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The disappearing abnormal returns to a fundamental signal strategy

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Abstract

Purpose – The purpose of this paper is to examine whether abnormal returns to a fundamental signal (FS) strategy disappear after the publication of Abarbanell and Bushee (1998).
Design/methodology/approach – Using data on NYSE/AMEX firms from 1974 to 2012, this research estimates annual Fama and MacBeth (1973) cross-sectional regression of risk-adjusted buy-and-hold returns on the FSs after controlling for contemporaneous earnings changes and a proxy for market risk.
Findings – This paper finds that predictable hedge returns to the FSs substantially decrease and become statistically insignificant after the Abarbanell and Bushee's publication date. This research also finds that the FSs have not lost their importance to equity valuation process; value relevance of the FSs has not diminished, and the FSs have retained their predictive ability over time. The evidence on changing information and trading environments appears to contribute to the disappearing abnormal returns to a FS strategy.
Originality/value – This paper adds to the growing body of literature on the persistence of pricing anomalies.

Keywords Value relevance, Market efficiency, Fundamental analysis, Return anomalies
Paper type Research paper

1. Introduction

The relation between accounting information and investor behavior that creates predictability in stock returns has been of central importance to both academics and practitioners, and this area of research will continue to develop over time as investor behavior evolves (Ball and Brown, 1968; Kothari, 2001). Given the substantial amount of time and efforts devoted by the investment community on a fundamental analysis, there is a need for more research on the actual value of fundamental signals (FSs) and on how investors use this information. It is incumbent on the research field to periodically measure how these signals affect investors' decisions (Schwert, 2003; Green *et al.*, 2011; Bebchuk *et al.*, 2013). In an influential survey article, Schwert (2003) points out a decline in hedge returns to various return predictive signals in recent years by noting that "after they are documented and analyzed in the academic literature, anomalies often seem to disappear, reverse, or attenuate" (p. 939).

Following the FS literature beginning with Lev and Thiagarajan (1993, hereafter LT), Abarbanell and Bushee (1997, hereafter AB1), and Abarbanell and Bushee (1998, hereafter AB2), we examine whether predictable abnormal returns to a FS strategy disappear after the publication of research that notes the pricing anomaly. Specifically, AB2 implement a zero-investment portfolio strategy based on a variation of the 12 signals originally used in LT and find economically meaningful and statistically significant abnormal returns to the fundamental-based trading strategy. It is important to revisit the findings of the fundamental

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analysis literature because the FS-based trading strategy requires arbitrageurs to collect and process a large quantity of financial statement information. Further, the fundamental analysis typically involves a relatively sophisticated understanding of the economic intuition underlying each FS with in-depth knowledge about industry prospects and macroeconomic conditions (Palepu and Healy, 2013; Penman, 2013). Prior studies also show that information processing costs can hinder arbitrageurs from fully taking advantage of abnormal profit opportunities (Hirshleifer and Teoh, 2003). These factors likely contribute to the persistence of the abnormal returns to a FS strategy over time. However, the findings in the recent literature (e.g. Green *et al.*, 2011) suggest that the FSs can be expected at some point to cease to generate abnormal profits as the signals' relevance to firm value and information content on future operating performance become fully impounded into stock prices.

Our research begins with a replication of the investment strategy of AB2 using their sample period (i.e. 1974-1988; 15 years) and brings the sample period forward to include the period after the publication of AB2 (i.e. 1998-2012; 15 years)[1]. Our analysis shows that the FS-based abnormal returns become statistically and economically insignificant in the recent time period. Although our findings suggest temporal attenuation of abnormal returns to FSs, the decline in hedge returns over time may be due to the FSs losing their importance to investors' equity valuation. Specifically, according to AB2, a necessary condition for earning an abnormal return is that the FSs contain useful information about firm value (i.e. value relevance) or future operating performance (i.e. predictive content) that will be eventually incorporated into prices but are not immediately priced by investors. To rule out these alternative explanations, we examine inter-temporal changes in value relevance and predictive content of the FSs (Collins *et al.*, 1997; Lev and Zarowin, 1999). We find that neither value relevance nor the predictive content of the FSs has diminished over time. These results suggest that our findings are not driven by time-series changes in value relevance or the ability of FSs to predict future earnings growth.

We further examine temporal changes in a firm's information as well as trading environments (Hand, 1990; Bhushan, 1994; Bartov *et al.*, 2000; Sadka, 2006). We find a significant increase in institutional ownership with more institutional investors holding our sample firms on which the fundamental strategy takes a portfolio position. Also, we find that firms traded by the fundamental strategy experienced approximately a four-fold (an 11-fold) increase in stock turnover (liquidity) in recent years. These changing information and trading environments appear, at least in part, to explain the disappearance of abnormal returns to a FS strategy.

The remainder of this paper proceeds as follows. Section 2 reviews previous research on the FSs and abnormal return persistence, and develops our empirical hypothesis. In Section 3, we describe our sample, define the FSs, and detail the research design. Section 4 presents empirical test results. Section 5 provides concluding remarks.

2. Previous literature and hypothesis development

In a seminal survey article, Schwert (2003) examines whether anomalies in return data go away due to the publication of papers that document these anomalies, which in turn causes investors to shift their behavior to take advantage of this information. He finds temporal attenuation in abnormal returns to market capitalization, valuation ratios, dividend yield, and small firms' turn-of-the-year effects. For example, there was a lot of research on anomalies for small cap firms for the time period 1936-1975, and this anomaly substantially decreased shortly after the publishing of these papers (e.g. Banz, 1981). Green *et al.* (2011) find that accrual-based trading strategy ceased to generate meaningful abnormal profits in recent years, which is consistent with expert traders (e.g. hedge funds) actively basing their trading position by reflecting accounting accruals information. Bebchuk *et al.* (2013) examine the existence of investor learning effects on abnormal returns from tracking the quality of firm governance. They find that the 1990s displayed significant abnormal returns

associated with whether a company had good corporate governance or bad corporate governance, but this result did not carry into the 2000s. Chordia *et al.* (2014) find that various return anomalies become attenuated in recent periods and attribute these results to increased investor arbitrage activity. Finally, McLean and Pontiff (2016) investigate post-publication returns of 97 return predictive signals from 79 different papers. They find that post-publication returns decrease drastically relative to the in-sample returns.

Focusing on "key value-drivers" that analysts view as being important for determining the value of securities, LT identify a list of fundamental information signals used by analysts and show that these signals contain value relevance. AB1 extend this line of research by showing that, although information contained in the fundamental analysis predicts future earnings growth, analysts underreact to the FSs apparent in financial statements. Specifically, AB1 use nine FSs (i.e. inventory, accounts receivable (AR), capital expenditures (CAPX), gross margin, selling and administrative expenses, effective tax rate, earnings quality, audit qualification, and labor force) often seen in analysts' reports and other financial statement analysis materials, which are a variation of the 12 signals originally used in LT. AB1 find that the analysts' revisions underreact to the FSs, which suggests that analysts are inefficient in that they do not fully utilize information contained in the FSs on a timely basis.

