

Research on the Influence of MD&A Readability on Tone

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Abstract

At present, financial text information has attracted more and more researchers' attention. This article builds the management tone based on MD&A text. First, explore the changes in the tone of management when the company's earnings reach expectations. We found that when the earnings reached expectations, the management's tone began to shift, that is, they did not respond positively to good news and did not react negatively to bad news. The tone of voice is significantly negatively correlated with the expected return. Afterwards, we constructed three text readability indicators suitable for the Chinese context based on the fog index and the characteristics of Chinese. Among them, we use NLP to process MD&A text to obtain the proportion of adverbs and conjunctions as a readability indicator to replace the text length in the fog index. The study found that the poorer the readability, the slower the management tone.

Keywords

TONE; Earnings; Meat-or-beat; Readability; NLP.

1. Introduction

The annual report is the most authoritative company information that can be provided equally to all investors in the current market. It is the main information channel for investors in the current capital market. The management discussion and analysis, as the management's summary of the company's current performance and vision for future development, have received particular attention from investors in recent years. As an intermediary of information transmission, the annual report is the main source of information for the management and the main source of information for investors. With the advancement of computer technology, text information has begun to be effectively processed, and related information has also begun to attract researchers' attention. As the most important text information in the capital market, the text information in the annual report has naturally begun to become a new research idea for domestic and foreign capital market researchers. For example, the tone (Li, 2010, etc.) conveyed in the annual report text is favored by foreign scholars who conduct extensive research based on the English annual report. After the concept was introduced into China, Chinese scholars have also conducted a lot of related research, such as research on the incremental information conveyed by management discussion and analysis (DeRen Xie, Le Lin, 2015).

After Li introduced the Fog Index (Fog Index) as an indicator of readability in 2008, the study of text readability began to become operational, which promoted related research on the readability of annual report texts. Later, foreign scholars continued to optimize the English text readability index, and obtained many new indexes. Relevant empirical studies have shown that the readability of the text will significantly affect investors' understanding of the text and thus affect investors' investment judgments (Lee, 2012). It shows that there is a lot of research on the readability of English annual reports. For Chinese, it is more complicated and its semantic expression is more subtle, with more information content. Research on the readability of Chinese annual reports is also very important. Chinese scholars have also conducted a lot of related research and made many attempts, but there are still many problems with Chinese

indicators. This paper constructs the readability index of Chinese text based on the fog index, and selects 3 readability indexes. Read1 is the average number of words in each sentence in MD&A, and Read2 is the average number of words (adverbs and conjunctions) in each sentence in MD&A. According to the fog index, Read3 is constructed by Read1 and Read2. We use this to study the relationship between text readability, MD&A management tone, and expected earnings.

The next arrangement of this article is the second part of literature review, the third part of research hypothesis and empirical research design, the fourth part of empirical results analysis, and the fifth part of summary.

2. Literature Review

There are many researches on management tone at home and abroad, and there are many different text options, such as company annual reports (LM, 2011), company announcements (Davis and Tran, 2012), management discussion and analysis (DeRen Xie, Le Lin, 2015; Li, 2010) and so on. This article chooses management discussion and analysis as the basic text of the management tone, because MD&A is the description chapter of the management of the company, and the management has greater autonomy, which means that there are many managements in MD&A that need to be disclosed or wanted Disclosure of information, so we use management discussion and analysis as the main text of the tone. Regarding company performance, the relationship between tone and company performance is often not the focus of research, and tone is not the focus of research. There is not much research on the relationship between tone and performance in China. Xie Deren and Lin Le (2014, 2015) found that the tone represented by my country's performance briefings can have a significant connection with the capital market. Later they also found The increase in management tone information of the performance briefing has an effect on performance prediction. Research on relevant information disclosure in English annual reports found that there is some correlation between management information disclosure and the market (Lee, 2014). Various studies have shown that the information increment of the management tone based on various financial documents will have a significant impact on the capital markets in Europe, America and China.

