

AGGREGATE DISCLOSURE AND SENTIMENT

by

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DEDICATION

For mom, dad, and Andrew – thanks for always cheering me on.

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ABSTRACT

Aggregate Disclosure and Sentiment

by

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This paper examines the relationship between aggregate disclosure and investor expectations about the future economy (i.e. sentiment). I specifically explore the relationship between the aggregate tone of firm-level annual and quarterly reports and common investor sentiment measures. Controlling for a number of macroeconomic factors, I find that more negative aggregate tone is associated with less positive sentiment in future months. Consistent with the Barberis, Shleifer, and Vishny (1998) model of investor sentiment, I find that this result is stronger when the disclosure is more salient (i.e. lower tone dispersion) and is more statistically informative (i.e. higher filing intensity). I also find preliminary evidence suggesting that aggregate tone relates to both short-term and long-term expectations and that it associates more to the non-fundamental expectations of investors. Overall, the findings suggest accounting information may play a role in influencing investor expectations about the future economy.

Chapter 1

Introduction

Expectations play an important role in shaping economic decisions and policies (Santomero, 2003).¹ Consequently, macroeconomists have long been interested in how expectations are formed and their effect on the economy (Gutmann, 1997; Evans and Honkapohja, 2001). There is a large literature exploring the wide range of effects expectations about the future economy, or sentiment, have at both the firm-level and the macro-level (e.g., Baker and Wurgler, 2006; Acemoglu and Scott, 1994; Bram and Ludvigson, 1998). As a result, how these expectations are formed has become an important topic to a wide range of economic agents, including market professionals who spend significant resources tracking these indices in pursuit of profitable trading strategies (Shleifer and Summers, 1990), as well as policymakers and regulators who often discuss market sentiment and its importance to the overall economy (e.g., Keynes, 1936; Greenspan, 1996; Shiller, 2000).

However, despite the importance of sentiment and the vast literature examining its effects on the economy, less is empirically known about how those expectations are formed (e.g., Doms and Morin, 2004; Baker and Wurgler, 2011). This paper attempts to address this question in the literature by examining how accounting information relates to sentiment. I specifically argue that corporate disclosures at an aggregate level could influence sentiment for two primary reasons.

¹ Expectations are defined as beliefs about the future. I choose the term expectations to maintain consistency with the macroeconomic literature which generally discusses beliefs in the context of expectations about the future (Santomero, 2003).

First, prior literature suggests corporate disclosures are an important source of information for investors that are used in the formation of their beliefs (Healy and Palepu, 2001; Verrecchia, 2001). Furthermore, corporations are a significant component of the macroeconomy, comprising a large portion of the suppliers, employers, and private sector investors within the economy (Gabaix, 2011; Shivakumar and Urcan, 2014). Consequently, aggregate corporate activities such as output and profits have been found to significantly affect the macroeconomy, including gross domestic product, interest rates, and inflation (e.g., Brown and Ball, 1967; Higson, Holly, and Kattuman, 2002; Bernstein and Arnott, 2003; Shivakumar, 2007). Thus, it is possible that corporate disclosures at an aggregate level could affect investor expectations about the overall economy.

On the other hand, there have been concerns over the information content of corporate disclosures. Specifically, annual and quarterly filings have come under scrutiny for containing boilerplate and stale information (SEC, 2003; Bloomfield, 2008), with evidence that there is limited reaction from the market to their filings (Li and Ramesh, 2009). Furthermore, there are numerous widely followed macroeconomic indicators (e.g., GDP, inflation, unemployment, etc.) that could either overshadow the information in corporate disclosures or subsume the information therein. Thus, it is an empirical question as to whether corporate disclosures at an aggregate level relate to investor expectations about the future economy.

To explore the relationship between aggregate corporate disclosure and sentiment, I examine how the average tone of firm-level annual and quarterly reports relate to three common measures of sentiment: the University of Michigan Index of Consumer Sentiment, the Conference Board Index of Consumer Confidence, and the Baker and Wurgler (2006) market sentiment index.

I focus on the tonal aspect of disclosure for several reasons. There is an established literature showing that language influences the perception and processing of information (e.g., Katz, 2001; Morris et al., 2005). Consistent with this idea, information theory models such as Sims (2003) suggest the tone of economic reporting can affect expectations above and beyond the actual economic information content. This is in part due to the fact that framing of performance is important in shaping individual's perceptions of actual performance, with relative performance being more important than absolute performance at times (e.g., Kahneman and Tversky, 1981). Thus, firms could influence investor expectations by using the tone in their filings to convey performance with respect to their own subjective benchmarks in a positive or negative sentiment (Graham, Harvey, and Rajgopal, 2005). I use two measures of firm-level tone based on the Loughran and McDonald (2011) textual dictionaries and aggregate to a monthly basis by taking the value-weighted average of firms filing each month.

To proxy for sentiment, I use three measures commonly used in the literature as there is no one consensus measure of sentiment (Baker and Wurgler, 2006). While the University of Michigan and Conference Board indices are based on surveys of consumers who may or may not be investors, they represent direct measures of expectations about the future economy. In addition, there is evidence suggesting these indices are better proxies for investor sentiment than commonly used market-based measures (Fisher and Statman, 2002; Qiu and Welch, 2004). However, due to the possibility of noise in the measures from surveying consumers who may not necessarily be investors, I also use the Baker and Wurgler (2006) market-based sentiment index to try to better capture the sentiment of investors specifically.

Estimating a lead-lag regression model using 227 monthly observations from 1994 to 2012, I find that more negative aggregate tone in annual and quarterly reports is related to less positive

sentiment in future months.² While controlling for a number of macroeconomic factors, the results remain economically significant, with a one standard deviation increase in past aggregate tone associated with anywhere from a 0.2 to 0.5 standard deviation decrease in sentiment. Overall, the results suggest that aggregate tone contains information incremental to widely followed macroeconomic indicators.

To reinforce my finding that aggregate tone could influence investor sentiment, I examine settings where prior theory suggests aggregate tone should influence expectations the most. Specifically, Barberis, Shleifer, and Vishny (1998) create a model of investor sentiment that argues that investors update their expectations based on two characteristics of information: strength and weight. Strength is defined as the salience of information, whereas weight is the statistical informativeness of the information (e.g., sample size). Based on their model, I expect that aggregate tone should have a stronger relationship with sentiment when the disclosures are more salient and statistically informative.

Using within-month filing tone dispersion as a proxy for the salience of aggregate tone, I find that aggregate tone has a larger impact on future sentiment when tone dispersion is lower. This is consistent with aggregate tone being a stronger signal if there is less variation or disagreement in tone across firms in a given month. Also consistent with the Barberis et al. (1998) model, I find that the association between aggregate tone and sentiment is larger when statistical informativeness is higher, with filing intensity utilized as a proxy for a larger, more representative sample of the population.

² Analyses using the Baker and Wurgler (2006) measure of sentiment have between 201 and 203 monthly observations based on data availability.

Overall, the results are consistent with aggregate tone having an impact on expectations about the future economy. However, in the absence of an exogenous source of identification, endogeneity concerns remain and the results are subject to this caveat.

Finally, to provide initial evidence on what type of expectations aggregate tone is related to, I examine the relationship between aggregate tone and different components of the University of Michigan and Conference Board indices.

While the University of Michigan and Conference Board indices are measures of expectations of the future economy, they ask questions about both current and future economic conditions. Subsequently, they each decompose their measures into current and expected (i.e. future) indices. Despite concerns of annual and quarterly reports containing only backward-looking, stale information, I find initial evidence that aggregate tone is related not only to short-term expectations of economic conditions, but also long-term expectations potentially one or more years into the future. These results could also be consistent with an adaptive expectations framework in which past information impacts future expectations (Gutmann, 1997).

Up until this point, I have remained agnostic on whether sentiment represents rational or irrational expectations about the future economy. The current literature suggests there are both rational and irrational elements. While the three measures of sentiment used in this paper are commonly used as proxies for behavioral concepts (e.g., optimism or pessimism above and beyond the fundamentals), papers also suggest they have predictive power over future fundamentals such as consumer spending and growth (e.g., Bram and Ludvigson, 1998; Ludvigson, 2004).³ Other papers correspondingly find that some of their variation can be explained by fundamental factors

³ When surveying the recent literature in accounting on sentiment, four papers use the Baker and Wurgler (2006) measure and two use the University of Michigan index as measures of sentiment defined in various different ways but capturing some element of irrational behavior.

such as aggregate dividend yields and GDP (Sibley, Xing, and Zhang, 2013; Lemmon and Portniaguina, 2006).

To provide further evidence on whether aggregate tone relates to fundamental or non-fundamental expectations, I examine how my aggregate tone measures relate to the fundamental and non-fundamental components of my measures of sentiment. Considering the Baker and Wurgler (2006) measure is already orthogonalized to several macroeconomic factors by construction, I follow the methodology in Lemmon and Portniaguina (2006) and only decompose the Michigan and Conference Board indices into a fundamental and non-fundamental component. Taking the main results with the Baker and Wurgler (2006) measure and initial results from these tests together suggest that aggregate tone relates to the non-fundamental component of expectations about the future economy.

These results are particularly interesting as the prior literature provides evidence that firm-level tone reflects information about future firm fundamentals (e.g., Li, 2010a; Davis, Piger, and Sedor, 2012). The results presented in this paper could be attributable to information about fundamentals in tone not being perfectly impounded into expectations due to the difficulties of instant calibration and incorporation of information in a market of continuous information flows (Lee and So, 2015). On the other hand, aggregate tone could be unintentionally influenced by managerial miscalibration or behavioral biases (e.g., Malmendier and Tate, 2005, 2008; Ben-David, Graham, and Harvey, 2013; Statman and Sepe, 1989; Shefrin, 2001) or intentional influence on the part of the manager due to strong incentives to skew disclosures (e.g., Kothari, Li, and Short, 2009). While this test provides initial evidence of aggregate tone relating to the non-fundamental component of expectations about the future economy, how and why this is the case could be interesting questions for future research.

This paper makes contributions to several different streams of literature. First, the findings relate to the broad macroeconomic literature exploring the formation of expectations. A growing number of empirical studies have focused on how inflation expectations are formed, but expectations of the overall economy have been less explored. Recent papers suggest the news media or fundamentals influence future sentiment (e.g., Doms and Morin, 2004; Lemmon and Portniaguina, 2006). This paper contributes to this growing literature by examining how aggregate disclosure tone can relate to expectations about the future economy, drawing attention to a potentially important role of accounting information at the aggregate level.

Related to the macroeconomic expectations literature is a vast literature in behavioral finance examining the effects of investor beliefs that are seemingly unjustified by fundamentals. I extend the recent stream of literature examining what drives these beliefs (e.g., Sibley et al., 2013; Doms and Morin, 2004) and provide evidence suggesting that corporate disclosures are a useful leading indicator of commonly used proxies of behavioral sentiment. In addition, by providing evidence that aggregate tone can lead all three measures up to three months in advance, the findings could be of interest to various parties, including market participants. In the recent past, Thomson Reuters paid \$1 million per year for exclusive access to the University of Michigan index and sold its early release to different classes of traders, with the most elite class obtaining the data two seconds before its release to the following class.⁴

This paper also adds to a nascent, but developing literature examining accounting at the aggregate level. Many current studies study the information content of aggregate earnings about the macroeconomy (e.g., Kothari, Lewellen, and Warner, 2006; Shivakumar, 2007). More recently, Bochkay and Dimitrov (2015) examine the effect of the Baker and Wurgler (2006)

⁴ <http://www.cnbc.com/id/100809395>

measure on aggregate tone. I contribute to the literature by examining this less explored dimension of corporate disclosure, specifically aggregate tone, and whether evidence suggests it could influence expectations about the future economy, directly addressing the call in Anilowski, Feng, and Skinner (2007) for more research in this area.

