Does Investor Sentiment Affect the Value Relevance of Accounting Information?*

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Abstract

We investigate whether investor sentiment affects the relationships between accounting variables and contemporaneous stock returns. Using price-relevant accounting variables identified by Chen and Zhang (2007) and the investor sentiment index constructed by Baker and Wurgler (2006), we find that the value relevance of accounting variables is collectively lower in high sentiment periods than in low sentiment periods. More importantly, earnings yield appears to be more related to contemporaneous stock returns in high sentiment periods, while other accounting variables are more related to stock returns in low sentiment periods. The effect of investor sentiment on the value relevance of accounting information is stronger for firms that are more difficult to value and to arbitrage.

Key words: Investor sentiment; Stock returns; Accounting information; Value relevance; Earnings; Information processing

JEL classifications: G12; G14; M41

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1. Introduction

We examine the effect of investor sentiment on the value relevance of accounting information. By value relevance, we refer to the extent to which accounting variables are associated with contemporaneous stock returns (see, e.g., Barth et al., 2001; Brimble and Hodgson, 2007). Numerous studies have used the value relevance of an accounting variable to gauge the information content of that variable and to provide guidance for accounting standard setters to improve accounting quality and the information environment for market participants.[1] These studies rely on the long-standing assumption in the accounting literature that investors are rational and they incorporate accounting information into stock prices efficiently. However, as Lee (2001) points out, stock prices may not always be efficient as investors suffer from various behavioral and cognitive biases and constraints. Recent studies in accounting and finance provide evidence that investor sentiment can cause stock prices to deviate from their fundamental values through biased valuation or cash flow forecasts.[2] In particular, investor sentiment, which captures investors' aggregate mood in the market that is unrelated to economic fundamentals (Baker and Wurgler, 2006), has been shown to have a significant effect on stock prices. These studies cast doubt on the degree to which the earnings-returns relation documented in the value relevance literature reflects the attributes of earnings, rather than investors' systematic biases in processing price-relevant firm-specific fundamental information.

In this paper, we address this question by studying whether the value relevance of accounting variables varies systematically with investor sentiment. We examine five relevant variables identified by Chen and Zhang (2007) that are fundamentally linked to firms' contemporaneous stock returns, including earnings yield, capital investment, changes in profitability, changes in growth opportunities and changes in discount rates. We focus on this set of fundamental variables as Chen and Zhang (2007) provide empirical evidence to show that they all have significant explanatory power for stock returns. We examine the full set of these fundamental variables to avoid potential biases caused by omitted related variables that undermine the value relevance literature (Skinner, 1996).

Prior studies offer different views on how sentiment may affect the value relevance of accounting information. The attention view observes that periods of high sentiment are usually accompanied by elevated investor attention to corporate news, which helps to incorporate accounting information into stock prices and thus makes the value relevance of accounting variables positively related to investor sentiment.[3] In contrast, the optimism view proposes that investors in high sentiment periods may become over-optimistic about firms' future prospects and hence care less about current accounting performance, and consequently accounting variables are less related to stock returns in high sentiment periods (Core, Guay and Van Buskirk, 2003; Povel, Singh and Winton, 2007). [4]

An alternate view, labelled the cognitive strategy view, suggests that investor sentiment may affect investors' choice of different cognitive strategies to process information. Studies in psychology reveal that people in a positive mood tend to adopt a heuristic processing strategy that relies on pre-existing knowledge

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[1] For a literature review of US studies, please see Barth, Beaver and Landsman (2001), Holthausen and Watts (2001) and Kothari (2001). There are also a number of value relevance studies on non-US markets. For example, Bugeja and Gallery (2006), Ritter and Wells (2006) and Brimble and Hodgson (2007) examine the value relevance of accounting numbers in Australia; Venter, Emanuel and Cahan (2014) examine the value relevance of non-GAAP earnings in New Zealand; Clarkson et al. (2015) investigate the value relevance of greenhouse gas emissions in Europe. Hung (2000) and Cahan et al. (2015) study value relevance across a number of countries.

[2] For a survey of early studies in finance research on investor sentiment, please see Hirshleifer (2000). Recent studies include Baker, Wurgler and Yuan (2012), Stambaugh, Yu and Yuan (2012) and Yu and Yuan (2011), among many others. Accounting studies on investor sentiment include Bergman and Roychowdhury (2008), Brown et al. (2012), Mian and Sankaraguruswamy (2012), Hribar and McInnis (2012), Walther and Willis (2013), Seybert and Yang (2012), and Coulton, Dinh and Jackson (2016), among others.

[3] The heightened investor attention in high sentiment periods could result from the entrance of new investors into the market and increased trading activities (Griffin, Nardari and Stulz, 2007). It could also result from the "ostrich effect" where investors pay more attention to stocks in rising markets with high sentiment but "put their heads in the sand" in flat or falling markets with low sentiment (Karlsson, Loewenstein and Seppi, 2009; Hou, Peng and Xiong, 2009). Consistent with this view, Coulton, Dinh and Jackson (2016) find that price discovery is more timely in high sentiment periods for stocks whose prices are sensitive to investor sentiment.

[4] Prior studies find that in the late 1990s when investor sentiment was at a record high, equity valuations of technology firms were less related to accounting numbers but more related to novel measures such as web traffic (Trueman, Wong and Zhang, 2000; Demers and Lev, 2001).

such as heuristics or stereotypes to make judgments, while people in a negative mood are more likely to adopt a systematic processing strategy that focuses on detailed information at hand (Schwarz, 2000; Schwarz and Clore, 2007). The cognitive strategy view implies that in high sentiment periods investors may focus on heuristics such as earnings that are frequently reported in the public domain by the financial media and thus become a salient measure of firm performance. This may cause earnings to be more value relevant in high sentiment times than in low sentiment times. In contrast, investors in low sentiment periods are more likely to process other accounting information in detail, causing other accounting variables that are less salient to be more value relevant in low sentiment periods than in high sentiment periods.

To test these three different perspectives emanating from investors' cognitive biases, we collect data on stock returns and accounting variables for a large sample of 47,062 firm-years in the United States from 1983 to 2010. Our sample selection follows Chen and Zhang (2007) and, consistent with their study, we find that the five variables explain a substantial portion of concurrent annual stock returns. We use the investor sentiment index developed by Baker and Wurgler (2006) and examine whether the explanatory power of accounting variables is influenced by investor sentiment over time. We first partition our sample period into high and low sentiment periods based on the median sentiment score and compare the collective explanatory power of accounting information as measured by the adjusted R^2 from regressions of stock returns on accounting variables. We find that the adjusted R^2 is 11.64% in high sentiment periods and 12.52% in low sentiment periods. The difference of 0.88% is statistically significant and presents a 7.6% (=0.88%/11.64%) increase in the explanatory power of accounting information when moving from high sentiment periods to low sentiment periods. The evidence is consistent with Core, Guay and Van Buskirk's (2003) finding that the explanatory power of accounting variables declined in the late 1990s when investor sentiment was at a record high.

Comparing the partial R^2 and the estimated coefficient of each accounting variable, we find significant differences in the estimates during high and low sentiment periods. More specifically, earnings yields are more significantly related to stock returns in high sentiment periods than in low sentiment periods. Other accounting variables, including changes in profitability, capital investments, and changes in growth rates, have a stronger association with contemporaneous stock returns in low sentiment periods than in high sentiment periods. We obtain robust results when we exclude loss firms from the sample, when we use quarterly data to redo the tests, and when we use the Michigan consumer sentiment index as an alternative measure of investor sentiment. In sum, our results are consistent with the cognitive strategy view that investors may choose to focus on different types of accounting information in different states of market sentiment.

Prior studies also show that the effect of investor sentiment varies across firms (Baker and Wurgler, 2006) and is closely related to the degree of disagreement with regards to firm-specific information (Hong and Stein, 2007). Specifically, sentiment tends to have a stronger effect for firms that are difficult to value and difficult to arbitrage, such as small firms, growth firms, firms with high return volatility, and firms that do not pay dividends. To examine the cross-sectional difference in the effect of sentiment on investors' use of accounting information, we partition sample firms each year into two groups based on firm size, stock return volatility, market-to-book ratios and dividend paying status. We find that earnings yield is more significantly related to returns in high sentiment periods, particularly for small firms, volatile firms, high market-to-book firms and firms not paying dividends. These firms have a stronger association between changes in profitability and stock returns in low sentiment periods. Our empirical evidence is largely consistent with the view that these firms are more likely to be subject to the influence of market sentiment.

Our study is closely related to two recent articles that examine the relation between short-window stock returns and earnings news. Mian and Sankaraguruswamy (2012) investigate the effect of investor sentiment on market reactions to earnings announcements. They argue that market valuation of incremental cash flows is more optimistic in high sentiment periods than in low sentiment periods. Accordingly, they document that in the three-day window around quarterly earnings announcements, negative (positive) earnings surprises are associated with less negative (more positive) stock returns when investor sentiment is higher. Seybert and Yang (2012) examine stock returns when managers issue earnings guidance. Arguing that managers' earnings guidance should help correct sentiment driven overvaluation, they find that the market reacts more negatively to negative earnings surprises. Our study complements yet differs from theirs in two important ways. First, we examine the long-window returns, consistent with prior studies in the

value relevance literature.[5] Second, we examine a number of price-relevant accounting variables and assess their value relevance conditional on investor sentiment, while the above studies focus exclusively on earnings. Using long-window (one year) stock returns, we find evidence that the value relevance of earnings and other accounting variables is also conditional on the prevailing investor sentiment.