Many attempts have been made abroad on text readability. After Li (2008) proposed the fog index, the readability of the text has attracted many researchers' attention. He used the fog index and the length of the text as indicators to study the relationship between the readability of the annual report text and the company's earnings. Some scholars believe that when the company's stocks are under short-selling pressure, the management will reduce the readability of the text in the annual report to confuse investors. They expect to reduce the accuracy of investors' judgment on news and reduce the risk of short selling of company stocks caused by bad news (Li and Zhang, 2015). Lo (2017) found that there is a readability bias in the company's annual report when it has weak earnings or misreported the company's annual report. LM (2014) uses the number of bytes displayed in the computer in the English annual report as an indicator of readability. They found that a company with good text readability means that the company's management is serious in transmitting information, and the information transmitted is more accurate and effective. Reduce the asymmetry of information. All these indicate that in the market, the readability of the annual report text will affect the investor's reception of information, which means that both the readability of the text and the tone of the management will have an impact on the capital market.

In short, existing research shows that text readability is likely to be a management tool for management. This method will significantly affect investors' understanding of information, and then have an impact on the capital market through investors' investment behavior. We use a method suitable for Chinese to construct readability indicators to observe how Chinese

companies that have achieved expected returns will affect the relationship between intonation and expected returns through readability.

3. Research Hypothesis and Empirical Research Design

3.1. Research Hypothesis

This article first starts from the tone of management in MD&A to observe the changes in tone of the company's earnings when it reaches expectations. There are nothing more than three outcomes: the tone becomes more positive, unchanged, or slowed down when the returns meet expectations. In previous studies, it is generally believed that there is a linear relationship between intonation and income, and the complete relationship between intonation and income is generally not the focus of research, and even only as a control variable when studying the relationship between other variables. There are many studies that show that the tone of management is sensitive to changes in earnings. For example, Xie Deren and Lin Le believe that the tone of management has a positive response to earnings. Many foreign scholars also believe that based on the market's sensitivity to information, the confidence of investors and analysts is very important to management, and management will cautiously express positive remarks for this reason. Then, is there a significantly positive linear relationship between tone and earnings, or will it change when the company's earnings reach expectations? Based on this, we put forward the first hypothesis:

Hypothesis 1: The tone of management will not change when the company's earnings meet expectations

With the advancement of computer technology, the readability of the text has become operable. The text readability of the Chinese annual report has attracted much attention from researchers due to the complexity of the Chinese annual report. The information contained in Chinese far exceeds English. Text readability is essential for readers to understand the meaning of the text. In the study of the English annual report text, Li pointed out that the worse the readability of the text, the more confusing the text, the more negative the management tone. The lower the readability of the text, the higher the cost for investors to extract information from the text, which will seriously affect the investor's investment decision. Under the Chinese annual report, will the management use the readability of the text for earnings management? In this regard, we introduce the readability of the text to explore whether the text has good readability and poor readability will affect the tone of the management, and then observe the text can be read Will readability have an impact on the relationship between company earnings and tone of voice? Based on this, we propose hypothesis 2:

Hypothesis 2: Text readability will not affect the relationship between management's tone and revenue

3.2. Sample Selection and Data Sources

This article selects listed companies from 2008 to 2019 excluding the financial industry. The relevant data comes from China Stock Market & Accounting Research Database and Chinese Research Data Services Platform. The financial data comes from China Stock Market & Accounting Research Database (CSMAR), and the text information of the annual report management discussion and analysis Originated from Chinese Research Data Services Platform (CNRDS).

3.3. Variable Design and Model Construction

3.3.1 Variable Design

This article is mainly to observe whether the readability of the MD&A related texts of the annual report will affect the tone of the management when the company's revenue reaches the

expected level. Among them, the positive and negative vocabulary summary of the MD&A text is taken from the China Research Data Service Platform, which uses the LM (Loughran and McDonald, 2011) financial dictionary as the main word segmentation basis and will also be improved according to the Chinese context. We constructed the intonation index TONE based on the result of word segmentation. For the company's income indicator, we have chosen a net profit indicator that represents the company's actual performance, that is, net profit after deducting non-recurring gains and losses.

