

## Large-sample evidence on firms' year-over-year MD&A modification

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### **ABSTRACT**

The Securities and Exchange Commission (SEC) has expressed concerns about the informativeness of firms' Management Discussion and Analysis (MD&A) disclosures. A firm's MD&A is potentially uninformative if it does not change appreciably from the previous year. Using a unique measure for document differences, we provide three primary findings on the informativeness of MD&A. First, firms modify MD&A from the previous year to a larger extent following significant earnings changes than they do following small changes, apparently meeting the minimum disclosure requirement of the SEC. Second, investors' reactions to 10-K filings are positively associated with MD&A modification, suggesting that our modification score captures new information in the MD&A and that investors appear to use the information. Finally, the degree of MD&A modification has declined in the past decade even as MD&A has become longer, suggesting that firms increasingly use boilerplate disclosures (i.e., standardized disclosures that use many words with little firm-specific content). Moreover, market reactions have weakened over time even after we control for the decline in MD&A modification, suggesting either MD&A information has been increasingly preempted by other information sources or investors' confidence in financial disclosures has declined. Our large-sample evidence on firms' MD&A modification should be of interest to both capital-market participants and policy makers.

Keywords: MD&A, voluntary disclosure, annual report, similarity score.

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### 1. Introduction

This study examines the extent to which a firm modifies its Management Discussion and Analysis (MD&A) from the prior year, especially after significant operating changes, and proposes a new measure for the quality of narrative disclosure. MD&A is a key narrative disclosure required by the Securities and Exchange Commission (SEC) for annual and quarterly financial reporting. The purpose of the disclosure is to enable investors to “see the company through the eyes of management,” helping them understand why the financial condition and operating results have changed and assess the implications of these changes for future performance (SEC 2003). A necessary condition for an MD&A to serve this purpose is that managers modify the narratives, not merely the numbers, from the previous year to reflect changes in the current year.

Although it would not be surprising to find that most firms prepare MD&A by copying the previous year's and using it as a starting template, the relatively low number of modifications firms make seems to have become a serious concern for regulators. The SEC states in “A plain English handbook: how to create clear SEC disclosure documents”:

*“Because it's always been there” is not reason enough to keep it in your draft. Since much of the language in these documents is recycled from older (or another company's) documents, often no one knows who initially wrote it or why it is needed now.*

At three places in the 2003 MD&A guidance, the SEC urges firms to “evaluate issues presented in previous periods and consider reducing or omitting discussion of those that may no longer be material or helpful, or revise discussions where a revision would make

the continuing relevance of an issue more apparent.”<sup>1</sup> Arguably, a firm’s MD&A provides little *new* information if the document does not change much from the previous year, particularly after significant economic changes.

Using a vector space model—an algorithm used by some Internet search engines to determine similarities between documents—we measure how different two documents are and calculate a difference score. The raw score is bounded between 0 and 1, with 0 indicating identical documents and 1 indicating completely dissimilar documents. The raw score is designed to measure the difference of various alternative documents against *one* given document. When we compare the degree of changes from the previous year’s disclosure *across* firms, we adjust the raw score by the expected score conditional on document length, because the vector space model produces mechanically lower scores when two long documents are compared than when two short ones are used. We refer to the adjusted difference score computed from comparing a firm’s current year’s MD&A against its previous year’s as the “MD&A modification score.”

We use the MD&A modification score to examine four specific MD&A disclosure questions. First, do firms which have just experienced significant operating changes modify MD&A to a larger extent than other firms? An affirmative finding would provide some support that firms on average appear to meet the minimum requirements for MD&A disclosures. Second, given the same operating changes, what firm characteristics are associated with more MD&A modification? Third, do investors and financial analysts respond to MD&A modification? In other words, is the MD&A information timely enough to be used by investors and analysts? Finally, have MD&A modification and investors’ and analysts’ reactions to MD&A changed over time?

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<sup>1</sup> See Part III. A, B.1, and B.2 of the Release.

For the first question we partition the sample each year into quintiles according to the earnings change from the previous year and designate the highest (lowest) quintile as the “super” (“poor”) earnings change group. We find that both groups modify MD&A from the previous year to a larger extent than other firms, suggesting that firms meet the minimum disclosure requirement of the SEC. Moreover, we find that the poor-earnings-change group’s MD&A is more different from the prior year than is the super-earnings-change group’s and provide further discussion of this finding in the paper.

We then examine the firm characteristics associated with the MD&A modification score and find that large firms, firms audited by a Big N accounting firm, and firms in litigious environments modify MD&A to a larger extent, whereas firms in more competitive industries and with high institutional ownership and analyst coverage modify less. These results suggest that the political costs of lack of transparency, more extensive monitoring by auditors, and higher litigation risk press firms to provide more informative MD&A, whereas proprietary disclosure costs deter the supply of informative disclosure and active private information search likely reduces the demand for informative MD&A.

Next, we examine investors’ and analysts’ reactions to MD&A modification. Consistent with the MD&A modification score capturing new information, investors react to firms’ 10-K filings more strongly when MD&A is modified to a larger degree. However, the magnitude of analyst forecast revision is not associated with MD&A modification, suggesting that analysts do not use the MD&A information, perhaps because they have other and better information sources.

Finally, we examine MD&A modification over the past decade. We observe that firms’ MD&A disclosures have become longer over time, but they more closely resemble what

investors have already seen in the previous year. The trend of increasing MD&A length and decreasing MD&A modification together suggest firms' increased use of boilerplate disclosures because these patterns are only possible with more frequent use of relatively common words. The 2003 SEC release of MD&A guidance has not reversed the decreasing trend of MD&A modification. We also observe a decline in investors' reactions to 10-K filings over time, consistent with the decline in MD&A information. After controlling for the decline in MD&A modification, we find that the decline in market reaction to 10-K filings remains, suggesting either the information investors can glean from MD&A has been increasingly preempted by other sources of information or investors have reduced confidence in the financial information and disclosure presented to them.

Our study makes several contributions to the accounting literature. First, we propose a new measure for the quality of narrative disclosure. So far, the measures for narrative disclosure have been quite limited. Botosan (1997) constructs her own measure from reading quantitative and qualitative disclosures. While her measure may be more accurate than the alternatives, the requirement of labor-intensive coding limits her sample size and the measure is difficult for other researchers to replicate. Li (2008a) uses readability and length of a document as measures for disclosure quality, arguing that disclosure quality is poor for hard-to-read and long documents. Although his measures are objective and applicable to a large sample, they are levels, inducing the thorny omitted-correlated-variable problem.<sup>2</sup> In comparison, our measure uses a firm's own past disclosures in the evaluation, thereby mitigating this problem. More importantly, by comparing the adjacent years' disclosures, our measure examines the amount of new information disclosed (i.e.,

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<sup>2</sup> Li also performs analysis using the change measures in supplementary analyses, but finds no result regarding document length in the MD&A section.

“what?”), whereas readability is a lexical feature (i.e., “how?”). Managers probably first decide *what* to disclose before considering *how* to disclose. Our measure complements Botosan’s and Li’s measures for disclosure quality.

Second, our study provides new evidence for the MD&A literature. Although the SEC mandates the form and specifies the major categories of disclosure in MD&A, its “management approach” allows considerable leeway to managers. Since the onset of required MD&A disclosures in 1980, the SEC has been concerned about the adequacy and quality of MD&A and has conducted several targeted reviews. The literature on MD&A, on the other hand, has been constrained by the high cost of hand-collecting data and provides limited evidence (Cole and Jones 2005). We find in this study that although firms appear to meet the minimum MD&A requirement, MD&A has become increasingly like the previous year’s. Moreover, the MD&A modification practices have varied increasingly less *across* firms over the years. That is, while MD&A becomes longer over time, it looks more familiar and firms act more similarly. Not surprisingly, investors have reacted less to MD&A in recent years. Because MD&A was mandated as a unique venue for investors to obtain information, the declining informativeness of MD&A should concern investors and policy makers.

Finally, our study contributes to the emerging literature of large-sample analysis of narrative information. Advances in information technology have allowed accounting researchers to integrate the knowledge of other disciplines in analyzing narrative data. Now, researchers are able to address questions that were not tackled in the past because of the limitation of traditional tools. This emerging literature has applied linguistic tools to measure the length, tone, readability, and voice of narrative disclosures (Li 2008a, 2008b;

Kothari, Li, and Short 2008; Davis, Piger, and Sedor 2009; Matsumoto, Pronk, and Roelofsen 2007; Frankel, Mayew, and Sun 2009; Mayew and Venkatachalam 2009; Lerman and Livnat 2008). These aspects are largely lexical features of disclosure. We add to the literature by introducing a tool from computational linguistics to measure the difference between documents. The new tool is applicable to many other accounting settings where the disclosure is narrative and routine, whether it is mandatory (e.g., notes to the financial statements), semi-mandatory/semi-voluntary (e.g., MD&A), or voluntary (e.g., earnings announcement press releases and conference call presentations).

The paper proceeds as follows. Section 2 provides background information about MD&A regulation and reviews relevant research. Section 3 explains how we measure the difference between two documents. Section 4 describes the data and provides descriptive statistics. Section 5 tests whether firms modify MD&A to a larger degree after significant operating changes. Section 6 tests investors' and analysts' reactions to MD&A modification. Section 7 examines the trend of MD&A modification and Section 8 concludes.

## **2. Background and Hypothesis Development**

### *2.1 Regulation*

Since 1980, Item 303 of Regulation S-K mandates that companies provide MD&A as Item 7 in the 10-K filing. Managers are required to discuss three major financial aspects of the business: liquidity, capital resources, and results of operations. The SEC adopts a management approach: the requirements are “intentionally general, reflecting the Commission’s view that a flexible approach elicits more meaningful disclosure and avoids boilerplate discussions, which a more specific approach could foster” (SEC 1989). While

this approach allows for informative and transparent disclosure that suits each individual business, it gives managers leeway to keep the disclosure at the minimum.

Because of this concern, the SEC has conducted several targeted reviews of firms' MD&A practices and provided three interpretive releases to guide MD&A disclosure (SEC 1981, 1989, and 2003). The most recent review is on the Fortune 500 companies' MD&A filed in 2002. Consequently, 350 companies received comment letters. After the review, the SEC issued the most recent interpretive guidance on December 19, 2003. The SEC emphasizes that rather than making "a disclosure of information responsive to MD&A's requirements," managers should provide an *analysis*, explaining management's view of the implications and significance of that information. Corporate consultants echo, "Analyze, not merely disclose," and "convey to investors the key 'why's' of their financial position and performance" (Barker and Hedin 2004). At three places in its guidance, the SEC warns firms against presenting stale information as if the matters "remain static from period to period."

## *2.2 Hypothesis Development*

One long-standing issue in the literature is whether MD&A is useful to investors and financial analysts. On the one hand, MD&A is expected to be useful if it satisfies the objectives of MD&A when the SEC mandated it in the first place. On the other hand, its usefulness is questionable because of the significant discretion granted to managers as well as its lack of timeliness.

Prior research has taken several approaches to examining the usefulness of MD&A disclosure. Bryan (1997) performs content analysis on a sample of 250 firms collected in Year 1990 and for each firm codes a disclosure as "unfavorable," "neutral," "favorable," or

“missing” in seven categories. He gauges MD&A usefulness by testing the associations between the coded disclosures and changes in future performance (sales, earnings per share, operating cash flows, and stock prices). He finds that only certain prospective disclosures in MD&A are associated with future performance and that investors do not react to MD&A unless the information about planned capital expenditures is provided. Using similar approaches, Cole and Jones (2004) find that the MD&A disclosure of comparable store sales, store openings and closings, future store openings, and capital expenditures are associated with future earnings and sales changes. Callahan and Smith (2004) also find a market reward to firms that provide better MD&A disclosure. Also using content analysis, Rogers and Grant (1997) trace the information in analyst reports to a firm’s annual report and find that 31% of the information in analyst reports can be found in the MD&A.

