE/P or dE/B. Earnings surprise is the forecast error from an AR(1) regression. The slope is estimated by including a lag of dE/P or dE/B in the regressions; the adj. R^2 measures the joint explanatory power of the two lags.

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.

		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							**0.56**	18.61	--	**0.62**	16.85	--
	1	**-0.16**	-5.90	--	**-0.21**	-7.72	--	0.03	1.16	--	0.03	1.21	--
	2	**-0.11**	-2.92	--	**-0.18**	-5.00		-0.00	-0.12	--	0.01	0.15	--
	3	-0.04	-1.44	--	**-0.07**	-3.27		0.01	0.34	--	0.01	0.21	--
Panel B: Aggregate													
dE/B-agg	0							**-3.56**	-2.38	0.13	**-3.72**	-2.44	0.15
	1	0.18	1.01	0.00	0.17	0.92	0.02	1.61	1.01	0.00	1.34	0.79	-0.02
	2	-0.13	-0.72	-0.02	-0.11	-0.60		1.58	0.96	0.00	0.97	0.57	-0.02
	3	-0.30	-1.68	0.06	-0.25	-1.37		1.72	1.06	0.00	1.41	0.84	-0.05
dE/P-ew	0							**-3.54**	-2.49	0.15	**-3.39**	-2.27	0.10
	1	0.15	0.86	-0.01	0.15	0.80	-0.05	0.53	0.34	-0.03	0.20	0.12	-0.03
	2	-0.10	-0.56	-0.02	-0.11	-0.56		1.69	1.07	0.01	1.23	0.74	-0.04
	3	-0.15	-0.80	-0.01	-0.11	-0.57		0.94	0.59	-0.02	0.18	0.11	-0.07
dE/P-vw	0							**-5.33**	-2.55	0.15	**-5.25**	-2.53	0.18
	1	0.07	0.42	-0.03	0.05	0.28	-0.02	2.81	1.26	0.02	2.69	1.15	-0.01
	2	-0.13	-0.74	-0.01	-0.12	-0.64		1.23	0.53	-0.03	0.74	0.31	-0.05
	3	-0.25	-1.41	0.03	-0.23	-1.26		1.67	0.73	-0.02	1.15	0.50	-0.07

[a] Earnings change is the actual value of dE/P or dE/B. Earnings surprise is the forecast error from an AR(1) regression. The slope is estimated by including a lag of dE/P or dE/B in the regressions; the adj. R^2 measures the joint explanatory power of the two lags.

Table 6
Size and B/M portfolios: Autocorrelation of quarterly earnings, 1970 – 2000

This table reports autocorrelations of seasonally-differenced quarterly earnings for (1) small and large stocks, defined as the bottom and top terciles of firms ranked by market capitalization, and (2) low and high B/M stocks, defined as the bottom and top terciles of firms ranked by the ratio of book equity (B) to market equity (P). E is earnings before extraordinary items; dE is seasonally-differenced earnings, equal to earnings this quarter minus earnings four quarters ago. The denominator in all ratios is lagged four quarters. The portfolio variables are measured three ways: dE/B-agg equals the sum of dE divided by the sum of B for all firms in the portfolio; 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 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			Large			Low B/M			High BM		
	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	1	**0.38**	15.29	--	**0.38**	17.66	--	**0.43**	15.18	--	**0.37**	15.19	--
	2	**0.21**	10.22	--	**0.22**	12.47	--	**0.25**	11.30	--	**0.21**	11.10	--
	3	**0.06**	2.32	--	**0.11**	5.94	--	**0.08**	2.14	--	**0.08**	4.36	--
	4	**-0.34**	-17.29	--	**-0.22**	-10.75	--	**-0.24**	-11.05	--	**-0.37**	-16.22	--
	5	**-0.12**	-6.72	--	**-0.09**	-4.85	--	**-0.08**	-4.52	--	**-0.12**	-6.00	--
Panel B: Portfolios													
dE/B-agg	1	**0.41**	4.77	0.15	**0.69**	10.08	0.45	**0.42**	4.87	0.16	**0.45**	5.47	0.19
	2	**0.25**	2.74	0.05	**0.52**	6.41	0.25	**0.32**	3.49	0.08	**0.43**	5.09	0.17
	3	0.09	0.94	0.00	**0.28**	3.15	0.07	0.05	0.56	-0.01	**0.18**	1.91	0.02
	4	**-0.18**	-1.91	0.02	0.07	0.71	0.00	**-0.21**	-2.25	0.03	0.00	-0.03	-0.01
	5	**-0.17**	-1.73	0.02	-0.03	-0.32	-0.01	-0.04	-0.45	-0.01	-0.03	-0.31	-0.01
dE/P-ew	1	**0.44**	5.29	0.18	**0.66**	9.32	0.41	**0.19**	2.09	0.03	**0.54**	6.84	0.27
	2	**0.28**	3.12	0.07	**0.53**	6.66	0.26	0.13	1.49	0.01	**0.40**	4.61	0.14
	3	0.08	0.82	0.00	**0.25**	2.80	0.05	-0.02	-0.22	-0.01	**0.18**	1.94	0.02
	4	0.01	0.07	-0.01	0.02	0.17	-0.01	**0.53**	6.98	0.29	0.01	0.11	-0.01
	5	-0.14	-1.49	0.01	-0.09	-1.02	0.00	-0.01	-0.08	-0.01	-0.15	-1.61	0.01
dE/P-vw	1	**0.50**	6.14	0.23	**0.73**	11.58	0.52	**0.52**	6.72	0.27	**0.51**	6.46	0.25
	2	**0.34**	3.81	0.10	**0.51**	6.48	0.25	**0.36**	4.24	0.12	**0.38**	4.52	0.14
	3	0.13	1.36	0.01	**0.24**	2.75	0.05	**0.16**	1.74	0.02	0.05	0.57	-0.01
	4	-0.07	-0.74	0.00	0.03	0.29	-0.01	-0.04	-0.47	-0.01	**-0.17**	-1.88	0.02
	5	-0.14	-1.49	0.01	-0.09	-0.93	0.00	0.02	0.20	-0.01	**-0.19**	-2.08	0.03