Finally, this paper contributes to the extant disclosure literature. While this area of research has primarily been focused at the firm-level and whether corporate disclosure policies and decisions have capital market consequences (e.g., Healy and Palepu, 2001; Beyer et al., 2010), this paper examines disclosure at an aggregate level and relates it to expectations about the overall economy. It also adds to the growing firm-level literature on sentiment and disclosure (e.g., Bergman and Roychowdhury, 2008; Brown et al., 2012; Seybert and Yang, 2012; Cooper, Plumlee, and He, 2015). While these papers focus on the reactive decisions managers make in response to investor sentiment, this paper examines whether aggregate disclosure could influence investor sentiment.

The paper proceeds as follows. The next chapter discusses the related literature and hypothesis development. Chapter 3 describes the data and variable descriptions. Chapter 4 discusses the research design and empirical results and Chapter 5 discusses results from additional tests and robustness analyses. Chapter 6 concludes.

Chapter 2

Related literature and hypothesis development

2.1. Expectations about the macroeconomy

The critical role expectations play in the macroeconomy have been recognized as early as Keynes (1936). While the majority of current macro models are grounded in a rational expectations framework, early critics commented on the lack of description as to how economic agents derive knowledge used to formulate expectations (Friedman, 1979). In addition, more recent criticisms have concerned the inability of these models to produce features of macroeconomic data such as the high persistence of inflation (Carroll, 2003).

Consequently, developments in the theoretical literature have begun to explore the implications of alternative assumptions about expectations formation, including models of learning (e.g., Sargent, 1993; Evans and Honkapohja, 2001), as well as sticky expectations and rational inattention (e.g., Carroll, 2003; Sims, 2003). Despite the vast theoretical base for the literature, empirical evidence of how economic agents form their expectations is more limited (Carroll, 2003; Doms and Morin, 2004; Malmendier and Nagel, forthcoming).

The present literature has largely focused on the formation of inflation expectations. Mankiw, Reis, and Wolfers (2003) use models of sticky information to examine the dispersion of inflation expectations over time, while Carroll (2003) further investigates the sticky-information model by studying the transmission of macroeconomic information from professional forecasters to households. Piazzesi and Schneider (2011) on the other hand explore subjective-rate

expectations in an adaptive learning model and Malmendier and Nagel (forthcoming) build on existing adaptive learning models by allowing personal experiences to play a role in shaping expectations about future inflation. Despite the lack of convergence on which model best predicts inflation expectations (Mankiw et al., 2003; Blanchflower and Kelly, 2008), this line of research provides evidence of systematic deviations from full-information rational expectations.

The area of research surrounding expectations of the overall economy remains less explored. Lemmon and Portniaguina (2006) suggest that the University of Michigan and Conference Board Consumer Confidence indices are led by a variety of macroeconomic indicators, such as GDP, inflation, and unemployment. In a related study to this paper, Doms and Morin (2004) find evidence that independent of the economic content in the articles, the volume and tone of media coverage play a role in how the media influences consumer sentiment. They also find that due to periods of reporting inconsistent with actual economic events, consumer sentiment can actually deviate from economic fundamentals.

2.2. Behavioral sentiment

One of the central concepts in behavioral finance is the notion of investor beliefs that cannot be easily traced back to fundamentals. While the indication that stock prices seem to respond to price pressures unrelated to fundamentals dates back to Roll (1984) and Black (1986), there is a vast recent literature examining the potential effects of this behavioral sentiment on asset pricing and economic decisions.⁵

⁵ There are many different definitions of behavioral sentiment in the literature, including optimistic and pessimistic beliefs about stocks in general that deviate from current fundamental information (DeLong et al., 1990; Baker and Wurgler, 2006; Lee and So, 2015), an overall social mood arising from a mix of rational and irrational biases affecting future expectations (Shiller, 2000), and beliefs conforming to psychological evidence rather than the normative economic model (Shleifer, 2000).

At a firm level, there is evidence that behavioral sentiment affects a variety of firm policies and decisions, including stock returns (e.g., Baker and Wurgler, 2006), investment decisions (e.g., Polk and Sapienza, 2009), as well as debt and equity issuances (e.g., Lee, Shleifer, and Thaler, 1991; Loughran, Ritter, and Rydqvist, 1994). Interestingly, other commonly used measures of behavioral sentiment have been found to contain information about future macroeconomic fundamentals as well. Acemoglu and Scott (1994) and Bram and Ludvigson (1998) both find that the University of Michigan and Conference Board indices predict future movements in consumer spending, with the Conference Board index in particular providing significant explanatory power for several different spending categories (e.g., total personal consumption expenditures, services, durables, etc.).⁶ In addition, Ludvigson (2004) finds evidence that the consumer sentiment measures contain some information about the future path of aggregate consumer expenditure growth.

While there is a large literature examining the effects of behavioral sentiment at both the firm and macro levels, less is known about what influences these beliefs. Sibley et al. (2013) focus on the Baker and Wurgler (2006) measure and find that the variation in the index is largely explained by Treasury bill rates, aggregate value-weighted dividend yields, and the percentage of stock with zero returns. Arif and Lee (2014) examine both the University of Michigan index and the Baker and Wurgler (2006) index and find that aggregate investment moves alongside both measures. In addition, as aforementioned in the previous section, both Doms and Morin (2004) and Lemmon and Portniaguina (2006) explore how the news media and macroeconomic indicators can influence the consumer sentiment indices.

⁶ Bram and Ludvigson (1998) find that the University of Michigan index also provides explanatory power, but to a lesser extent.

2.3. Accounting and the macroeconomy

A growing literature in accounting investigates the role of accounting in the macroeconomy. The majority of papers thus far have specifically examined aggregate earnings and their relationship with macro variables. Kothari et al. (2006) and Cready and Gurun (2010) specifically look at aggregate earnings surprises and market returns. Both papers find evidence of a negative relationship between aggregate earnings and current market returns, suggesting that aggregate earnings conveys discount rate news. Ball, Sadka, and Sadka (2009) meanwhile find evidence that aggregate earnings risks and return risks are related.

On the other hand, while Anilowski et al. (2007) find that aggregate guidance captures aggregate quarterly earnings news, they find mixed evidence on whether aggregate earnings guidance is informative of market returns, finding some evidence that largely downward guidance is associated with market returns at the end of the calendar quarter.

Hirshleifer, Hou, and Teoh (2009) examine the relationship between aggregate accruals, cash flows, and market returns. In contrast to firm-level findings, they find that aggregate accruals (cash flows) is a strong positive (negative) predictor of aggregate returns, yet innovations in accruals (cash flows) are negatively (positively) correlated with concurrent returns, suggesting these innovations contain information about changes in discount rates. More recently, Patatoukas (2014) finds evidence that aggregate earnings changes are correlated with new information about both discount rates as well as expected future cash flows.

Connected to this literature, papers have begun to examine whether aggregate earnings contain information about future macroeconomic fundamentals. Shivakumar (2007) finds evidence that aggregate earnings changes lead future inflation, but not industrial production growth, nominal or real GDP growth, real labor income, nor real consumption. Shivakumar and

Urcan (2014) investigate this further and find evidence consistent with aggregate earnings news affecting business investments rather than containing information about future consumption shocks. Konchitchki and Patatoukas (2014a) on the other hand find that the change in profitability of the 100 largest firms have predictive content for future real GDP growth. They also find that although macroeconomic forecasters incorporate return data into their forecasts of real GDP growth, their projections could be improved by incorporating accounting profitability measures.

While Gallo, Hann, and Li (2016) find mixed evidence on aggregate earnings growth as a leading indicator for real GDP growth, they find that it does lead both inflation and unemployment for up to six months. They then explore how aggregate earnings changes relate to the Federal Reserve's monetary policy stance, showing that aggregate earnings news is significantly associated with future changes in the federal funds target rate. Crawley (2015) examines conditional conservatism at the aggregate level and also finds results suggesting that accounting can shape monetary policy decisions by altering the measurement attributes of key macroeconomic indicators. Specifically, he finds that aggregate corporate profits and GDP compiled by the US Bureau of Economic Analysis are more sensitive to negative aggregate news than positive aggregate news.

As evidenced by the work in the area thus far, the literature has provided a growing amount of evidence suggesting that aggregate earnings contain information about the macroeconomy. However, we know less about how other dimensions of disclosure relate to the overall economy. In a related paper, Bochkay and Dimitrov (2015) study how market sentiment affects aggregate managerial optimism. Specifically, the authors examine the relationship between the Baker and Wurgler (2006) sentiment index and the aggregate tone of annual and quarterly reports. They find that the sentiment index explains 38% of the time-series variation in average

managerial tone in the MD&A and that this increased optimism leads to lower earnings and returns in the future, suggesting that market sentiment leads to biased management disclosures which are in turn less useful to investors.

2.4. Hypothesis development

The primary research question in this paper is whether aggregate disclosure relates to investor expectations about the future economy. On one hand, there are numerous important macroeconomic indicators that are widely covered by the media (e.g., GDP, unemployment, inflation, etc.). These indicators could have an important influence on investor expectations and eclipse any information contained in corporate annual and quarterly reports, which have received criticisms for being stale and backward looking (SEC, 2003).⁷ In addition, due to the fact that tone is soft information requiring more information processing, investors could underweight this signal despite its potential information content (e.g., Gleason and Lee, 2003; Della Vigna and Pollet, 2007; Cohen, Diether, and Malloy, 2013).

However, corporate disclosures are a significant and important source of information to investors (Healy and Palepu, 2001) which they incorporate into their beliefs (Verrecchia, 2001). In addition, corporations comprise a large part of the overall economy and can affect a large number of macro factors through their investments, production, and employment. As their filings are released on a near-daily basis, their disclosures could convey important timely information about the macroeconomy (Bonsall, Bozanic, and Fischer, 2013) or potentially the systematic component of corporate economic news when aggregated (Ball et al., 2009). Thus, corporate

⁷ Even if firms did have important private macroeconomic information, there could be costs to revealing this information (e.g., Verrecchia, 1983).

disclosures overall could be an important factor in investor expectations of the future economy.

Accordingly, my first hypothesis is:

H1: Increases in aggregate tone (measured as a percentage of net negative words) are related to future decreases in investor sentiment.

Although 10-K and 10-Q SEC filings contain a great amount of textual and numerical information, I choose to focus on the tonal facet of the disclosures due to the importance of contextual information for belief formation.⁸ Consistent with literature showing language influences the perception and processing of information, Sims (2003) presents an information theory model suggesting that expectations can be influenced more by the tone of economic reporting than the underlying economic information. The reasoning behind this proposition is there is a significant body of literature suggesting the way one performs relative to others can be more important than performance in absolute terms (e.g., Kahneman and Tversky, 1981; Mowen and Mowen, 1986; Azar, 2008). Managers could therefore alter investor perceptions of the absolute content of their filings by choosing subjective reference points to convey their performance in a certain light, which is in turn captured in their filing tone (Graham et al., 2005). Thus, I focus on the tonal aspect of disclosures as it contains important contextual information that is shown to be important to the formation of investor expectations, perhaps more so than quantitative data.

To provide further support that aggregate tone could influence investor expectations about the economy, I use guidance from the Barberis et al. (1998) model of investor sentiment to examine

⁸ In addition, I choose not to focus on other textual aspects of filings such as amount or transparency and/or readability as the predictions are unclear. Consider an increase in the number of filings; unlike voluntary disclosure, the variation in the volume of these mandatory filings is more likely due to industry reporting cycles than the amount of new information. In addition, if all firms say something different in their filings, it is not clear investors would change their expectations even if the volume of filings is high. In terms of transparency and readability, once again it is unclear whether investor expectations would become more positive or negative.

whether aggregate tone has a stronger relationship with investor sentiment in certain expected settings. Barberis et al. (1998) develop a model of investor expectations outlining how investors process information to form their expectations. The model assumes that investors update their expectations based on two informational characteristics: strength and weight. The strength of the information is defined as how salient the information is, while the weight of the information is how statistically informative it is (e.g., sample size). Based on their model, my second and third hypotheses are as follows:

H2: Increases in aggregate tone (measured as a percentage of net negative words) are related to larger future decreases in investor sentiment when aggregate tone is more salient (measured as within-month filing tone dispersion).