Clarkson, Kao, and Richardson (1999) take a survey approach instead. They ask financial analysts to evaluate MD&A disclosures made in 1991-1992. The analysts responded that they viewed MD&A useful, especially when firms offered capital expenditure plans and directional forecasts by segments. The authors find that the firm characteristics associated with MD&A ratings are the same as those associated with firms’ disclosures in other venues and thus conclude that MD&A is part of a firm’s overall disclosure package. Similarly, Barron, Kile, and O’Keefe (1999) use the compliance ratings assigned by the SEC in a targeted review. They find that analyst forecasts issued in the 30 to 60 days after the MD&A release have less dispersion and smaller errors for firms with higher ratings.

Both of the above approaches have the advantages of using human judgment on (complicated) narrative disclosures. Yet, the disadvantages are small sample size, limited sample period, and difficulties for replication by future researchers. For these reasons, Cole and Jones (2005) conclude in their review that our “knowledge of the role and usefulness of MD&A information is still limited.” The third approach taken only recently in the literature is to analyze a large sample of MD&A disclosures using modern text processing technology. Using this approach, Li (2008a) finds that the annual reports (and the MD&A section) of firms with lower earnings and those with positive but less-persistent earnings are harder to read. Li (2008b) finds that firms strategically use the tone of forward-looking statements in MD&A and that the tone information can be used to predict future earnings.

Similar to Li, we provide large-sample evidence, due to the high computing power available with modern technology, and introduce a measure for the quality of narrative disclosures, based on developments in the computational linguistics literature. Unlike Li, we measure the *amount* of new information in the current year’s MD&A by comparing the current year’s and the prior year’s documents, rather than examining the linguistic features, such as readability and tone.

With this measure of MD&A modification we primarily examine three hypotheses. First, we investigate whether firms modify MD&A to a large extent after significant operating changes. One of the three major discussions required in MD&A is on operating results.<sup>3</sup> Firms with substantial operating changes are required by regulations to provide in-depth analysis. If firms meet this requirement, their current year’s MD&A is expected to

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<sup>3</sup> We take an income-statement (i.e., operating results) focus in this study and control for MD&A modification because of changes in firms’ financial conditions.

differ greatly from the previous year's. We expect firms on average meet this minimum requirement and state the first hypothesis in the alternative form:

**H1a: Firms modify MD&A to a larger extent after significant operating changes than after small operating changes.**

In addition to the average disclosure behavior of managers following large operating changes, we are interested in the variations in MD&A modification for firms with large operating changes. As Clarkson et al. (1999) argue, MD&A is part of a firm's overall disclosure package. We therefore examine the following as a supplement to the previous hypothesis:

**H1b: For firms that have experienced substantial operating changes, the firm characteristics associated with MD&A modification are the same as those associated with firms' disclosures in other venues.**

Our second major hypothesis examines market participants' reactions to MD&A modification. On the one hand, we expect the market to react to MD&A modification, because the purpose of MD&A disclosure is to provide investors with a unique managerial perspective on recent performance of the firm. On the other hand, the market might not react to MD&A modification if the information has already been made public through earnings announcement press releases, conference calls, or other disclosure channels. In particular, sophisticated investors and financial analysts might have collected the information privately through their own search efforts, and this information might have already be impounded in stock prices through trading. Our second hypothesis in the null form is:

**H2: Market participants do not react to MD&A modification.**

Our third hypothesis addresses the time trends of MD&A modification and market reactions to such modification. The past decade has seen tightening of regulations. The

Sarbanes-Oxley Act was passed in July 2002 and most of the recommended changes took place near or after the first quarter of 2003. These regulations require firms to provide additional disclosures, for example, on internal control and off-balance-sheet arrangements. In addition, the SEC issued the 2003 MD&A interpretive guidance, specifically asking firms to provide meaningful discussions. Therefore, we expect;

**H3a: Firms modify MD&A to a larger extent in recent years than in the early years of the past decade.**

Even if firms increasingly modify MD&A, the market reactions to MD&A information might have declined over time. The past decade has seen increased media outlets, faster dissemination of information, and major accounting scandals. The speed of information production and dissemination might have made MD&A disclosure less timely information in recent years than earlier in the decade. In addition, serious accounting scandals, such as Enron and Worldcom, publicized in 2002 have eroded public confidence in financial information and disclosure. Therefore, we expect:

**H3b: The market responds less to MD&A modification in the recent years than in the early years of the past decade.**

### **3. Measuring the Difference between Two Documents**

Internet search engines analyze the Internet documents for word usage. The stored information is used to match against users' search queries and compare documents to one another. We use a similar algorithm to compare the MD&A disclosures of a firm in two consecutive years. In particular, we use an extension of the vector space model first proposed by Salton, Wong, and Yang (1975). This model represents documents as vectors in  $n$ -dimensional space, where  $n$  is the number of unique words in the full set of documents and each vector element is the frequency of a particular word. Comparing the similarity of

two documents is to calculate the uncentered correlation coefficient of the two vectors that represent the documents. The angle between the two vectors reveals how similar (or correlated) those two documents are, with smaller angles implying more similar text.<sup>4</sup>

Formally, for two documents with  $n$  unique words in total, we write each document as an  $n$ -dimension vector of frequency weights ( $w_i$  for  $v_1$  and  $\psi_i$  for  $v_2$ , where  $i \in [1, n]$ ):

$$v_1 = (w_1, w_2, \dots, w_{n-1}, w_n) \text{ and } v_2 = (\psi_1, \psi_2, \dots, \psi_{n-1}, \psi_n)$$

We normalize each vector by dividing it by its length and calculate the cosine of the angle between the normalized vectors using the dot product.<sup>5</sup> This cosine is the similarity score:

$$sim = \frac{v_1}{\|v_1\|} \cdot \frac{v_2}{\|v_2\|}$$

This score is bounded between 0 and 1 (because of the normalization), with a higher score indicating more similarity.

As an example, consider two documents where the number of unique words in the two documents is five. For each document, we create a vector ( $v_1$  and  $v_2$ , respectively), which is spanned by the unique words in the two documents and with the loadings being the frequency of each word. Three possible cases are:

	Case (i)	Case (ii)	Case (iii)
Word frequency vector	$v_1 = (1, 3, 1, 2, 1)$ $v_2 = (1, 3, 1, 2, 1)$	$v_1 = (1, 1, 0, 1, 1)$ $v_2 = (1, 0, 1, 1, 1)$	$v_1 = (4, 0, 0, 0, 3)$ $v_2 = (0, 2, 2, 1, 0)$
Length of vector	$\ v_1\  = 4, \ v_2\  = 4$	$\ v_1\  = 2, \ v_2\  = 2$	$\ v_1\  = 5, \ v_2\  = 3$
Normalized vector	$u_1 = (.25, .75, .25, .5, .25)$ $u_2 = (.25, .75, .25, .5, .25)$	$u_1 = (.5, .5, 0, .5, .5)$ $u_2 = (.5, 0, .5, .5, .5)$	$u_1 = (.8, 0, 0, 0, .6)$ $u_2 = (0, .67, .67, .33, 0)$
Dot product	1	0.75	0

<sup>4</sup> This interpretation is similar to the geometric interpretation of traditional correlation measures. Also see Jaffe (1986), where he uses the same construct to measure the proximity of two firms.

<sup>5</sup> The length of a vector is not the same concept as the dimension of the vector or the length of the document. For example, the dimension of  $v_1$  is  $n$ , the length of the document represented by  $v_1$  is  $(w_1 + w_2 + \dots + w_n)$ , and the length of  $v_1$  is  $(w_1^2 + w_2^2 + \dots + w_n^2)^{1/2}$ .

The two documents are the same in case (i), totally different in case (iii), and somewhat in between in case (ii). The basic vector space model would first normalize  $v_1$  and  $v_2$  and then calculate the dot products of normalized vectors, producing similarity scores of 1 for case (i), 0.75 for case (ii), and 0 for case (iii).

In the empirical execution, we refine the vector weights by using the "term frequency-inverse document frequency (TF-IDF)" approach to down-weight words that are commonly used in the full sample and assign a higher weight to rarer words.<sup>6</sup> For example, the word "sales" is more common than the word "accidental" and thus "sales" receives a lower weight; the word "the" is extremely common and receives a weight very close to zero. After the similarity score is calculated, the raw difference score is  $(1 - sim)$  and a higher score indicates more document difference. Appendix A presents two examples of difference score calculations from real-life MD&A disclosures.

The raw difference score depends on the selection of words not the order of words in the documents. In statistical terms, it is the combination rather than permutation that matters. Intuitively, given the same population of words from which managers can choose for disclosure, the longer the pair of documents from the consecutive years, the more likely a word is included in both documents and thus the less likely the second document would differ from the first. Appendix B confirms this intuition and shows analytically that the raw difference score is a decreasing function of document length. Li (2008a) shows that MD&A length is sticky. So, the comparison of consecutive-year MD&As involves two long documents for some firms, but two short documents for others. The raw difference scores need to be adjusted for document length before they are compared across firms.

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<sup>6</sup> As is common practice with vector-space-model implementations, we stem each word using the Porter stemming algorithm to abstract away from word tense and form so that we can focus on the underlying word choice. For example, "faith," "faithful," and "faithfulness" are all stemmed to "faith."

As demonstrated in Appendix B, we empirically approximate the functional form of the relation between the raw difference score and document length using the Taylor expansion around 0 and calculate the expected difference score conditional on document length. Our MD&A modification score is the adjusted score (that is, the raw score minus the expected score) and is denoted as the variable *Score*.

To our knowledge, three other studies have independently developed measures for detecting document similarity (or difference). Hoberg and Phillips (2009) measure product similarity from product descriptions in 10-K filings and examine whether this similarity affects merger and acquisition decisions. Like ours, their measurement of similarity is rooted in the vector space model. Unlike us, they analyze only the words that appear in fewer than 5% of all product descriptions in a given year and their weight for each vector element is either 1 or 0. Hanley and Hoberg (2009) use a regression version of the vector space model to examine whether the standard and informative language of a prospectus predicts IPO underpricing. They treat each document as a vector whose elements are the frequency (including 0) of each unique word appearing in the prospectus and normalize each vector by the sum of its elements. This vector is regressed on the mean vector of recent IPOs and of IPOs in the same industry. They use the predicted values as a proxy for the standard content of the current IPO prospectus and the residuals as a proxy for the informative content. Nelson and Pritchard (2007) ask whether firms exposed to higher litigation risk modify their cautionary language to a larger extent from the previous year. To compute the resemblance score, they take three adjacent words in a sentence as a unit and examine the change in the sequence of words from the previous year.

Our approach to calculating the difference score is most appropriate for our setting. We consider managers' choice of words rather than the order of words, sentences, and paragraphs, or the precise phrasing of the MD&A. An average MD&A is over 6,000 words long; detecting the changes in the order of words, sentences, and paragraphs would be a daunting task. More importantly, the choice of words is likely a more critical decision than phrasing in communication.