We contribute to the value relevance literature in two ways. First, we provide unique evidence that the association between accounting variables and stock returns varies with the prevailing investor sentiment. The evidence suggests that the value relevance of a particular accounting variable may change over time with investors' moods. Our study, together with Mian and Sankaraguruswamy (2012), calls for caution when interpreting the relation between returns and accounting numbers. Second, the value relevance literature has long been criticized for the issue of omitted related variables which makes it difficult to draw conclusions from value relevance regressions (Skinner, 1996; Holthausen and Watts, 2001). Our evidence suggests that investor sentiment is likely to be an omitted related variable that can explain time-series variations in the coefficients of accounting variables.

Our study also contributes to the literature on investor sentiment by providing evidence on a distinct aspect of sentiment. While prior studies focus on the effect of sentiment driven optimism on discount rates and earnings forecasts, our study sheds light on investors' information processing strategies and the link between individuals' mood and their cognitive information processing. We provide novel evidence on the effect of investor sentiment on the use of fundamental information in stock valuation and in doing so we add to the growing literature on investor sentiment in financial markets.

The remainder of the paper is organized as follows. Section 2 reviews the literature and develops our main hypotheses. Section 3 describes our research design. We report the empirical findings in Section 4 and conclude in Section 5.

2. Prior Studies

2.1 Investor sentiment, attention and optimism

A growing literature finds that stock returns are predictable following some events that are unrelated to economic fundamentals but potentially can change investors' mood, such as daylight changes (Kamstra, Kramer and Levi, 2003), weather patterns (Hirshleifer and Shumway, 2003), outcomes of international sports games (Edmans, García and Norli, 2007), and occurrence of aviation disasters (Kaplanski and Levy, 2010). A separate stream of research shows that during high sentiment periods, market participants including managers, financial analysts and investors tend to have more opportunistic forecasts of future earnings and earnings growth (Brown et al., 2012; Walther and Willis, 2013). Collectively, these two research strands provide growing evidence to support the view that investor sentiment has a profound influence on stock prices by influencing investors to have erroneous beliefs about discount rates or future cash flows that cannot be justified by economic fundamentals (Baker and Wurgler, 2006).

In accounting research, experiments and field studies find individuals' mood has a significant impact on the behavior of market participants including auditors (Chung, Cohen and Monroe, 2008) and managers (Ding and Beaulieu, 2011). Using the sentiment index developed by Baker and Wurgler (2006), archival studies document that investor sentiment is associated with managers' financial disclosure strategies (Bergman and Roychowdhury, 2008; Brown et al., 2012; Simpson, 2013) and market reactions to earnings news (Mian and Sankaraguruswamy, 2012; Seybert and Yang, 2012).

Investor sentiment may affect the value relevance of accounting information through investor attention, as sentiment is likely to be related to investors' attention to financial markets and corporate news. High sentiment periods usually witness investors, big and small, flooding into the markets and increased trading activities, which implies heightened investor attention. If investors have a constraint on limited attention that prevents them from processing and incorporating value-relevant accounting information into stock prices (DellaVigna and Pollet, 2009; Hirshleifer, Lim and Teoh, 2009), the increased attention should mitigate this constraint and result in a stronger association between stock returns and accounting information. Furthermore, Karlsson, Loewenstein and Seppi (2009) document an "ostrich effect" where

[5] We recognise that there are drawbacks to the use of long-window returns for our purpose in that a) the effect of sentiment can reverse in long-term returns; and b) controlling and adjusting for risk becomes problematic when using long-term returns. The full effects of investor sentiment are likely to be even greater than documented in our empirical analyses but nonetheless our results provide a minimum for the size of the effects.

investors tend to pay attention to stocks in rising markets but "put their heads in the sand" and ignore stocks during falling markets. This effect also implies that accounting information will receive more investor attention and become more value relevant in high sentiment periods. Consistent with this view, Hou, Peng and Xiong (2009) find that investors' under-reaction to earnings information is stronger in declining markets than in rising markets. Coulton, Dinh and Jackson (2016) find that information is incorporated in stock prices in a more timely manner in high sentiment periods for stocks whose prices are sensitive to investor sentiment. In sum, the attention view predicts that value relevance of accounting variables will be positively related to investor sentiment.

However, the optimism view suggests that in high sentiment periods investors are over-optimistic and may ignore accounting information and make accounting variations less relevant to equity prices. In their analytic model, Povel, Singh and Winton (2007) argue that in boom years when investors are very optimistic about firms' investment opportunities, they care less about financial statement information but more about scarce investment opportunities. It is observed that during the late 1990s when investor sentiment was at a record high, equity valuations of technology firms were less closely related to accounting numbers and were instead more related to novel measures such as web traffic (Trueman, Wong and Zhang, 2000; Demers and Lev, 2001). Core, Guay and Van Buskirk (2003) find that accounting variables have less explanatory power for stock returns in the late 1990s for both technology and non-technology stocks. Therefore, the optimism view predicts that the value relevance of accounting information will be negatively related to investor sentiment.

2.2 Mood and information processing

Extant studies in human psychology find that mood affects judgment and decision making in that people in different mood states may choose different strategies to process information. Specifically, individuals who are in a positive mood are more likely to adopt a heuristic processing strategy that relies more on their pre-existing knowledge structure and they pay insufficient attention to the details at hand. In contrast, people in a negative mood are more likely to use a systematic processing strategy that relies less on their pre-existing knowledge and instead they pay more attention to the details to formulate their decision (Schwarz, 2000; Schwarz and Clore, 2007). For example, Bodenhausen, Kramer and Susser (1994) find that people in a positive mood are more likely to use stereotypes to make judgments, suggesting that they use a heuristic processing strategy. In tasks of processing visual information, Gasper and Clore (2002) document that participants who are in a positive mood are more likely to use global information while participants in negative moods are more likely to pay attention to local information.

Consistent with the psychological findings, Ali and Gurun (2008) argue that in low sentiment periods investors pay more attention to earnings components and thus differentiate accruals from cash flows, while in high sentiment periods investors may just focus on reported earnings and overlook the differences between earnings components. Similarly, in their study on frauds across business cycles, Povel, Singh and Winton (2007) argue that in boom years investors subject financial statement information to less scrutiny than during bust years. Taken together, there is much evidence to suggest an underlying cognitive bias affects the value relevance of accounting information.

Equity valuation based on fundamental analysis is a complex task that requires systematic information processing and detailed analysis of accounting information. Conducting a detailed valuation of a firm involves analyzing industry and economic conditions, understanding business operations, evaluating performance and risks, making forecasts, and estimating the value of the firm using some valuation models. However, there is also a heuristic approach to valuing stocks using price multiples such as price-to-earnings (PE) ratios. Given the benchmark PE ratio, investors can quickly react to accounting information by focusing solely on earnings.

If investors in a positive mood are more likely to use a heuristic information processing strategy, it follows that they are likely to rely on company earnings to perform valuations and make investment decisions as corporate earnings have become a salient measure of firms' performance among investors (Graham et al., 2005). As a result, earnings will be more related to stock returns during high sentiment periods than during low sentiment periods. In contrast, detailed analysis using other accounting variables will be less likely to be adopted by investors when they are in a positive mood than when they are in a negative mood. Consequently, the relation between stock returns and other accounting variables will be stronger when sentiment is low than when sentiment is high. Following this discussion, the cognitive

strategy view predicts that the value relevance of earnings will be higher when investor sentiment is high, while the value relevance of other accounting variables will be higher when investor sentiment is low.

3. Research Design

3.1 Valuation model

Prior studies on the value relevance of accounting variables usually focus on financial statement items that are of interest to researchers. These items are sometimes chosen without any theoretical motivation. As Holthausen and Watts (2001) point out, various econometric issues, particularly the omitted related variables, make it difficult to draw conclusions from value relevance regressions. In this study, we follow the valuation model of Chen and Zhang (2007) for guidance on the selection of accounting variables that are theoretically related to contemporaneous stock returns.

Chen and Zhang (2007) follow the equity valuation model of Zhang (2000) to investigate the explanatory power of observed accounting data for equity returns. The model defines equity value as the present value of future cash flows which depend on two basic operational attributes: scale and profitability. It embeds the firm's value-creating capital investment decisions within the set of available options to grow and to downsize or abandon. Profitability captured by the Return on Equity (*ROE*) not only assesses a firm's ability to generate value from the invested capital but also indicates how the firm will adjust its future investments.