To formally test whether investors fully incorporate information contained in the FSs about future earnings, AB2 create a zero-investment long/short trading strategy that exploits the nine FSs. Using annual cross-sectional regression of one-year ahead risk-adjusted stock returns in the spirit of Fama and MacBeth (1973) over the period 1974-1988, AB2 find that a FS-based trading strategy yields economically significant abnormal returns, which demonstrates a delay in investor reactions to exploitable information reflected in the FSs.

Subsequent research extends the literature by using a subset of the FSs introduced by LT and/or using a context-specific setting. For example, Thomas and Zhang (2002) examine the ability of inventory signals to predict future returns in relation to the accruals anomaly, while Schmidt (2006) extends the effective tax rate signal by decomposing it into quarter-by-quarter revisions. Piotroski (2000) documents that the performance of value investing (i.e. buying firms with high book-to-market ratios) can be improved by using a different set of FSs important to distressed firms (e.g. profitability, financial leverage/liquidity, and operating efficiency). He suggests that historical financial statements are especially useful for value firms as these firms are less likely to be followed by analysts. Thus, Piotroski's fundamental analysis serves as a substitutive information source to value investing[2]. In contrast, we focus on LT and AB's FSs, as identified from the content analysis of equity analysts' reports. That is, these signals are typical financial statement indicators from which analysts form their future expectations. Thus, our fundamental analysis serves as a complementary information source to investing in general.

Building on the anomaly persistence literature, we test the following hypothesis in an alternative form:

H1. Abnormal returns to the fundamental analysis strategy disappear over time after the publication of AB2.

3. Data, variable measurement, and methodology

3.1 Sample

Following AB2, we obtain financial statement and stock return data from the intersection of COMPUSTAT and CRSP. Specifically, we use firms listed in NYSE or AMEX that have a fiscal year end in December with a CRSP share code of 10 or 11 (i.e. the US domestic common stocks). To ensure that information on FSs is fully available to investors before implementing our portfolio strategy, we require firms to announce their year t earnings no later than March 31 of the following year. We include firm-year observations only if they

have sufficient daily stock return data (from CRSP) and financial statement data (from COMPUSTAT) to calculate the FSs, risk-adjusted buy-and-hold returns, and a market beta. For the AB2 time period (i.e. 1974-1988), we obtain a sample of 9,690 firm-year observations, which is very close to the sample size of 9,764 noted in AB2 over the same time period (p. 27). An identical sample selection procedure yields a sample of 7,359 firm-year observations for the post-AB2 time period (i.e. 1998-2012).

3.2 The FSs

We begin with LT's FSs, where they identify 12 FSs that analysts used to make market forecasts by reviewing several different mediums for financial analysis. AB1 took nine of LT's signals that impose less restrictive data requirements, and associate these signals with future earnings growth and analysts' earnings forecasts. To formally test whether investors understand the economic implications of the FSs, AB2 create a zero-investment portfolio strategy that uses these nine signals employed by AB1. We also use these nine FSs and summarize them in Table I.

3.3 The FS strategy

Following the methods used by AB2, we implement a FS strategy to measure the level of investor underreaction. Our analysis uses a zero-investment hedge portfolio over the 12-month period subsequent to the release of annual reports for year t. The measurement period is from 1974 to 1988 (1998 to 2012) for the AB2 (post-AB2) time period[3]. We use the FSs calculated in Section 3.2 (and also summarized in Table I), a firm's market beta, and a concurrent change in earnings as independent variables. Specifically, we use annual Fama and MacBeth (1973) cross-sectional regression methods with scaled decile ranks of independent variables. That is, we rank the values of each signal, market beta, and earnings change into deciles 0-9 by year. The rank is then divided by nine so that they range between 0 and 1 (i.e. taking a long (short) position in firms with a signal taking the value of 1(0)). To determine the weighting of each security, we use the following annual cross-sectional regression model:

$$BHAR(+m)_{i,t} = a_0 + \sum_{k=1}^{9} a_k RSIGNAL_{k,i,t} + a_{10} RBETA_{i,t} + a_{11} RCEPS_{i,t} + e_{i,t} \quad (1)$$

where $BHAR(+m)_{i,t}$ is the size-adjusted abnormal returns compounded up to month $+m$ (where $m = 1, \ldots, 12$ relative to three months after the fiscal year end) beginning on April 1 after the fiscal year end of year t, in which firm i's buy-and-hold daily raw returns are subtracted by the corresponding size-matched portfolio's daily buy-and-hold returns, $RSIGNAL_{k,i,\ t}$ is the scaled decile rank of signal k for firm i in year t, $RBETA_{i,\ t}$ is the scaled decile rank of a market beta for firm i, which is estimated over the rolling 36-month period ending on the fiscal year end of year t using a market model regression of monthly firm returns on a CRSP value-weighted market index[4], and $RCEPS_{i,t}$ is the scaled decile rank of a change in earnings per share from year $t-1$ to t, scaled by stock price at the end of year $t-1$. Finally, the hedge return to a FS strategy (at the portfolio level) is calculated as the sum of estimated coefficients on $RSIGNAL_{k,i,t}$; that is, $BHAR(+m)_{p,t} = \sum_{k=1}^{9} \hat{\alpha}_j$, where $\hat{\alpha}_j$ is an estimated coefficient representing a portfolio return from taking a long (short) position in firms with the highest (lowest) decile of signal k from Equation (1)[5].

Following AB2, we use size-adjusted returns to control for the size effect in our main results. In order to assess the robustness of our findings, we use the following three methods to calculate risk-adjusted buy-and-hold returns: market model-adjusted returns (i.e. one-factor model), Fama and French (1993) three-factor model-adjusted returns (i.e. three-factor model), and Carhart (1997) four-factor model-adjusted returns (i.e. four-factor model). The four-factor