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

This table reports slope estimates from the regression $R_{t+k} = \alpha + \beta\ dE/S_t + e_{t+k}$, where dE is seasonally-differenced quarterly 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 5 quarters in the future (k = 0 is the quarter for which earnings are measured). The table reports estimates for (1) small and large stocks, defined as the bottom and top terciles of firms ranked by market equity, and (2) low and high B/M stocks, defined as the bottom and top terciles of firms ranked by B/P. The portfolio variables 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 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.

		Small			Large			Low B/M			High BM		
	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	**0.31**	19.95	--	**0.91**	17.99	--	**0.51**	15.17	--	**0.36**	22.98	--
	1	**0.41**	20.40	--	**0.77**	16.12	--	**0.51**	15.84	--	**0.45**	22.80	--
	2	**0.14**	9.49	--	**0.20**	4.16	--	**0.20**	7.53	--	**0.15**	8.78	--
	3	**0.06**	4.15	--	**0.10**	2.13	--	**0.09**	3.06	--	**0.08**	4.13	--
	4	-0.02	-1.35	--	0.04	0.77	--	-0.02	-0.53	--	0.01	0.40	--
Panel B: Portfolios													
dE/B-agg	0	0.13	0.12	-0.01	**-2.55**	-2.03	0.03	-0.88	-0.75	0.00	-0.59	-0.60	-0.01
	1	-0.08	-0.07	-0.01	**-2.76**	-2.15	0.03	-1.78	-1.45	0.01	-1.24	-1.24	0.00
	2	-1.30	-1.14	0.00	0.07	0.05	-0.01	1.13	0.96	0.00	-0.23	-0.23	-0.01
	3	0.02	0.01	-0.01	-0.78	-0.61	-0.01	-1.26	-1.10	0.00	-0.12	-0.12	-0.01
	4	-1.69	-1.48	0.01	-0.88	-0.69	0.00	0.13	0.12	-0.01	0.06	0.06	-0.01
dE/P-ew	0	-0.06	-0.06	-0.01	**-3.78**	-1.94	0.02	0.56	0.45	-0.01	-0.13	-0.20	-0.01
	1	0.02	0.02	-0.01	**-5.32**	-2.71	0.05	1.03	0.83	0.00	**-1.68**	-2.49	0.04
	2	-1.56	-1.39	0.01	-1.75	-0.89	0.00	0.17	0.14	-0.01	-0.63	-0.94	0.00
	3	-1.05	-0.94	0.00	-1.37	-0.71	0.00	-1.30	-1.11	0.00	0.08	0.12	-0.01
	4	**-3.34**	-3.07	0.07	-0.84	-0.43	-0.01	-1.55	-1.33	0.01	-0.81	-1.20	0.00
dE/P-vw	0	0.20	0.14	-0.01	**-4.84**	-2.32	0.03	-4.16	-1.07	0.00	-0.37	-0.47	-0.01
	1	-1.09	-0.75	0.00	**-4.36**	-2.07	0.03	-4.60	-1.17	0.00	**-1.36**	-1.72	0.02
	2	-1.87	-1.32	0.01	-0.31	-0.15	-0.01	3.09	0.83	0.00	-0.44	-0.56	-0.01
	3	-0.82	-0.58	-0.01	-1.50	-0.73	0.00	-4.07	-1.11	0.00	-0.43	-0.55	-0.01