In the spirit of Chen and Zhang (2007), we let V_t denote the value of an all equity-finance firm at date t. The variable B_t is the book value of equity, X_t is the earnings generated in period t and g_t is the firm's growth opportunities at t. Let g_t be the percentage by which the capital invested may grow. Define $q_t \equiv X_t / B_{t-1}$ as profitability (ROE) at time t. Let $E_t(X_{t+1})$ be the expected next-period earnings and k is the earnings capitalization factor. $P(q_t)$ and $C(q_t)$ are the put option to close operations and the call option to increase operations, respectively. To simplify the analysis, profitability is assumed to follow a random walk, $\tilde{q}_{t+1} = q_t + \tilde{e}_{t+1}$. Chen and Zhang (2007) derive the valuation function of equity as:

$$V_t = B_t\left[q_t / r_t + P(q_t) + g_t C(q_t)\right] \equiv B_t \upsilon(q_t, g_t, r_t) \tag{1}$$

where $\upsilon(q_t, g_t, r_t) \equiv q_t / r_t + P(q_t) + g_t C(q_t)$. This implies that the value of an equity can be decomposed into the amount of equity capital invested and the value per unit of capital, growth opportunities and the discount rate. Now consider ΔV_{t+1}, the change in equity value from date t to date t+1. Define $\upsilon_1 \equiv d\upsilon/dq_t$ and $\upsilon_3 \equiv d\upsilon/dr_t$. Let D_t be the dividends paid in period t+1. Chen and Zhang (2007) derive the period t+1 stock return, denoted R_{t+1} as:

$$R_{t+1} = \left[\frac{X_{t+1}}{V_t}\right] + \upsilon_1\left[\frac{B_t}{V_t}\Delta q_{t+1}\right] + \left[\left(1 - \frac{B_t}{V_t}\right)\frac{\Delta B_{t+1}}{B_t}\right] + C(q_t)\left[\frac{B_t}{V_t}\Delta g_{t+1}\right] + \upsilon_1\left[\frac{B_t}{V_t}\Delta r_{t+1}\right] \tag{2}$$

Eq. (2) shows that the stock return is a function of the earnings yield, the change in profitability, the change in equity capital, the change in growth opportunities and the change in the discount rate. Based on the relationship represented in Eq. (2), Chen and Zhang (2007) run the following approximate regression to explain stock returns:

$$R_{it} = \alpha + \beta x_{it} + \gamma \Delta \hat{q}_{it} + \delta \Delta \hat{b}_{it} + \omega \Delta \hat{g}_{it} + \varphi \Delta \hat{r}_{it} + e_{it} \tag{3}$$

where R_{it} is the annual stock return; $x_{it} = X_{it} / V_{it-1}$ is the earnings yield, or earnings (X_{it}) divided by the beginning-of-period market value of equity (V_{it-1}); $\Delta \hat{q}_{it} = (q_{it} - q_{it-1}) B_{it-1} / V_{it-1}$ is the change in profitability ($q_{it} = X_{it}/B_{it-1}$), adjusted by the beginning-of-period ratio of the book value of equity to the market value of equity; $\Delta \hat{b}_{it} = [(B_{it} - B_{it-1}) / B_{it-1}](1 - B_{it-1} / V_{it-1})$ is capital investment, or changes in the book value of equity, adjusted by one minus the beginning-of-period book-to-market ratio; $\Delta \hat{g}_{it} = (g_{it} - g_{it-1}) B_{it-1} / V_{it-1}$ is the change in growth opportunities, measured by the change in financial analysts' median forecasts of long-term growth rates adjusted by the beginning-of-period book-to-market ratio; $\Delta \hat{r}_{it} = (r_t - r_{t-1}) B_{it-1} / V_{it-1}$ is the change in the discount rate, calculated as the annual change in 10-year treasury bond rates, adjusted by the firm's beginning-of-period book-to-market ratio. We take the five accounting variables in Eq. (3) as our set of firm-specific fundamental variables for explaining stock price movements.

3.2 Investor sentiment

Following prior studies, we measure investor sentiment with the market sentiment index developed by Baker and Wurgler (2006). The index is constructed using six underlying proxies that have been shown to capture investor sentiment: the closed-end fund discount, NYSE share turnover, the number of IPOs, the average first-day returns, the share of equity issues in total equity and debt issues, and the dividend premium. Each proxy was made orthogonal to a set of macroeconomic variables to remove the information about economic fundamentals. Using principal component analysis (PCA), Baker and Wurgler (2006) extract the first principal component of the six individual proxies to use as a measure of market sentiment. A higher index score indicates a more positive investor sentiment in the market.

The monthly and annual sentiment indexes up to 2010 are available at Jeffrey Wurgler's website. The sentiment indexes have been widely used in a number of studies, including Baker and Wurgler (2006), Mian and Sankaraguruswamy (2012) and Hribar and McInnis (2012), among many others. Following these studies, we also use the sentiment index to capture investor sentiment.

3.3 Data and sample

We obtain accounting data from Compustat North America, stock return data from the Center of Research on Security Prices (CRSP), analysts' forecasts of long-term growth rates from the Institutional Broker Estimate System (I/B/E/S) and treasury bond yields from the US Treasury website. Our sample period starts in 1983 because analysts' growth rate forecasts are not available for a large sample of firms in I/B/E/S until 1982 and we need to calculate annual changes in earnings growth. We require all sample firms to have non-missing values of stock returns and accounting variables. The final sample consists of 47,824 firm-year observations from 1983 to 2010.

To calculate the annual returns, we compound monthly returns in the 12 month period starting from the fourth month of fiscal year t and ending in the third month of fiscal year $t+1$. This return period contains the announcements of annual earnings of year t since firms are required to announce annual earnings within 90 days after fiscal year end. To align the timing of investor sentiment and stock price changes, we calculate the average monthly investor sentiment score for each firm-year using the market sentiment index in the same 12 month period. Similarly, we calculate the changes in treasury bond yields using the values at the beginning and end of the 12 month period. To capture changes in analysts' long-term growth rate forecasts, we use the median forecast immediately after the annual earnings announcements minus the median forecasts made 12 months ago.[6]

4. Empirical Results

4.1 Descriptive statistics and correlation matrix

Panel A in Table 1 reports the descriptive statistics of the annual stock returns and other variables used in value relevance regressions across the full sample period studied. The mean (median) of annual stock returns is 15.4% (10.1%). The median earnings yield (E/P) is 5.8%, implying a price-to-earnings ratio of 17.2 (=1/0.058). The mean of annual changes in profitability is -1.1%, consistent with increasing competition and declining profitability in US firms in recent decades (Bates, Kahle and Stulz, 2009). Similarly, the mean of annual changes in analyst forecasts' of long-term growth rates is -0.3%, suggesting that analysts expected a slower earnings growth on average over the same period. The mean annual capital investment is 9.9%, and the average change in discount rates is -0.184. These statistics are very similar to those reported by Chen and Zhang (2007) although their sample period of 1983 to 2001 is shorter than our period of 1983 to 2010.[7]

[Insert Table 1 about here]

In Panel B, we report the Pearson correlation coefficients between the variables. Stock returns are positively associated with earnings yields, changes in profitability, changes in growth opportunities, and

[6] I/B/E/S provides the summary statistics (mean, median, standard deviation, etc) of the long-term growth forecasts every month.

[7] In untabulated results, we also examine the summary statistics across high and low sentiment sub-periods. The mean earnings yield is 5.26% in high sentiment periods and 4.38% in low sentiment periods. Similarly, the mean change in capital investments is higher in high sentiment periods (11.05% vs. 10.02%). It seems that sentiment may have some effect on accounting variables, but the effect appears to be uniform for the accounting variables.

capital investments. This correlation pattern is consistent with the expectation that firms with higher earnings, higher profitability, and more growth and investment opportunities should see higher share prices. However, the correlation between stock returns and changes in discount rates is positive. Consistent with Chen and Zhang (2007), we find positive correlations between accounting variables and a negative correlation between earnings yields and changes in discount rates.

4.2 Value relevance regressions

We start our analysis by replicating the baseline results in Chen and Zhang (2007) for two reasons. First, we provide up-to-date evidence on the key findings from their study. Second, we examine if there are any changes in the model's explanatory power since 2001 when their sample period ends.

Table 2 reports the results from pooled time-series and cross-sectional regressions. The regression results from the full sample indicate that accounting variables and changes in discount rates collectively explain 9.8% of the variations in annual stock returns. Each accounting variable has a positive and statistically significant coefficient, consistent with the results reported by Chen and Zhang (2007). The coefficient for changes in discount rates, however, is positive and statistically insignificant.

[Insert Table 2 about here]

We then partition the sample period into two subsamples at fiscal year 2001, and re-estimate the value relevance regression for each subsample. The first subsample period is the same as that examined in Chen and Zhang (2007), and we find very similar results to theirs. For example, our coefficients for earnings yield (x), changes in profitability (Δq), capital investments (Δb), changes in growth opportunities (Δg) and changes in discount rates (Δr) are 1.329, 0.695, 0.218, 2.768 and -0.068, respectively. These coefficients have the same sign and are of similar magnitude to those reported by Chen and Zhang (2007): 0.97, 0.76, 0.31, 2.97 and -0.08, respectively. The regression model has an adjusted R^2 of 15.2%, compared with 16.01% reported by Chen and Zhang (2007).