#### **4. Sample and Descriptive Statistics**

Our sample period is fiscal years 1997-2006. It starts with 1997 because we require the previous year's filing to be on EDGAR and 1996 is the first fiscal year for which almost all companies filed 10-K electronically. We download 10-K filings from EDGAR and extract MD&A from Item 7 in each filing.<sup>7</sup> As in Li (2008a, 2008b), before further processing, we remove tables from the MD&A because we are interested in narrative disclosures. We then merge the EDGAR data with Compustat using the Central Index Key (CIK) and exclude observations (1) whose MD&A for the previous year is missing, (2) whose total assets or diluted earnings per share (EPS) before extraordinary and discontinued items for the current year or the previous year are missing, (3) whose year-end stock price is below \$1 (to avoid outliers created by small scalars), or (4) which changed the month of fiscal year end during the year. The screening leaves us with 28,142 firm-year observations. This

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<sup>7</sup> Our sample includes both 10-K and 10-K405. Before 2003, 10-K405 was filed instead of 10-K if insider trading activity was not disclosed in a timely manner. In addition to Item 7, we also extract Item 7a because it covers similar themes as Item 7. The 10-Ks retrieved from EDGAR are free-form text. We use a variety of string searches to extract MD&A, such as "Item 7," and exclude the extractions led by phrases such as "please refer to Item 7 for more information" and "Item 7 .... Page 8" (which is likely to be a Table of Contents entry). We were able to successfully extract MD&A (that has a reasonable number of words) from 73% of the 10-K filings that are covered by Compustat. Most of the filings from which we could not extract MD&A refer to other sources for MD&A. To confirm that the extractions in our final sample are successful, we randomly verify 100 MD&A documents with the original filings and observe no inaccurate or incomplete extractions.

number is comparable to the number of 28,279 firm-year observations for the period of 1994-2004 in Li (2008a).

Before proceeding with the MD&A modification score that we will use in the analyses, we use industry classifications to check the validity of our raw difference score by comparing the MD&A of two firms in the same year. Because of similar business environments, operating conditions, and specialized industry terminology, the raw difference score from comparing two firms within an industry should be lower than from firms *not* in the same industry. Moreover, the raw difference score from comparing firms within an industry should decrease when the definition of industry is stricter. We define “industry” in progressively narrower terms by using the 8-digit Global Industry Classification Standard (GICS) code. Digits 1-2 define the sector (the broadest definition of an industry); digits 1-4 define the industry group; digits 1-6 define the industry; and digits 1-8 define the sub-industry (the narrowest definition of an industry). In each year for each industry definition we compare a firm to every other firm in the industry and calculate an average difference score for the firm.

Figure 1 plots the sample average within-industry peer-to-peer raw difference score for the four industry definitions, as well as the average difference score from comparing 1,000 random pairs each year. Each year has five data points. The graph shows that in each year the raw score decreases monotonically when the industry definition becomes stricter. The raw score from comparing two random firms is the highest. Such patterns are consistent with our expectations, lending support to our measure for document differences.<sup>8</sup>

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<sup>8</sup> We discuss in Section 3 that when a firm’s MD&A is compared with its previous year’s, the raw score cannot be further compared across firms without adjusting for document length. In Figure 1, comparing the five data points in a given year is valid because each data point is an average of many firms, each being compared to others with different MD&A length rather than to its previous year’s.

After confirming the validity of the difference measure, we calculate the raw difference score for each sample firm-year by comparing the current year's MD&A document with the previous year's. Figure 2 presents the distributions of the raw difference score and MD&A length (i.e., the number of words). The majority of MD&A documents in our sample are between 2,000 and 8,000 words; a few are extremely long (i.e. the distribution has a right tail). As expected, the raw score decreases with document length, confirming the need to adjust length before comparing difference scores *across* firms. After adjusting for length (see Appendix B), *Score* is basically flat with respect to MD&A length.

## **5. Do firms modify MD&A to a larger extent after significant operating changes?**

### *5.1. Empirical model*

Our primary measure for the change in operating results is the change in a firm's diluted EPS before extraordinary and discontinued items from the previous year, scaled by the year-end stock price. Each year, we sort the firms into quintiles of this change and refer to the highest (lowest) quintile as the "super" ("poor") group. Because it is unclear whether firms provide the same amount of discussion when the change is favorable as when it is unfavorable, we create two dummy variables. *EPSincrease* is 1 for the super group and 0 otherwise; *EPSdecrease* is 1 for the poor group and 0 otherwise.

Our second measure for operating change uses zero profit as a reference point. If a firm incurs a loss in the previous year, but a profit in the current year, *LtoP* is 1; otherwise, it is 0. If a firm has a profit in the previous year, but a loss in the current year, *PtoL* is 1; otherwise, it is 0. In our sample, 10.3% experience a change from loss to profit, 10.9% change from profit to loss, 26.9% have a loss in both years, and 68.3% report a profit for

both years. Our third measure is whether a firm reports negative special items in the current year and the dummy variable *Special* is 1 when firms do so. Negative special items are unusual, unfavorable events; investors would be interested to know to what extent these items are temporary. In our sample, 40.8% have negative special items, 46.7% do not report special items, and 12.5% report positive special items.

We control for other informational events that could have triggered managers to modify MD&A. These events relate to (1) liquidity, (2) capital resources, (3) risk disclosure, (4) structural changes, and (5) regulatory changes. Managers are required to evaluate in MD&A the amounts and certainty of cash available to satisfy short-term and long-term debts. We expect a firm to modify the liquidity discussion from the previous year when it experiences changes in the current ratio ( $|\Delta Current|$ ), the debts due in the coming year ( $|\Delta Debtdue|$ ), and its total debts ( $|\Delta Liability|$ ). Managers are also required to disclose material commitments for capital expenditures and we use the change in capital expenditures ( $|\Delta Capex|$ ) to control for discussion for this cause in the current year. All these changes are in absolute values and are scaled by total assets.

The SEC requires firms to discuss in MD&A a known market risk that has “affected reported trends or financial condition in the period presented, or is reasonably likely to affect materially future reported results or liquidity.”<sup>9</sup> Such discussions are expected to change if a firm’s risk exposure changes. We use the change in a firm’s return volatility from the previous year,  $|\Delta Stdret|$ , to control for this factor. Return volatility is calculated from weekly returns to avoid the influence of infrequent and non-synchronous trading in daily returns.

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<sup>9</sup> See SEC staff responses at <http://www.sec.gov/divisions/corpfin/guidance/derivfaq.htm#qgen>.

Firms are also supposed to discuss structural changes such as recent mergers, acquisitions, divestitures, and large equity or debt offerings. We use the change in total assets to control for such events.<sup>10</sup> The dummy “*Acquire*” is 1 if total assets increase by 1/3 from the previous year and 0 otherwise. The dummy “*Downsize*” is 1 if total assets decrease by 1/3 from the previous year and 0 otherwise. In our sample, 20.7% have the value of 1 for *Acquire* and 4.2% have the value of 1 for *Downsize*. Finally, we use the fixed year effects to control for the change in regulatory requirements for MD&A. For example, a new rule in February 2003 requires off-balance-sheet and aggregate contractual obligation disclosures, while a December 2003 rule change requires disclosures of critical accounting estimates. We use 2003 as the benchmark year and create dummy variables for the other years. The empirical model is:

$$\text{Score} = a_0 + a_1 \text{EPSincrease} + a_2 \text{EPSdecrease} + a_3 |\Delta \text{Current}| + a_4 |\Delta \text{Debt due}| + a_5 |\Delta \text{Liability}| + a_6 |\Delta \text{Capex}| + a_7 |\Delta \text{Stdret}| + a_8 \text{Acquire} + a_9 \text{Downsize} + \text{year dummies} + e \quad (1)$$

## 5.2. Test results

Panel A of Table 2 presents the descriptive statistics of the non-indicator variables in the model and Panel B reports the Spearman correlations. *Score* has a reasonable variation, ranging from -0.090 at the 25<sup>th</sup> percentile to 0.047 at the 75<sup>th</sup> percentile. As expected, *Score* is positively correlated with the magnitude of both favorable and unfavorable earnings changes; the absolute changes in the current ratio, leverage, and return volatility; and structural changes.

Panel C reports the multivariate results, which are robust to heteroskedasticity and within-firm error correlations. Model 1 uses our primary earnings change indicators,

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<sup>10</sup> We do not use the event data from the SDC because some firms routinely make *small* acquisitions. Our method ensures that the structural changes are major.

Model 2 uses the profit-loss change indicators, and Model 3 uses the indicator for negative special items. In the primary model, both dummies for the super and poor earnings change groups are statistically significant at 0.006 ( $t=2.68$ ) and 0.016 ( $t=6.83$ ), respectively, consistent with H1. The coefficient on *EPSdecrease* is significantly higher than that on *EPSincrease* in a Wald test ( $F=14.50$ ), suggesting that the poor group modifies MD&A even more than the super group. The results from Model 2 are consistent with Model 1, where both *LtoP* and *PtoL* have positive coefficients and the latter is significantly higher than the former ( $F=14.52$ ). In Model 3 the coefficient on *Special* is positive at 0.028 ( $t=14.69$ ).

The control variables are largely as expected. A firm modifies MD&A to a larger extent when the liquidity situation ( $|\Delta Debtdue|$  and  $|\Delta Liability|$ ) and risk exposure ( $|\Delta Stdret|$ ) change, as well as when it undergoes structural changes (*Acquire* and *Downsize*).<sup>11</sup> However, the coefficient on  $|\Delta Capex|$  is negative, suggesting that when capital expenditures change, a firm provides less information in MD&A.<sup>12</sup> Overall, our results suggest that firms appear to meet the minimum requirements for MD&A disclosures.

### 5.3. Further discussion

We find that firms modify MD&A to a larger degree after unfavorable earnings changes than they do after favorable earnings changes. In this section we probe this finding

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<sup>11</sup> Alternatively, we include the increase and decrease of each “change” variable. With the exception of  $\Delta Current$ , the coefficients on the increase and decrease have similar magnitudes and consistent signs that indicate that larger changes are associated with a higher *Score*. For  $\Delta Current$ , a higher *Score* follows a larger decrease, but *Score* is not associated with an increase in the current ratio.

<sup>12</sup> To understand this result, we hand-checked the firms with large changes in CAPEX. Many of these firms are small firms with volatile CAPEX and low MD&A modification scores.

further and reconcile with and extend Li (2008a), who uses two other disclosure measures: *Fog* and *Length*.

Following Li, we calculate the Fog index as a measure for readability as follows:

$$\text{Fog} = (\text{words\_per\_sentence} + \text{percent\_of\_complex\_words}) * 0.4$$

A higher value of *Fog* indicates lower readability; that is, a document is considered more readable if it uses fewer words per sentence and fewer complex words. A Fog of 18 means the text is readable only by those with at least 18 years of education, that is, those with a graduate degree. Panel A of Table 3 shows that the average Fog index is about 18 for the super, average, and poor earnings change groups. After a large earnings decline, MD&A becomes more difficult to read than after a large earnings increase ( $Z=5.69$  for  $\Delta Fog$ ), consistent with Li (2008a).

$\Delta Length$  is the percentage change in MD&A length from the previous year. Panel A shows that the super and poor earnings change groups do not differ in *Length*, but  $\Delta Length$  for the poor group is almost double that of the super group (the Wilcoxon's  $Z = 13.72$ ). In contrast, Li (2008a) finds that MD&A is longer for firms with low earnings than for those with high earnings, but does not find an association between  $\Delta Length$  and earnings change.