China has always been relatively backward in financial research, and text research is no exception. After Li (2008) conducted related work on text readability, the English readability index Fog Index (Fog Index) has become a relevant index commonly used by English text researchers. The fog index is composed of the number of English words in each sentence and the proportion of complex words used in each sentence. What are complex English words? That is, a word with a certain number of letters. This method is reasonable for English words composed of letters, but this rationality has also been questioned by many scholars. Two LM scholars proposed in 2014 that it is not accurate to rely solely on the number of letters to judge the complexity of a word. After empirical studies, they found that using this as an indicator to study its relationship with information efficiency is not significant. Furthermore, the fog index can only be used as a measure of the readability of English text, and it is not available for Chinese. Correspondingly, the length of Chinese text is often used as an indicator of readability. However, the problem with Chinese text is that the longer the Chinese description, the more information it contains. This is likely to be related to the text readability index we constructed. The logic is the opposite. The logic of constructing text length as a readability indicator is that the more words, the worse the readability, but there are many related studies showing that the more information disclosed by the company, it often means that the management has better management capabilities (Eng and Mak, 2003). Studies have also shown that companies with better earnings performance will disclose more information, which will inevitably increase the text length and number of texts in the annual report. If we analyze the readability of the text according to the previous logic, then more text indicates that the readability of the text is poor, and the corresponding signal will be sent to the market that the company's performance is poor, which may lead to a decline in earnings (Lo et al., 2017). In summary, we can see that the length of the text may be caused by many factors. From the market point of view, the company's information disclosure is regarded as the transmission of information between the company and the market. In order to gain the trust of investors, the company will disclose detailed information to the market as much as possible in exchange for more accurate investor feedback. In the research of Li (2008), it was even found that management would use more descriptions to confuse investors' judgments on bad news. Therefore, if the length of the text is used as the readability of the text, there will be a logical ambiguity. In their 2014 study, the two LM scholars used the number of bytes of the English text to represent the readability of the text without the use of English vocabulary complexity. This is indeed feasible. Every letter and number in English text is a single byte, and since Chinese characters are double bytes in Chinese text, this means that there is not much difference between byte and text length in Chinese. In the domestic research on text readability, many scholars have explored this. Some scholars have used the number of sentences, paragraphs, sentence length and even a lot of work to measure the text readability by using the number of Chinese character strokes as an indicator. There may be some problems with these indicators. It is difficult to assign weights to sentence paragraphs and there is not enough reason to set up. Furthermore, the number of strokes is the same as the number of letters in English words. The number of strokes does not mean that the text is more complex. A large number of strokes does not mean that the text is less readable.

Based on this, we start from the text structure to construct indicators for text readability. We start with the fog index to construct. The fog index contains an indicator of the number of words

in a single sentence, which can be replaced by the number of words per sentence in the text in the Chinese text. Furthermore, in the study of modern Chinese, the more function words contained in a sentence, the more logical relationships the text will contain, and the more complex the text, which means that function words increase the difficulty of reading the text (Zhang Lu and Peng Yanli, 2013; Zuo Hong and Zhu Yong, 2014). In financial texts, especially in management discussions and analysis, adverbs are often used as degree modifiers, such as: more, very. These are almost all used by management in MD&A to modify the company's current situation and future prospects. It is likely that the management wants to think about or can confuse the situation. The more adverbs are used, the more complex the management modifies the text, and the worse the readability of the text. Conjunctions are the same as adverbs, similarly, more conjunctives mean that the text has more and more complex logical relationships. Other types of function words, such as auxiliary words, which do not have much influence on the readability of the text, so we take the proportion of adverb conjunctions in the sentence as another indicator of the readability of the text, and at the same time combine the two to construct a fog index similar to the fog index. The specific indicators are shown in Table 1 below.