Signal	Variable formula	Explanation of signal
Inventory (INV)	Δ Sales (COMPUSTAT item *SALE*)−Δ Inventory (COMPUSTAT item *INVFG*; if not available, then *INVT*)	If inventory increases at a faster rate than sales, analysts will see this as an indicator of poor quality of earnings. This signal could mean that sales are not keeping up with the amount of goods that the company produces, which represents a problem in either the company's operations or sales. AB2 find (+) on INV
Gross margin (GM)	Δ Gross margin (COMPUSTAT item *SALE* less *COGS*)−Δ Sales	If sales increase at a faster rate than gross margin, analysts view this as a sign of poor quality of earnings. When a company's sales increase, analysts look for gross margin to increase at a greater rate to be viewed as a positive sign. The contrary would be a sign of operational weakness. AB2 find (+) on GM
Labor force (LF)	$\left(\frac{\text{Sales}_t}{\text{No. of employees}_t} - \frac{\text{Sales}_{t-1}}{\text{No. of employees}_{t-1}}\right) \Big/ \frac{\text{Sales}_{t-1}}{\text{No. of employees}_{t-1}}$ where, No. of employees is from COMPUSTAT item *EMP*	When an organizational development occurs in a company, an increase in sales per employee is seen as a positive sign by analysts. If a company is restructuring, the LF signal is how analysts measure the company's success with a corporate restricting activity. AB2 find insignificant (+) on LF
Effective tax rate (ETR)	$\left[ETR_t - \left(\frac{1}{3}\sum_{T=1}^{3} ETR_{t-T}\right)\right] \times CHGEPS_t$ where the effective tax rates are COMPUSTAT item *TXT*/(*PI*+*AM*) and $CHGEPS_t$ is the change in earnings per share from year $t-1$ to t, deflated by stock price at the end of year $t-1$	The effective tax rate signal tells analysts of any change in GAAP effective tax rate not due to statutory tax rate changes. This signal indicates a temporary increase/decrease in earnings due to the fluctuation in effective tax rate, but not a sustainable source of earnings, and therefore a poor outlook for future earnings. AB2 find insignificant (−) on ETR
Accounts receivable (AR)	Δ Sales−Δ Accounts receivable (COMPUSTAT item *RECT*)	When this signal decreases, analysts see this as an indication that there are problems with collecting payments or a decrease in sales. Contrary to this prediction, AB1 find (−) on AR in predicting future earnings (thus, the sign will be reversed in an alternative fundamental signal strategy). AB2 find insignificant (+) on AR
Capital expenditures (CAPX)	Δ Firm CAPX (COMPUSTAT item *CAPXV*)−Δ Industry CAPX (at the two-digit SIC industry level)	This signal is straightforward, as firm capital expenditure increases at a greater rate than industry capital expenditure, analysts see this as a positive sign of future growth. Contrary to this prediction, AB1 find (−) on CAPX in predicting future earnings (thus, the sign will be reversed in an alternative fundamental signal strategy). AB2 find (−) on CAPX
Selling and administration (S&A)	Δ Sales−Δ S&A (COMPUSTAT item *XSGA*)	As this signal increases, analysts view that companies are creating greater efficiencies with their indirect costs, and therefore show a positive sign for future earnings. AB2 find (+) on S&A
Earnings quality (EQ)	1 for LIFO, 0 for FIFO or other (COMPUSTAT item *INVVAL*)	We use this signal to measure what analysts generalize about inventory methods. Analysts view FIFO as being associated with higher quality earnings, whereas LIFO is considered by analysts to be less reliable. AB2 find insignificant (+) on EQ
Audit qualification (AQ)	1 for unqualified, 0 for qualified or other (COMPUSTAT item *AUOP*)	This signal measures the quality of earnings and its impact on future stock returns when a company has a positive audit result as opposed to the qualified or adverse result. AB2 find insignificant (+) on AQ

Notes: This table summarizes the construction of the fundamental signals. Δ denotes a percentage change in a given variable over its average in the past two years. For example, Δ Sales is calculated as $(\text{Sales}_t - E(\text{Sales}_t))/E(\text{Sales}_t)$, where $E(\text{Sales}_t)$ is defined as $(\text{Sales}_{t-1}+\text{Sales}_{t-2})/2$

Table I.
Fundamental signals

model includes momentum factor returns in addition to market returns, size, and book-to-market factor returns. We obtain factor-mimicking portfolio returns (i.e. RMRF, SMB, HML, and MOM) from Professor Kenneth French's website[6]. Specifically, we define $1\_FAC\_BHAR(+m)_{i,t}$ as the market model-adjusted returns compounded up to month $+m$ after the fiscal year end of year t (i.e. firm i's returns are subtracted by the expected returns from a single-factor market model), $3\_FAC\_BHAR(+m)_{i,t}$ as the Fama-French three-factor model-adjusted returns compounded up to month $+m$ after the fiscal year end of year t (i.e. firm i's returns are subtracted by the expected returns from a three-factor model), and $4\_FAC\_BHAR(+m)_{i,t}$ as the four-factor model-adjusted returns compounded up to month $+m$ after the fiscal year end of year t (i.e. firm i's returns are subtracted by the expected returns from a four-factor model). In each model, we estimate factor betas over the rolling 36-month period ending on the fiscal year end of year t.

3.4 The alternative fundamental signal (AFS) strategy

AB1 find evidence supporting that AR and CAPX signals are negative indicators for future earnings (i.e. the opposite of LT's original intuition), which leads to AB2 creating an AFS strategy which reverses the portfolio weights on these two signals. We note that a hindsight bias is a major concern in the AB2 time period as the signs on AR and CAPX are switched after observing their realized relations with future earnings growth. However, the post-AB2 estimation results do not suffer from this type of bias as we implement a portfolio strategy that was publicized by AB2.

3.5 The perfect foresight (PF) strategy

In order to evaluate the economic importance of the FS strategy as well as the AFS strategy, we implement the PF analysis as demonstrated in AB2. Specifically, we estimate the following annual cross-sectional regression model:

$$BHAR(+m)_{i,t} = \gamma_0 + \gamma_1 RBETA_{i,t} + \gamma_2 RCEPS_{i,t+1} + e_{i,t} \quad (2)$$

where $RCEPS_{i,t+1}$ is the scaled decile rank of a change in earnings per share from year t to t+1, scaled by stock price at the end of year t, and the other variables are as previously defined. We infer the hedge return to a PF strategy that takes a long (short) position in the highest (lowest) decile in year t+1 earnings per share changes from the estimated coefficient on $RCEPS_{i,t+1}$ (i.e. $\hat{\gamma}_2$). As information on earnings per share in year t+1 is not available to investors at the portfolio investment period, this is a hypothetical portfolio strategy while assuming investors had possessed PF of the future earnings changes (Ball and Brown, 1968; Bernard and Thomas, 1990). We use the PF returns as a benchmark over the same time period to see how the fundamental strategy changes over time.

3.6 Value relevance and future earnings growth predictability of the FSs

Following LT and AB1, we investigate the valuation usefulness as well as future earnings growth predictability of the FSs. LT show that the FSs have value relevance after controlling for contemporaneous earnings changes (i.e. the earnings response coefficient). AB1 find that the value relevance of LT's FSs can be explained by the signals' ability to predict future earnings growth. We estimate the following annual cross-sectional model which regresses contemporaneous buy-and-hold stock returns ($RET_{i,t}$) on the FSs, market beta, and contemporaneous earnings changes:

$$RET_{i,t} = \beta_0 + \sum_{k=1}^{9} \beta_k RSIGNAL_{k,i,t} + \beta_{10} RBETA_{i,t} + \beta_{11} RCEPS_{i,t} + e_{i,t} \quad (3)$$

where $RET_{i,\ t}$ is the size-adjusted abnormal returns compounded over the 12-month period beginning on fourth month after the fiscal year end of year $t-1$, in which firm i's buy-and-hold daily raw returns are subtracted by the corresponding size-matched portfolio's daily buy-and-hold returns, and the other variables are as previously defined.