Next, we examine to what extent our finding about MD&A modification is due to the changes in readability and length from the previous year. Panel B reports the Spearman correlations of *Score*,  $\Delta Fog$ , and  $\Delta Length$ . In the full sample, *Score* is positively correlated with  $\Delta Length$  and its correlation with  $\Delta Fog$  is negative but small, meaning that the MD&A modification score is slightly higher for those with improved readability. In the poor earnings change sample, *Score* and  $\Delta Fog$  are not correlated. The low or lack of correlation

of *Score* and  $\Delta Fog$  is not surprising because *Score* measures the *amount* of new information, whereas  $\Delta Fog$  measures the change in phrasing.

The multivariate analyses of *Score*,  $\Delta Fog$ , and  $\Delta Length$  are reported in Panel C. In Column 1 we replace *Score* in Equation (1) with  $\Delta Fog$ . Readability decreases for the poor group, but increases for the super group. In Column 2 we replace *Score* with  $\Delta Length$ . Length increases for the poor group and decreases for the super group. After controlling for  $\Delta Fog$  and  $\Delta Length$ , our previous findings about *Score* are robust (Columns 3-5).

Overall, we document a decrease in MD&A readability, an increase in length, and an increase in MD&A modification after an earnings decline than after an earnings increase. The last two findings are new in the literature, extending Li (2008a). While Li provides a bad-news obfuscation explanation for his finding, our analyses suggest that perhaps firms merely provide more information after an earnings decline than after an earnings increase, evidenced by both a higher difference score and a longer MD&A. After a large earnings decline, managers may need to address the concerns of various market participants. By providing longer and different explanations and discussion, managers might hope that each group of participants will find some part of the explanation or discussion satisfactory.<sup>13</sup>

#### 5.4. *What firm characteristics are associated with MD&A modification?*

In this section we examine whether the usual determinants in other disclosure venues are also associated with MD&A modification. We augment Equation (1) with variables capturing a firm's political cost (*Size*), audit quality (*BigN*), private information search (*IO* and *Analyst*), competition (*Herf*), and legal environment (*Litig*).

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<sup>13</sup> We also examine the changes of forward-looking (using keyword search as in Li (2008b)) and backward-looking (counting past-tense verbs) discussions and find that firms increase both types of disclosures both after earnings declines and earnings increases (untabulated).

$$\begin{aligned} \text{Score} = & a_0 + a_1 \text{ Size} + a_2 \text{ BigN} + a_3 \text{ IO} + a_4 \text{ Analyst} + a_5 \text{ Herf} + a_6 \text{ Litig} & (2) \\ & + a_7 \text{EPSincrease} + a_8 \text{EPSdecrease} + a_9 |\Delta \text{Current}| + a_{10} |\Delta \text{Debt due}| + a_{11} |\Delta \text{Liability}| \\ & + a_{12} |\Delta \text{Capex}| + a_{13} |\Delta \text{Stdret}| + a_{14} \text{Acquire} + a_{15} \text{Downsize} + \text{year dummies} + e \end{aligned}$$

First, the political cost of lacking transparency may press firms to modify MD&A to a larger extent. We use *Size*, the natural logarithm of total assets at the end of the current year, as a proxy for the cost and predict a positive coefficient. Second, although MD&A is not audited, it is reviewed by auditors. Auditors have a professional responsibility to ensure that MD&A contains no materially misleading information or inconsistencies with facts known by the auditor.<sup>14</sup> We expect Big N auditors (N is 6, 5, or 4 during our sample period) to review the clients' MD&A more closely and influence managers to provide more informative and transparent disclosure. *BigN* is 1 if the firm is audited by a Big N accounting firm and 0 otherwise.

Typically, institutional investors and financial analysts demand more corporate disclosures for valuation and monitoring. However, MD&A is not a timely source of information. By the time the 10-K is filed, institutional investors and analysts might have already obtained the information from other sources or through their own information search. Therefore, their demand for new information in the MD&A is likely low. On the other hand, institutional investors and analysts may influence managers to provide more disclosures through increased governance and monitoring (Bushee and Noe 2000). Thus, we do not predict the sign of the relationship between MD&A modification and either institutional ownership or analyst coverage. *IO* is the percentage ownership by institutional investors according to the most recent SEC 13f filings before the firm's 10-K filing.

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<sup>14</sup> In 2004, the Standing Advisory Group of the PCAOB released a memo, "Potential Standard – Communications and Relations with Audit Committees," that proposes expanded auditor involvement in MD&A.

*Analyst* is the number of financial analysts whose earnings estimates for the subsequent year are included in the most recent IBES consensus before the 10-K filing.

MD&A disclosure may benefit competitors. Firms in more competitive industries may be more concerned about proprietary disclosure costs. We use the Herfindahl index, *Herf*, as a proxy for industry competition and calculate it using the 100 firms with the highest sales in the industry (“industry” uses the first six digits of the GICS code).<sup>15</sup> A lower *Herf* indicates more intense competition. We predict its coefficient to be positive, meaning that firms in more competitive industries are less likely to make informative MD&A disclosures. Finally, firms in a more litigious environment may be more likely to provide more disclosure to defend themselves against a potential law suit. On the other hand, firms may limit disclosures of information, particularly forward-looking statements, to avoid litigation (Rogers and Van Buskirk 2009). Following Francis et al. (1994), we use industry classifications to identify firms that are exposed to more litigation risk. *Litig* is 1 if the four-digit SIC code is 2833-2836, 8731-8734, 3570-3577, 7370-7374, 3600-3674, or 5200-5961, and 0 otherwise. We do not predict a sign for the coefficient on *Litig*.

Panel A of Table 4 shows the Spearman correlations of the main variables. Consistent with our expectations, *Score* is positively correlated with *BigN*, *Herf*, and *Litig* and is negatively correlated with *IO*. As expected, firm size is highly positively correlated with *IO* and *Analyst*, but the correlation is not high enough for the concern of multicollinearity.

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<sup>15</sup> The original Herfindahl index is the sum of percentage market shares of firms in the industry and is bounded below by  $1/n$ , where  $n$  is the number of firms in the industry. To ensure that the index from all industries have the same lower bound, we choose 100 largest firms from each industry and further adjust it as follows: the adjusted index =  $\frac{H - \frac{1}{N}}{1 - \frac{1}{N}}$ , where  $N$  is 100 for large industries and is the number of firms in the industry if this number is less than 100.

Panel B reports the multivariate regression analysis. The coefficient on *Size* is significantly positive at 0.004 ( $t=3.83$ ) and the coefficient on *BigN* is also significantly positive at 0.010 ( $t=2.78$ ), suggesting that large firms and firms audited by the Big N modify MD&A from the previous year to a larger extent. The coefficients on *IO* and *Analyst* are both significantly negative (coefficient = -0.011 and  $t = -2.35$  for *IO*; coefficient = -0.001 and  $t = -2.01$  for *Analyst*), suggesting the MD&A of firms with higher institutional ownership and analyst coverage looks more like the previous year's. The positive coefficients of 0.058 on *Herf* ( $t=2.33$ ) and of 0.012 on *Litig* ( $t=4.04$ ) suggest that firms facing more competition are less likely to provide informative MD&A and those in a more litigious environment modify MD&A to a larger degree from year to year. These findings indicate that the firm characteristics typically identified with other disclosure venues are also associated with MD&A modification.

## **6. Investors' and Analysts' Responses to MD&A Modification**

To test investors' responses, we measure the cumulative market-adjusted stock returns on the 10-K filing date and its subsequent two days and take the absolute value,  $|CAR|$ .<sup>16</sup> To measure analysts' responses, we measure analyst revision as the change in the first IBES consensus estimate for the subsequent year after the 10-K filing from the last consensus before the filing, scaled by the stock price at the end of the current year.<sup>17</sup> We examine the relation of the responses and MD&A modification in a multivariate

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<sup>16</sup> Griffin (2003) reports that the market reaction to 10-K filings occurs on the filing day and its subsequent two days.

<sup>17</sup> IBES compiles a consensus in the 3<sup>rd</sup> week of each month.

regression. Because the response variables are positive numbers, violating the normality assumption of an OLS regression, we convert them to natural logarithms.<sup>18</sup>

The factors for which we control are firm size (*Size*), a filing delay (*Filelate*), complexity of a firm's financial reporting (*Complex*), and market reaction around the earnings announcement date ( $|CAR^{EA}|$ ). We expect the market reaction to large firms' 10-K filings to be smaller than its reaction to small firms' because private information search for large firms is more active than for small firms. *Size* has been defined earlier and now controls for the richness of the information environment. *Filelate* is 1 if the filing is more than 90 days after the fiscal year end and 0 otherwise.<sup>19</sup> We suspect that a late filing indicates a potentially significant problem (Chambers and Penman 1984). We, however, do not predict the coefficient on *Filelate* because prior research has documented a price drop when firms fail to file on time and it is unclear whether the market's anticipation of bad news due to the missed filing deadline is adequate.

MD&A is only a part of the 10-K. Much of the information that investors can obtain uniquely from 10-K is the notes to the financial statements. As in Li (2008a), we proxy such information by the number of non-missing Compustat items for the event year and refer to it as *Complex*. Finally, we control for the market reaction to earnings announcement, that is, the three-day [-1, 1] cumulative market-adjusted stock return, but do not predict the sign of the coefficient. If earnings announcement and 10-K filing are complementary, the 10-K of a firm whose earnings announcement is informative is also

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<sup>18</sup> To preserve the observations that experience no analyst revisions, we add 0.001 to  $|Revision|$  before the log transformation.

<sup>19</sup> On September 5, 2002, the SEC issued release 33-8128, which required accelerated filers to begin filing the 10-K within 75 days of the fiscal year end for years ending before December 15, 2006. Large, accelerated filers were required to file within 60 days for years ending after December 15, 2006. The prior deadline was 90 days. Firms currently have 60, 75, or 90 days to file the 10-K, depending on company size. If a 10-K is not filed within 90 days after the fiscal year end, it is definitely late for all companies under either the old or new deadlines.

expected to reveal much new information. If they are substitutes, investors are not expected to react much to the 10-K of a firm whose earnings announcement has already contained significant information. The empirical models are:

$$\log|CAR| = b_0 + b_1 \text{Score} + b_2 \text{Size} + b_3 \text{Filelate} + b_4 \text{Complex} + b_5 |CAR^{EA}| + e \quad (3)$$

$$\log|\text{Revision}| = c_0 + c_1 \text{Score} + c_2 \text{Size} + c_3 \text{Filelate} + c_4 \text{Complex} + c_5 |CAR^{EA}| + e \quad (4)$$

Panel A of Table 5 presents the descriptive statistics of the variables. Some of the sample firms do not have the returns data, so the observations for  $|CAR|$  are 26,738. In the sample, 20,803 observations are covered by IBES and analysts revise the earnings estimates for only 8,178 of the firms (39.3%). At least 11.6% of the sample firms file late. The average number of non-missing Compustat items is 159 and its distribution is fairly symmetric. The average market reaction at the earnings announcement is 6.1%. Panel B shows the Spearman correlations.  $|CAR|$  is positively correlated with *Score*, *Filelate*, and  $|CAR^{EA}|$ , and is negatively correlated with *Size* and *Complex*.  $|\text{Revision}|$  is not correlated with *Score*.

Panel C reports the regression results. To compare with prior research, we present in the first column the estimation before log-transforming the dependent variable.<sup>20</sup> The coefficient on *Score* is 0.019 with a t statistic of 5.80, meaning that if a firm's score increases from the 25<sup>th</sup> to the 75<sup>th</sup> percentile of the distribution, the market reaction increases by an increment of 0.3%.