Table 1. Variable design

Variable name	Variable interpretation
TONE	The difference between the positive and negative words in MD&A is divided by the total number of words
Earning	The difference between the net profit deducting non-recurring gains and losses this year and the previous year is divided by the market value
D	Dummy variable, take 1 when the surplus is greater than 0, otherwise take 0 The natural logarithm of the difference between the average number of words in each sentence of MD&A and the industry average
Read1	The difference between the average number of adverb conjunctions in each sentence in MD&A and the industry average.
Read2	The table of adverb conjunctions comes from Wang Ziqiang's "Modern Chinese Function Word Dictionary" in 1998
Read3	0.5 (Read1+Read2)

3.3.2 Model Design

The asymmetric model used in this article is to measure the change in the tone of management when earnings expectations are critical. We introduce the dummy variable D, construct its cross-multiplication term with the income term to indicate that the income reaches the expectation, and then observe the change in tone at this time. Based on this, we have to build model 1 (in the model we added the fixed effects of company and year):

$$TONE = \beta_1 + \beta_2 Earning + \beta_3 D + \beta_4 D \times Earning + firmfixed + yearfixed + \sigma$$

According to Model 1, the non-linear relationship emphasized in this paper is mainly reflected in the coefficient β_4 , which indicates that when the income reaches the expected, the intonation will have a more positive reaction. On the contrary, when the β_4 is negative, the intonation will

be weakened. Both of these situations will indicate a non-linear relationship between intonation and income.

After exploring the relationship between intonation and expected benefits, we then add relevant indicators of text readability to explore the impact of text readability on intonation. We use the triple product of text readability and exceeding-expected benefits to observe the effect of text readability on intonation at this time. The text readability index is READ (Read1, Read2, Read3). Based on this, we build model 2:

$$TONE = \delta_1 + \delta_2 Earning + \delta_3 D + \delta_4 D \times Earning + \delta_5 READ + \delta_6 READ \times D + \delta_7 READ \times Earning + \delta_8 READ \times D \times Earning + firmfixed + yearfixed + \sigma$$

4. Empirical Analysis Results

4.1. Descriptive Statistics and Correlation Graphs

4.1.1 Descriptive Statistics

This article selects relevant data from 2008 to 2019 for all Chinese A-share listed companies excluding the financial industry, and obtains corresponding data from two major databases. Table 2 below is the relevant descriptive statistics of each variable, including related indicators of tone, income, and readability. The table lists the number of observations, mean, standard deviation, minimum, and maximum.

Table 2. Descriptive Statistics

variable	Obs	Mean	SD	Min	Max
TONE	31282	0.4105	0.1502	-0.9898	1
Earning	29045	-0.0035	0.1121	-9.3850	4.2417
Read1	31282	2.0600	0.8133	-3.0511	50.4949
Read2	31282	-1.1600	0.2052	-6.1170	2.8271
Read3	31282	3.7000	0.4856	-4.1759	26.6610

4.1.2 Correlation Graphs

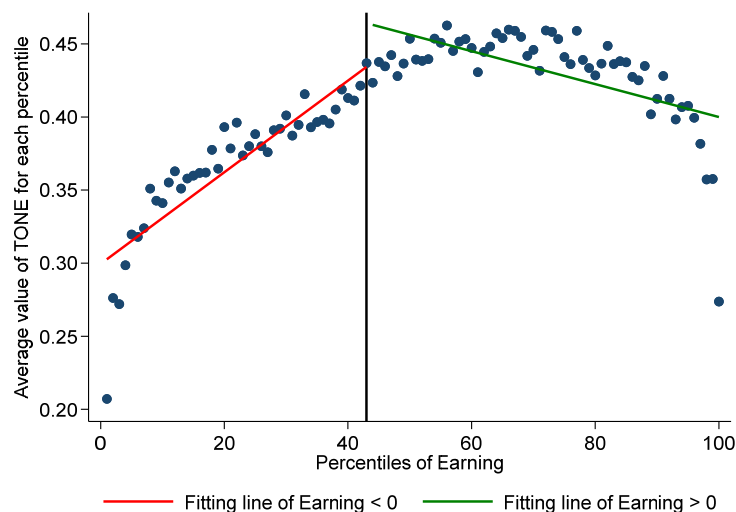


Figure 1. Correlation diagram

We made a scatter plot of TONE and Earning, as shown in Figure 1. The black line represents the position where Earning is equal to 0, the left side indicates that Earning is less than 0, and the right side is the situation where Earning is greater than 0. It is not difficult for us to see that when Earning is greater than 0 (that is, the income reaches expectations), the tone of TONE begins to change in the opposite direction, which is not the simple positive linear relationship proposed by the previous research.