H3: Increases in aggregate tone (measured as a percentage of net negative words) are related to larger future decreases in investor sentiment when aggregate tone has more weight (measured as filing intensity).

Specifically, if aggregate tone influences sentiment, I would expect the relationship between aggregate tone and future sentiment to be stronger when the dispersion of firm-level filing tone is smaller as there is less disagreement amongst firms and therefore a stronger signal. In other words, if firms are disclosing a similar message, investors will be more likely to incorporate that message into their expectations. Also, if aggregate tone represents a bigger sample of firms for a particular month, that should lead to a stronger relationship between aggregate tone and future sentiment as aggregate tone represents a less noisy, more representative signal.

Chapter 3

Data and variable descriptions

3.1. Sample and data

My initial sample is based on firms with SEC filing data in the EDGAR database. All firms with 10-K and 10-Q filings from EDGAR with the necessary requirements to calculate my firm-level measures of tone were retained. This restricts my sample from years 1994 to 2012. I also require firms to have Compustat data on quarterly income before extraordinary items to calculate firm-level measures of earnings surprise, as well as monthly market capitalization data from CRSP to obtain weights for my value-weighted tone measures.

My proxies for investor sentiment were obtained from the University of Michigan Survey of Consumers website, the Conference Board, and Jeffrey Wurgler's website. Macroeconomic variables were collected from the St. Louis Federal Reserve Economic Database (FRED), the Bureau of Labor Statistics (BLS), and CRSP.⁹

3.2. Variable descriptions

3.2.1. Aggregate disclosure

The specific characteristic of disclosure that I examine is the linguistic tone of 10-K and 10-Q SEC filings.¹⁰ I choose to focus on the 10-K and 10-Q filings for several reasons. First,

⁹ Consumption-wealth ratios were obtained from Sydney Ludvigson's website.

¹⁰ The tone of firm-level filings could represent managerial or firm sentiment or optimism (e.g. Feldman et al., 2010; Rogers, Van Buskirk, and Zechman, 2011; Davis et al., 2012); favorable news (e.g., Kothari et al., 2009); or possibly

annual and quarterly reports are a rich information source with in-depth descriptions on a wide array of company topics, including overall firm outlook, company operations, and performance. Thus, it is possible they may contain more information about the overall economy in addition to having more contextual information compared to other measures of disclosure.¹¹ In addition, they are filed on a near daily basis and are publicly available to all investors, providing potentially timely information to a broad array of investors. Consequently, they have been frequently cited as information sources for investors as well as analysts (Previts et al., 1994; Rogers and Grant, 1997). Finally, these reports are mandated for all US public firms, theoretically providing a more representative sample that is less subject to potential biases of the disclosure decision choice (e.g., performance).

I also choose to focus on the entire filing as opposed to just the Management, Discussion, and Analysis (MD&A) section.¹² While the MD&A has been argued to be the most widely read section of the financial statement, containing the most forward-looking information, there are also critiques that it only contains boilerplate information (Pozen, 2008).¹³ In addition, contextual information about the firm and its performance is discussed in areas other than just the MD&A (e.g. notes discussing performance and changes in account balances in relation to industry economic conditions, the macroeconomic outlook, etc.). Furthermore, it is also important to not solely stress forward-looking information in the formation of expectations as expectations relate not only to future information, but also take into account past and current information (Wyer and

managerial private information sets as managers have access to important data on firm operations and the state of labor and capital markets (e.g., Bochkay and Dimitrov, 2015).

¹¹ For example, 8-Ks could have information about CEO and/or director departures, delistings, etc. that do not provide as much context as the annual and quarterly filings, nor as much macroeconomic information.

¹² This is similar to prior papers in the literature such as Kothari et al. (2009); Lehavy, Li, and Merkley (2011), Li (2010b), and Li, Lundholm, and Minnis (2013).

¹³ Forward-looking statements in the MD&A may also require the most managerial subjectivity, making it the most susceptible to endogeneity issues (i.e., reverse causality).

Albarracin, 2005). Correspondingly, the adaptive expectations framework in macroeconomics model expectation formation as an extrapolation of past information.

To calculate firm-level measures of filing tone, I use the Loughran and McDonald (2011) dictionaries which specify lists of positive and negative words tailored for financial documents and specifically SEC filings. I use two measures of firm-level filing tone, both based on the number of net negative words, i.e. the relative number of negative to positive words. My two measures of firm-level filing tone are:

$$FIRM_TONE_TOTAL = \frac{(\# \text{ Negative Words} - \# \text{ Positive Words})}{\text{Total \# Words}} \quad (1)$$

$$FIRM_TONE_TONAL = \frac{(\# \text{ Negative Words} - \# \text{ Positive Words})}{(\# \text{ Negative Words} + \# \text{ Positive Words})} \quad (2)$$

While prior literature suggests that negative words convey more information than positive words (e.g., Tetlock, 2007; Hutton et al., 2003), more recent evidence suggests that both positive and negative words have incremental information content to one another (Henry and Leone, forthcoming). Thus, my tone measures are based on the relative proportion of negative to positive words. While the first measure takes into account the total length of the document (i.e. total number of words), the second measure only takes into account the number of tonal words, reducing the effect of numerous tonal-neutral words. Finally, I equal-weight all words based on Henry and Leone (forthcoming).¹⁴

To calculate my aggregate measure of disclosure tone, I take the value-weighted average of firm-level filing tones for all firms filing in a month and multiply by 100 to obtain a percentage value. I use a value-weighted measure as disclosures of larger firms may have a larger impact on

¹⁴ Henry and Leone (TAR, forthcoming) find that while idf weighting provides some improvement to the power of tone measures for certain randomly-selected samples, the results are not consistent and the improvement is minor compared to the disadvantages of using idf weightings.

investor expectations as they represent a more significant proportion of macroeconomic activity (Gabaix, 2011). The value-weighting is based on monthly market capitalization data from CRSP and I weight each firm-level filing tone by the firm's market capitalization proportion for that month. Thus, variables *TONE_TOTAL* and *TONE_TONAL* represent the value-weighted average of the firm-level filing tones in a month.

3.2.2. Sentiment

Investor sentiment is a difficult construct to capture empirically and consequently the literature lacks a consensus measure (Baker and Wurgler, 2006). I choose to use three commonly used measures in the literature that have advantages with respect to this specific study.

My first two measures are the University of Michigan's Index of Consumer Sentiment, *ICS*, and the Conference Board's Index of Consumer Confidence, *CBICS*. Both indices are based on US survey data, with the former conducted by the University of Michigan Survey Research Center and the latter independently by the Conference Board. Each group polls a large number of households on a monthly basis, asking questions concerning personal financial situations to overall business conditions. The questions are aggregated into a monthly index that represents public confidence in the overall economy.¹⁵

The use of survey-based expectations data has been an important part of macroeconomic analysis (Gennaioli et al., 2015) and one of the primary benefits of these surveys is they are direct measures of expectations about the economy. Even though they survey consumers, which may or may not be investors, recent literature suggests these consumer sentiment measures are appropriate, and even better, measures of investor sentiment than market-based measures.

¹⁵ For further details on each survey, see Appendix B.

Fisher and Statman (2002) provide evidence that the measures of consumer sentiment are positively correlated with a direct measure of investor sentiment compiled by the American Association of Individual Investors from 1987 to 2000. Similarly, Qiu and Welch (2004) find a positive relationship between the consumer sentiment measures and a direct measure of investor sentiment compiled by UBS/Gallup.

Despite this evidence, there remains the concern that these measures do not capture *investor* sentiment. Thus, I use the market-based Baker and Wurgler (2006) sentiment index as an additional proxy for investor sentiment. The Baker and Wurgler (2006) index is comprised of six proxies: 1) the value-weighted closed-end fund discount, 2) NYSE share turnover, 3) the number of IPOs, 4) the average first-day IPO returns, 5) the dividend premium, and 6) the ratio of gross equity issuance to total gross debt and equity issuance. Each proxy is orthogonalized to macroeconomic measures and the index is based on the first principal component of each proxy and their one-year lags.¹⁶

Although the Baker and Wurgler (2006) measure does not correlate well with direct measures of investor sentiment (Qiu and Welch, 2004) and direct measures of expectations are available (i.e., *ICS* and *CBICS*), this market-based index arguably captures *investor* expectations better.

3.2.3. Control variables

To mitigate correlated omitted variable concerns, I control for a number of fundamental and macroeconomic factors to better isolate the relationship between aggregate tone and investor sentiment.

¹⁶ Baker and Wurgler (2006) regress each of the six raw proxies on growth in industrial production index, growth in consumer durables, nondurables, and services, the growth in employment, and a dummy for NBER recessions.

To control for firm fundamentals, I include the aggregate earnings surprise, which I calculate as the value-weighted average of firm-level standardized unexpected earnings (SUE) announced during a month. Specifically I assume that earnings expectations are based on a seasonal random-walk model. Following prior literature, I model expected earnings as:

$$E[e_t^i] = e_{t-4}^i + \delta^i \quad (3)$$

where δ^i is the expected change in earnings from the same quarter's earnings of the prior year, and is referred to as the earnings drift for firm i . I estimate the drift using up to twenty quarters of previous data for each firm. The estimated drift is:

$$\hat{\delta}^i = \frac{1}{n} \sum_{j=1}^n (e_{t-j}^i - e_{t-j-4}^i) \quad (4)$$

where n is the number of intervals used to calculate drift and where one interval requires earnings information for a given quarter and the same quarter in the prior year. I then standardize the unexpected earnings measure by dividing each firm's surprise by the standard deviation of that firm's earnings, as measured by the available subset of the preceding twenty announcements. Thus, the firm-level earnings surprise measure is

$$SUE_t^i = \frac{e_t^i - e_{t-4}^i - \hat{\delta}^i}{\sigma(e_t^i)} \quad (5)$$

where $\sigma(e_t^i)$ is estimated using up to the previous twenty announcements.

I also control for a variety of macroeconomic variables, including the log consumption-to-wealth ratio from Lettau and Ludvigson (2001) (*CAY*); the natural log of personal consumption expenditures per capita (*CONS*); the inflation rate (*CPI*); the default rate, calculated as the difference between yields to maturity on Moody's Baa- and Aaa-rated bonds (*DEF*); the natural log of gross domestic product per capita in chained 2009 dollars (*GDP*); the natural log of labor

income, measured as real disposable personal income per capita, deflated by the PCE deflator (*LABOR*); the unemployment rate (*URATE*); and the yield on three-month Treasury bills (*YLD3*).¹⁷

Lastly, I also control for the number of annual and quarterly reports filed per month (*FILINGCT*) to account for differences in the number of filings across months.

3.3. Descriptive statistics

Table 1 reports the descriptive statistics for the sample. The mean (median) values of *ICS*, *CBICS*, and *BW* are 87.78 (90.60), 94.68 (98.40), and 0.15 (0.02), respectively, with significant variation in each measure over the sample period. On average, 667 10-Qs and 10-Ks are filed each month. However, there is a wide variation in the number of filings filed each month, with the median value being only 367 filings per month. For the monthly aggregated filings, 0.92% of total words are net negative on average and 35.84% of total tonal words are net negative on average. Finally, the mean (median) aggregate earnings surprise during my sample period is approximately $-\$0.02$ ($\$0.04$).