The estimation of Equation (3) is presented in the second column. The coefficient on *Score* is significantly positive at 0.272 with a t statistic of 4.46, suggesting that MD&A modification contains new information that investors use. The coefficient on *Size* is significantly negative, consistent with our expectation that MD&A from large firms is not

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<sup>20</sup> Many studies such as Griffin (2003) and Yu (2008) use positive-valued variables as the dependent variable.

timely information. *Filelate* has a positive coefficient, indicating that a late 10-K filing has more information than a timely filing even though investors might have already reacted to the news when the firm misses the filing deadline. The coefficient on *Complex* is significantly positive, suggesting that the more complex a firm's financial reporting (e.g., more information in the notes to the financial statements), the stronger the market reaction. The coefficient on  $|CAR^{EA}|$  is significantly positive, suggesting that 10-K filings complement firms' earnings announcements.

The estimation results of Equation (4) show no evidence that analysts respond to MD&A modification even though the control variables have similar coefficients as in Equation (3).<sup>21</sup> The difference in investor and analyst responses suggest that these two types of market participants use different information sources.

Overall, the results suggest that investors react to MD&A modification, but analysts do not. A caveat of the analyses is that 10-K filings contain substantial information in the sections other than the MD&A. The literature has limited guidance about how to quantify and control for such information. To the extent our controls are inadequate, the test power is compromised.

## **7. MD&A Modification Over Time**

Figure 3 presents the distributions of *Score* and *Length* over time. MD&A length increases over time, possibly triggered by a more litigious environment after the Enron and WorldCom scandals and more regulatory and public scrutiny. In contrast, *Score* generally declines over these years. The dramatic increase in *Score* in 1998 might be due to the

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<sup>21</sup> Even for those with analyst forecast revisions, the magnitude of the revision is not associated with MD&A modification (untabulated).

SEC's push for "plain English" (SEC 1998; Loughran and McDonald 2008). The *Score* in 2001 is relatively high, possibly triggered by accounting scandals and disclosures of the effect of terrorists' attacks. Other than these two years, the trend in *Score* is downward, which is confirmed by the year fixed effects in Table 2. Even the SEC's MD&A guidance in 2003 was unable to reverse this trend. These distributions indicate that even as MD&A becomes longer, it looks more similar to what investors have already seen in the previous year.

Figure 4a plots the average difference score of the super, poor, and other groups over time. Consistent with our regression analysis, firms with both large favorable and unfavorable earnings changes modify MD&A to a larger extent than the other firms and the poor earnings change group modifies slightly more than the super earnings change group. The trend of *Score*, however, is generally downward for each group. Figure 4b shows the standard deviation of the scores within each group over time. Regardless of the magnitude of earnings change, the standard deviations of *Score* within each group have declined over time. Thus, not only does the average score decline over time, but also the firms in each group act more similarly in providing less-informative MD&A over time.

We then examine the trend of market reaction to 10-K filings. We additionally plot the mean  $|CAR|$  by year over time in Figure 3. The average market reaction is as high as about 6% for fiscal year 2000, but is only about 2% for 2006. Market reaction has declined since 2000 even though MD&A length has been trending upward. The decline in market reaction might be due to the simultaneous decline in MD&A modification (that is, over time less new information is revealed by MD&A). The coefficients on the year dummies in Table 5 confirm the downward trend in the market reaction to MD&A even after controlling for the

decline in MD&A modification. This result suggests that either MD&A has become more untimely, meaning that it has been increasingly preempted by other sources of information, or investors have lower confidence in financial information in general in recent years.

## **8. Conclusion**

Our study introduces a document modification score, based on computational linguistics research, to detect year-over-year changes in a firm's MD&A. We believe this score measures the quality of narrative MD&A disclosures, because disclosures that are very similar to the prior year's are not revealing much new information, especially after firms experience large changes in the economic conditions. We find that firms modify their MD&A to a larger extent after significant operating changes than after small or no changes, suggesting that firms meet the minimum requirement of MD&A. Moreover, managers modify MD&A to a larger extent after an earnings decline than after an earnings increase, perhaps because they provide many explanations and discussion, hoping that each group of their audience will find some explanation or discussion acceptable.

We also find that certain firm characteristics are associated with more MD&A modification, given the same changes in financial condition and operations. Large firms, firms audited by a Big N accounting firm, and firms in litigious environments modify MD&A to a larger extent, whereas firms in more competitive industries and with high institutional ownership and analyst coverage modify less. These results suggest that political costs of lack of transparency, more extensive monitoring by auditors, and higher litigation risk press firms to provide more informative MD&A, whereas proprietary disclosure costs deter the supply of informative disclosure and active private information

search reduces the demand for informative MD&A. We also find that investors react to MD&A modification, but analysts do not.

Despite firms apparently meeting the minimum requirement of MD&A disclosure and investors reacting to MD&A information, the overall trend in the MD&A modification score is downward in the past 10 years. This trend is coupled with an increasing MD&A length, suggesting firms' increased use of boilerplate disclosures. Consistent with the decline in MD&A modification, we find the market reaction to 10-K filings has also declined over time. Moreover, our results suggest the downward trend in the market reaction remains even after controlling for the decline in MD&A modification. This decline could be due to MD&A being increasingly preempted by other more timely information sources or to investors' lower confidence in financial information after the accounting scandals.

Our study provides the first large sample evidence on firms' year-over-year MD&A modification in the recent 10-year period. The measure we introduce could be applied to a variety of other accounting research settings. The findings should be relevant for market participants and policy makers to reevaluate MD&A regulation and practices.

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**APPENDIX A**  
**Sample MD&A Disclosures**

To further illustrate the function of our similarity measure, we calculate the Rawscore for a portion of the MD&A of Delta Air Lines, Inc. and Southwest Airlines Co. for their fiscal years ending December 31, 2004 and 2005. The excerpt used is the first substantive paragraph in the MD&A section for each firm.

<b>Delta Air Lines, Inc.</b>	
<b>2004</b>	<b>2005</b>
<p>Our financial performance continued to deteriorate during 2004, the fourth consecutive year we reported substantial losses. Our consolidated net loss of \$5.2 billion in 2004 reflects a net charge of \$2.9 billion, which is discussed elsewhere in this Form 10-K (see Notes 5, 9, 14 and 16 of the Notes to the Consolidated Financial Statements), a significant decline in passenger mile yield, historically high aircraft fuel prices and other cost pressures. Our unrestricted cash and cash equivalents and short-term investments were \$1.8 billion at December 31, 2004, down from \$2.7 billion at December 31, 2003. These results underscore the urgent need to make fundamental changes in the way we do business.</p>	<p>Our Chapter 11 filing followed an extended effort by us to restructure our business to strengthen our competitive and financial position. In 2004, we announced our transformation plan, which is intended to provide us with approximately \$5 billion in annual financial benefits by the end of 2006, as compared to 2002. While we were, and continue to be, on schedule to achieve the targeted benefits, we experienced a liquidity shortfall in 2005 due to historically high aircraft fuel prices and other cost pressures, continued low passenger mile yields and cash holdbacks instituted for the first time by our credit card processors. As a result, we determined that we could not continue to operate without the protections provided by Chapter 11. In connection with our Chapter 11 proceedings, we obtained \$2.2 billion in post-petition financing, which provided net proceeds of \$1.2 billion after the required repayment of certain pre-petition facilities. For further information about our Chapter 11 proceedings and our post-petition financing, see Notes 1 and 8, respectively, of the Notes to the Consolidated Financial Statements.</p>

While Delta experienced poor operating results in both years, the 2005 filing is dramatically different from 2004 due to their Chapter 11 bankruptcy filing. Very little overlap exists between the two excerpts, as evidenced by a year-over-year *Rawscore* of 0.81.

<b>Southwest Airlines Co.</b>	
<b>2004</b>	<b>2005</b>
<p>In 2004, Southwest posted a profit for its 32nd consecutive year, and 55th consecutive quarter. Southwest's 2004 profit of \$313 million exceeded our 2003 profit, excluding the impact of a 2003 federal government grant, by 5.0 percent. These achievements were accomplished despite record-high energy prices, and aggressive industry growth, which contributed to the continuing weak airline revenue environment. For the fourth consecutive year, the airline industry as a whole suffered a substantial net loss. As a result, certain carriers filed for bankruptcy protection, and many carriers underwent or continued massive efforts to restructure their business, gain wage concessions from their employees, and slash costs.</p>	<p>In 2005, Southwest posted a profit for its 33rd consecutive year, and also extended its number of consecutive profitable quarters to 59. Southwest's 2005 profit was \$548 million, representing a 75.1% increase compared to our 2004 profit of \$313 million. This performance was driven primarily by strong revenue growth, as the Company grew capacity, and effective cost control measures, including a successful fuel hedge program. For the fifth consecutive year, the airline industry as a whole is expected to suffer a substantial net loss, as additional carriers filed for bankruptcy protection and many underwent or continued massive efforts to restructure or merge their businesses, gain wage concessions from their employees, and slash costs.</p>

Unlike Delta, Southwest chose to retain much of the same language for 2005 that it used in the previous year. Its *Rawscore* of 0.54 reflects a much lower year-over-year MD&A difference than is found in Delta's.

## APPENDIX B

### Adjusting the Raw Difference Score by Document Length

#### 1. The relation between the raw score and document length:

Let's assume a simple scenario, where (1) for a document a manager could choose words from a population of  $n$  number of words ( $w_1, w_2, w_3, \dots w_n$ ), (2) the firm's document length is typically  $r$  number of words, and (3) each of the  $r$  words is used in a document once.

Given the previous year's document, what is the probability that the current year's document is totally different from the previous year's (note: the sequence of words does not matter)?

Previous year's document					Current year's document				
w <sub>1</sub>	w <sub>2</sub>	...	w <sub>r-1</sub>	w <sub>r</sub>	?	?	?	?	?

With the constraint that this year's document is totally different from last year's, the number of possible word selections for the current year is as follows. That is, we ask how many ways we could combine  $r$  objects chosen from  $(n-r)$  objects without replacement:

$${}_{n-r}C_r = \frac{(n-r)!}{r!(n-2r)!}$$

Without that constraint, the number of possible word selections for the current year is as follows. That is, we ask how many ways we could combine  $r$  objects chosen from  $n$  objects without replacement:

$${}_nC_r = \frac{n!}{r!(n-r)!}$$

Therefore, the probability that the current document is totally different from the previous year's is:

$$P(r) = \frac{{}_{n-r}C_r}{{}_nC_r} = \frac{(n-r)!(n-r)!}{(n-2r)!n!}$$

$P(r)$  decreases with  $r$  as long as  $r$  is below  $(2/3)n$ .

Proof:  $P(r) / P(r-1) = (n-2r+2)(n-2r+1) / (n-r+1)^2$ . The difference between the numerator and denominator of this ratio is  $3r^2 - 2(n+2)r + (n+1)$ . This difference is a U-shaped function of  $r$  with the first intercept with the x-axis less than 1 and the second intercept with the x-axis larger than  $(2/3)n$ . In other words, as long as  $r < (2/3)n$ , the ratio is less than 1.

Our setting is more complicated than this simple scenario: (1) we allow a word to be used more than once and (2) in calculating the raw difference score, we downweight a word that is used often by the sample firms as a group. Despite these, the relation between the raw difference score and the document length remains: the raw score of a firm's consecutive year document comparison decreases with length, because the condition of  $r < (2/3)n$  is readily satisfied in our setting.

## 2. The procedure to adjust the raw score for document length:

We use the Taylor series (or strictly speaking, the Maclaurin series) to empirically estimate the functional form between the raw score and document length, where document length is measured by the number of words in the current year's MD&A. We regress the raw score on five polynomials of document length. The OLS estimation is reported in Table A.1.