We also estimate the following annual cross-sectional regression model which predicts future earnings growth using the FSs, market beta, and concurrent earnings changes:

$$CEPS_{i,t+1} = \phi + \sum_{k=1}^{9} \phi_k RSIGNAL_{k,i,t} + \phi_{10} RBETA_{i,t} + \phi_{11} RCEPS_{i,t} + e_{i,t} \quad (4)$$

where $CEPS_{i,t+1}$ is firm i's future earnings growth that is measured as one-year ahead earnings growth.

Equations (3) and (4) are estimated annually in two different ways. First, we do not restrict any of the coefficients (i.e. an unrestricted model). Then, we restrict the coefficients on the FSs to be equal to 0 (i.e. a restricted model). Specifically, a restricted model suggests that $\beta_k = 0$ (for all k) for Equation (3) and $\phi_k = 0$ (for all k) for Equation (4), respectively. Diff_R2 is the difference between the adjusted R^2 of the unrestricted model and the adjusted R^2 of the restricted model. Inc_R2 is computed as one minus the ratio of the adjusted R^2 of the restricted model to the adjusted R^2 of the unrestricted model (i.e. $1-Adj.R_r^2/Adj.\ R_{ur}^2$), which is equivalent to an F-statistic that tests whether the coefficients on the FSs (i.e. β_k and ϕ_k, for all k) are jointly equal to 0. Intuitively, Diff_R2 and Inc_R2 capture the incremental ability of the FSs to explain concurrent stock returns in Equation (3) and to predict earnings growth in Equation (4).

3.7 Temporal changes in information and trading environments

We examine whether changing information environments of the firms traded in the fundamental strategy over time can explain the disappearing abnormal returns to a FS strategy. We examine three analyst-related characteristics including the percentage of firms covered by analysts, the number of analysts per firm-year observation, and the forecast horizon which is defined as the number of months between the earliest earnings forecasts and the corresponding fiscal year end dates. Our analyst-related data are available in I/B/E/S from 1976. We also examine two institutional investor-related characteristics including the percentage of institutional ownership and the number of institutional investors per firm-year observation. Our 13-f finding data are available from 1984.

In addition, we examine time-series changes in trading environments of our sample firms over time. We calculate the Amihud (2002) illiquidity, which is the average daily ratio of absolute stock returns to the dollar trading volume on the respective day during year t (multiplied by 10^6 for expositional purposes). This illiquidity metric serves as a proxy for the daily price impact of the order flow[7]. We define stock turnover as the average ratio of daily trading volume to common shares outstanding on the respective date during year t.

4. Empirical results

4.1 Do the abnormal returns to a fundamental strategy disappear after the publication of AB2?

In Table II, we present our replication results of AB2. We find that the mean 12-month hedge return (i.e. *BHAR* (+12)) to a FS strategy for the period of 1974-1988 is 14.3 percent (with a t-stat. of 2.25), compared to the corresponding hedge return of 13.2 percent reported in AB2. Similarly, we find that the mean 12-month hedge return (i.e. *BHAR* (+12)) to an AFS strategy for the period of 1974-1988 is 16.0 percent (with a t-stat. of 2.85), compared to the corresponding hedge return

Cumulation period	Fundamental signal (FS) strategy (NYSE/AMEX firms, 1974-1988) AB2 (1998, TAR, Table II) Mean (%)	Replication Mean (%)	Replication *t*-stat.	Alternative fundamental signal (AFS) strategy (NYSE/AMEX firms, 1974-1988) AB2 (1998, TAR, Table IV) Mean (%)	Replication Mean (%)	Replication *t*-stat.
BHAR(+1)	3.2	2.0	1.56	5.2	3.6	3.11
BHAR(+2)	1.1	0.3	0.17	4.3	2.7	1.87
BHAR(+3)	1.7	−0.4	−0.19	4.7	3.7	1.71
BHAR(+4)	−0.6	0.1	0.02	3.4	5.2	1.84
BHAR(+5)	3.2	2.7	0.73	7.4	5.3	1.41
BHAR(+6)	6.4	6.7	1.81	9.2	6.9	1.55
BHAR(+7)	6.3	8.0	2.13	10.6	9.8	2.16
BHAR(+8)	9.2	8.7	1.81	14.7	10.4	2.29
BHAR(+9)	13.2	11.1	2.18	18.1	12.1	2.66
BHAR(+10)	12.2	10.6	2.11	17.0	12.2	2.59
BHAR(+11)	14.2	12.5	2.32	19.5	15.0	2.95
BHAR(+12)	13.2	14.3	2.25	17.2	16.0	2.85

Notes: This table compares our replication results with the statistics presented in AB2, showing hedge portfolio returns for the AB2 period (1974-1988) using the fundamental signal (FS) strategy and alternative fundamental signal (AFS) strategy following the formula provided in Section 3. *t*-statistics are based on annual Fama-MacBeth cross-sectional regressions

Table II.
Replication of hedge portfolio returns over the AB2 time period (1974-1988)

of 17.2 percent reported in AB2. Overall, our replication results are fairly comparable to those reported in AB2 in terms of their economic magnitude and statistical significance.

In Table III, we report year-by-year 12-month hedge returns to a FS strategy, an AFS strategy, and a PF strategy for the period of 1974-1988 in Panel A and for the period of 1998-2012 in Panel B. In Panel B, we find that the mean 12-month hedge return to a FS strategy is economically small and statistically insignificant during the period of 1998-2012 (3.1 percent with a *t*-stat. of 0.51). Further, we find qualitatively similar results using an AFS strategy. Specifically, we find that the mean 12-month hedge return to an AFS strategy is positive but statistically insignificant during the period of 1998-2012 (7.0 percent with a *t*-stat. of 0.98). In contrast to the hedge returns to FS and AFS strategies, we find that the mean 12-month hedge return to a hypothetical PF strategy is positive and statistically significant during the period of 1998-2012 (42.7 percent with a *t*-stat. of 13.2). The yearly hedge returns to a PF strategy are positive in all 15 years during the post-AB2 period, similar to the yearly performance of the corresponding strategy during the AB2 period[8]. We note that the performance of a FS (AFS) strategy explains only about 7.2 (16.5) percent of the PF strategy performance during the post-AB2 period, whereas the performance of a FS (AFS) strategy accounts for about 30.2 (33.8) percent of the PF strategy performance during the AB2 period.