Table 2 reports the Pearson correlation matrix for the sample. There is a significantly positive correlation between all three investor sentiment proxies, ranging in magnitude from 0.22 to 0.93, with the strongest correlation being between the two consumer sentiment indices. The significant correlation between all three measures provides some additional confidence that the measures are capturing similar constructs. Of primary interest in this paper is the correlation between the sentiment and aggregate tone measures. The correlation between all three sentiment measures and both aggregate disclosure tone measures are significantly negative at the 1% level, with magnitudes ranging from -0.17 to -0.26. Although the univariate correlation provides support

¹⁷ Controls *CAY*, *CONS*, *GDP*, and *LABOR* are multiplied by 100 so that all coefficients on macroeconomic control variables can be interpreted as the change in sentiment related to a 1% change in that control variable.

for the predicted relationship between sentiment and aggregate disclosure tone, in the following section I focus on the multivariate relationship between aggregate tone and sentiment to control for fundamental and macroeconomic factors that could be driving the observed univariate relationship.

Chapter 4

Research design and empirical results

4.1. Aggregate tone and sentiment

4.1.1. Main research design

To examine whether there is a relationship between aggregate disclosure tone and sentiment, I first estimate the following pooled time-series regression:

$$\begin{aligned} SENTIMENT_{t+j} = & \beta_0 + \beta_1 AGG_DISL_{t-1} + \beta_2 FILINGCT_{t-1} + \beta_3 EARN SURP_{t-1} \\ & + \beta_4 CAY_{t-1} + \beta_5 CONS_{t-1} + \beta_6 CPI_{t-1} + \beta_7 DEF_{t-1} + \beta_8 GDP_{t-1} + \beta_9 LABOR_{t-1} \\ & + \beta_{10} URATE_{t-1} + \beta_{11} YLD3_{t-1} \end{aligned} \quad (6)$$

where $SENTIMENT_{t+j}$ is either *ICS*, *CBICS*, or *BW* during month $t+j$ ($j = 0, 1$ or 2); AGG_DISL_{t-1} is either *TONE_TOTAL* or *TONE_TONAL* during month $t-1$; and all other variables are as defined in the previous section, as well as Appendix A, during month $t-1$. All observations are at a monthly level.

Due to the current lack of economic theory providing a consensus model specification to explain the dynamics of investor sentiment, I use an OLS regression model correcting for standard errors (Cochrane, 2012).¹⁸ With respect to the potential for autocorrelation in the error terms, I use Newey-West standard errors with four lags as is common practice in time-series analysis. I chose four lags based on two criteria: 1) $n^{1/4}$, where n is the number of time-series observations

¹⁸ I also run a number of different specifications in robustness analyses in Section 5.

(Konchitchki and Patatoukas, 2014b) and 2) minimization of the Akaike Information Criterion. Both tests yield four lags, which is what I use in all my analyses.¹⁹

I also use lead-lag regressions to not only help mitigate reverse causality issues, but due to the fact that soft information such as tone could take more time to process and perpetuate to all investors.²⁰ The use of lagged independent variables also allows for the filing information and macroeconomic data to be available prior to the formation of the next month's expectations about the overall economy.²¹

4.1.2. Main results

The multivariate regression results examining the relationship between aggregate tone and sentiment are presented in Table 3, Panels A, B, and C for the *ICS*, *CBICS*, and *BW* samples, respectively. Consistent with initial predictions, I find that more negative tone in monthly filings precedes significantly more negative sentiment up to three months in the future. Specifically I find that there is a significantly negative coefficient on both measures of aggregate tone relating to all three measures of sentiment for months t , $t+1$, and $t+2$. The persistence of the relationship could be consistent with a sticky expectations or rational inattention framework, with soft information taking time to perpetuate the entire economy due to past information being an important source of information for generating future expectations and/or partial attention to the information (Carroll, 2003).

¹⁹ Upon re-running my analyses with various different lags (i.e. 8, 12, 24, 36, and 48), I find my results are quantitatively and qualitatively similar.

²⁰ This could also be consistent with sticky expectations or rational inattention models (Carroll, 2003).

²¹ For example, monthly data from the St. Louis FRED can represent different times within that month (i.e., beginning, middle, or end of the month). Thus, by using the prior month's data, it is more likely that this information has been released prior to the formation of the next month's expectations. Another example would be the University of Michigan survey, whose interviewing process for month t begins a couple days in month $t-1$ and runs until the end of month t . By using disclosures filed in month $t-1$, the research design allows for filings to be issued before or a couple days into the administering of the survey.

The results are also economically significant. While controlling for numerous macroeconomic and fundamental factors, a one standard deviation increase in past *TONE_TOTAL* (*TONE_TONAL*) is associated with a 0.2 (0.2) standard deviation decrease in both the *ICS* and *CBICS* and a 0.4 (0.4) standard deviation decrease in the *BW* measure in the following month.

In terms of controls, it is also interesting to note the earnings surprise variable does not load for the first leading month in the majority of the specifications. This is somewhat consistent with Kothari et al. (2006) who find that returns are unrelated to past aggregate earnings or it could also be attributable to the information in aggregate earnings being subsumed by another numerical summary measure (e.g., GDP). The macroeconomic controls operate similarly for *ICS* and *CBICS*, with larger default spreads being associated with lower sentiment in the future and greater levels of GDP being associated with higher sentiment in the future. The Baker and Wurgler (2006) measure on the other hand is positively associated with prior treasury yields and consumption-to-wealth ratios.

4.2. Variations in the informational characteristics of aggregate tone

While the initial results suggest aggregate tone could influence future investor sentiment, it is important to address the lack of identification and consequent presence of endogeneity issues. The first issue is the presence of a correlated omitted variable. The concern is that there is a latent factor, such as a macroeconomic force, that is driving both aggregate disclosure tone and sentiment simultaneously, resulting in the observed negative relationship. In addition, there are reverse causality concerns. There is growing empirical evidence suggesting that investor sentiment has an effect on firm-level disclosure policies (e.g., Bergman and Roychowdhury, 2008; Brown et al., 2012; Cooper et al., 2015). Furthermore, in light of the importance of investor sentiment to many

different stakeholders, including managers, Bochkay and Dimitrov (2015) find evidence that a third of the time-series variation in average management tone is explained by investor sentiment.

While I make certain research design choices to mitigate these issues (e.g., inclusion of numerous macroeconomic controls, lead-lag regressions), I perform additional tests in this section examining settings where theory suggests aggregate tone should have a stronger influence on investor sentiment. Specifically, based on the Barberis et al. (1998) model of investor sentiment, I examine how the relationship between aggregate tone and sentiment varies depending on the strength and weight of aggregate tone.

4.2.1. Strength

To test whether aggregate tone has a stronger association with future sentiment when aggregate tone is stronger, I estimate the following regression with Newey-West standard errors:

$$\begin{aligned} SENTIMENT_{t+j} = & \beta_0 + \beta_1 AGG_DISL_HIGHDISP_{t-1} + \beta_2 AGG_DISL_LOWDISP_{t-1} \\ & + \beta_3 FILINGCT_{t-1} + \beta_4 EARN SURP_{t-1} + \beta_5 CAY_{t-1} + \beta_6 CONS_{t-1} + \beta_7 CPI_{t-1} \\ & + \beta_8 DEF_{t-1} + \beta_9 GDP_{t-1} + \beta_{10} LABOR_{t-1} + \beta_{11} URATE_{t-1} + \beta_{12} YLD3_{t-1} \end{aligned} \quad (7)$$

SENTIMENT and all control variables are as defined earlier. *AGG_DISL* represents either *TONE_TOTAL* or *TONE_TONAL*.

To proxy for the strength, or salience, of the information in aggregate disclosure tone, I use tone dispersion, defined as the standard deviation of within-month firm-level tone measures.²² I then divide the aggregate tone measure into two variables conditional on monthly tone dispersion

²² To minimize issues with monthly standard deviations being driven by distribution tails, I take the natural log of firm-level tone measures before calculating the standard deviations.

following methodologies used in the macroeconomic literature for similar analyses (e.g., Auerbach and Gorodnichenko, 2013; Owyang, Ramey, and Zubairy, 2013).²³

Specifically, *AGG_DISL_HIGHDISP* equals *AGG_DISL* when the month's standard deviation of within-month firm-level filing tone is in the top tercile of the monthly standard deviations for the sample, and zero otherwise.²⁴ *AGG_DISL_LOWDISP* equals *AGG_DISL* when the month's standard deviation of within-month firm-level filing tone is in the bottom two terciles of the monthly standard deviations for the sample, and zero otherwise. By dividing the aggregate tone measures in this manner, I can examine how aggregate tone relates to investor sentiment in states of high and low tone dispersion, as well as whether tone dispersion has a persistent effect on the relationship.

The results are found in Table 4, Panels A, B, and C. Consistent with aggregate disclosure having an effect on investor expectations when they are most likely to according to the Barberis et al. (1998) model, I find that the coefficients on my aggregate tone measures are larger when aggregate tone dispersion is lower for investor sentiment at time t . This difference is statistically significant for both tone measures and all three measures of investor sentiment. Interestingly, I also find that this difference persists into future months, suggesting that when firms' disclosures are more similar, they continue to impact future sentiment more than when firms' disclosures are less similar.

²³ These papers specifically examine whether government spending multipliers are larger during times when resources are idle (e.g., recessions, periods of high unemployment, etc.).

²⁴ The tercile classification is based upon graphical cutoff points in the data.

4.2.2. Weight

To test whether aggregate tone has a stronger association with future sentiment when aggregate tone has more weight, I estimate the following regression with Newey-West standard errors:

$$\begin{aligned} SENTIMENT_{t+j} = & \beta_0 + \beta_1 AGG_DISL_HIGHFILING_{t-1} \\ & + \beta_2 AGG_DISL_LOWFILING_{t-1} + \beta_3 EARN SURP_{t-1} + \beta_4 CAY_{t-1} + \beta_5 CONS_{t-1} \quad (8) \\ & + \beta_6 CPI_{t-1} + \beta_7 DEF_{t-1} + \beta_8 GDP_{t-1} + \beta_9 LABOR_{t-1} + \beta_{10} URATE_{t-1} + \beta_{11} YLD3 \end{aligned}$$

SENTIMENT and all control variables are as defined earlier. *AGG_DISL* represents either *TONE_TOTAL* or *TONE_TONAL*.

To proxy for the weight, or statistical informativeness, of aggregate disclosure tone, I use filing intensity, or the number of filings in a month. I perform the same analyses as in the tone dispersion tests only dividing the aggregate tone measure based upon filing count. *AGG_DISL_HIGHFILING* equals *AGG_DISL* when the filing count for the month is above the median monthly filing count for the sample, and zero otherwise.²⁵ *AGG_DISL_LOWFILING* equals *AGG_DISL* when the filing count for the month is below the median monthly filing count for the sample, and zero otherwise. For this analysis I omit sample years 1994 and 1995 as the annual and quarterly report filings available on EDGAR were dramatically lower in these years and represent outliers for the bifurcation variable.²⁶

The results are found in Table 5, Panels A, B, and C. I find that the coefficients on my aggregate tone measures are larger when filing intensity is higher for investor sentiment at time t for five out of the six specifications. This difference is statistically significant for both tone measures and the *ICS* and *CBICS* measures of investor sentiment. The results are qualitatively

²⁵ The median classification is based upon graphical cutoff points in the data.

²⁶ When I run the other analyses excluding years 1994 and 1995, the results are quantitatively and qualitatively similar.

similar for *TONE_TONAL* and the *BW* measure. This difference also persists in future months, although the coefficients lose statistical significance in certain cases.

Overall, the results are consistent with the Barberis et al. (1998) model of investor sentiment. Aggregate disclosure tone has a stronger relationship with investor sentiment when the signal is more salient (i.e. lower tone dispersion) and statistically informative (i.e. higher filing intensity). These results, alongside the research design choices hopefully mitigate some of the endogeneity concerns surrounding the main analyses and provide initial evidence that aggregate disclosure tone could have an influence on investor sentiment. However, it is important to acknowledge that I cannot completely address the endogeneity concerns in this paper due to the absence of an exogenous source of identification.