**Table B.1**  
**Empirical Estimation of the Relation between the Raw Score and Document Length**

	coefficient	t-statistic
Intercept	0.267	57.95 ***
Length	- 2.79E-5	-13.71 ***
Length <sup>2</sup>	1.72E-9	6.14 ***
Length <sup>3</sup>	- 4.98E-14	-3.28 ***
Length <sup>4</sup>	6.53E-19	1.96 **
Length <sup>5</sup>	- 3.13E-24	-1.30
Model Fit F-stat.		417.15 ***
R <sup>2</sup>		6.9%

Note: *Rawscore* measures the extent to which two documents are different. A higher score indicates more differences. “\*\*\*”, “\*\*”, and “\*” mark statistical significance at 1%, 5%, and 10% in a two-tailed test, respectively.

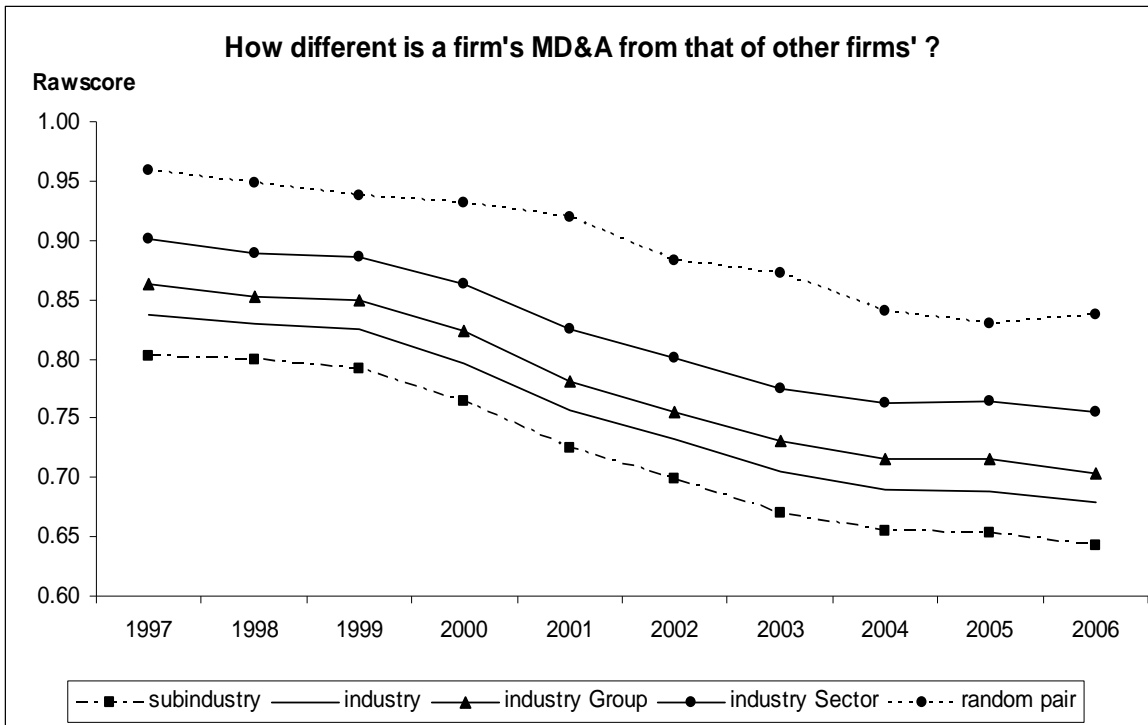
The fitted values are the expected score conditional on document length. The score we use for empirical analysis in the paper is:  $Score = Rawscore - expected\ score$ .

The distributions of *Rawscore* and *Score* are shown in Table B.2.

**Table B.2**  
**Distributions of Rawscore and Score**

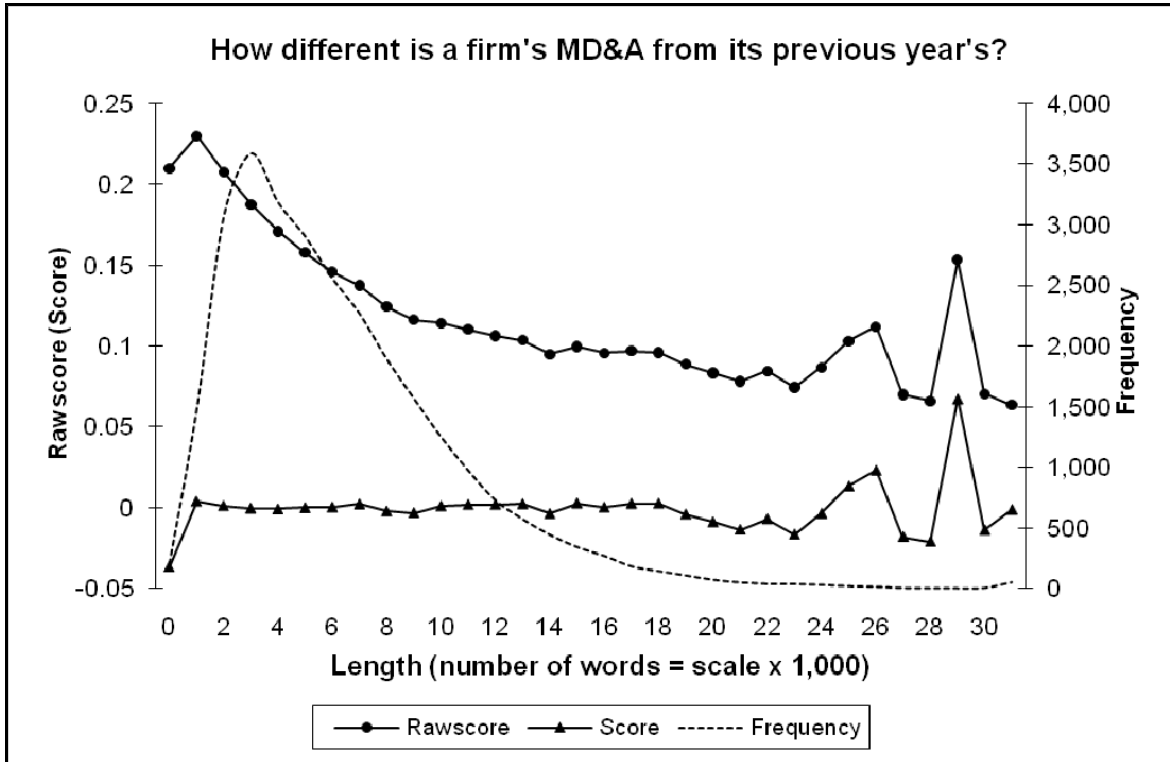
Variable	Obs.	Mean	Std.	min	max
Rawscore	28,142	0.155	0.147	0.000	0.978
Score	28,142	0.000	0.142	-0.253	0.840

FIGURE 1



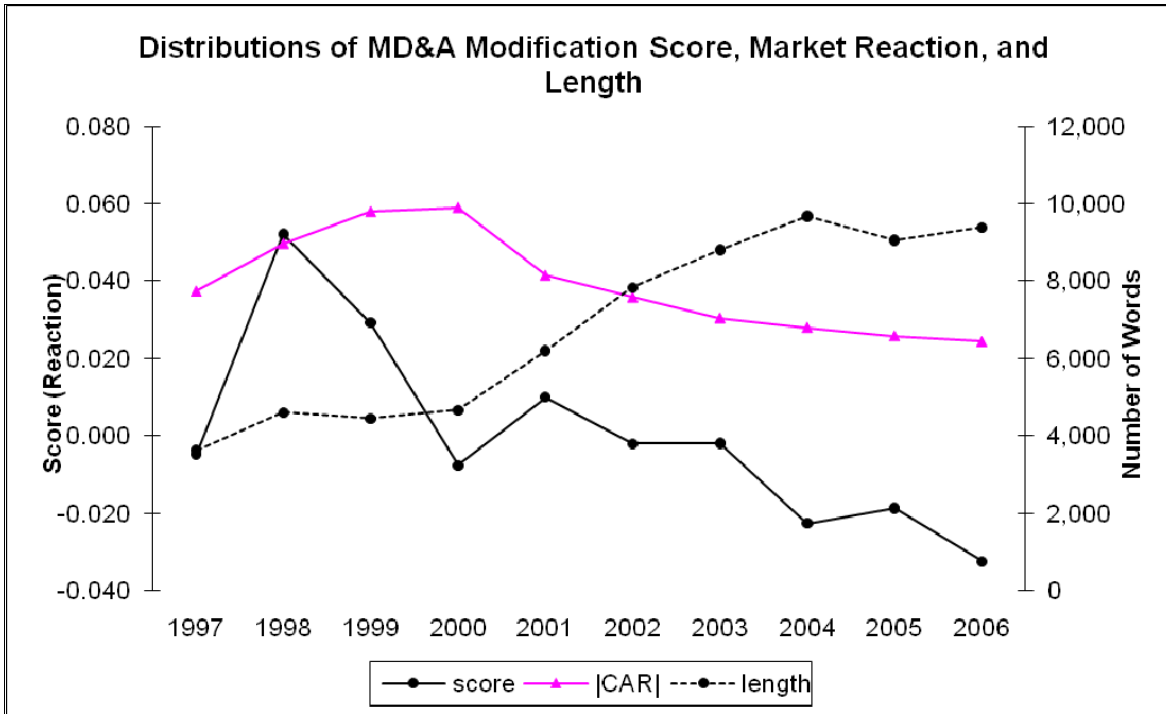
Note: *Rawscore* measures the extent to which two documents are different. A higher score indicates more differences. The figure shows the average raw score of MD&A comparisons within a sub-industry, industry, industry group, and industry sector as well as the comparisons of 1,000 randomly selected pairs each year. For a within-group *Rawscore*, each year a member is compared with every other firm in that group and the average *Rawscore* of these comparisons are calculated for each firm; the data point in the graph is the average *Rawscore* of each firm in the group. We use the Global Industry Classification Standard (GICS) code for industry groupings. Digits 1-2 define the sector, digits 1-4 define the industry group, digits 1-6 define the industry, and digits 1-8 define the sub-industry. The sector represents the broadest definition of “industry” while the sub-industry represents the narrowest.

FIGURE 2



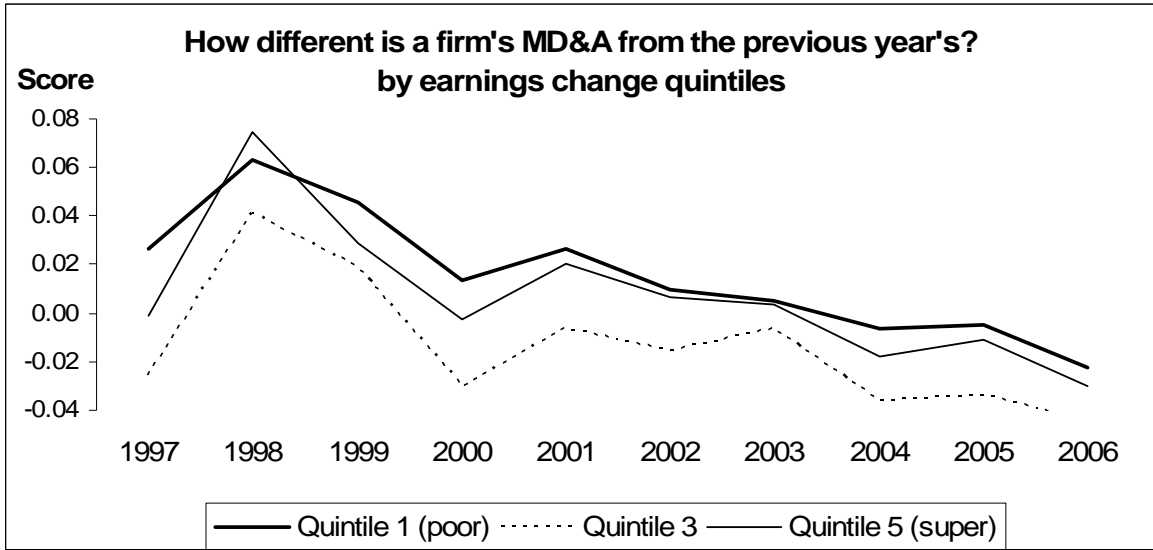
Note: *Rawscore* measures the extent to which two documents are different. A higher score indicates more differences. In theory, *Rawscore* decreases with the length of the documents under comparison (See Appendix A). We empirically estimate this functional relationship by regressing *Rawscore* on the first five polynomials of *Length*, where *Length* is the number of words in the MD&A of the current year. The fitted value is then a firm's expected raw score given the length of its MD&A. *Score* is the raw score minus the expected score. This graph shows the empirical relation between *Rawscore* and *Length* as well as the distributions of *Rawscore* and *Score* for a given Length. Sample mean is used for each variable.