Our hedge return evidence during the post-AB2 period appears to be affected by a number of regulatory reforms clustered during the period 2000-2003. These regulatory changes include the enforcement of Regulation Fair Disclosure in late 2000, the decimalization in stock trading in 2001, and the enactment of Sarbanes-Oxley Act in 2002. To see the effect of these regulatory changes on our results, we report our hedge return results during 1998-2002 (i.e. pre-regulation) and 2003-2012 (i.e. post-regulation) in Panel C of Table III. We find that the 12-month hedge returns to a FS strategy are 16.0 percent (with a *t*-stat. of 1.13) pre-regulation and −3.4 percent (with a *t*-stat. of −0.59) post-regulation. In addition, we find that the 12-month hedge returns to an AFS strategy are 2.1 percent (with a *t*-stat. of 0.18) pre-regulation and 9.5 percent (with a *t*-stat. of 0.97) post-regulation. Although FS (AFS) strategy-based returns appear to be more pronounced

Year	Fundamental signal (FS) strategy *BHAR*(+12)	Alternative fundamental signal (AFS) strategy *BHAR*(+12)	Perfect foresight (PF) strategy *BHAR*(+12)
Panel A: AB2 period (1974-1988)			
1974	44.7%	51.1%	66.7%
1975	9.3%	14.8%	40.9%
1976	3.9%	8.1%	50.1%
1977	−0.6%	14.0%	47.8%
1978	−5.8%	20.2%	51.4%
1979	−41.3%	−18.0%	72.1%
1980	18.6%	33.9%	29.7%
1981	17.2%	5.6%	90.7%
1982	13.4%	14.3%	19.5%
1983	38.3%	31.3%	36.0%
1984	57.5%	52.7%	68.3%
1985	17.8%	−4.6%	33.4%
1986	6.8%	23.8%	30.0%
1987	34.8%	11.8%	29.2%
1988	0.2%	−18.7%	45.7%
Summary			
Mean	14.3%	16.0%	47.4%
t-stat.	2.25	2.85	9.03
% relative to perfect foresight strategy	30.2%	33.8%	
Year	Fundamental signal (FS) strategy *BHAR*(+12)	Alternative fundamental signal (AFS) strategy *BHAR*(+12)	Perfect foresight (PF) strategy *BHAR*(+12)
Panel B: post-AB2 period (1998-2012)			
1998	47.0%	4.4%	63.0%
1999	22.3%	24.1%	55.2%
2000	26.9%	−36.7%	39.7%
2001	13.2%	18.6%	28.9%
2002	−29.5%	0.1%	43.9%
2003	19.0%	41.0%	51.1%
2004	4.3%	29.6%	61.0%
2005	−24.7%	−37.6%	32.9%
2006	−20.1%	−33.9%	44.8%
2007	−13.7%	20.0%	36.8%
2008	−22.8%	1.7%	51.8%
2009	−4.8%	−15.9%	31.5%
2010	20.8%	23.8%	32.9%
2011	13.0%	38.1%	44.6%
2012	−4.7%	28.2%	22.0%
Summary			
Mean	3.1%	7.0%	42.7%
t-stat.	0.51	0.98	13.20
% relative to perfect foresight strategy	7.2%	16.5%	
Period	Fundamental signal (FS) strategy *BHAR*(+12)	Alternative fundamental signal (AFS) strategy *BHAR*(+12)	Perfect foresight (PF) strategy *BHAR*(+12)
Panel C: robustness tests over the post-AB2 period (1998-2012)			
Pre-regulation period (1998-2002)			
Mean	16.0%	2.1%	46.1%
t-stat.	1.13	0.18	6.92

Table III.
Returns to a fundamental strategy

(*continued*)

Period	Fundamental signal (FS) strategy	Alternative fundamental signal (AFS) strategy	
Post-regulation period (2003-2012)			
Mean	−3.4%	9.5%	40.9%
t-stat.	−0.59	0.97	10.43
Excluding the financial crisis period (excluding base year 2007-2008)			
Mean	6.4%	6.4%	42.4%
t-stat.	0.99	0.77	11.59
Panel D: robustness tests using alternative risk-adjusted returns			
Single-factor adjusted returns (1_*FAC_BHAR* (+12))			
AB2 period (1974-1988)			
Mean	14.4%	30.5%	
t-stat.	2.33	5.59	
Post-AB2 period (1998-2012)			
Mean	−5.5%	11.0%	
t-stat.	−0.70	1.50	
Fama-French 3-factor adjusted returns (3_*FAC_BHAR* (+12))			
AB2 period (1974-1988)			
Mean	14.1%	27.9%	
t-stat.	2.63	5.16	
Post-AB2 period (1998-2012)			
Mean	−5.2%	10.8%	
t-stat.	−0.62	1.32	
Carhart 4-factor adjusted returns (4_*FAC_BHAR* (+12))			
AB2 period (1974-1988)			
Mean	13.1%	26.6%	
t-stat.	2.40	4.42	
Post-AB2 period (1998-2012)			
Mean	−7.5%	11.0%	
t-stat.	−0.85	1.19	

Notes: This table shows hedge returns for the AB2 period (in Panel A) and the post-AB2 period (in Panel B) following the formula provided in Section 3. This table also presents robustness checks using alternative subsamples of the post-AB2 period (in Panel C) and alternative risk-adjusted returns including market model, three-factor, and four-factor model adjustments (in Pane D). *t*-Statistics are based on annual Fama-MacBeth cross-sectional regressions

Table III.

pre-regulation (post-regulation), all of these hedge returns suggest the disappearing abnormal returns to a FS strategy.

The post-AB2 period includes the 2008 financial crisis, which is typically characterized as a period of extreme return volatility. To ensure our inferences are not driven by the crisis period, we use the CBOE's VIX index (based on the implied volatility of S&P 500 index options) to identify September 2008-June 2009 as the financial crisis period, and exclude base year 2007-2008 observations from our post-AB2 period. In Panel C of Table III, we find that hedge returns to a FS strategy and to an AFS strategy are 6.4 percent (with a *t*-stat. of 0.99) and 6.4 percent (with a *t*-stat. of 0.77), respectively, suggesting that the financial crisis period does not appear to drive our results.

In Panel D of Table III, we assess the robustness of our findings by employing alternative risk-adjustment procedures. Specifically, we use a single-factor market model, Fama-French three-factor model, as well as the four-factor model as an equilibrium expected return model. In all three cases, we find that the 12-month hedge returns to a FS strategy and to an AFS strategy are economically meaningful and statistically significant during the AB2 period

(i.e. 1974-1988), suggesting that AB2's original findings are not sensitive to alternative risk adjustments. However, we find that the 12-month hedge returns to a FS strategy and an AFS strategy become statistically insignificant during the post-AB2 period (i.e. 1998-2012), similar to the results reported earlier using size-adjusted returns. These results suggest that disappearing abnormal returns to a fundamental trading strategy are not driven by a specific choice of risk-adjustment procedures.

The evidence presented in Table III collectively suggests that although we do not find meaningful changes in the performance of a PF strategy returns, the hedge returns to a FS strategy and an AFS strategy become economically less meaningful and statistically insignificant in recent years. Overall, these results support the disappearance of abnormal returns to a FS-based trading strategy after the publication of AB2.