Chapter 5

Additional tests and robustness analyses

5.1. Additional tests

5.1.1. Components of sentiment

To provide some evidence on what type of expectations aggregate tone relates to, I examine the relationship between aggregate tone and different components of the University of Michigan and Conference Board indices.

Current versus expected

In this paper, I define sentiment as investor expectations about the future economy and provide evidence suggesting that aggregate tone could influence these expectations. While the Michigan and Conference Board indices capture expectations of the future economy, both indices include questions pertinent to current, as well as future economic conditions. For example, the University of Michigan survey contains questions asking about current financial conditions, business conditions in the next year, as well as business conditions in the next five years. As such, both groups separate the questions into two categories, creating indices of current and expected sentiment. In order to better understand what time horizon aggregate tone relates to, I replace the *ICS* and *CBICS* measures in equation (6) with their current and expected components and examine how aggregate tone relates to both the current and expected sentiment indices. The results are presented in Table 6, Panels A and B for the *ICS* and *CBICS* samples, respectively.

Across both measures, the aggregate tone measure is significantly negatively correlated with both the current and expected components of both the *ICS* and *CBICS*. Results on which component aggregate tone is related to more are mixed. While the coefficient on the expected component of the *ICS* index is larger than the current component, the magnitudes are flipped for the *CBICS* index, with the coefficient on aggregate tone being larger for the current component than the expected component. Regardless, the results provide initial evidence that aggregate tone relates to expectations about the future by not only containing information about short-term economic conditions that could have an influence on expectations further into the future (e.g., sticky expectations), but also potentially information pertaining to conditions one or more years into the future.

Fundamental versus non-fundamental

Throughout the paper, I remain agnostic on whether sentiment represents rational or irrational expectations about the future economy. Regardless of whether the expectations are rational or not, it is important to better understand what influences them. However, in this section I begin to explore whether aggregate tone relates to expectations related or unrelated to fundamentals.

While the literature commonly uses the two consumer sentiment indices and the Baker and Wurgler (2006) index as measures of optimism or pessimism above and beyond the fundamentals, there is also evidence that these measures contain information about future fundamentals. For example, there is evidence that both consumer sentiment indices predict future household spending (Acemoglu and Scott, 1994; Bram and Ludvigson, 1998) and Curtin (2004) reports that the University of Michigan index anticipates changes in real GDP and unemployment. Lemmon and Portniaguina (2006) additionally show that consumer sentiment measure are effective predictors

of business cycles, while Sibley et al. (2013) provide evidence that even the Baker and Wurgler (2006) measure can be explained by fundamental factors such as aggregate dividend yields.

To explore which type of expectations aggregate tone relates to, I examine the relationship between my aggregate tone measures and the fundamental and non-fundamental components of the consumer sentiment measures. To do so, I follow the methodology in Lemmon and Portniaguina (2006) and decompose the indices into two components. Specifically, I perform the following regression of the *ICS* and *CBICS* measures of sentiment on various macroeconomic variables:²⁷

$$\begin{aligned}
 ICS (CBICS)_t = & a + b_1DIV_t + b_2DEF_t + b_3YLD3_t + b_4GDP_t + b_5CONS_t \\
 & + b_6LABOR + b_7URATE_t + b_8CPI_t + b_9CAY_t + b_{10}DIV_{t-1} + b_{11}DEF_{t-1} \quad (9) \\
 & + b_{12}YLD3_{t-1} + b_{13}GDP_{t-1} + b_{14}CONS_{t-1} + b_{15}LABOR_{t-1} + b_{16}URATE_{t-1} \\
 & + b_{17}CPI_{t-1} + b_{18}CAY_{t-1} + \eta
 \end{aligned}$$

where *DIV* is the dividend yield measured as the total cash ordinary dividend of the CRSP value-weighted index for month *t*; and all other variables are as defined in Appendix A during either month *t* or *t-1*. The predicted value represents the fundamental component of the indices, while the residual represents the non-fundamental component. I then regress these predicted and residual values on the aggregate tone measures and the fundamental aggregate earnings surprise control, correcting for auto-correlation with Newey-West standard errors.

Table 7 presents the results of these analyses. The results of both indices are consistent with one another: there is a significantly negative relationship between the aggregate tone measures and the non-fundamental components of the indices and there is no significant relationship with the fundamental components. Consistent with the results using the Baker and

²⁷ The Baker and Wurgler (2006) index is already orthogonalized by construction to several macroeconomic factors.

Wurgler (2006) measure, the results suggest that aggregate tone relates to the non-fundamental component of expectations.

These results are quite interesting in light of the prior literature on tone at the firm-level. Li (2010a) finds that increases in optimism in the MD&A predict better future earnings and higher liquidity. Davis et al. (2012) find consistent results that an increase in optimism in earnings press releases precede higher future ROA. The literature also finds evidence that the market responds positively to increased levels of optimism in both earnings releases as well as 10-K filings (e.g., Henry, 2008; Davis et al., 2012; Feldman et al., 2010; Loughran and McDonald, 2011).

Despite the results found in the prior literature, the initial results suggesting that aggregate tone relates to the non-fundamental portion of expectations about the future economy could be attributable to a couple different factors. First, it could be the case that consistent with prior literature, there is fundamental information in aggregate tone, but that information is not perfectly impounded into expectations. For example, there could be overreactions or underreactions to the information (e.g., La Porta et al., 1997; Bernard and Thomas, 1990; Bernard, 1992; Jegadeesh and Titman, 1993). It could also be the case that aggregate tone is unintentionally or intentionally influenced by managerial biases. A growing literature shows that managers appear to be influenced by behavioral biases of their own and can also be considerably miscalibrated in their own expectations. Malmendier and Tate (2005) find evidence of managerial overconfidence leading to investment inefficiencies, while Ben-David et al. (2013) find that managers' expectations of the stock market are severely miscalibrated and this is at times correlated with miscalibration of firm prospects. In addition, managers also have strong incentives to skew disclosures (e.g., Kothari et al., 2009). While this paper does not delve into these channels specifically, this could be an interesting topic for future research.

5.1.2. Market return channel analysis

The primary research question this paper explores is whether aggregate disclosure relates to investor expectations about the future economy. One of the channels through which aggregate disclosure tone could affect investor expectations is through the market. Edmans, Goncalves-Pinto, and Xu (2014) note that information can influence decisions directly or indirectly through signals like prices. To test this hypothesis, I perform a channel analysis by running my main empirical specification including the market return as an additional control. If investors are influenced by aggregate tone through the market return, I would expect the inclusion of the market return to reduce the significance and/or magnitude of the coefficient on my aggregate tone measures.

In untabulated results, although the coefficients on the aggregate disclosure tone measures decrease in magnitude when including the CRSP value-weighted market return, they do so only minimally and continue to retain their statistical significance. Thus, the market may be a way aggregate disclosure relates to investor sentiment, but the current results do not provide strong support for that channel.

5.2. Robustness analyses

5.2.1. Different measures of tone and sentiment

In my analyses I use two net measures of tone, taking into account the difference between negative and positive words in filings as prior literature suggests there is information in both types of words (e.g., Tetlock, 2007; Henry and Leone, forthcoming). To provide further evidence that both word types contain information about sentiment, I also use the percentage of negative words and the percentage of positive words as two additional measures of aggregate disclosure tone. I

find that the main results are qualitatively similar: a higher percentage of negative words is associated with significantly lower sentiment in future months and a higher percentage of positive words is associated with significantly higher sentiment in future months.²⁸

I use three separate measures of sentiment for my main analyses as opposed to using a principal components based approach. However, when using the first principal component of my three sentiment measures as a proxy for sentiment, I find that my results are quantitatively and qualitatively similar.²⁹

5.2.2. Stationarity and serial correlation

Before my initial analyses, I performed the Dickey-Fuller test to assess the stationarity in my variables and found most could be rejected. However, when using a change specification for my control variables, the main results are similar. When graphically observing the data, there does not appear to be a strong trend in the sentiment or tone measures over the sample period. However, to mitigate the presence of any trends or seasonality in the data that may affect both sentiment and tone due to a third unobserved factor, I perform several robustness tests. First, I include a yearly time trend to account for a stable trend in certain variables. Second, I control for an overall time trend to capture any linear trends over the sample period. Third, I control for both an overall time trend and its squared value to capture a nonlinear, quadratic trend. Fourth, I include an NBER recession indicator to control for cyclicity over time. Fifth, I include month fixed effects to

²⁸ In addition, when running the main analyses with both positive and negative words separately, I find that each measure has incremental significance to the other.

²⁹ Untabulated principal component analysis of the correlation matrix yields the first factor with an eigenvalue greater than one that explains approximately 70% of the variation in the variables. The correlation matrix was utilized as the three variables utilize different scales.

account for any industry reporting cycles or other unobservables that change across months (e.g., seasonality).³⁰ For all tests, the main results are similar.

While I use Newey West standard errors to allay concerns of potential serial correlation in the error terms due to the correlation in sentiment with itself over time, another method of handling serially correlated errors is a lagged specification, particularly when current values are thought to be a function of prior values (Shumway and Stoffer, 2006). When including lagged values of sentiment in months $t-1$ to $t-3$, I find the main results are quantitatively and qualitatively similar. Additionally, I run analyses using three-month rolling windows for my independent variables to account for potential serial correlation in my regressors and again find my results are similar.

5.2.3. Controls

In my main specification, I control for past realizations of macroeconomic variables as prior data could have a strong influence on future investor sentiment and this also helps to ensure data is released prior to investors forming their expectations. However, as current realizations could obviously have a strong impact as well, I control for current values of my macroeconomic controls and find the results are quantitatively and qualitatively similar. I also find results are similar when controlling for industrial production data from the St. Louis FRED rather than GDP or when I use different measures of aggregate earnings surprise, such as the sum of all firms' seasonally difference quarterly earnings scaled by aggregate lagged market value of equity (e.g., Gallo et al. 2016) or one taking the difference between earnings and analyst consensus forecasts (e.g., Shivakumar and Urcan, 2014).

³⁰ In terms of industry reporting cycles, this paper is agnostic on which firms report in each month. The main interest is whether aggregate tone relates to sentiment in general, irrespective of which industries file in which months.

Finally, I find that even when I include contemporaneous aggregate tone as an additional regressor, the main results are quantitatively and qualitatively similar. These results suggest that past disclosure tone provides information incremental to that in contemporaneous tone.

Chapter 6

Conclusion

Expectations of the future economy play an important role in influencing economic decisions and policies. This paper seeks to add to our understanding of how those expectations are formed by finding evidence that accounting information at an aggregate level relates to future investor sentiment.

Specifically, I find that more negative aggregate tone is associated with less positive sentiment in the following three months, controlling for numerous macroeconomic factors. In addition, consistent with the Barberis et al. (1998) model of investor sentiment, I find that this relationship is stronger when the disclosure is more salient and statistically informative. I also provide preliminary evidence on what type of expectations aggregate tone relates to, finding evidence suggestive that it not only relates to short-term future expectations, but also long-term expectations. I also find initial evidence suggesting that aggregate tone relates more to the non-fundamental component of expectations about the future economy.

Despite sentiment being widely followed by academics, industry practitioners, as well as policymakers, there is less empirical knowledge about what influences these expectations. This paper adds to a growing empirical macroeconomic literature exploring how expectations are formed by providing evidence that accounting information at an aggregate level could influence future sentiment. In addition, the results add to our understanding of how accounting at an

aggregate level relates to the macroeconomy by examining aggregate tone, a relatively unexplored facet of disclosure.

Tables

Table 1 – Descriptive statistics

This table reports sample descriptive statistics. The sample is from 1994-2012. All data are monthly and variables are as defined in Appendix A. Unscaled values of *CONS*, *GDP*, and *LABOR* are presented for ease of interpretation.