FIGURE 3

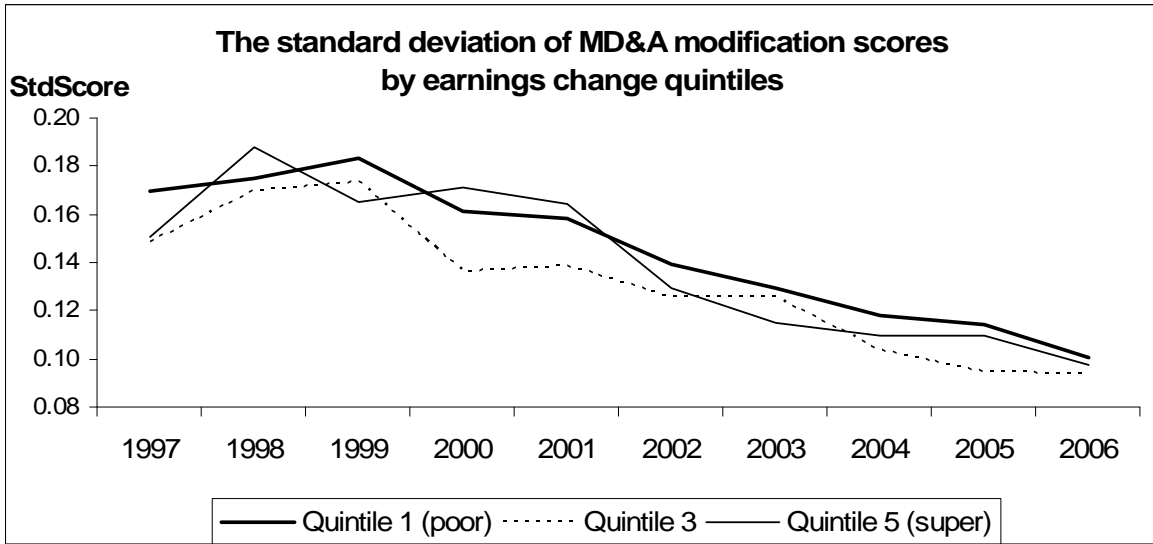


Note: *Score* measures the extent to which two documents are different and has been adjusted for document length (i.e., the number of words). A higher score indicates more differences. *|CAR|* is the absolute value of the cumulative market-adjusted returns on the day of the 10-K filing and the following two days. Sample mean is used for each variable.

**FIGURE 4a**



**FIGURE 4b**



Note: *Score* measures the extent to which two documents are different and has been adjusted for document length (i.e., the number of words). A higher score indicates more differences. Earnings change is the change in diluted earnings per share before extraordinary and discontinued items, scaled by the stock price at the end of the fiscal year. Both earnings and price are adjusted for stock splits. The observations with a scalar less than 1 are excluded. Sample mean is used for each group.

**TABLE 1**  
**Sample Composition and Descriptive Statistics**

Year	Obs.	Score	Assets	$\Delta$ EPS	BigN	IO	Analyst	Herf	Litig	CAR	Revision
1997	2,655	-0.005	1,176	-0.006	89.3%	39.7%	5.1	0.062	30.7%	3.7%	0.004
1998	2,767	0.052	1,499	-0.031	88.0%	40.8%	5.5	0.061	31.1%	5.0%	0.005
1999	2,832	0.029	1,689	0.005	86.3%	39.9%	5.5	0.060	31.3%	5.8%	0.004
2000	2,771	-0.008	1,944	-0.041	85.8%	42.5%	5.4	0.057	32.7%	5.9%	0.006
2001	2,884	0.010	2,021	-0.026	85.9%	46.2%	5.5	0.058	34.7%	4.1%	0.005
2002	2,716	-0.002	2,590	0.077	84.2%	50.4%	5.9	0.062	33.1%	3.6%	0.005
2003	2,907	-0.002	2,939	0.035	82.3%	54.2%	6.5	0.063	33.4%	3.0%	0.002
2004	2,931	-0.023	3,507	0.015	78.2%	58.6%	6.7	0.063	32.3%	2.8%	0.002
2005	2,910	-0.019	4,484	0.003	77.7%	61.1%	6.6	0.065	31.8%	2.6%	0.002
2006	2,769	-0.032	5,413	0.008	73.8%	64.8%	7.1	0.076	31.0%	2.4%	0.002

Notes: The table shows the variable means by year. *Score* measures the extent to which two documents are different and has been adjusted for document length (i.e., the number of words). A higher score indicates more differences. *Assets* is the total assets at the end of the fiscal year.  $\Delta$ EPS is the change in diluted earnings per share before extraordinary and discontinued items, scaled by the stock price at the end of the fiscal year. Both earnings and price are adjusted for stock splits. The observations with a scalar less than 1 are excluded. *BigN* is 1 if the firm is audited by a Big N (N is 6, 5, or 4) accounting firm or its predecessor. *IO* is the percentage of ownership by institutional investors according to the most recent SEC 13f filings before the firm's 10-K filing, collected by Thomson-Reuters. *Analyst* is the number of financial analysts whose earnings estimates for the subsequent year are included in the most recent IBES consensus before the 10-K filing. *Herf* is the Herfindahl index, using the 100 firms with the highest sales in the industry. *Litig* is 1 for high litigation risk firms (the four-digit SIC code is 2833-2836, 8731-8734, 3570-3577, 7370-7374, 3600-3674, or 5200-5961), following Francis et al. (1994), and 0 otherwise. |CAR| is the absolute value of the cumulative market-adjusted returns on the day of the 10-K filing and the following two days. *Revision* is the change in earnings estimates for the subsequent year from the last IBES consensus before the 10-K filing to the first consensus after it, scaled by the stock price at the end of the fiscal year. |Revision| is the absolute value of *Revision*.  $\Delta$ EPS and *Revision* are winsorized at 1% and 99% each year. The sample has 28,142 firm-year observations. For some variables, the number of observations is slightly smaller.

**TABLE 2**  
**Operating Changes and MD&A Modification Score**

Panel A: Descriptive statistics

	Mean	P25	Median	P75
Score	0.000	-0.090	-0.041	0.047
Current	3.103	1.376	2.138	3.526
Debt due	0.020	0.000	0.003	0.021
Liability	0.520	0.299	0.514	0.716
Capex	0.048	0.011	0.030	0.062
Stdret	0.076	0.043	0.065	0.096
\Delta Current	0.846	0.049	0.065	0.830
\Delta Debt due	0.014	0.000	0.001	0.011
\Delta Liability	0.071	0.014	0.038	0.088
\Delta Capex	0.022	0.002	0.009	0.026
\Delta Stdret	0.022	0.005	0.013	0.028

Panel B: Pairwise Spearman correlations <sup>a</sup>

	EPSincrease	EPSdecline	\Delta Current	\Delta Debt due	\Delta Liability	\Delta Capex	\Delta Stdret	Acquire	Downsize
Score	<b>0.028</b>	<b>0.061</b>	<b>0.092</b>	<b>0.085</b>	<b>0.130</b>	0.003	<b>0.056</b>	<b>0.082</b>	<b>0.083</b>
EPSincrease		<b>-0.250</b>	<b>0.067</b>	<b>0.090</b>	<b>0.112</b>	<b>0.076</b>	<b>0.132</b>	0.001	<b>0.072</b>
EPSdecline			<b>0.102</b>	<b>0.068</b>	<b>0.131</b>	<b>0.081</b>	<b>0.079</b>	<b>-0.075</b>	<b>0.119</b>
\Delta Current				<b>0.114</b>	<b>0.359</b>	<b>0.383</b>	<b>0.198</b>	<b>0.135</b>	<b>0.125</b>
\Delta Debt due					<b>0.217</b>	<b>0.187</b>	<b>0.030</b>	<b>0.029</b>	<b>0.020</b>
\Delta Liability						<b>0.243</b>	<b>0.127</b>	<b>0.265</b>	<b>0.182</b>
\Delta Capex							<b>0.156</b>	<b>0.072</b>	<b>0.065</b>
\Delta Stdret								<b>0.015</b>	<b>0.097</b>
Acquire									<b>-0.090</b>

<sup>a</sup>: The correlations that are statistically significant at 5% are bolded.

**TABLE 2**  
**(Continued)**

Panel C: Regression with *Score* as the dependent variable

	Model 1		Model 2		Model 3	
	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.
Intercept	-0.023	-9.09***	-0.022	-8.85***	-0.032	-12.05***
EPSincrease	0.006	2.68***				
EPSdecline	0.016	6.83***				
LtoP			0.010	3.48***		
PtoL			0.025	7.91***		
Special					0.028	14.69***
$\Delta$ Current	0.001	1.06	0.001	1.27	0.001	1.46
$\Delta$ Debt due	0.209	6.62***	0.212	6.73***	0.205	6.51***
$\Delta$ Liability	0.146	11.84***	0.151	12.31***	0.145	11.86***
$\Delta$ Capex	-0.292	-9.01***	-0.287	-8.82***	-0.279	-8.69***
$\Delta$ Stdret	0.200	6.22***	0.208	6.59***	0.207	6.63***
Acquire	0.029	10.68***	0.028	10.41***	0.027	10.27***
Downsize	0.032	5.66***	0.036	6.34***	0.031	5.50***
Y1997	-0.004	-1.22	-0.005	-1.42	-0.001	-0.22
Y1998	0.050	13.20***	0.048	12.72***	0.052	13.76***
Y1999	0.028	7.31***	0.027	7.05***	0.031	8.01***
Y2000	-0.010	-2.72***	-0.011	-3.00***	-0.008	-2.09***
Y2001	0.011	3.12***	0.008	2.48***	0.010	2.96***
Y2002	0.001	0.47	0.001	0.19	0.001	0.33
Y2004	-0.021	-7.98***	-0.021	-7.89***	-0.021	-8.01***
Y2005	-0.015	-5.30***	-0.015	-5.20***	-0.015	-5.19***
Y2006	-0.030	-10.75***	-0.030	-10.64***	-0.029	-10.53***
Model F		76.13***		77.51***		88.53***
R <sup>2</sup>		6.3%		6.4%		7.0%
Obs.		28,142		28,142		28,142

Note: *Score* measures the extent to which two documents are different and has been adjusted for document length. A higher score indicates more differences.  $\Delta$ EPS is the change in diluted EPS before extraordinary and discontinued items, scaled by the stock price at the end of the fiscal year. EPSincrease is 1 if a firm is in the highest quintile of  $\Delta$ EPS in the year and 0 otherwise. EPSdecline is 1 if a firm is in the lowest quintile of  $\Delta$ EPS in the year and 0 otherwise. *LtoP* is 1 if a firm has a loss in the prior year but a profit in the current year and 0 otherwise. *PtoL* is 1 if a firm has a profit in the prior year but a loss in the current year and 0 otherwise. *Special* is 1 if a firm has negative special items in the current year and 0 otherwise. *Current* is the current ratio. *Debt due* is the debts due in one year, *Liability* is the total liabilities, and *Capex* is the capital expenditures in the current year, all scaled by total assets. *Stdret* is the volatility of weekly returns in the current fiscal year. The change variables are from the prior year to the current year. *Acquire* is 1 if a firm's asset growth during the year is 1/3 or higher and 0 otherwise. *Downsize* is 1 if the total assets decrease by 1/3 or more during the year and 0 otherwise. The non-indicator independent variables (before taking the absolute value) are winsorized at 1% and 99%. The regression estimations are robust to heteroskedasticity and within-firm error correlations. “\*\*\*”, “\*\*”, and “\*” mark statistical significance at 1%, 5%, and 10% in a two-tailed test, respectively.