Comparing the two subsample periods, we find significant changes in the coefficient estimates of the explanatory variables and in the adjusted R^2. The coefficient of earnings yield decreases dramatically from 1.329 to 0.329. Similarly, the coefficient of capital investments also decreases (from 0.218 to 0.196) and the coefficient of changes in growth opportunities decreases (from 2.768 to 1.371). In contrast, the coefficient of changes in profitability increases from 0.695 to 0.895. More strikingly, the coefficient of changes in discount rates changes in sign, increasing from -0.068 to 0.534.[8]

Overall, the changes in the coefficients of the variables seem to suggest that after 2001, the relation between accounting variables and stock returns has weakened, while the relation between stock returns and discount rate changes has strengthened. The adjusted R^2 increases from 15.2% to 26.4%, suggesting that overall the set of fundamental variables identified by the valuation model in Chen and Zhang (2007) provides a greater explanatory power for contemporaneous stock returns in more recent years. It is also interesting to note that in each subsample period, the adjusted R^2 is larger than in the pooled sample. Combined with changes in the coefficients, this evidence suggests that forcing the coefficients of the variables to be the same in the pooled sample actually reduces the model's overall explanatory power.

In Table 3, we present results from annual cross-sectional regressions of stock returns on accounting variables to provide further insight into the time-series variations in the coefficients and R^2. The results reveal some significant changes in the coefficients over time. The coefficient of earnings yield exhibits a wide range from -0.884 (in 1999) to 2.259 (in 1996)[9]. It is negative in three years and positive in 25 years. The coefficients of other explanatory variables are also mostly positive with the exception of changes in discount rates which shifted from a consistently negative relationship with stock returns to a positive one after 2003. The bottom two rows report the average coefficients and R^2 for the two subsample periods partitioned by 2001. Consistent with the results in Table 2, we find a decrease in the average coefficients of earnings yields, capital investments and changes in growth rate forecasts from the first subsample period to the second. On average, the model explains about 20.83% of the variations in stock returns before 2001, and the R^2 decreases to 18.00% after 2001. More importantly, there are large time-

[8] The positive coefficient for discount rate changes suggests some structural changes in the model or the economy in recent years. One possible reason could be that low interest rates have been maintained for extended periods in the second sample period. We leave it to future research to explore this issue.

[9] For comparison, Chen and Zhang (2007) report the coefficient of earnings yield ranged from -1.07 (in 1999) to 1.83 (in 1996).

series variations in both the coefficients and the explanatory power of the model. For example, the R^2 ranges from 9.87% (in 1987) to 30.89% (in 1983).

[Insert Table 3 about here]

The significant changes in the coefficients are consistent with findings in Kothari and Shanken (2003) who also find significant time-series variations in the coefficients of value relevance regressions that include earnings and balance sheet items as the independent variables. We now examine whether investor sentiment could be related to the time-series variations in these coefficients.

In Table 4, we partition the sample into high and low sentiment periods. Firm-year observations with above-median sentiment scores are classified into a high sentiment subsample, while the remaining observations are allocated into the low sentiment subsample. We then estimate the value relevance regressions separately for each subsample, and compare the coefficients and R^2 between the two subsamples. First, we note that the adjusted R^2 is 12.52% in low sentiment periods and 11.64% in high sentiment periods. The difference of 0.88% is statistically significant and represents a 7.6% (= 0.88%/12.52%) reduction in the explanatory power when moving from low to high sentiment periods.[10] The evidence suggests that accounting variables are collectively statistically less related to contemporaneous stock returns when sentiment is high. This result is consistent with the view that investors pay less attention to accounting fundamentals when they are excessively optimistic in bull markets (Core, Guay and Van Buskirk, 2003; Povel, Singh and Winton, 2007).

[Insert Table 4 about here]

Examining the coefficients of individual accounting variables, we find significant differences in the two subsample periods. The coefficient of earnings yield is 1.357 (p-value = 0.00) in high sentiment periods, which is about three times larger than the coefficient in low sentiment periods (coefficient = 0.426, p-value = 0.00). The difference in the magnitude of the coefficient estimates between high and low sentiment periods is statistically significant at the 1% level. The evidence suggests that earnings are more related to contemporaneous stock returns in high sentiment periods than in low sentiment periods. In contrast, the coefficient of 1.069 (p-value = 0.00) for changes in profitability in low sentiment periods is about double the estimate of 0.523 (p-value = 0.00) in high sentiment periods and the difference is statistically significant at the 1% level. We also observe larger coefficient estimates for other accounting variables like capital investments and changes in growth opportunities in low sentiment periods.[11]

Table 4 also reports the incremental explanatory power of individual accounting variables. Earnings yield alone explains 6.41% of the variation in stock returns in high sentiment periods, but only 1.52% in low sentiment periods. In contrast, changes in profitability, capital investments and changes in growth opportunities all have greater explanatory power in low sentiment periods.

To benchmark our results with those in prior value relevance studies that focus on earnings, we include only the earnings yields in the regression and re-estimate the model for high and low sentiment periods. The results in Table 4 reveal that the coefficient of earnings yields is 1.680 in high sentiment periods and 1.001 in low sentiment periods, and the difference in the coefficients is statistically significant at the 1% level. This result suggests that the value relevance of earnings varies with the prevailing investor sentiment.

Overall, the evidence suggests that the detailed accounting information captured by non-earnings variables is more related to contemporaneous stock returns in low sentiment periods than in high sentiment periods. Taken as a whole, the results in Table 4 are inconsistent with predictions of the optimism view or the attention view. Instead, the results appear to support the cognitive strategy view that investors rely on more salient information such as earnings to make investment decisions in high sentiment periods, and they conduct more detailed analysis using other accounting information in low sentiment periods.

It is also interesting to note that the coefficient on changes in discount rates is negative in high sentiment periods but positive in low sentiment periods. One reason could be our measure of discount rates, the yields of 10-year treasury bonds, may not capture the firm-specific discount rates but rather economy-wide performance. To address this concern, we calculate individual firm betas using daily stock returns in the fiscal year. Using firm-specific beta as an alternative measure of discount rates yields very similar

[10] In a related study, Core, Guay and Van Buskirk (2003) also find a lower R^2 in the late 1990s when sentiment is high from their value relevance regressions of market-to-book ratios on accounting variables.

[11] The differences in the coefficients of all the variables between the two subsample periods are statistically significant at the 1% level.

results. We are not aware of any theory that can explain the differential relation between stock returns and changes in discount rates in high and low sentiment periods. We leave this question to future research.

To further investigate the sentiment driven variations in the relation between stock returns and accounting variables, we create interaction terms between investor sentiment and explanatory variables and include them in the value relevance regressions. The interaction terms capture the effect of investor sentiment on the returns-accounting variables relation. Table 5 reports the results from regressions with interaction terms progressively added to the base model specification to assess the potential multi-collinearity between the variables. We find the interaction term between sentiment and earnings yield is always positive and statistically significant in all model specifications, suggesting a stronger relation between earnings and returns in high sentiment periods. The interaction terms between sentiment and other accounting variables have negative and statistically significant coefficients in Models 2, 3 and 4, indicating a weaker relation between stock returns and these variables in high sentiment periods. In Model 5, when we also control for the interaction between sentiment and changes in discount rates, the results still hold except the coefficient for the interaction between sentiment and changes in growth opportunities becomes insignificant. Overall, the results in Table 5 reinforce those in Table 4 and support the cognitive strategy view that the relation between stock returns and different accounting variables is conditional on investor sentiment, suggesting that sentiment influences market participants' use of different types of accounting information for stock valuations.

[Insert Table 5 about here]

We conduct robustness tests to ensure that the results are not sensitive to our choice of research design. First, we redo our tests using quarterly data. Since investor sentiment may change within a year, quarterly data allows us to measure sentiment more frequently and to potentially address the concern that the effect of sentiment may not be long-lasting. We calculate the quarterly return in the period starting from the third day after the last quarter's earnings announcement and ending on the second day after the current quarter's earnings announcement. Accounting variables are computed on a quarterly basis. We replicate all the results using quarterly data and, for the sake of space, we report in Table 6 the results from regressions examining the effect of investor sentiment on the coefficients of the value relevance regressions.[12] We find that the interaction term between earnings yield and investor sentiment has positive coefficients in all model specifications, suggesting a stronger association between earnings yield and stock returns in high sentiment periods. The interaction terms between sentiment and capital investment and changes in profitability have negative and statistically significant coefficients in Models 2, 3 and 4, indicating a weaker relation between stock returns and these two accounting variables in high sentiment periods. These results are consistent with the results in Table 5.

[Insert Table 6 about here]

Second, there is an alternative explanation for the relatively weaker association between earnings yield and stock returns in low sentiment periods. Hayn (1995) shows that negative profits have a weak association with stock returns, as losses are not expected to be sustainable. It is likely that more firms report accounting losses in low sentiment periods with lower economic growth and the variation in the number of loss firms may drive our results. To address this concern, we exclude firms reporting accounting losses from the sample and then we redo all tests. We obtain essentially the same results as those in reported tables.