Variable	Mean	Std Dev	Q1	Median	Q3	N
<i>ICS</i>	87.78	13.79	76.40	90.60	96.50	227
<i>ICS_CURRENT</i>	98.73	14.50	88.10	103.60	109.20	227
<i>ICS_EXPECTED</i>	80.73	14.04	69.60	81.60	90.10	227
<i>CBICS</i>	94.68	28.46	71.54	98.40	111.94	227
<i>CBICS_CURRENT</i>	104.37	49.36	64.21	110.37	138.47	227
<i>CBICS_EXPECTED</i>	88.22	17.93	78.36	91.52	99.59	227
<i>BW</i>	0.15	0.57	-0.14	0.02	0.27	203
<i>TONE_TOTAL</i>	0.92	0.36	0.63	0.99	1.20	227
<i>TONE_TONAL</i>	35.84	12.99	26.65	40.69	45.98	227
<i>FILINGCT</i>	667.06	624.02	211.00	367.00	1144.00	227
<i>EARNSURP</i>	-0.02	0.68	-0.28	0.04	0.33	227
<i>CAY</i>	-0.13	2.06	-1.71	-0.66	1.31	227
<i>CONS</i>	10.18	0.21	9.99	10.20	10.38	227
<i>CPI</i>	0.20	0.36	0.00	0.20	0.40	227
<i>DEF</i>	0.98	0.46	0.69	0.87	1.13	227
<i>GDP</i>	10.71	0.09	10.66	10.74	10.78	227
<i>LABOR</i>	5.90	0.03	5.87	5.91	5.93	227
<i>URATE</i>	5.93	1.72	4.70	5.50	6.10	227
<i>YLD3</i>	2.66	1.89	0.82	3.14	4.35	227

Table 2 – Correlation matrix

This table reports Pearson correlations for the sample. All data are monthly and variables are as defined in Appendix A. Variables *CONS*, *GDP*, and *LABOR* are unscaled. Correlations significant at least at the 10% level are in bold.

		[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]
[1]	<i>ICS</i>	1.00														
[2]	<i>CBICS</i>	0.94	1.00													
[3]	<i>BW</i>	0.22	0.38	1.00												
[4]	<i>TONE_TOTAL</i>	-0.26	-0.24	-0.23	1.00											
[5]	<i>TONE_TONAL</i>	-0.20	-0.17	-0.23	0.96	1.00										
[6]	<i>FILINGCT</i>	-0.23	-0.17	0.01	0.07	0.16	1.00									
[7]	<i>EARNSURP</i>	0.07	0.03	-0.05	-0.08	-0.12	-0.05	1.00								
[8]	<i>CAY</i>	0.60	0.58	0.23	-0.45	-0.39	-0.31	0.03	1.00							
[9]	<i>CONS</i>	-0.69	-0.61	-0.12	0.41	0.34	0.35	-0.02	-0.94	1.00						
[10]	<i>CPI</i>	0.08	0.09	0.06	0.03	0.02	-0.09	-0.01	0.01	-0.03	1.00					
[11]	<i>DEF</i>	-0.67	-0.65	-0.19	0.34	0.29	0.17	-0.30	-0.49	0.52	-0.24	1.00				
[12]	<i>GDP</i>	-0.53	-0.43	-0.05	0.46	0.40	0.34	-0.03	-0.91	0.97	-0.01	0.44	1.00			
[13]	<i>LABOR</i>	0.50	0.53	0.21	0.35	0.36	-0.05	-0.11	0.02	-0.09	0.05	-0.11	0.14	1.00		
[14]	<i>URATE</i>	-0.74	-0.85	-0.38	0.07	0.03	0.17	0.05	-0.57	0.50	-0.09	0.45	0.30	-0.66	1.00	
[15]	<i>YLD3</i>	0.69	0.81	0.42	-0.26	-0.20	-0.19	-0.01	0.75	-0.67	0.08	-0.56	-0.57	0.24	-0.80	1.00

Table 3 – Aggregate disclosure and sentiment*Panel A – ICS sample*

This table presents the results from OLS regressions of the University of Michigan Index of Consumer Sentiment at times t , $t+1$, and $t+2$ on the lagged aggregate disclosure tone measures and control variables. Statistical significance is assessed using Newey-West standard errors, which are presented underneath coefficient values. Variables are as defined in Appendix A.

Dependent Variable	(1) ICS_t	(2) ICS_{t+1}	(3) ICS_{t+2}	(4) ICS_t	(5) ICS_{t+1}	(6) ICS_{t+2}
$TONE_TOTAL_{t-1}$	-6.6331*** [2.079]	-6.7785*** [2.207]	-7.9664*** [2.257]			
$TONE_TONAL_{t-1}$				-0.1779*** [0.054]	-0.1785*** [0.061]	-0.2031*** [0.064]
$FILINGCT_{t-1}$	0.0004 [0.000]	0.0009** [0.000]	0.0004 [0.000]	0.0003 [0.000]	0.0008** [0.000]	0.0003 [0.000]
$EARN SURP_{t-1}$	0.5003 [0.420]	0.2880 [0.401]	-0.8404* [0.429]	0.2636 [0.430]	0.0458 [0.419]	-1.1259** [0.464]
CAY_{t-1}	-6.0743*** [1.038]	-5.3436*** [1.030]	-4.4802*** [1.056]	-6.1289*** [1.022]	-5.3970*** [1.022]	-4.5381*** [1.049]
$CONS_{t-1}$	-2.6081*** [0.374]	-3.0218*** [0.361]	-3.1456*** [0.364]	-2.6580*** [0.376]	-3.0712*** [0.362]	-3.2002*** [0.364]
CPI_{t-1}	-3.0385** [1.500]	-0.9265 [1.485]	-0.3312 [1.508]	-3.2707** [1.449]	-1.1705 [1.444]	-0.6315 [1.478]
DEF_{t-1}	-3.0449** [1.297]	-1.2918 [1.120]	-1.3974 [1.257]	-3.2917*** [1.245]	-1.5653 [1.079]	-1.7612 [1.209]
GDP_{t-1}	4.4739*** [0.925]	5.5094*** [0.882]	5.9189*** [0.876]	4.5737*** [0.932]	5.6067*** [0.889]	6.0239*** [0.882]
$LABOR_{t-1}$	-0.9685** [0.476]	-1.1796** [0.525]	-1.1810** [0.537]	-1.0234** [0.482]	-1.2426** [0.532]	-1.2690** [0.543]
$URATE_{t-1}$	-0.2011 [1.815]	1.1644 [1.971]	1.7993 [1.878]	-0.1416 [1.783]	1.2094 [1.950]	1.8205 [1.872]
$YLD3_{t-1}$	0.9791 [0.728]	1.1135 [0.798]	0.6763 [0.834]	1.0094 [0.716]	1.1366 [0.793]	0.6875 [0.834]
N	227	227	227	227	227	227
R-squared	0.88	0.86	0.85	0.88	0.86	0.85

***, **, * indicates significance at the 0.01, 0.05, and 0.10 level, respectively.

Table 3 – Aggregate disclosure and sentiment*Panel B – CBICS sample*

This table presents the results from OLS regressions of the Conference Board Index of Consumer Confidence at times t , $t+1$, and $t+2$ on the lagged aggregate disclosure tone measures and control variables. Statistical significance is assessed using Newey-West standard errors, which are presented underneath coefficient values. Variables are as defined in Appendix A.

Dependent Variable	(1) $CBICS_t$	(2) $CBICS_{t+1}$	(3) $CBICS_{t+2}$	(4) $CBICS_t$	(5) $CBICS_{t+1}$	(6) $CBICS_{t+2}$
$TONE_TOTAL_{t-1}$	-13.5705*** [2.983]	-15.1891*** [3.040]	-15.0301*** [3.453]			
$TONE_TONAL_{t-1}$				-0.3560*** [0.080]	-0.4019*** [0.084]	-0.3859*** [0.099]
$FILINGCT_{t-1}$	0.0021** [0.001]	0.0011 [0.001]	0.0011 [0.001]	0.0019** [0.001]	0.0009 [0.001]	0.0008 [0.001]
$EARN SURP_{t-1}$	0.0714 [0.898]	-0.5178 [0.831]	-2.6386*** [0.886]	-0.4137 [0.935]	-1.0603 [0.883]	-3.1769*** [0.951]
CAY_{t-1}	-9.0568*** [1.703]	-9.1873*** [1.781]	-8.5878*** [1.971]	-9.1627*** [1.705]	-9.3084*** [1.786]	-8.6990*** [1.987]
$CONS_{t-1}$	-4.7202*** [0.609]	-5.6165*** [0.597]	-5.9984*** [0.634]	-4.8183*** [0.623]	-5.7281*** [0.614]	-6.1028*** [0.649]
CPI_{t-1}	-2.2718 [2.201]	1.9467 [2.232]	3.2513 [2.491]	-2.7632 [2.142]	1.4036 [2.166]	2.6901 [2.422]
DEF_{t-1}	-5.0389** [2.392]	-2.4920 [2.175]	-3.1763 [2.328]	-5.5952** [2.349]	-3.0928 [2.156]	-3.8453* [2.294]
GDP_{t-1}	9.1505*** [1.524]	11.1515*** [1.505]	12.0329*** [1.591]	9.3433*** [1.558]	11.3721*** [1.548]	12.2348*** [1.631]
$LABOR_{t-1}$	-2.3462*** [0.809]	-2.9349*** [0.890]	-3.1842*** [0.982]	-2.4753*** [0.829]	-3.0722*** [0.906]	-3.3445*** [1.005]
$URATE_{t-1}$	-1.9167 [2.647]	0.2683 [2.906]	1.4177 [3.128]	-1.8333 [2.596]	0.3780 [2.864]	1.4707 [3.131]
$YLD3_{t-1}$	5.0009*** [1.165]	5.2772*** [1.181]	4.7212*** [1.301]	5.0438*** [1.157]	5.3334*** [1.172]	4.7489*** [1.308]
N	227	227	227	227	227	227
R-squared	0.90	0.91	0.90	0.90	0.91	0.90

***, **, * indicates significance at the 0.01, 0.05, and 0.10 level, respectively.

Table 3 – Aggregate disclosure and sentiment*Panel C – BW sample*

This table presents the results from OLS regressions of the Baker and Wurgler (2006) sentiment index at times t , $t+1$, and $t+2$ on the lagged aggregate disclosure tone measures and control variables. Statistical significance is assessed using Newey-West standard errors, which are presented underneath coefficient values. Variables are as defined in Appendix A.