**TABLE 3**  
**MD&A Modification Score and other measures of MD&A Disclosures**

Panel A: Summary statistics by earnings change groups

	Means			Medians			Wilcoxon Z (poor–super)
	Large EPS decline	Average EPS change	Large EPS increase	Large EPS decline	Average EPS change	Large EPS increase	
Score	0.015	-0.007	0.007	-0.027	-0.047	-0.036	3.45***
Fog	18.2	18.0	18.3	18.1	17.9	18.2	-2.82***
Length	7036	6756	7048	6021	5794	5981	0.64
ΔFog	0.045	0.008	-0.070	0.050	0.024	-0.030	5.69***
ΔLength	21.0%	16.7%	13.5%	12.6%	9.5%	6.7%	13.72***

Panel B: Spearman pairwise correlations

	Full Sample		Large EPS decline		Large EPS increase	
	Score	ΔFog	Score	ΔFog	Score	ΔFog
ΔFog	<b>-0.025</b>		-0.005		<b>-0.051</b>	
ΔLength	<b>0.164</b>	<b>0.274</b>	<b>0.174</b>	<b>0.285</b>	<b>0.118</b>	<b>0.247</b>

Note: The correlations that are statistically significant at 5% are bolded.

Panel C: Multivariate Regression

Y=	ΔFog	ΔLength	Score		
			Model 1	Model 1	Model 1
EPSincrease	-0.061*** (-4.04)	-0.035** (-2.28)	0.006** (2.43)	0.008*** (3.19)	0.007*** (2.95)
EPSdecline	0.052*** (3.32)	0.041*** (4.96)	0.017*** (7.03)	0.014*** (6.20)	0.015*** (6.46)
ΔFog			-0.010*** (-7.73)		-0.010*** (-7.82)
ΔLength				0.039*** (3.80)	0.039*** (3.62)
Control variables	yes	yes	yes	yes	Yes
Year dummies	yes	yes	yes	yes	Yes
Model F-stat	91.71	98.67	75.78	76.19	75.05
R <sup>2</sup>	5.9%	3.9%	6.7%	9.8%	10.2%
Obs.	28,109	28,109	28,109	28,109	28,109

**TABLE 3**  
**(Continued)**

Notes: *Score* measures the extent to which two documents are different and has been adjusted for document length. A higher score indicates more differences. *Fog* is the Fog index, measured as  $Fog = (\text{words\_per\_sentence} + \text{percent\_of\_complex\_words}) * 0.4$ .  $\Delta Fog$  is the change in *Fog* from the previous year to the current year. *Length* is the number of words in MD&A.  $\Delta Length$  is the percentage change in *Length* from the previous year to the current year.  $\Delta EPS$  is the change in diluted earnings per share before extraordinary and discontinued items, scaled by the stock price at the end of the fiscal year. *EPSincrease* (or “large EPS increase”) is 1 if a firm is in the highest quintile of  $\Delta EPS$  in the year and 0 otherwise. *EPSdecline* (or “large EPS decrease”) is 1 if a firm is in the lowest quintile of  $\Delta EPS$  in the year and 0 otherwise. The control variables are *|Current|*, *|DebtDue|*, *|Liability|*, *|Capex|*, *|Stdret|*, *|Acquire|*, and *|Downsize|*. The control variables and the year dummies are defined in Table 2. The non-indicator control variables are winsorized at 1% and 99% before the absolute values are calculated. The regression estimations are robust to heteroskedasticity and within-firm error correlations. “\*\*\*,” “\*\*”, and “\*” mark statistical significance at 1%, 5%, and 10% in a two-tailed test, respectively.

**TABLE 4**  
**MD&A Modification and Firm Characteristics**

Panel A: Pairwise Spearman correlations <sup>a</sup>

	Size	BigN	IO	Analyst	Herf	Litig
Score	0.008	<b>0.029</b>	<b>-0.022</b>	-0.012	<b>0.065</b>	<b>0.064</b>
Size		<b>0.020</b>	<b>0.391</b>	<b>0.534</b>	<b>-0.164</b>	<b>-0.301</b>
BigN			<b>0.241</b>	<b>0.188</b>	<b>0.021</b>	<b>0.103</b>
IO				<b>0.511</b>	<b>0.026</b>	0.002
Analyst					<b>0.050</b>	<b>0.071</b>
Herf						<b>0.306</b>

<sup>a</sup>: The correlations that are statistically significant at 1% are bolded.

Panel B: Regression with *Score* as the dependent variable

	Coefficient	t-statistic
Intercept	-0.048	-6.40 ***
Size	0.004	3.83 ***
BigN	0.010	2.78 ***
IO	-0.011	-2.35 **
Analyst	-0.001	-2.01 **
Herf	0.058	2.33 **
Litig	0.012	4.04 ***
EPSincrease	0.002	0.68
EPSdecline	0.011	4.25 ***
\Delta Current	0.001	0.92
\Delta Debtdue	0.196	5.35 ***
\Delta Liability	0.124	8.78 ***
\Delta Capex	-0.328	-8.89 ***
\Delta Stdret	0.218	6.11 ***
Acquire	0.026	8.92 ***
Downsize	0.023	3.54 ***
Y1997	-0.009	-2.18 **
Y1998	0.048	10.42 ***
Y1999	0.030	6.42 ***
Y2000	-0.010	-2.24 **
Y2001	0.009	2.16 **
Y2002	-0.000	-0.01
Y2004	-0.023	-7.82 ***
Y2005	-0.015	-4.88 ***
Y2006	-0.030	-9.70 ***
Model F		43.78 ***
R <sup>2</sup>		6.2%

Note: See other notes in Tables 1 and 2. The observations used are 20,712.

**TABLE 5**  
**Investors' and Analysts' Reactions**

Panel A: Descriptive statistics

	Obs.	Mean	P25	Median	P75
CAR	26,738	3.9%	0.9%	2.2%	4.7%
Revision	20,803	0.004	0.000	0.000	0.002
Score	28,142	0.000	-0.090	-0.041	0.047
Assets	28,142	2,742	79	286	1,093
Filelate	28,142	1 for 11.6% of the sample			
CAR <sup>EA</sup>	27,172	6.1%	1.6%	3.9%	8.0%
Complex	28,142	159	143	160	179

Panel B: Pairwise Spearman correlations <sup>a</sup>

	Revision	Score	Size	Filelate	CAR <sup>EA</sup>	Complex
CAR	<b>0.049</b>	<b>0.051</b>	<b>-0.262</b>	<b>0.145</b>	<b>0.083</b>	<b>-0.123</b>
Revision		0.005	<b>0.081</b>	<b>0.018</b>	<b>0.134</b>	<b>0.021</b>
Score			0.010	<b>0.044</b>	<b>0.031</b>	<b>0.123</b>
Size				<b>-0.121</b>	<b>-0.141</b>	<b>0.362</b>
Filelate					<b>0.023</b>	<b>-0.054</b>
CAR <sup>EA</sup>						0.005

<sup>a</sup>: The correlations that are statistically significant at 5% are bolded.

Note: |CAR| is the absolute value of the cumulative market-adjusted returns on the day of the 10-K filing and the following two days. *Revision* is the change in earnings estimates for the subsequent year from the last IBES consensus before the 10-K filing to the first consensus after it, scaled by the year-end stock price. |*Revision*| is the absolute value of *Revision*. *Score* measures the extent to which two documents are different and has been adjusted for document length. A higher score indicates more differences. *Assets* is the total assets at the end of the fiscal year. *Size* is the natural logarithm of *Assets*. *Filelate* is 1 if the 10-K filing is 90 days after the fiscal year end and 0 otherwise. |CAR<sup>EA</sup>| is the absolute value of the 3-day [-1, 1] cumulative market-adjusted returns around the earnings announcement. *Complex* is the number of non-missing financial statement items in Compustat. The estimations in Panel C are robust to heteroskedasticity and within-firm error correlations. For the regression, we set |CAR<sup>EA</sup>| to 0 for 3,684 observations that do not have earnings announcement date before the 10-K filing. “\*\*\*,” “\*\*,” and “\*” mark statistical significance at 1%, 5%, and 10% in a two-tailed test, respectively.

**TABLE 5**  
**(Continued)**

Panel C: Regressions

Dependent variable	Investor Reaction		Analyst Reaction	
	CAR	Log CAR	Revision	Log( Revision +0.001)
Intercept	0.050*** (24.19)	-3.643*** (-62.25)	0.002*** (3.35)	-6.667*** (-117.19)
Score	0.019*** (5.80)	0.278*** (4.55)	-0.000 (-0.12)	-0.100* (-1.67)
Size	-0.005*** (-23.86)	-0.147*** (-28.32)	-0.000*** (-4.76)	0.007 (1.31)
Filelate	0.025*** (12.47)	0.398*** (14.25)	0.002*** (4.86)	0.127*** (3.77)
CAR <sup>EA</sup>	0.047*** (5.48)	1.056*** (9.05)	0.013*** (8.18)	1.647*** (11.46)
Complex	0.000*** (4.74)	0.002*** (5.09)	0.000*** (3.37)	0.001*** (3.57)
Y1997	0.003** (2.19)	0.135*** (3.90)	0.002*** (6.99)	0.258*** (7.94)
Y1998	0.014*** (9.93)	0.389*** (10.79)	0.002*** (7.01)	0.237*** (7.27)
Y1999	0.023*** (15.66)	0.611*** (17.70)	0.001*** (5.09)	0.188*** (6.10)
Y2000	(0.023)*** (13.48)	0.525*** (15.00)	0.004*** (9.76)	0.321*** (9.31)
Y2001	0.006*** (4.15)	0.193*** (5.41)	0.002*** (8.42)	0.280*** (9.17)
Y2002	0.004*** (3.15)	0.097*** (2.89)	0.003*** (8.83)	0.248*** (8.52)
Y2004	-0.001 (-0.77)	-0.052 (-1.56)	-0.000 (-0.96)	-0.068*** (-2.87)
Y2005	-0.002** (-2.38)	-0.097*** (-2.92)	0.000 (0.64)	0.024 (0.97)
Y2006	-0.003*** (-2.68)	-0.155*** (-4.53)	-0.000 (-1.48)	-0.082*** (-3.33)
Model F	136.41***	206.04***	35.59***	44.07***
R <sup>2</sup>	10.3%	11.1%	3.6%	3.6%
Obs.	26,476	26,476	20,327	20,327