4.2. Regression Analysis

Table 3. Regression results

	TONE			
	Hypothesis 1	Read1	Read2	Read3
Earning	0.1315* (1.94)	0.1444** (2.76)	0.2025*** (8.80)	0.1593*** (3.87)
D	0.0472*** (18.1)	0.0470*** (20.64)	0.0451*** (-9.23)	0.0465*** (23.13)
Earning×D	-0.2989*** (-3.66)	-0.3269*** (-4.92)	-0.3847*** (-9.23)	-0.3438*** (-6.14)
READ		-0.0584* (-2.07)	-0.0356*** (-3.57)	-0.0112* (-2.35)
READ×D×Earning		-0.1335*** (-3.61)	-0.5495*** (-3.83)	-0.2559*** (-4.09)
Firm Fixed			yes	
Year Fixed			yes	
Intercept	0.3807*** (78.16)	0.3839*** (82.52)	0.3862*** (92.61)	0.3846*** (86.44)

As shown in Table 3 below, we put the basic regression results of Hypothesis 1 in the first column, and the regression results of Hypothesis 2 (Read1, Read2, Read3) in the second column (* represents the confidence level of 10%, ** represents 5% Confidence level, *** represents the confidence level of 1%). We first observe the regression results of Hypothesis 1, and it is not difficult to find that the tone and income maintain a significant positive relationship at the beginning, and when the company's income reaches expectations (that is, when the Earning×D term is not 0). We found that the tone of voice actually began to show a significant negative correlation with the expected return. This shows that when the return reaches the expected value, the management began to consider the language and slowed down its own tone of voice enthusiasm. The result of Hypothesis 1 fully shows that there is not a simple linear relationship between intonation and income. This is more pronounced in companies that meet expectations. In Hypothesis 2, we added the relevance indicators of readability. First of all, we can see that the three readability indicators have obviously deepened the convergence of the tone when the income reaches the expected. Describe MD&A related information carefully. The research in this article is based on investor confidence. The management will maintain investor confidence and manage accordingly. When the company's earnings reach the current expectations, the management will slow down the tone of the description to lower investors' expectations for future performance, so that the next period can better meet the investors' expectations, so the tone will begin to shift when the expectations are met. So how does text readability affect intonation? The cross-products (three-times in bold) of the readability index given in the table and the expected return show a significant negative correlation with intonation. Our readability indicators are all inverse indicators of readability, that is, the larger the value of the indicator,

the worse the readability of the indicator. Our empirical results show that when the company's earnings reach expectations, management may confuse investors with less readable MD&A descriptions to reduce the efficiency of investors' access to information, and at the same time use a more gradual tone. In other words, the management will use less positive tone for positive news and less negative description for negative news. This shows that the readability of the text is a management tool for the management. When dealing with future expectations, the management will use the readability of the text to deal with the tone and stabilize the market confidence.

5. Summary and Shortcomings

Based on the results of Hypothesis 1, this article first finds that management will change its tone description in the annual report when the company's earnings meet expectations, reduce positive descriptions of good news, and reduce negative descriptions of bad news (ie, management's tone slows down). After we added readability, we found that readability significantly aggravated the management's tone slowdown. The poorer the readability, the harder it is for investors to understand. When the company's earnings reach expectations, the management must slow down in a deeper tone in order to still achieve the expected earnings goals in the future. This may be the management's use of readability to confuse investors' judgments on the news, thereby achieving the purpose of stabilizing investor confidence.

Since Li (2008)'s research on text readability, researchers have conducted many studies on the readability of Chinese texts in English annual reports, and the results have been rich. However, related research is rare in China, mainly due to the lack of readability indicators of Chinese annual reports due to the complexity of Chinese. This article draws on the readability indicators constructed by the fog index, and all have good theoretical expectations under the management behavior logic driven by investor confidence. However, this article also has many shortcomings. We are screening indicators based on ignorance of linguistics, which does not necessarily meet the relevant requirements of linguistics. Subsequent researchers can conduct more linguistic research to construct more accurate and reasonable readability indicators. Secondly, in terms of research methods, although the model we adopted can show various responses to intonation, there are still many things that can be improved. Subsequent researchers can make more attempts at the model.

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