Dependent Variable	(1) BW_t	(2) BW_{t+1}	(3) BW_{t+2}	(4) BW_t	(5) BW_{t+1}	(6) BW_{t+2}
$TONE_TOTAL_{t-1}$	-0.6612*** [0.220]	-0.7157*** [0.221]	-0.6881*** [0.235]			
$TONE_TONAL_{t-1}$				-0.0174*** [0.006]	-0.0182*** [0.006]	-0.0173*** [0.006]
$FILINGCT_{t-1}$	0.0000 [0.000]	0.0001 [0.000]	0.0001 [0.000]	0.0000 [0.000]	0.0000 [0.000]	0.0001 [0.000]
$EARN SURP_{t-1}$	-0.1867*** [0.066]	-0.1344** [0.058]	-0.0895* [0.050]	-0.2109*** [0.068]	-0.1597*** [0.060]	-0.1135** [0.051]
CAY_{t-1}	0.3732*** [0.140]	0.3378** [0.146]	0.2913* [0.153]	0.3642*** [0.137]	0.3273** [0.143]	0.2809* [0.150]
$CONS_{t-1}$	0.0128 [0.041]	-0.0015 [0.038]	-0.0198 [0.036]	0.0074 [0.041]	-0.0076 [0.038]	-0.0260 [0.036]
CPI_{t-1}	0.0476 [0.098]	0.0435 [0.099]	0.0768 [0.099]	0.0192 [0.097]	0.0134 [0.100]	0.0476 [0.099]
DEF_{t-1}	-0.1433 [0.150]	-0.0762 [0.140]	0.0120 [0.133]	-0.1647 [0.148]	-0.0988 [0.136]	-0.0108 [0.127]
GDP_{t-1}	0.0619 [0.093]	0.0901 [0.089]	0.1232 [0.085]	0.0721 [0.093]	0.1011 [0.090]	0.1342 [0.088]
$LABOR_{t-1}$	0.1078 [0.065]	0.0966 [0.062]	0.0786 [0.058]	0.1013 [0.063]	0.0889 [0.060]	0.0709 [0.057]
$URATE_{t-1}$	0.2986** [0.142]	0.3120** [0.157]	0.3148* [0.166]	0.3014** [0.143]	0.3138* [0.160]	0.3172* [0.169]
$YLD3_{t-1}$	0.1849*** [0.070]	0.2053*** [0.079]	0.2236*** [0.080]	0.1881*** [0.072]	0.2092** [0.081]	0.2276*** [0.083]
N	203	202	201	203	202	201
R-squared	0.40	0.40	0.40	0.40	0.40	0.39

***, **, * indicates significance at the 0.01, 0.05, and 0.10 level, respectively.

Table 4 – Aggregate disclosure and sentiment conditional on tone dispersion*Panel A – ICS sample*

This table presents the results from OLS regressions of the University of Michigan Index of Consumer Sentiment at times t , $t+1$, and $t+2$ on the lagged aggregate disclosure tone measures during periods of high and low tone dispersion and control variables. $TONE_TOTAL_HIGHDISP$ ($TONE_TONAL_HIGHDISP$) equals $TONE_TOTAL$ ($TONE_TONAL$) when the month's standard deviation of within-month firm-level filing tone is in the top tercile of the monthly standard deviations for the sample, and zero otherwise. $TONE_TOTAL_LOWDISP$ ($TONE_TONAL_LOWDISP$) equals $TONE_TOTAL$ ($TONE_TONAL$) when the month's standard deviation of within-month firm-level filing tone is in the bottom two terciles of the monthly standard deviations for the sample, and zero otherwise. Statistical significance is assessed using Newey-West standard errors, which are presented underneath coefficient values. All variables are as defined in Appendix A.

Dependent Variable	(1) ICS_t	(2) ICS_{t+1}	(3) ICS_{t+2}	(4) ICS_t	(5) ICS_{t+1}	(6) ICS_{t+2}
$TONE_TOTAL_HIGHDISP_{t-1}$	-2.7085 [1.803]	-1.6410 [1.791]	-2.3044 [1.806]			
$TONE_TOTAL_LOWDISP_{t-1}$	-6.6327*** [1.950]†††	-6.7780*** [2.002]†††	-7.9659*** [2.027]†††			
$TONE_TONAL_HIGHDISP_{t-1}$				-0.0942** [0.045]	-0.0541 [0.047]	-0.0636 [0.050]
$TONE_TONAL_LOWDISP_{t-1}$				-0.1805*** [0.051]†††	-0.1823*** [0.053]†††	-0.2074*** [0.056]†††
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	227	227	227	227	227	227
R-squared	0.89	0.87	0.86	0.89	0.87	0.86

***, **, * indicates significance at the 0.01, 0.05, and 0.10 level, respectively.

Table 4 – Aggregate disclosure and sentiment conditional on tone dispersion*Panel B – CBICS sample*

This table presents the results from OLS regressions of the Conference Board Index of Consumer Confidence at times t , $t+1$, and $t+2$ on the lagged aggregate disclosure tone measures during periods of high and low tone dispersion and control variables. $TONE_TOTAL_HIGHDISP$ ($TONE_TONAL_HIGHDISP$) equals $TONE_TOTAL$ ($TONE_TONAL$) when the month's standard deviation of within-month firm-level filing tone is in the top tercile of the monthly standard deviations for the sample, and zero otherwise. $TONE_TOTAL_LOWDISP$ ($TONE_TONAL_LOWDISP$) equals $TONE_TOTAL$ ($TONE_TONAL$) when the month's standard deviation of within-month firm-level filing tone is in the bottom two terciles of the monthly standard deviations for the sample, and zero otherwise. Statistical significance is assessed using Newey-West standard errors, which are presented underneath coefficient values. All variables are as defined in Appendix A.

Dependent Variable	(1) $CBICS_t$	(3) $CBICS_{t+1}$	(5) $CBICS_{t+2}$	(2) $CBICS_t$	(4) $CBICS_{t+1}$	(6) $CBICS_{t+2}$
$TONE_TOTAL_HIGHDISP_{t-1}$	-4.7833 [3.333]	-6.3263** [2.752]	-5.1214* [3.007]			
$TONE_TOTAL_LOWDISP_{t-1}$	-13.5697*** [2.716]†††	-15.1883*** [2.724]†††	-15.0291*** [3.095]†††			
$TONE_TONAL_HIGHDISP_{t-1}$				-0.1711* [0.090]	-0.2030*** [0.072]	-0.1607* [0.083]
$TONE_TONAL_LOWDISP_{t-1}$				-0.3617*** [0.072]†††	-0.4080*** [0.073]†††	-0.3929*** [0.087]†††
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	227	227	227	227	227	227
R-squared	0.91	0.91	0.90	0.91	0.91	0.90

***, **, * indicates significance at the 0.01, 0.05, and 0.10 level, respectively.

Table 4 – Aggregate disclosure and sentiment conditional on tone dispersion*Panel C – BW sample*

This table presents the results from OLS regressions of the Baker and Wurgler (2006) sentiment index at times t , $t+1$, and $t+2$ on the lagged aggregate disclosure tone measures during periods of high and low tone dispersion and control variables. $TONE_TOTAL_HIGHDISP$ ($TONE_TONAL_HIGHDISP$) equals $TONE_TOTAL$ ($TONE_TONAL$) when the month's standard deviation of within-month firm-level filing tone is in the top tercile of the monthly standard deviations for the sample, and zero otherwise. $TONE_TOTAL_LOWDISP$ ($TONE_TONAL_LOWDISP$) equals $TONE_TOTAL$ ($TONE_TONAL$) when the month's standard deviation of within-month firm-level filing tone is in the bottom two terciles of the monthly standard deviations for the sample, and zero otherwise. Statistical significance is assessed using Newey-West standard errors, which are presented underneath coefficient values. All variables are as defined in Appendix A.

Dependent Variable	(1) BW_t	(3) BW_{t+1}	(5) BW_{t+2}	(2) BW_t	(4) BW_{t+1}	(6) BW_{t+2}
$TONE_TOTAL_HIGHDISP_{t-1}$	-0.3122 [0.199]	-0.3188 [0.195]	-0.2614 [0.175]			
$TONE_TOTAL_LOWDISP_{t-1}$	-0.7861*** [0.217]†††	-0.8570*** [0.215]†††	-0.8397*** [0.236]†††			
$TONE_TONAL_HIGHDISP_{t-1}$				-0.0132** [0.006]	-0.0137** [0.006]	-0.0120** [0.006]
$TONE_TONAL_LOWDISP_{t-1}$				-0.0203*** [0.006]††	-0.0214*** [0.006]†††	-0.0210*** [0.006]†††
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	203	202	201	203	202	201
R-squared	0.48	0.46	0.46	0.42	0.42	0.42

***, **, * indicates significance at the 0.01, 0.05, and 0.10 level, respectively.

Table 5 – Aggregate disclosure and sentiment conditional on filing intensity

Panel A – ICS sample

This table presents the results from OLS regressions of the University of Michigan Index of Consumer Sentiment at times t , $t+1$, and $t+2$ on the lagged aggregate disclosure tone measures during periods of high and low filing intensity and control variables. $TONE_TOTAL_HIGHFILING$ ($TONE_TONAL_HIGHFILING$) equals $TONE_TOTAL$ ($TONE_TONAL$) when the filing count for the month is above the median monthly filing count for the sample, and zero otherwise. $TONE_TOTAL_LOWFILING$ ($TONE_TONAL_LOWFILING$) equals $TONE_TOTAL$ ($TONE_TONAL$) when the filing count for the month is below the median monthly filing count for the sample, and zero otherwise. This analysis was performed for sample years 1996-2012. Statistical significance is assessed using Newey-West standard errors, which are presented underneath coefficient values. All variables are as defined in Appendix A.

Dependent Variable	(1) ICS_t	(2) ICS_{t+1}	(3) ICS_{t+2}	(4) ICS_t	(5) ICS_{t+1}	(6) ICS_{t+2}
$TONE_TOTAL_HIGHFILING_{t-1}$	-7.6741*** [2.182]	-7.5064*** [2.387]	-8.1829*** [2.434]			
$TONE_TOTAL_LOWFILING_{t-1}$	-6.1877*** [2.005]††	-6.3766*** [2.185]†	-8.0996*** [2.286]			
$TONE_TONAL_HIGHFILING_{t-1}$				-0.2225*** [0.058]	-0.2138*** [0.067]	-0.2269*** [0.071]
$TONE_TONAL_LOWFILING_{t-1}$				-0.1759*** [0.052]†††	-0.1770*** [0.061]††	-0.2162*** [0.066]
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	204	204	204	204	204	204
R-squared	0.89	0.87	0.86	0.90	0.88	0.86

***, **, * indicates significance at the 0.01, 0.05, and 0.10 level, respectively.

Table 5 – Aggregate disclosure and sentiment conditional on filing intensity

Panel B – CBICS sample

This table presents the results from OLS regressions of the Conference Board Index of Consumer Confidence at times t , $t+1$, and $t+2$ on the lagged aggregate disclosure tone measures during periods of high and low filing intensity and control variables. $TONE_TOTAL_HIGHFILING$ ($TONE_TONAL_HIGHFILING$) equals $TONE_TOTAL$ ($TONE_TONAL$) when the filing count for the month is above the median monthly filing count for the sample, and zero otherwise. $TONE_TOTAL_LOWFILING$ ($TONE_TONAL_LOWFILING$) equals $TONE_TOTAL$ ($TONE_TONAL$) when the filing count for the month is below the median monthly filing count for the sample, and zero otherwise. This analysis was performed for sample years 1996-2012. Statistical significance is assessed using Newey-West standard errors, which are presented underneath coefficient values. All variables are as defined in Appendix A.

Dependent Variable	(1) $CBICS_t$	(2) $CBICS_{t+1}$	(3) $CBICS_{t+2}$	(4) $CBICS_t$	(5) $CBICS_{t+1}$	(6) $CBICS_{t+2}$
$TONE_TOTAL_HIGHFILING_{t-1}$	-14.6192*** [3.193]	-15.3580*** [3.272]	-15.8664*** [3.669]			
$TONE_TOTAL_LOWFILING_{t-1}$	-12.5927*** [2.774]†	-14.5126*** [3.053]	-14.8108*** [3.426]			
$TONE_TONAL_HIGHFILING_{t-1}$				-0.4209*** [0.085]	-0.4441*** [0.090]	-0.4394*** [0.110]
$TONE_TONAL_LOWFILING_{t-1}$				-0.3530*** [0.073]††	-0.4080*** [0.083]	-0.3974*** [0.101]
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	204	204	204	204	204	204
R-squared	0.92	0.92	0.91	0.92	0.92	0.91

***, **, * indicates significance at the 0.01, 0.05, and 0.10 level, respectively.

Table 5 – Aggregate disclosure and sentiment conditional on filing intensity*Panel C – BW sample*

This table presents the results from OLS regressions of the Baker and Wurgler (2006) sentiment index at times t , $t+1$, and $t+2$ on the lagged aggregate disclosure tone measures during periods of high and low filing intensity and control variables. $TONE_TOTAL_HIGHFILING$ ($TONE_TONAL_HIGHFILING$) equals $TONE_TOTAL$ ($TONE_TONAL$) when the filing count for the month is above the median monthly filing count for the sample, and zero otherwise. $TONE_TOTAL_LOWFILING$ ($TONE_TONAL_LOWFILING$) equals $TONE_TOTAL$ ($TONE_TONAL$) when the filing count for the month is below the median monthly filing count for the sample, and zero otherwise. This analysis was performed for sample years 1996-2012. Statistical significance is assessed using Newey-West standard errors, which are presented underneath coefficient values. All variables are as defined in Appendix A.