	4	**-3.28**	-2.36	0.04	-0.99	-0.48	-0.01	1.28	0.35	-0.01	-0.36	-0.45	-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 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	0.571	0.349	0.598	0.487	0.265	0.497
ΔTERM	-0.463	-0.347	-0.523	-0.454	-0.332	-0.522
ΔDEF	-0.332	-0.585	-0.371	-0.423	-0.662	-0.494
ΔSENT[b]	0.200	0.365	0.131	0.258	0.392	0.202
GDP[a]	0.441	0.400	0.538	0.591	0.608	0.668
IPROD	0.599	0.673	0.652	0.666	0.717	0.744
CONS[a]	0.333	0.291	0.421	0.475	0.526	0.524
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**	0.04	**0.04**	**0.07**	0.02	**0.03**
	(3.24)	(1.39)	(2.72)	(2.41)	(0.73)	(1.78)
ΔTERM	0.03	0.00	-0.01	0.02	-0.01	-0.02
	(0.60)	(0.09)	(-0.29)	(0.36)	(-0.23)	(-0.69)
ΔDEF	**-0.34**	**-0.55**	**-0.22**	**-0.39**	**-0.64**	**-0.26**
	(-3.39)	(-4.95)	(-3.96)	(-3.85)	(-5.70)	(-4.79)
dE_{t-1}	**0.48**	**0.39**	**0.53**	**0.50**	**0.35**	**0.53**
	(6.10)	(4.62)	(7.53)	(6.42)	(4.29)	(7.71)
Adj. R^2	0.52	0.49	0.61	0.52	0.53	0.62
Adj. R^2 without AR1	0.38	0.41	0.44	0.36	0.46	0.43

[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:

$R_{t+k} = \alpha + \beta$ Fitted(dE/S_t) + γ 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 5 quarters in the future (k = 0 is the quarter for which earnings are measured; k = 1 is the quarter that earnings are announced). 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	**-6.30**	-3.45	1.41	0.77	0.08
	1	-1.37	-0.76	**-5.77**	-2.97	0.06
	2	-1.93	-1.05	1.76	0.89	0.00
	3	-1.14	-0.61	-0.20	-0.10	-0.01
	4	-0.17	-0.09	-1.85	-0.93	-0.01
dE/P-ew	0	**-6.86**	-3.44	**3.57**	1.89	0.10
	1	**-5.01**	-2.51	-3.02	-1.55	0.05
	2	-2.93	-1.45	-2.44	-1.23	0.01
	3	**-4.20**	-2.09	1.47	0.75	0.02
	4	-1.55	-0.76	**-4.53**	-2.28	0.03
dE/P-vw	0	**-9.08**	-3.27	0.76	0.23	0.07
	1	-2.58	-0.95	**-9.27**	-2.84	0.05
	2	-2.84	-1.02	2.30	0.69	0.00
	3	-1.09	-0.39	-1.65	-0.49	-0.01
	4	0.29	0.10	-2.53	-0.75	-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	**-4.27**	-2.02	-2.21	-0.97	0.09
	1	-0.86	-0.38	**4.42**	1.80	0.04
	2	2.05	0.86	0.38	0.15	-0.05
	3	1.00	0.43	1.51	0.61	-0.06
dE/P-ew	0	**-4.49**	-2.03	-2.30	-1.15	0.11
	1	-0.64	-0.26	1.29	0.58	-0.06
	2	2.19	0.88	0.71	0.32	-0.04
	3	1.11	0.45	-0.27	-0.13	-0.07
dE/P-vw	0	**-5.86**	-2.04	-3.97	-1.23	0.11
	1	-1.19	-0.40	**7.74**	2.29	0.11
	2	2.95	0.91	-1.75	-0.48	-0.04
	3	1.41	0.44	0.71	0.20	-0.07