

A study on the MD&A Disclosure Quality in real-time calculated and provided By Programming Technology

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Abstract

The Management Discussion and Analysis(MD&A) provides investors with an opportunity to gain insight into the company from a manager's perspective and enables short-term and long-term analysis of the business. And MD&A is an important channel through which companies and investors can communicate, providing a useful source of information for analyzing financial statements. MD&A is measured by the quality of disclosure and there are many previous studies on the usefulness of disclosure information. Therefore, it is very important for the financial analyst who is the representative information user group in the capital market that MD&A Disclosure Quality is measured in real-time in combination with IT information technology and provided timely to financial analyst. In this study, we propose a method that real-time data is converted to digitalized data by combining MD&A disclosure with IT information technology and provided to financial analyst's information environment in real-time. The real-time information provided by MD&A can help the financial analysts' activities and reduce information asymmetry.

Keywords: MD&A, MD&A Disclosure Quality, Big Data Log Analysis System, Predictive analytics.

1. Introduction

It is very important that the information about the company is conveyed smoothly in the capital market. Managers who know the superior information about the company utilize various forms of disclosure system to convey the valuable information the company has to the capital market. This means smooth communication with external investors[1]. This study focuses on MD&A(Management Discussion and Analysis), which is provided through the disclosure channel in the manager's language among the various disclosure methods provided by the corporate executives. Numerous information about the company is provided in the form of forced disclosure or voluntary disclosure. However, most of the external investors lack expert knowledge of accounting languages and have difficulty in analyzing and processing the amount of information for many companies and interpret them as meaningful results. As an alternative solution to the problem, MD&A provides compressed and analytical information about the company with the view of the CEO, which makes it an important channel for companies and investors to communicate. However, the timely provision of the results measured in real-time in combination with the disclosure information of the MD&A and IT information

technology is a very important meaning to financial analysts who are the main information users of the capital market. Financial analysts are representative information users with sophisticated knowledge in the capital market, and as a specialized information broker, they have a significant impact on the beliefs and behavior of capital market investors[2,3]. And financial analysts have a significant impact on managerial decision making[4]. Financial analysts play a key role in helping an efficient capital market function by analyzing and evaluating firms, and forecasts published by financial analysts play an important role in shaping market expectations[5]. US financial analysts see MD&A as the most useful disclosure of business reports than financial statements, although MD&A is part of the company disclosure[6].

This study suggests how MD&A Disclosure Quality is combined with IT information technology to provide real-time information to financial analyst's information environment. This real-time MD&A information can help to activate financial analysts' activities, make accurate earnings forecasts, and reduce uncertainty. If the MD&A Disclosure Quality provides opportunity to insight into the company with the view of the manager in real-time through it information technology and shortens the uncertainty of the company information by enabling short and long term analysis of the business, the analyst's information environment will be greatly improved. If the MD&A information can influence the financial analysts' earnings forecasts through real-time IT information technology, it will raise the awareness of the necessity of improvement and establishment of the MD&A disclosure system.

This study has the following contribution. The existing MD&A disclosure provides narrative information that reflects the insights and views of the management and can not be provided as a summary of the numerical or annotated financial statements. However, There is a difference that can be transmitted in real-time to the combined DATA INDICATOR. If MD&A Disclosure Quality is provided in real-time as IT information technology and it is used as an important basis for decision making of actual capital market information users, motivate companies to voluntarily improve their disclosure practices and attract attention from capital market participants and policy authorities. It will contribute to the establishment of MD&A disclosure environment.

2. Prior Researches and The Purpose of This Paper

The announcement of MD&A began with the need for additional commentary because it is difficult for outside investors to predict the future profit of the company by the company's financial statements and comments alone. The United States began disclosing MD&A in 10-K for the first time in 1968, and subsequently continued its efforts to improve MD&A Disclosure Quality. The Republic of Korea was obliged to write the text of the MD&A business report only after the Capital Market Law was enacted in 2009.