In Table IV, we report hedge returns to a FS strategy, an AFS strategy, and a PF strategy around future earnings announcement dates. Specifically, when we estimate Equations (1) and (2), we substitute $BHAR(+m)_{i,t}$ with $BHAR(Q+q)_{i,t}$ which represents the earnings announcement period size-adjusted abnormal returns compounded up to quarter q (where $q = 1, \ldots, 4$) earnings announcement dates after the fiscal year end of year t. Each quarterly announcement period begins two days prior to the earnings announcement date and ends on the earnings announcement date. In Panel A of Table IV, we confirm AB2's results that hedge returns to an AFS strategy are clustered around future earnings announcements dates during the period of 1974-1988[9]. Specifically, when cumulating quarterly announcement returns (similar to AB2), we find the mean hedge returns of 1.3, 1.7, 2.2, and 1.5 percent, respectively, for first through fourth quarter earnings announcement dates (with the corresponding t-stats of 2.24, 1.65, 1.57, and 0.83, respectively). Thus, the average earnings announcement-period returns are statistically significant at the five-percent level (one-tailed) up to the second quarterly announcement date. In Panel B, we find that hedge returns to an AFS strategy are not statistically significant around future earnings announcement dates during the period of 1998-2012. Specifically, the mean hedge returns to an AFS strategy are −0.2, 1.0, 1.7, and 2.4 percent for first through fourth quarter earnings announcements during the post-AB2 period. Although these returns appear to be larger than their counterparts during the AB2 period, we note that none of these returns are statistically significant at the conventional level (with the corresponding t-stats of −0.20, 0.71, 1.10, and 1.16, respectively). We find similar insignificance of a FS strategy around future earnings announcement windows. However, for both AB2 and post-AB2 time periods, we find robust and monotonically increasing hedge returns to a PF strategy when hedge returns are accumulated from first to fourth quarter earnings announcement dates.

	Strategy											
	BHAR(*Q*+1)			*BHAR*(*Q*+2)			*BHAR*(*Q*+3)			*BHAR*(*Q*+4)		
	FS	AFS	PF	FS	AFS	PF	FS	AFS	PF	FS	AFS	PF
Panel A: AB2 period (1974-1988)												
Mean	−0.7%	1.3%	3.2%	−0.8%	1.7%	6.4%	−0.6%	2.2%	9.5%	−0.7%	1.5%	11.4%
t-stat.	−0.98	2.24	11.38	−0.79	1.65	12.51	−0.47	1.57	12.70	−0.49	0.83	12.22
Panel B: post-AB2 period (1998-2012)												
Mean	−1.1%	−0.2%	3.0%	−1.5%	1.0%	5.4%	−1.4%	1.7%	6.5%	0.2%	2.4%	7.4%
t-stat.	−1.13	−0.20	8.91	−1.26	0.71	9.61	−1.09	1.10	10.30	0.11	1.16	11.45

Table IV.
Hedge returns around earnings announcements

Notes: This table shows hedge portfolio returns around quarterly earnings announcements for the AB2 period (in Panel A) and the post-AB2 period (in Panel B), respectively, using the fundamental signal (FS) strategy, alternative fundamental signal (AFS) strategy, and perfect foresight (PF) strategy following the formulas provided in Section 3. t-statistics are based on annual Fama-MacBeth cross-sectional regressions

In sum, we fail to find meaningful hedge returns to a FS strategy and to an AFS strategy around future earnings announcement dates after the publication of AB2. These results are consistent with our 12-month hedge return results reported earlier for the post-AB2 period.

4.2 Do changes in value relevance and predictive content explain the disappearing abnormal returns to a fundamental strategy?

In Table V, we report the estimation results of value relevance of the FSs over time. We find that Diff_R2 is 2.9 percent (with a *t*-stat. of 8.38) and Inc_R2 is 0.16 (with a *t*-stat. of 5.73) during the AB2 time period. These results confirm LT's results that the FSs have value relevance after controlling for market beta and contemporaneous earnings changes. When we examine the corresponding statistics during the post-AB2 period, we find that Diff_R2 is 3.2 percent (with a *t*-stat. of 7.55) and Inc_R2 is 0.21 (with a *t*-stat. of 5.31), suggesting that the FSs have similar incremental value relevance for the period of

Year	R2_ur	R2_r	Diff_R2	Inc_R2
1974	29.4%	26.0%	3.4%	0.12
1975	19.4%	16.7%	2.8%	0.14
1976	15.4%	13.8%	1.6%	0.10
1977	28.3%	26.2%	2.1%	0.07
1978	17.2%	15.3%	1.9%	0.11
1979	20.7%	19.5%	1.2%	0.06
1980	21.1%	18.7%	2.4%	0.11
1981	32.3%	31.1%	1.1%	0.04
1982	21.7%	17.4%	4.3%	0.20
1983	11.6%	6.8%	4.8%	0.41
1984	19.3%	15.3%	4.0%	0.21
1985	24.5%	20.0%	4.5%	0.18
1986	12.8%	8.5%	4.3%	0.34
1987	17.1%	15.6%	1.5%	0.09
1988	17.8%	14.4%	3.4%	0.19
1998	11.5%	9.9%	1.6%	0.14
1999	10.9%	9.5%	1.4%	0.13
2000	14.3%	12.7%	1.6%	0.11
2001	9.1%	3.1%	6.1%	0.66
2002	13.1%	9.4%	3.8%	0.29
2003	21.8%	19.5%	2.2%	0.10
2004	23.4%	18.4%	4.9%	0.21
2005	22.8%	17.7%	5.0%	0.22
2006	11.2%	10.4%	0.8%	0.07
2007	11.6%	7.8%	3.8%	0.33
2008	33.6%	31.2%	2.4%	0.07
2009	28.9%	26.0%	2.8%	0.10
2010	13.2%	9.8%	3.4%	0.26
2011	11.4%	8.7%	2.7%	0.24
2012	17.0%	12.2%	4.8%	0.28
AB2 period (1974-1988)				
Mean	20.6%	17.7%	2.9%	0.16
t-stat.	12.99	10.29	8.38	5.73
Post-AB2 period (1998-2012)				
Mean	16.9%	13.8%	3.2%	0.21
t-stat.	8.53	6.88	7.55	5.31

Notes: This table shows estimates using the annual cross-sectional model which regresses contemporaneous buy-and-hold stock returns on the fundamental signals, market beta, and contemporaneous earnings changes given the formula provided in Section 3

Table V.
Value relevance of fundamental signals

1998-2012. In untabulated results, we find that the difference in Diff_R2 and Inc_R2 across the two time periods is not statistically different from 0 (with p-values > 0.10).

In Table VI, we report the estimation results of future earnings growth predictability of the FSs over time. Specifically, when predicting one-year ahead earnings growth, we find that Diff_R2 is 4.0 percent (with a t-stat. of 7.48) and Inc_R2 is 0.68 (with a t-stat. of 9.7) during the AB2 time period. These results confirm AB1's results that the FSs have predictive content with respect to the subsequent earnings growth after controlling for market beta and contemporaneous earnings changes. During the post-AB2 period, we find that Diff_R2 is 3.9 percent (with a t-stat. of 8.01) and Inc_R2 is 0.75 (with a t-stat. of 14.33), suggesting that the ability of the FSs to predict earnings growth for the period of 1998-2012 is comparable to the predictive ability of the FSs for the period of 1974-1988. In untabulated results, we find that the difference in Diff_R2 and Inc_R2 across the two time periods is not statistically different from 0 (with p-values > 0.10). We find similar results when we use three-year and five-year average earnings growth, respectively, as a dependent variable (untabulated).