Third, while the sentiment index developed by Baker and Wurgler (2006) has been widely used in the literature, there are other measures of sentiment available. To ensure our results are not specific to this particular sentiment measure, we use the consumer sentiment index developed by the University of Michigan to redo the tests. Results using this alternative measure of sentiment are very similar to those reported in the paper.

Lastly, there is a possibility that sentiment could impact the "real information content" of accounting variables, which in turn affects the association between accounting variables and stock returns.[13] For example, earnings could be more persistent and thus a better predictor of future cash flows in high sentiment periods, leading to a stronger earnings-return relation (Barth et al., 1999). While we acknowledge that "the real information content" of accounting variables could change over time, we doubt our results can be fully explained by this possibility for two reasons. First, as we document that investor sentiment affects the value relevance of earnings differently from that of other accounting variables, it is unclear in

[12] Other results from using quarterly data are available upon request.
[13] We thank an anonymous reviewer for pointing out this possibility.

theory why other accounting variables' real information content should decrease with sentiment while earnings' real information content increases with sentiment. Second, Mian and Sankaraguruswamy (2012) show that the "real information content" of earnings does not seem to vary with investor sentiment. Specifically, they find that the association between earnings increases and future cash flows does not vary with sentiment, and the association between earnings increases and future earnings decreases, rather than increases, with sentiment. Mian and Sankaraguruswamy (2012, p. 1370) conclude that "the information content of earnings is either unrelated to sentiment (when measured using future cash flows), or is related in the 'wrong' way (when measured using future earnings)."

4.3 Effect of firm characteristics

Prior studies show that investor sentiment has a particularly strong effect on firms that have small size, high return volatility and high market-to-book ratios, and also firms that do not pay dividends (e.g., Baker and Wurgler, 2006; Mian and Sankaraguruswamy, 2012). On one hand, these firms are difficult to value because of the inherently high uncertainty in their risk and future prospects. On the other hand, these firms are difficult to arbitrage due to poor liquidity, limited supply of lendable shares and high arbitrage risk. Following prior studies, we examine whether the differential effect of sentiment on the association between accounting variables and returns is stronger for firms with smaller size, higher volatility, higher market-to-book ratios and those that do not pay dividends. To conduct our empirical tests, we divide our sample firms each year into two subsamples based on the median of firm size, return volatility (measured by the standard deviation of daily stock returns), and the market-to-book ratios. We also form subsamples for dividend payers and non-payers. We then estimate regression Model 5 in Table 5 separately for each subsample and compare the coefficients between the subsamples. To facilitate a direct comparison and interpretation, we replace sentiment with a dummy variable, *High*, for high sentiment periods that have above-median sentiment scores. The interaction terms between *High* and the various accounting variables capture the change in the returns-accounting variables' relations in high sentiment periods relative to low sentiment periods. Similarly, to investigate the effect of return volatility, we partition the firms into high and low volatility firms each year based on the median standard deviation of daily stock returns in the fiscal year, and estimate and compare the value relevance regression coefficients.

Table 7 presents the results from this analysis. Comparing large and small firms, we find the coefficient estimates of the interaction term between *High* and earnings yield are positive for both large and small firms, suggesting a stronger association between returns and earnings yield in high sentiment periods. However, the coefficient is larger in magnitude for small firms than for large firms, suggesting that sentiment has a larger effect on the earnings-returns relation for small firms. Similarly, the interaction term between *High* and changes in profitability has a relatively more negative coefficient for small firms than for larger firms, implying a stronger effect of sentiment on small firms. Comparing high volatility and low volatility firms, we find similar results: the coefficient of the interaction term between earnings yield and *High* is more positive for high volatility firms, and the coefficient of the interaction term between *High* and changes in profitability is more negative for high volatility firms. We also find similar patterns in the coefficients of the interactions terms between *High* and other price-relevant accounting variables and alternative subsamples formed on market-to-book ratios and dividend paying status. Hence, our results corroborate earlier studies arguing that traded stocks of certain types of firms are more likely to be subject to waves of investor sentiment (Baker and Wurgler, 2006). Overall, our results are consistent with prior findings that investor sentiment has a stronger effect on firms with small size, high volatility, high market-to-book ratios and those not paying out dividends.

[Insert Table 7 about here]

5. Conclusion

We investigate the effect of investor sentiment on the value relevance of accounting information. Prior studies offer three different views on how investor sentiment may affect the relation between stock returns and accounting information. The attention view predicts the value relevance of accounting variables will be positively related to prevailing investor sentiment as a higher level of investor sentiment in the market draws more investor attention to the market. The optimism view predicts lower value relevance of accounting information in high sentiment periods because investors may be overly optimistic about future prospects and overlook current accounting information. In contrast, the cognitive strategy view differentiates earnings and other accounting variables and predicts earnings will be more related to stock

returns in high sentiment periods, while other more detailed accounting information will be more related to stock returns in low sentiment periods. Using a large sample of US firms, we find empirical evidence consistent with the cognitive strategy view.

Our study has important implications for the large and long-standing literature on the value relevance of accounting information. Relying on the assumption that stock prices efficiently incorporate accounting information, prior studies use the association between stock prices or returns and accounting variables to draw conclusions on the value relevance of particular accounting variables such as fair value estimates. Based on the statistical association, some studies make recommendations to policy makers and accounting standards setters (see Holthausen and Watts, 2001 for a critical review of the literature). Consistent with findings in the behavioral finance literature that stock prices may not be completely efficient, our results suggest that the relationships between stock returns and accounting variables can be influenced by investor sentiment. This evidence thus calls for caution when making inferences or drawing conclusions from value relevance regressions. At the minimum, our finding that the coefficients in the value relevance regressions vary systematically with investor sentiment suggests that sentiment could be an omitted correlated variable in value relevance regression models.

Our study also extends the behavioral finance literature. Prior studies on investor sentiment focus on investors' risk aversion and cash flow forecasts. Our study examines a distinct effect of market sentiment on investors' information processing strategy. The evidence suggests that investors tend to choose different strategies and focus on different sets of information to formulate valuations in high versus low sentiment periods. By linking sentiment to investors' cognitive strategies, we also connect sentiment studies with research on investors' cognitive constraints such as limited attention (DellaVigna and Pollet, 2009; Hirshleifer, Lim and Teoh, 2009) and overconfidence (Barber and Odean, 2001).

A major caveat in this study is that our evidence shows the relation between accounting variables and stock returns varies with investor sentiment and we argue that the evidence is consistent with mood affecting investors' use of information processing strategies. However, we acknowledge that we cannot observe how investors actually process accounting information in financial markets. The evidence, although supportive of the cognitive strategy view, could be subject to alternative explanations. Such alternative explanations, however, must explain why in high sentiment periods there is a stronger relation between earnings and stock returns, but a weaker association between stock return and non-earnings accounting variables. Nevertheless, readers should be aware of the limitations of our study when interpreting the new empirical evidence.

References

Ali, A. and U. Gurun, 2008. Investor sentiment, accruals anomaly, and accruals management. *Journal of Accounting, Auditing and Finance* 10, 415-43.

Baker, M. and J. Wurgler, 2006. Investor sentiment and the cross-section of stock returns. *Journal of Finance* 61, 1645-1680.

Baker, M., J. Wurgler and Y. Yuan, 2012. Global, local, and contagious investor sentiment. *Journal of Financial Economics* 104, 272-287.

Barber, B. and T. Odean, 2001. Boys will be boys: gender, overconfidence, and common stock investment. *Quarterly Journal of Economics* 116, 261-292.

Barth, M., W. Beaver and W. Landsman, 2001. The relevance of the value relevance literature for financial accounting standard setting. *Journal of Accounting and Economics* 31, 77-104.

Barth, M. E., J.A. Elliott and M.W. Finn, 1999. Market rewards associated with patterns of increasing earnings. *Journal of Accounting Research* 37(2), 387-413.

Bates, T.W., K.M. Kahle and R.M. Stulz, 2009. Why do U.S. firms hold so much more cash than they used to? *Journal of Finance* 64, 1985-2021.

Bergman, N.K. and S. Roychowdhury, 2008. Investor sentiment and corporate disclosure. *Journal of Accounting Research* 46, 1057-1083.

Bodenhausen, G.V., G.P. Kramer and K. Susser, 1994. Happiness and stereotypic thinking in social judgment. *Journal of Personality and Social Psychology* 66, 621-632.

Brimble, M., and A. Hodgson, 2007. On the intertemporal value relevance of conventional financial accounting in Australia. *Accounting and Finance* 47, 599-622.

Brown, N., T. Christensen, W. Elliot and R. Mergenthaler, 2012. Investor sentiment and pro forma earnings disclosures. *Journal of Accounting Research* 50, 1-50.

Bugeja, M., and N. Gallery, 2006. Is older goodwill value relevant? *Accounting and Finance* 46, 519-535.

Cahan, S.F., C. De Villiers, D.C. Jeter, V. Naiker, and C.J. Van Staden, 2015. Are CSR disclosures value relevant? Cross-country evidence. *European Accounting Review* 25, 1-33.