Dependent Variable	(1) BW_t	(2) BW_{t+1}	(3) BW_{t+2}	(4) BW_t	(5) BW_{t+1}	(6) BW_{t+2}
$TONE_TOTAL_HIGHFILING_{t-1}$	-0.6832*** [0.222]	-0.7650*** [0.221]	-0.7401*** [0.238]			
$TONE_TOTAL_LOWFILING_{t-1}$	-0.7108*** [0.223]	-0.7748*** [0.222]	-0.7486*** [0.234]			
$TONE_TONAL_HIGHFILING_{t-1}$				-0.0209*** [0.006]	-0.0226*** [0.006]	-0.0218*** [0.006]
$TONE_TONAL_LOWFILING_{t-1}$				-0.0206*** [0.006]	-0.0219*** [0.006]	-0.0211*** [0.006]
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	180	179	178	180	179	178
R-squared	0.43	0.43	0.42	0.45	0.44	0.43

***, **, * indicates significance at the 0.01, 0.05, and 0.10 level, respectively.

Table 6 – Aggregate disclosure and current and expected components of consumer indices
Panel A – ICS sample

This table presents the results from OLS regressions of the current and expected components of the University of Michigan Index of Consumer Sentiment on the lagged aggregate disclosure tone measures and control variables. Statistical significance is assessed using Newey-West standard errors, which are presented underneath coefficient values. All variables are as defined in Appendix A.

Dependent Variable	(1) <i>ICS_CURRENT_t</i>	(2) <i>ICS_EXPECTED_t</i>	(3) <i>ICS_CURRENT_t</i>	(4) <i>ICS_EXPECTED_t</i>
<i>TONE_TOTAL_{t-1}</i>	-4.0222* [2.190]	-8.2831*** [2.410]		
<i>TONE_TONAL_{t-1}</i>			-0.1172** [0.057]	-0.2165*** [0.062]
<i>FILINGCT_{t-1}</i>	-0.0001 [0.000]	0.0007 [0.001]	-0.0001 [0.000]	0.0006 [0.001]
<i>EARNSURP_{t-1}</i>	0.9999** [0.473]	0.1768 [0.520]	0.8575* [0.489]	-0.1194 [0.515]
<i>CAY_{t-1}</i>	-4.7775*** [0.960]	-6.9207*** [1.341]	-4.8174*** [0.945]	-6.9848*** [1.330]
<i>CONS_{t-1}</i>	-1.9072*** [0.352]	-3.0563*** [0.451]	-1.9422*** [0.354]	-3.1158*** [0.454]
<i>CPI_{t-1}</i>	-2.0869 [1.544]	-3.6381** [1.610]	-2.2088 [1.499]	-3.9396** [1.559]
<i>DEF_{t-1}</i>	-7.6863*** [1.545]	-0.0537 [1.408]	-7.7769*** [1.520]	-0.3980 [1.343]
<i>GDP_{t-1}</i>	3.2338*** [0.821]	5.2629*** [1.138]	3.3074*** [0.822]	5.3796*** [1.152]
<i>LABOR_{t-1}</i>	-0.7393 [0.460]	-1.1143* [0.579]	-0.7532 [0.461]	-1.1947** [0.582]
<i>URATE_{t-1}</i>	-1.7421 [1.801]	0.7755 [1.967]	-1.6619 [1.783]	0.8229 [1.934]
<i>YLD3_{t-1}</i>	1.0545 [0.779]	0.9285 [0.808]	1.0950 [0.771]	0.9529 [0.801]
N	227	227	227	227
R-squared	0.89	0.82	0.89	0.82

***, **, * indicates significance at the 0.01, 0.05, and 0.10 level, respectively.

Table 6 – Aggregate disclosure and current and expected components of consumer indices
Panel B – CBICS sample

This table presents the results from OLS regressions of the current and expected components of the Conference Board Index of Consumer Confidence on the lagged aggregate disclosure tone measures and control variables. Statistical significance is assessed using Newey-West standard errors, which are presented underneath coefficient values. All variables are as defined in Appendix A.

Dependent Variable	(1) <i>CBICS_CURRENT_t</i>	(2) <i>CBICS_EXPECTED_t</i>	(3) <i>CBICS_CURRENT_t</i>	(4) <i>CBICS_EXPECTED_t</i>
<i>TONE_TOTAL_{t-1}</i>	-22.0705*** [3.511]	-7.9038** [3.419]		
<i>TONE_TONAL_{t-1}</i>			-0.5746*** [0.093]	-0.2102** [0.089]
<i>FILINGCT_{t-1}</i>	0.0022* [0.001]	0.0020** [0.001]	0.0019 [0.001]	0.0019** [0.001]
<i>EARN SURP_{t-1}</i>	-2.5767* [1.361]	1.8369* [0.977]	-3.3662** [1.402]	1.5547 [1.005]
<i>CAY_{t-1}</i>	-8.6833*** [2.460]	-9.3058*** [1.966]	-8.8524*** [2.559]	-9.3695*** [1.936]
<i>CONS_{t-1}</i>	-6.6451*** [0.859]	-3.4370*** [0.679]	-6.8024*** [0.893]	-3.4956*** [0.681]
<i>CPI_{t-1}</i>	1.5972 [2.766]	-4.8511** [2.337]	0.7892 [2.658]	-5.1314** [2.306]
<i>DEF_{t-1}</i>	1.2296 [3.977]	-9.2179*** [2.390]	0.2973 [3.960]	-9.5235*** [2.340]
<i>GDP_{t-1}</i>	14.2293*** [2.044]	5.7646*** [1.611]	14.5368*** [2.117]	5.8809*** [1.623]
<i>LABOR_{t-1}</i>	-4.0386*** [1.120]	-1.2179 [0.919]	-4.2575*** [1.147]	-1.2871 [0.926]
<i>URATE_{t-1}</i>	-6.5669** [2.584]	1.1834 [3.141]	-6.4517** [2.502]	1.2457 [3.119]
<i>YLD3_{t-1}</i>	11.1289*** [1.398]	0.9156 [1.362]	11.1883*** [1.394]	0.9474 [1.359]
N	227	227	227	227
R-squared	0.93	0.74	0.93	0.75

***, **, * indicates significance at the 0.01, 0.05, and 0.10 level, respectively.

Table 7 – Aggregate disclosure and fundamental and non-fundamental components of consumer indices

This table presents the coefficients from an OLS regression of the fundamental and non-fundamental components of the University of Michigan Index of Consumer Sentiment and the Conference Board Index of Consumer Confidence on the aggregate tone measures and the aggregate earnings surprise. The decomposition of the consumer indices into their fundamental and non-fundamental components is performed following the methodology found in Lemmon and Portniaguina (2006). Statistical significance is assessed using Newey-West standard errors, which are presented underneath coefficient values. All other variables are as defined in Appendix A.

Independent Variable	<i>TONE_TOTAL_{t-1}</i>	<i>TONE_TONAL_{t-1}</i>
<i>UM_NONFUNDAMENTAL_t</i>	-2.7488** [1.359]	-0.0892** [0.038]
<i>CB_NONFUNDAMENTAL_t</i>	-5.1479** [2.171]	-0.1635*** [0.059]
<i>UM_FUNDAMENTAL_t</i>	-8.2943 [5.218]	-0.1502 [0.145]
<i>CB_FUNDAMENTAL_t</i>	-15.8287 [10.937]	-0.280 [0.302]
N	227	227

***, **, * indicates significance at the 0.01, 0.05, and 0.10 level, respectively.

Appendices

Appendix A: Variable definitions

This appendix provides the variable definitions. All data are monthly.

Variable	Definition
<i>ICS</i>	University of Michigan Index of Consumer Sentiment
<i>ICS_CURRENT</i>	Current component of the University of Michigan Index of Consumer Sentiment
<i>ICS_EXPECTED</i>	Expected component of the University of Michigan Index of Consumer Sentiment
<i>CBICS</i>	Conference Board Index of Consumer Confidence
<i>CBICS_CURRENT</i>	Current component of the Conference Board Index of Consumer Confidence
<i>CBICS_EXPECTED</i>	Expected component of the Conference Board Index of Consumer Confidence
<i>BW</i>	Baker and Wurgler (2006) sentiment index
<i>TONE_TOTAL</i>	Value-weighted average of the firm-level percentage of negative words less positive words in 10-Q and 10-K filings (base is total words)

<i>TONE_TONAL</i>	Value-weighted average of the firm-level percentage of negative words less positive words in 10-Q and 10-K filings (base is total positive and negative words)
<i>FILINGCT</i>	Number of 10-Q and 10-K filings
<i>EARNSURP</i>	Value-weighted average of firm-level standardized unexpected earnings (SUE) based on a seasonal random-walk model
<i>CAY</i>	Log consumption-to-wealth ratio from Lettau and Ludvigson (2001), multiplied by 100
<i>CONS</i>	Natural log of personal consumption expenditures per capita, multiplied by 100
<i>CPI</i>	Inflation rate
<i>DEF</i>	Default spread, measured as the difference between yields to maturity on Moody's Baa- and Aaa-rated bonds
<i>GDP</i>	Natural log of chained (2009 dollars) gross domestic product per capita, multiplied by 100
<i>LABOR</i>	Natural log of labor income, measured as real disposable personal income per capita, deflated by the PCE deflator, multiplied by 100
<i>URATE</i>	Unemployment rate
<i>YLD3</i>	Yield on three-month Treasury bills

Appendix B: Consumer sentiment indices

The University of Michigan Index of Consumer Sentiment is conducted by the University of Michigan Survey Research Center. It was initiated in 1947 on a quarterly basis and moved to a monthly basis in 1978.

The survey is sent to approximately 500 households in the United States and the respondents are asked the following questions: (1) We are interested in how people are getting along financially these days. Would you say that you (and your family living there) are better off or worse off financially than you were a year ago? (2) Now looking ahead—do you think that a year from now you (and your family living there) will be better off financially, or worse off, or just about the same as now?” (3) Now turning to business conditions in the country as a whole – do you think that during the next twelve months we’ll have good times financially, or bad times, or what?” (4) Looking ahead, which would you say is more likely—that in the country as a whole we’ll have continuous good times during the next five years or so, or that we will have periods of widespread unemployment or depression, or what?” (5) About the big things people buy for their homes—such as furniture, a refrigerator, stove, television, and things like that. Generally speaking, do you think now is a good or bad time for people to buy major household items?”

A relative score is calculated for each question as the percent of favorable replies less the percent of unfavorable replies, plus 100, rounded to the nearest whole number. The scores for questions (1) and (5) comprise the current component of the index, questions (2) – (4) comprise the expected component of the index, and the final index is comprised of all five questions.

A representative of the University of Michigan Survey Research Center states that the normal interview pattern begins shortly before the final release of the previous month and continues through the beginning of the week before the final data release. The final release dates are towards the end of the month. Thus, the index calculated for the month of October is related to interviews held at the very end of September and throughout the month of October.

The Conference Board Index of Consumer Confidence is conducted by the Conference Board and was initiated in 1967, turning into a monthly poll in 1977. The survey is sent to approximately 5,000 households in the United States and although the questions are similar to those of the University of Michigan survey, they are as follows: (1) How would you rate present general business conditions in your area? (2) What would you say about available jobs in your area right now? (3) Six months from now, do you think business conditions in your area will be better, the same, or worse? (4) Six months from now, do you think there will be more, the same, or fewer jobs available in your area? (5) Would you guess your total family income to be higher, the same, or lower six months from now?

A relative score is calculated for each question as the percent of favorable replies divided by the sum of favorable and unfavorable replies. The scores for questions (1) and (2) comprise the current component of the index, with the remaining questions comprising the expected component, and the final index is comprised of all five questions. The final results for a month are released towards the end of the following month.

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