Year	R2_ur	R2_r	Diff_R2	Inc_R2
1974	5.9%	3.1%	2.8%	0.48
1975	8.5%	1.9%	6.6%	0.77
1976	6.9%	5.3%	1.6%	0.23
1977	9.8%	9.0%	0.9%	0.09
1978	3.4%	1.6%	1.8%	0.53
1979	3.0%	0.9%	2.1%	0.71
1980	6.5%	2.1%	4.4%	0.67
1981	3.6%	0.4%	3.2%	0.88
1982	6.8%	0.7%	6.1%	0.90
1983	10.0%	2.2%	7.7%	0.78
1984	5.3%	2.3%	3.0%	0.57
1985	5.6%	0.3%	5.3%	0.94
1986	4.7%	0.0%	4.7%	1.00
1987	6.5%	1.6%	4.9%	0.76
1988	5.4%	0.6%	4.7%	0.88
1998	6.4%	0.5%	5.9%	0.92
1999	3.5%	0.4%	3.1%	0.87
2000	1.8%	0.0%	1.8%	0.99
2001	11.6%	4.9%	6.6%	0.57
2002	1.4%	0.5%	0.8%	0.59
2003	4.3%	0.6%	3.7%	0.87
2004	5.8%	0.5%	5.3%	0.91
2005	7.9%	1.6%	6.3%	0.80
2006	3.6%	0.7%	2.8%	0.79
2007	2.7%	0.1%	2.6%	0.95
2008	11.8%	7.9%	3.9%	0.33
2009	7.0%	0.7%	6.4%	0.90
2010	6.4%	2.8%	3.6%	0.57
2011	6.4%	3.1%	3.2%	0.51
2012	3.3%	1.0%	2.3%	0.69
AB2 period (1974-1988)				
Mean	6.1%	2.1%	4.0%	0.68
t-stat.	10.86	3.45	7.48	9.70
Post-AB2 period (1998-2012)				
Mean	5.6%	1.7%	3.9%	0.75
t-stat.	6.65	2.92	8.01	14.33

Table VI. Ability of fundamental signals to predict earnings growth

Notes: This table shows estimates using the annual cross-sectional regression model which predicts one-year ahead earnings growth using the fundamental signals, market beta, and concurrent earnings changes given the formula provided in Section 3

Overall, our results reported in Tables V and VI suggest that possible time-series changes in value relevance or earnings growth predictability of the FSs cannot explain the decline in hedge returns to a FS strategy and an AFS strategy. Instead, the results reported here are consistent with the FSs retaining their importance to investors after the publication of AB2.

4.3 Do changes in information and trading environments explain the disappearing abnormal returns to a fundamental strategy?

In Table VII, we find that analysts tend to cover more of our sample firms that are included in the fundamental strategy in recent years and that the intensity of analyst coverage increases with more timely earnings forecasts during the post-AB2 period. Specifically, we note that 74.9 percent of the portfolio firms are covered by at least one analyst during the period of 1976-1988, whereas 89.6 percent of the firms have at least one analyst forecast during the period of 1998-2012. The difference in the percentage of analyst-covered firms between the two time periods is statistically significant (with a p-value < 0.01). We also note that our portfolio firms are covered by more analysts during the post-AB2 period relative to the AB2 period (i.e. 8.2 analysts vs 7.0 analysts) and that the difference is marginally significant (with a p-value < 0.10). We further find that analysts tend to issue their earliest earnings forecasts about 18.2 months before the fiscal year end dates during the AB2 period, whereas analysts issue their initial forecasts about 31.9 months before the fiscal year end dates during the post-AB2 period. The difference in forecast timeliness between the two time periods is statistically significant (with a p-value < 0.01).

Similar to the improvement in information environments supported by analyst activity, we find a significant increase in institutional ownership with more institutional investors per our firm-year observation. Specifically, institutional investors hold, on average, less than 40 percent of our portfolio firm's equity during the AB2 period, whereas institutions hold 64.5 percent during the post-AB2 period. The difference in institutional ownership between the two time periods is highly statistically significant (with a p-value < 0.01). We also note a similar increase in the number of institutional investors from less than 90 institutions to 217.3 institutions with a statistically significant difference (with a p-value < 0.01), suggesting that more institutional investors tend to trade the firms included in the fundamental strategy during the post-AB2 period. Finally, when we regress annual FS hedge returns on these information environment characteristics, we find that the coefficients on institutional ownership and the number of institutions are negative and statistically significant (-0.9566 and -0.0018 both with p-values < 0.01), suggesting that institutional investor attributes are negatively associated with the performance of the fundamental strategy in a time-series setting.

In Table VIII, we find that our portfolio firms experienced approximately an 11-fold increase in market liquidity and a 4-fold increase in stock turnover in recent years. Specifically, the Amihud illiquidity drops from 1.47 (AB2 period) to 0.13 (post-AB2 period) with a significant difference (with a p-value < 0.01). Similarly, the average stock turnover increases from 0.19 percent (AB2 period) to 0.80 percent (post-AB2 period) with a significant difference (with a p-value < 0.01). When we regress annual hedge returns from the fundamental strategy on these trading characteristics, we find the coefficient on stock turnover is negative and statistically significant (-22.8091 with a p-value < 0.05).

In sum, our evidence suggests dramatic changes in information environments and trading environments of the firms traded in the fundamental strategy. In our regression tests, our findings suggest that increased institutional trading and high-stock turnover are negatively associated with the hedge returns from a fundamental strategy. These changing information and trading environments appear to contribute to the disappearing abnormal returns to a FS-based trading strategy.