Chen, P. and G. Zhang, 2007. How do accounting variables explain stock price movements? Theory and evidence. *Journal of Accounting and Economics* 43, 219-244

Chung, J., J. Cohen and G. Monroe, 2008. The effect of moods on auditors' inventory valuation decisions. *Auditing: A Journal of Practice and Theory* 27, 137-160.

Clarkson, P.M., Y. Li, M. Pinnuck, and G.D. Richardson, 2015. The valuation relevance of greenhouse gas emissions under the European Union Carbon Emissions Trading Scheme. *European Accounting Review* 24 (3), 551-580.

Core, J., W. Guay and A. Van Buskirk, 2003. Market valuations in the new economy: an investigation of what has changed. *Journal of Accounting and Economics* 34, 43-67.

Coulton, J., T. Dinh and A. Jackson, 2016. The impact of sentiment on price discovery. *Accounting and Finance* 56, 669-694.

DellaVigna, S. and J.M. Pollet, 2009. Investor inattention and Friday earnings announcements. *Journal of Finance* 64, 709-749.

Demers, E. and B. Lev, 2001. A rude awakening: internet shakeout in 2000. *Review of Accounting Studies* 6, 331-359.

Ding, S. and P. Beaulieu, 2011. The role of financial incentives in balanced scorecard-based performance evaluation: correcting mood congruency biases. *Journal of Accounting Research* 49, 1223-1247.

Edmans, A., D. García and Ø. Norli, 2007. Sports sentiment and stock returns. *Journal of Finance* 62, 1967-1998.

Gasper, K. and G. Clore, 2002. Attending to the big picture: mood and global versus local processing of visual information. *Psychological Science* 13, 34-40.

Graham, J.R., C.R. Harvey and S. Rajgopal, 2005. The economic implications of corporate financial reporting. *Journal of Accounting and Economics* 40, 3-73.

Griffin, J., F. Nardari and R. Stulz, 2007. Do investors trade more when stocks have performed well? Evidence from 46 countries. *Review of Financial Studies* 20, 905-951.

Hayn, C., 1995. Information content of losses. *Journal of Accounting and Economics* 20, 125-153.

Hirshleifer, D., 2000. Investor psychology and asset pricing. *Journal of Finance* 56, 1533-1597.

Hirshleifer, D. and T. Shumway, 2003. Good day sunshine: stock returns and the weather. *Journal of Finance* 58, 1009-1032.

Hirshleifer, D., S. Lim and S.H. Teoh, 2009. Driven to distraction: extraneous events and underreaction to earnings news. *Journal of Finance* 64, 2289-2325.

Holthausen, R. and R. Watts, 2001. The relevance of the value relevance literature for financial accounting standard setting. *Journal of Accounting and Economics* 31, 3-75.

Hong, H. and J. Stein, 2007. Disagreement and the stock market. *Journal of Economic Perspectives* 21, 109-128.

Hou, K., L. Peng and W. Xiong, 2009. A tale of two anomalies: The implications of investor attention for price and earnings momentum. Working paper, Princeton University.

Hribar, P. and J. McInnis, 2012. Investor sentiment and analysts' earnings forecast errors. *Management Science* 58, 293-307.

Hung, M., 2000. Accounting standards and value relevance of earnings: An international analysis. *Journal of Accounting and Economics* 30, 401-420.

Karlsson, N., G. Loewenstein and D. Seppi, 2009. The 'ostrich effect': selective attention to information about investments. *Journal of Risk and Uncertainty* 38, 95-115.

Kamstra, M.J., L.A. Kramer and M.D. Levi, 2003. Winter blues: A SAD stock market cycle. *American Economic Review* 93, 324-343.

Kaplanski, G. and H. Levy, 2010. Sentiment and stock prices: the case of aviation disasters. *Journal of Financial Economics* 95, 174-201.

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

Kothari, S.P. and J. Shanken, 2003. Time-series coefficient variation in value-relevance regressions: a discussion of Core, Guay, and Van Buskirk and new evidence. *Journal of Accounting and Economics* 34, 69-87.

Lee, M.C., 2001. Market efficiency and accounting research: A discussion of capital market research in accounting. *Journal of Accounting and Economics* 31, 233-253.

Mian, M. and S. Sankaraguruswamy, 2012. Investor sentiment and stock market response to earnings news. *The Accounting Review* 87, 1357-1384

Povel, P., R. Singh and A. Winton, 2007. Booms, bust and fraud. *Review of Financial Studies* 20, 1219-1254.

Ritter, A., and P. Wells, 2006. Identifiable intangible asset disclosure, stock prices and future earnings. *Accounting and Finance* 46, 845-863.

Schwarz, N., 2000. Emotion, cognition, and decision making. *Cognition & Emotion* 14, 433-440.

Schwarz, N. and G.L. Clore, 2007. Feelings and phenomenal experiences. In A. Kruglanski and E.T. Higgins (Eds.), *Social Psychology. Handbook of Basic Principles* (2nd ed.), 385-407. New York: Guilford.

Seybert, N. and H. Yang, 2012. The party's over: The role of earnings guidance in resolving sentiment driven overvaluation. *Management Science* 58, 309-319.

Simpson, A., 2013. Does investor sentiment affect earnings management? *Journal of Business Finance and Accounting* 40, 869-900.

Skinner, D., 1996. Are disclosures about bank derivatives and employee stock options value-relevant? *Journal of Accounting and Economics* 22, 393-405.

Stambaugh, R., J. Yu and Y. Yuan, 2012. The short of it: investor sentiment and anomalies. *Journal of Financial Economics* 104, 288-302.

Trueman, B., F. Wong and X. Zhang, 2000. The eyeballs have it: searching for the value in internet stocks. *Journal of Accounting Research* 38 (Supplement), 137-162.

Venter, E. R., D. Emanuel, and S.F. Cahan, 2014. The value relevance of mandatory non-GAAP earnings. *Abacus* 50, 1-24.

Walther, B. and R. Willis, 2013. Do investor expectations affect sell-side analysts' forecast bias and forecast accuracy? *Review of Accounting Studies* 18, 207-227.

Yu, J. and Y. Yuan, 2011. Investor sentiment and the mean-variance relation. *Journal of Financial Economics* 100, 367-381.

Zhang, G. 2000. Accounting information, capital investment decisions, and equity valuation: theory and empirical implications. *Journal of Accounting Research* 38, 271–295.

Table 1
Descriptive Statistics and Correlation Matrix

This table reports the descriptive statistics of the stock returns and accounting variables in Panel A and Pearson correlation coefficients between the variables in Panel B. *R* is the stock returns in the 12 month period starting from the fourth month of fiscal year *t* and ending in the third month after fiscal year *t*. *x* is earnings yield, calculated as the net income in fiscal year *t* (NI_t) divided by the market value of equity at the beginning of the fiscal year *t* (V_{t-1}). Δq is the change in profitability, calculated as annual changes in the ratio of net income to the beginning common equity (NI_t/B_{t-1}), then multiplied by book-to-market ratio at the beginning of the year *t* (B_{t-1}/Vt_{-1}). Δb is capital investment, calculated as the change in book value of equity in fiscal year *t* divided by beginning equity ($(B_t - B_{t-1})/B_{t-1}$), then multiplied by ($1 - B_{t-1}/Vt_{-1}$). Δg is the change in growth opportunities, calculated as change in the median analyst forecast of the long-term growth rate after current annual earnings announcements relative to the forecast one year ago, then multiplied by (B_{t-1}/Vt_{-1}). Δr is the change in the discount rates, calculated as the change in the 10-year US Treasury bond yield over the return period, then multiplied by (B_{t-1}/Vt_{-1}). The pooled sample contains 47,062 firm-year observations from 1983 to 2010.

Panel A Descriptive statistics

	R	*x*	*Δq*	*Δb*	*Δg*	*Δr*
Mean	0.154	0.048	-0.011	0.099	-0.003	-0.184
Median	0.101	0.058	-0.002	0.041	0.000	-0.105
Stdev	0.501	0.083	0.094	0.242	0.027	0.826
Min	-0.937	-1.226	-1.170	-0.508	-0.355	-9.967
Max	6.110	0.439	1.489	6.061	0.407	4.714
Q1	0.366	0.029	0.016	0.124	0.002	0.140
Q3	-0.144	0.086	-0.029	0.001	-0.008	-0.434
Skewness	1.985	-3.021	-0.614	5.729	0.682	-2.347
Kurtosis	13.444	24.596	23.062	70.833	34.474	19.096

Panel B Pearson Correlation Coefficients

	R	*x*	*Δq*	*Δb*	*Δg*
x	0.221				
Δq	0.243	0.429			
Δb	0.123	0.071	0.065		
Δg	0.136	0.073	0.090	0.028	
Δr	0.022	-0.044	0.074	0.059	0.067

Table 2
Relation between Stock Returns and Accounting Variables

This table reports the results from pooled regression of stock returns on accounting variables. The dependent variable is the annual stock returns in the 12 month period starting from the fourth month of fiscal year *t* and ending in the third month after fiscal year *t*. *x* is earnings yield, calculated as the net income in fiscal year *t* (NI_t) divided by the market value of equity at the beginning of the fiscal year *t* (V_{t-1}). Δq is the change in profitability, calculated as annual changes in the ratio of net income to the beginning common equity (NI_t/B_{t-1}), then multiplied by book-to-market ratio at the beginning of the year *t* (B_{t-1}/Vt_{-1}). Δb is capital investment, calculated as the change in book value of equity in fiscal year *t* divided by beginning equity ($(B_t - B_{t-1})/B_{t-1}$), then multiplied by $(1 - B_{t-1}/Vt_{-1})$. Δg is the change in growth opportunities, calculated as change in the median analyst forecast of the long-term growth rate after current annual earnings announcements relative to the forecast one year ago, then multiplied by (B_{t-1}/Vt_{-1}). Δr is the change in the discount rates, calculated as the change in the 10-year US Treasury bond yield over the return period, then multiplied by (B_{t-1}/Vt_{-1}). The pooled sample contains 47,062 firm-year observations from 1983 to 2010.