Year	Frequency of firms with analyst coverage	Number of analysts per firm-year	Forecast horizon for the earliest forecast	Institutional ownership	Number of institutional investors per firm-year
1974	n/a	n/a	n/a	n/a	n/a
1975	n/a	n/a	n/a	n/a	n/a
1976	44.2%	2.7	10.4	n/a	n/a
1977	47.7%	3.0	15.7	n/a	n/a
1978	68.2%	4.6	13.9	n/a	n/a
1979	72.4%	5.2	17.1	n/a	n/a
1980	74.5%	6.1	18.1	n/a	n/a
1981	76.5%	7.0	18.6	n/a	n/a
1982	79.9%	7.5	19.0	n/a	n/a
1983	82.5%	7.9	18.8	n/a	n/a
1984	83.9%	8.1	19.1	31.5%	63.0
1985	85.2%	9.6	19.4	34.3%	77.2
1986	84.4%	10.0	20.5	37.0%	92.0
1987	88.1%	9.3	22.5	39.5%	99.2
1988	86.7%	10.0	23.9	37.8%	105.0
1998	89.9%	8.2	31.4	50.8%	137.2
1999	88.9%	8.6	29.6	51.0%	145.0
2000	87.7%	8.0	27.9	54.2%	159.1
2001	84.9%	7.2	26.8	56.8%	169.2
2002	82.7%	6.6	25.6	58.6%	172.0
2003	85.8%	7.8	26.5	62.0%	192.3
2004	88.3%	7.9	26.2	65.5%	215.3
2005	88.6%	8.0	28.8	65.2%	224.3
2006	87.1%	8.1	31.2	71.3%	230.7
2007	88.8%	7.9	34.8	73.1%	244.2
2008	91.5%	8.0	36.9	74.3%	276.5
2009	94.4%	7.8	35.4	70.3%	249.7
2010	95.4%	9.4	38.1	69.3%	268.8
2011	94.1%	9.9	39.1	71.8%	284.9
2012	96.5%	10.1	40.9	73.8%	290.7
AB2 period (1974-1988)					
Mean	74.9%	7.0	18.2	36.0%	87.3
Post-AB2 period (1998-2012)					
Mean	89.6%	8.2	31.9	64.5%	217.3
Diff.: post-AB2 period−AB2 Period					
Mean	14.7%	1.2	13.7	28.5%	130.1
t-stat.	3.62	1.65	8.28	11.01	8.39
Regression of annual FS hedge returns on information characteristics					
Coefficient	0.2080	0.0311	−0.0036	−0.9566	−0.0018
t-stat.	0.57	1.36	−0.66	−3.09	−2.83

Notes: This table presents time-series changes in information environments over the AB2 (1974-1988) vs post-AB2 (1998-2012) periods for firms included in long/short positions of the fundamental strategy. We report the percentage of firms covered by analysts, the number of analysts, and the forecast horizon as analyst characteristics and the percentage of institutional ownership and the number of institutional investors as institutional investor characteristics (see Section 3.7 for details)

Table VII.
Changing information environments

5. Conclusion

We examine whether hedge returns to a FS strategy disappear after the publication of research that documents the FS-related pricing anomaly. Findings in the recent literature (e.g. Green *et al.*, 2011) suggest that the FSs are expected to cease at some point to yield the

	Amihud illiquidity	Stock turnover
1974	6.43	0.08%
1975	4.09	0.11%
1976	1.99	0.13%
1977	2.22	0.13%
1978	1.42	0.19%
1979	1.18	0.18%
1980	1.01	0.21%
1981	0.64	0.18%
1982	0.90	0.20%
1983	0.32	0.24%
1984	0.44	0.20%
1985	0.37	0.23%
1986	0.26	0.28%
1987	0.32	0.31%
1988	0.47	0.24%
1998	0.16	0.38%
1999	0.23	0.37%
2000	0.24	0.46%
2001	0.51	0.47%
2002	0.37	0.48%
2003	0.14	0.64%
2004	0.09	0.65%
2005	0.05	0.80%
2006	0.03	0.98%
2007	0.03	1.07%
2008	0.02	1.39%
2009	0.06	1.23%
2010	0.03	1.12%
2011	0.03	1.05%
2012	0.01	0.93%
AB2 period (1974-1988)		
Mean	1.47	0.19%
Post-AB2 period (1998-2012)		
Mean	0.13	0.80%
Diff.: post-AB2 period − AB2 period		
Mean	−1.34	0.61%
t-stat.	3.02	6.92
Regression of annual FS hedge returns on trading characteristics		
Coefficient	0.0330	−22.8091
t-stat.	1.04	−2.16

Notes: This table presents time-series changes in trading environments over the AB2 (1974-1988) vs post-AB2 (1998-2012) time periods for firms included in long/short positions of the fundamental strategy. We report the Amihud (2002) illiquidity as the average daily ratio of absolute stock returns to the dollar trading volume on the respective day during year *t* and stock turnover as the average ratio of daily trading volume to common shares outstanding on the respective date during year *t* (see Section 3.7 for details)

Table VIII. Changing trading environments

abnormal returns as the FSs' relevance to firm value and information content on future operating performance become fully impounded into stock prices over time. Using financial statement and stock return data for NYSE/AMEX firms from 1974 to 2012, we find that the FS-based abnormal returns decrease substantially and become statistically insignificant in the recent time period. Further, we find that neither value relevance nor the predictive content of the FSs has diminished over time. Finally, we find evidence suggesting that

changing information and trading environments appear, at least in part, to explain the disappearing abnormal returns to a FS strategy.

This paper contributes to the literature in three important ways. First, we extend the fundamental analysis literature by investigating temporal changes in the hedge returns to a FS strategy. To our knowledge, this is the first paper to systematically revisit the findings in the fundamental analysis literature while addressing possible explanations.

Second, we contribute to the emerging literature on the persistence of anomaly returns (e.g. Schwert, 2003) which collectively suggests attenuation of abnormal returns to the previously documented trading strategies. We extend this literature by investigating whether abnormal returns to the FS strategy disappear and whether the evidence is explained by temporal variation in value relevance or predictive content of the FSs.

Third, we contribute to the literature on the role of investor sophistication and trading costs in explaining the extent to which investors fail to fully incorporate new information. Unlike prior studies focusing on cross-sectional variation (e.g. Hand, 1990; Zhang, 2008), we examine time-series variation in information (i.e. analysts and institutional investors) and trading (i.e. liquidity and turnover) environments. These time-series statistics also have important implications for the literature by shedding light on a specific mechanism through which pricing efficiency has improved over time.

Notes

1. AB2 use the sample period 1989-1993 as the holdout sample period. Our inferences are not altered when we alternatively define the post-AB2 sample period by including the holdout period (i.e. 1989-1993) or the period after the holdout but before 1998 (i.e. 1994-1997).
2. Professional investors suggest that the *F*-score for value firms still generate abnormal returns in recent years (www.quant-investing.com/blogs/general/2015/03/12/can-the-piotroski-f-score-also-improve-your-investment-strategy).
3. For example, for 1998 fiscal year observations, the portfolio strategy begins to take trading positions four months after the fiscal year end of 1998 (i.e. from the beginning of April in 1999). Therefore, investors had access to the investment strategy of AB2 when they collect and process the financial statements of these firms.
4. Results are similar when we use returns on a CRSP equal-weighted market index.
5. To correct for cross-sectional dependence in residuals (Fama and MacBeth, 1973), *t*-statistics are calculated as the ratio of the time-series mean to the standard error of the time-series estimates.
6. http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html
7. Higher values of the Amihud illiquidity indicate lower market liquidity.
8. In untabulated results, we find that the PF hedge return during the period of 1998-2012 is not statistically different from the corresponding hedge return during the period of 1974-1988 (with a p-value > 0.10).
9. Note that AB2 present their future earnings announcement results based on either an AFS strategy or a PF strategy (see AB2's Table V, p. 38).

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Further reading

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