	1981 – 2010		1981 – 2001		2002 – 2010	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
x	0.802	0.00	1.329	0.00	0.329	0.00
Δq	0.909	0.00	0.695	0.00	0.895	0.00
Δb	0.206	0.00	0.218	0.00	0.196	0.00
Δg	2.043	0.00	2.768	0.00	1.371	0.00
Δr	0.001	0.62	-0.068	0.00	0.534	0.00
Intercept	0.112	0.00	0.057	0.00	0.168	0.00
N	47,824		28,504		19,320	
Adj R^2	0.098		0.152		0.264	

Table 3
Annual Regressions of Stock Returns on Accounting Variables

This table reports the coefficients of independent variables in annual regressions of stock returns on accounting variables. The dependent variable is the annual stock returns in the 12 month period starting from the fourth month of fiscal year *t* and ending in the third month after fiscal year *t*. *x* is earnings yield, calculated as the net income in fiscal year *t* (NI_t) divided by the market value of equity at the beginning of the fiscal year *t* (V_{t-1}). Δq is the change in profitability, calculated as annual changes in the ratio of net income to the beginning common equity (NI_t/B_{t-1}), then multiplied by book-to-market ratio at the beginning of the year *t* (B_{t-1}/Vt_{-1}). Δb is capital investment, calculated as the change in book value of equity in fiscal year *t* divided by beginning equity ($(B_t - B_{t-1})/B_{t-1}$), then multiplied by $(1 - B_{t-1}/Vt_{-1})$. Δg is the change in growth opportunities, calculated as change in the median analyst forecast of the long-term growth rate after current annual earnings announcements relative to the forecast one year ago, then multiplied by (B_{t-1}/Vt_{-1}). Δr is the change in the discount rates, calculated as the change in the 10-year US Treasury bond yield over the return period, then multiplied by (B_{t-1}/Vt_{-1}).

Year	#obs	Intercept	*x*	Δq	Δb	Δg	Δr	R^2 (%)
1983	866	0.209	1.594	-0.068	-0.132	2.219	-0.114	30.89
1984	1,023	2.156	-0.138	-0.001	1.503	-0.109	-0.091	29.99
1985	1,029	1.655	0.189	0.409	2.466	-0.053	-0.012	27.07
1986	1,076	0.115	1.302	0.779	0.285	2.334	-0.046	24.45
1987	1,043	-0.055	0.335	0.699	0.355	1.202	-0.001	9.87
1988	1,063	-0.032	1.269	0.388	0.151	3.177	0.120	18.45
1989	1,103	0.071	1.013	0.858	0.425	2.592	-0.005	20.67
1990	1,114	-0.106	1.183	0.990	0.543	2.034	-0.256	25.66

1991	1,187	0.035	1.561	0.794	0.774	3.542	-0.373	28.92
1992	1,240	-0.029	1.616	1.086	0.284	2.206	-0.178	26.01
1993	1,370	0.021	1.150	0.766	0.473	3.669	-0.147	19.19
1994	1,506	-0.069	1.106	0.649	0.271	4.038	0.028	14.10
1995	1,713	0.088	1.162	0.892	0.423	3.939	-0.082	18.54
1996	1,953	0.084	2.259	0.512	0.146	4.397	-0.020	19.44
1997	2,132	0.051	2.000	0.406	0.185	3.406	-0.232	20.30
1998	2,242	-0.074	0.796	1.083	0.211	4.520	-0.148	14.68
1999	2,101	0.050	-0.884	1.967	0.794	4.640	0.136	16.16
2000	2,007	0.009	2.085	0.845	0.050	3.813	-0.072	15.85
2001	1,974	0.006	1.310	0.292	0.080	0.849	-0.152	15.46
2002	2,119	-0.143	1.630	-0.136	0.115	1.461	-0.006	20.30
2003	2,178	0.525	-0.740	2.432	0.346	2.173	0.780	24.07
2004	2,181	0.050	1.820	0.739	0.146	2.635	0.322	14.30
2005	2,204	0.097	0.785	1.123	0.217	2.684	0.210	11.04
2006	2,168	0.071	1.000	0.769	0.079	2.789	0.125	11.72
2007	2,169	0.005	1.768	0.531	0.132	2.194	0.315	20.67
2008	2,107	-0.389	0.574	0.418	0.110	1.076	-0.110	15.33
2009	2,094	0.201	0.022	0.655	0.381	0.653	0.585	24.24
2010	2,100	0.329	0.449	0.742	0.099	0.835	0.514	20.32
Mean (1983 – 2001)		0.220	1.100	0.702	0.489	2.759	-0.087	20.83
Mean (2002 – 2010)		0.083	0.812	0.808	0.181	1.833	0.304	18.00

Table 4
Effect of Investor Sentiment

This table reports the results from regressions of stock returns on accounting variables in high and low sentiment periods. The dependent variable is the annual stock returns in the 12 month period starting from the fourth month of fiscal year *t* and ending in the third month after fiscal year *t*. *x* is earnings yield, calculated as the net income in fiscal year *t* (NI_t) divided by the market value of equity at the beginning of the fiscal year *t* (V_{t-1}). Δq is the change in profitability, calculated as annual changes in the ratio of net income to the beginning common equity (NI_t/B_{t-1}), then multiplied by book-to-market ratio at the beginning of the year *t* (B_{t-1}/Vt_{-1}). Δb is capital investment, calculated as the change in book value of equity in fiscal year *t* divided by beginning equity ($(B_t - B_{t-1})/B_{t-1}$), then multiplied by $(1 - B_{t-1}/Vt_{-1})$. Δg is the change in growth opportunities, calculated as change in the median analyst forecast of the long-term growth rate after current annual earnings announcements relative to the forecast one year ago, then multiplied by (B_{t-1}/Vt_{-1}). Δr is the change in the discount rates, calculated as the change in the 10-year US Treasury bond yield over the return period, then multiplied by (B_{t-1}/Vt_{-1}). Sentiment is the average monthly investor sentiment scores obtained from Jeffrey Wurgler's website. Sample periods are divided into high and low sub-periods based on the median sentiment score. The pooled sample contains 47,062 firm-year observations from 1983 to 2010.

	High sentiment sub-period					Low sentiment sub-period				
	Coeff.	p-value	Partial R^2	Coeff.	p-value	Coeff.	p-value	Partial R^2	Coeff.	p-value
x	1.357	0.00	6.41%	1.680	0.00	0.426	0.00	1.52%	1.001	0.00
Δq	0.532	0.00	2.64%			1.069	0.00	4.89%		
Δb	0.173	0.00	1.11%			0.272	0.00	1.47%		
Δg	1.357	0.00	1.07%			1.872	0.00	1.30%		
Δr	-0.032	0.00	0.43%			0.166	0.00	3.36%		
Intercept	0.051	0.00	0.00%	0.047	0.00	0.167	0.00	0.00%	0.130	0.00

N	28,507	28,507	25,426	25,426
Adj R^2	11.64%	8.47%	12.52%	2.76%

Table 5
Effect of Investor Sentiment on Regression Coefficients

This table reports the results from regressions of stock returns on accounting variables and investor sentiment. The dependent variable is the annual stock returns in the 12 month period starting from the fourth month of fiscal year *t* and ending in the third month after fiscal year *t*. *x* is earnings yield, calculated as the net income in fiscal year *t* (NI_t) divided by the market value of equity at the beginning of the fiscal year *t* (V_{t-1}). Δq is the change in profitability, calculated as annual changes in the ratio of net income to the beginning common equity (NI_t/B_{t-1}), then multiplied by book-to-market ratio at the beginning of the year *t* (B_{t-1}/Vt_{-1}). Δb is capital investment, calculated as the change in book value of equity in fiscal year *t* divided by beginning equity ($(B_t - B_{t-1})/B_{t-1}$), then multiplied by ($1 - B_{t-1}/Vt_{-1}$). Δg is the change in growth opportunities, calculated as change in the median analyst forecast of the long-term growth rate after current annual earnings announcements relative to the forecast one year ago, then multiplied by (B_{t-1}/Vt_{-1}). Δr is the change in the discount rates, calculated as the change in the 10-year US Treasury bond yield over the return period, then multiplied by (B_{t-1}/Vt_{-1}). *s* is investor sentiment, calculated as the average monthly investor sentiment scores obtained from Jeffrey Wurgler's website. Sample periods are divided into high and low sub-periods based on the median sentiment score. The pooled sample contains 47,062 firm-year observations from 1983 to 2010.

Model	1		2		3		4		5	
	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
x	0.708	0.00	0.661	0.00	0.633	0.00	0.632	0.00	0.654	0.00
Δq	0.902	0.00	1.001	0.00	1.002	0.00	1.002	0.00	0.969	0.00
Δb	0.215	0.00	0.221	0.00	0.294	0.00	0.294	0.00	0.283	0.00
Δg	2.025	0.00	2.070	0.00	2.064	0.00	2.119	0.00	2.119	0.00
Δr	0.001	0.59	0.005	0.05	0.006	0.03	0.007	0.02	0.089	0.00
s	-0.045	0.00	-0.072	0.00	-0.052	0.00	-0.054	0.00	-0.092	0.00
$x \times s$	0.583	0.00	0.916	0.00	0.897	0.00	0.902	0.00	0.766	0.00
$\Delta q \times s$			-0.697	0.00	-0.649	0.00	-0.638	0.00	-0.488	0.00
$\Delta b \times s$					-0.161	0.00	-0.160	0.00	-0.133	0.00
$\Delta g \times s$							-0.323	0.02	0.120	0.38
$\Delta r \times s$									-0.118	0.00
Intercept	0.116	0.00	0.119	0.00	0.113	0.00	0.114	0.00	0.124	0.00
N	47,062		47,062		47,062		47,062		47,062	
Adj R^2	10.13%		10.55%		10.90%		10.91%		12.54%	

Table 6
Robustness Test: Quarterly Data

This table reports the results from regressions of stock returns on accounting variables and investor sentiment. The dependent variable is the quarterly stock returns in the period starting from the two days after quarter *t-1*'s earnings announcement and ending one day after quarter *t*'s earnings announcement. *x* is earnings yield, calculated as the net income in fiscal quarter *t* (NI_t) divided by the market value of equity at the beginning of the fiscal quarter *t* (V_{t-1}). Δq is the change in profitability, calculated as quarterly changes in the ratio of net income to the beginning common equity (NI_t/B_{t-1}), then multiplied by book-to-market ratio at the beginning of the quarter *t* (B_{t-1}/Vt_{-1}). Δb is capital investment, calculated as the change in book value of equity in fiscal quarter *t* divided by beginning equity ($(B_t - B_{t-1})/B_{t-1}$), then multiplied by ($1 - B_{t-1}/Vt_{-1}$). Δg is the change in growth opportunities, calculated as change in the median analyst forecast of the long-term growth rate after current annual earnings announcements relative to the forecast one quarter ago, then multiplied by (B_{t-1}/Vt_{-1}). Δr is the change in the discount rates, calculated as the change in the 10-year US Treasury bond yield over the return period, then multiplied by (B_{t-1}/Vt_{-1}). *s* is the average monthly investor sentiment scores obtained from Jeffrey Wurgler's website. Sample periods are divided into high and low sub-periods based on the median sentiment score. The pooled sample contains 205,428 firm-quarter observations from 1981 to 2010.

	Model 1		Model 2		Model 3		Model 4		Model 5	
	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
x	0.663	0.00	0.631	0.00	0.628	0.00	0.628	0.00	0.628	0.00
Δq	0.387	0.00	0.443	0.00	0.443	0.00	0.443	0.00	0.415	0.00
Δb	0.100	0.00	0.101	0.00	0.113	0.00	0.113	0.00	0.114	0.00
Δg	0.985	0.00	0.981	0.00	0.981	0.00	0.962	0.00	0.956	0.00
Δr	-0.009	0.00	-0.009	0.00	-0.009	0.00	-0.009	0.00	0.037	0.00
s	-0.030	0.00	-0.031	0.00	-0.031	0.00	-0.030	0.00	-0.033	0.00
$x \times s$	0.357	0.00	0.475	0.00	0.477	0.00	0.475	0.00	0.460	0.00
$\Delta q \times s$			-0.327	0.00	-0.326	0.00	-0.325	0.00	-0.263	0.00
$\Delta b \times s$					-0.035	0.00	-0.035	0.00	-0.029	0.01
$\Delta g \times s$							0.080	0.11	0.146	0.00
$\Delta r \times s$									-0.072	0.00
Intercept	0.031	0.00	0.032	0.00	0.031	0.00	0.031	0.00	0.031	0.00
N	205,208		205,208		205,208		205,208		205,208	
Adj R^2	3.22%		3.30%		3.31%		3.31%		4.09%	

Table 7 Effect of Firm Characteristics

This table reports the results from regressions of stock returns on accounting variables and investor sentiment. The dependent variable is the annual stock returns in the 12 month period starting from the fourth month of fiscal year *t* and ending in the third month after fiscal year *t*. *x* is earnings yield, calculated as the net income in fiscal year *t* (NI_t) divided by the market value of equity at the beginning of the fiscal year *t* (V_{t-1}). Δq is the change in profitability, calculated as annual changes in the ratio of net income to the beginning common equity (NI_t/B_{t-1}), then multiplied by book-to-market ratio at the beginning of the year *t* (B_{t-1}/Vt_{-1}). Δb is capital investment, calculated as the change in book value of equity in fiscal year *t* divided by beginning equity ($(B_t - B_{t-1})/B_{t-1}$), then multiplied by ($1 - B_{t-1}/Vt_{-1}$). Δg is the change in growth opportunities, calculated as change in the median analyst forecast of the long-term growth rate after current annual earnings announcements relative to the forecast one year ago, then multiplied by (B_{t-1}/Vt_{-1}). Δr is the change in the discount rates, calculated as the change in the 10-year US Treasury bond yield over the return period, then multiplied by (B_{t-1}/Vt_{-1}). *s* is investor sentiment, calculated as the average monthly investor sentiment scores obtained from Jeffrey Wurgler's website. *High* is an indicator variable equal to 1 if investor sentiment is above the median. Sample firms are divided into subsamples based on the median of market value of common equity (V_{t-1}), the median of return volatility measured by the standard deviation of daily stock returns in the return calculation period, the median of market-to-book ratios and the dividend paying status. The pooled sample contains 47,062 firm-year observations from 1983 to 2010.

	Firm Size				Return Volatility				Market-to-Book Ratio				Dividends			
	Small		Large		High		Low		High		Low		Non-Payer		Payer	
Variables	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
x	0.192	0.00	0.421	0.00	0.111	0.04	1.295	0.00	0.124	0.08	0.408	0.00	0.122	0.03	1.141	0.00
Δq	1.320	0.00	0.734	0.00	1.204	0.00	0.443	0.00	1.213	0.00	0.977	0.00	1.328	0.00	0.411	0.00
Δb	0.218	0.00	0.419	0.00	0.371	0.00	0.200	0.00	0.324	0.00	-0.204	0.00	0.307	0.00	0.283	0.00
Δg	1.769	0.00	1.783	0.00	1.846	0.00	1.512	0.00	2.624	0.00	1.345	0.00	1.923	0.00	1.843	0.00
Δr	0.113	0.00	0.246	0.00	0.295	0.00	-0.030	0.00	0.220	0.00	0.135	0.00	0.272	0.00	0.082	0.00
High	-0.189	0.00	-0.170	0.00	-0.223	0.00	-0.085	0.00	-0.198	0.00	-0.201	0.00	-0.224	0.00	-0.124	0.00
x × *High*	1.368	0.00	1.197	0.00	1.288	0.00	0.407	0.00	1.736	0.00	1.178	0.00	1.256	0.00	0.734	0.00
Δq × *High*	-0.848	0.00	-0.308	0.00	-0.657	0.00	-0.197	0.01	-0.806	0.00	-0.632	0.00	-0.779	0.00	-0.123	0.09
Δb × *High*	-0.127	0.00	-0.222	0.00	-0.207	0.00	0.005	0.84	-0.178	0.00	0.067	0.04	-0.161	0.00	-0.085	0.00
Δg × *High*	0.353	0.09	1.636	0.00	0.693	0.01	0.457	0.02	1.108	0.00	0.219	0.18	0.683	0.01	0.338	0.08
Δr × *High*	-0.173	0.00	-0.297	0.00	-0.360	0.00	-0.018	0.00	-0.344	0.00	-0.192	0.00	-0.303	0.00	-0.144	0.00
Intercept	0.174	0.00	0.200	0.00	0.208	0.00	0.105	0.00	0.284	0.00	0.113	0.00	0.237	0.00	0.103	0.00
Adj R^2	15.03%		13.59%		16.95%		13.97%		11.30%		19.16%		16.16%		13.34%	
N	25,315		22,488		24,773		23,030		23,785		24,018		20,961		26,842	