A number of previous studies have verified the usefulness of such MD&A information. Rogers and Grant (1997) found that MD&A is the most cited information(over 30%) in financial analyst reports[7]. Bryan (1997) selected financial reports from 250 US companies and analyzed the content of seven MD&A disclosures. As a result of the analysis, the disclosure of capital expenditure is significantly related to future short-term profits, and the disclosure of future forecasts affects financial analysts' forecast revisions[8]. Clarkson et al.(1999) examined the relationship between the MD&A Disclosure Quality measured by financial analyst survey and firm characteristics. Through empirical analysis, they supported the usefulness of MD&A information by suggesting that MD&A Disclosure Quality is influenced by firm performance, funding level, size of company, and occurrence of major events[9]. Barron et al.(1999) analyzed the degree of compliance with MD&A guidelines as defined by MD&A Disclosure Quality. As a result, it is reported that the degree of compliance of MD&A guidelines and the relationship between earnings forecast error and variance of financial analysts are negative, so that firms with higher MD&A Disclosure Quality have higher predictability of future earnings

of MD&A information[10]. Li(2010) argued that forward-looking statements in the MD&A context are highly relevant to future profits and have predictive power to predict future performance[11].

However, these studies were limited to subjective or quantitative measures of disclosure quality. In order to improve this, Lee et al.(2013) in Korea measure companies' compliance with the guidelines provided by the Financial Supervisory Service (FSS) on the quality of disclosure of all companies listed on the Korea securities market[12]. In addition, Park Hahn and Lee(2016) confirmed that the MD&A Disclosure Quality measured by Lee et al.(2013) is positively correlated with the accuracy of forecasts for sales, operating profit and net profit. These studies show that although MD&A disclosure information is limited, it provides useful information to investors in capital markets[12,13]. There are prior studies that examine the usefulness of disclosure information and disclosure quality in various aspects. However, it is more meaningful for a financial analyst who is a representative information user group in the capital market that the MD&A Disclosure Quality is measured in real-time in combination with IT information technology and provided to financial analysts in a timely manner. This study suggests how MD&A Disclosure Quality is combined with IT information technology to provide real-time information to financial analyst 's information environment. This real-time MD&A information can help to activate financial analysts' activities, make accurate earnings forecasts, and reduce asymmetry.

3. MD&A Disclosure Quality Measure

In the United States, it began to include the disclosure of MD&A in 1968 for the first time in 10-K, and since 1980 it was included as a requirement of the business report(Form 10-K) and now includes semi-annual reports, quarterly reports, The disclosure of MD&A was expanded. For reference, the UK and Australia are mandated to include the MD&A text in business reports, semi-annual reports and securities reports. Japan, like the United States, is required to include MD&A texts in semi-annual reports, quarterly reports and securities reports. Acknowledging the importance of MD&A disclosure, US policy makers regularly revised the MD&A guidelines to ensure that companies do not simply repeat the financial statement or provide insights into past performance or business prospects and noted that only routine analysis was performed. In other words, the US policy authorities continued to encourage companies to become meaningful MD&A disclosures with insights from management, rather than formally disclosing MD&A.

In the case of the Republic of Korea, the 2009 Capital Market Consolidation Act was enacted, and it became mandatory for the MD&A to include the text of the business report from 2009. On the other hand, the contents provided in the MD&A Guideline(2008) provided by the Financial Supervisory Service(FSS) to encourage companies to disclose MD&A are as follows. The MD&A Disclosure consists of a description of the cautionary statements for the forecast information, a summary and a description of the introduction paragraphs, analysis of financial condition and operating results, liquidity, important accounting policies and estimates, environmental and employee related items, regulatory regulations, derivatives and risk management policies, and Other matters. MD&A is a statement of opinion about the management of the management of the executives, which contains analytical contents about the future business plan and prospect as well as the comment of the manager about the financial status and business performance of the company from the viewpoint of the manager. For example, the information related to the future provided by MD&A will affect future sales, future operating profit, target sales, future performance announcements such as target sales by foreign sector, anticipated effects on assets and liabilities. The disclosure related to anticipated future trends and uncertainties, future investment plans, and future disclosure of new capital expenditures. In other words, the disclosures provided by MD&A are much more comprehensive and are based on narrative information

rather than cumulative numerical information. The MD&A Disclosure Quality Measurement was prepared in May 2008 by the Financial Supervisory Service(FSS), which is based on the purpose and principles of the management opinion statement established by the International Securities and Exchange Commission(IOSCO), General matters related to the preparation of the written statement, and detailed instructions for each major item. The process of deriving the MD&A Disclosure Quality measure is summarized as Figure1.

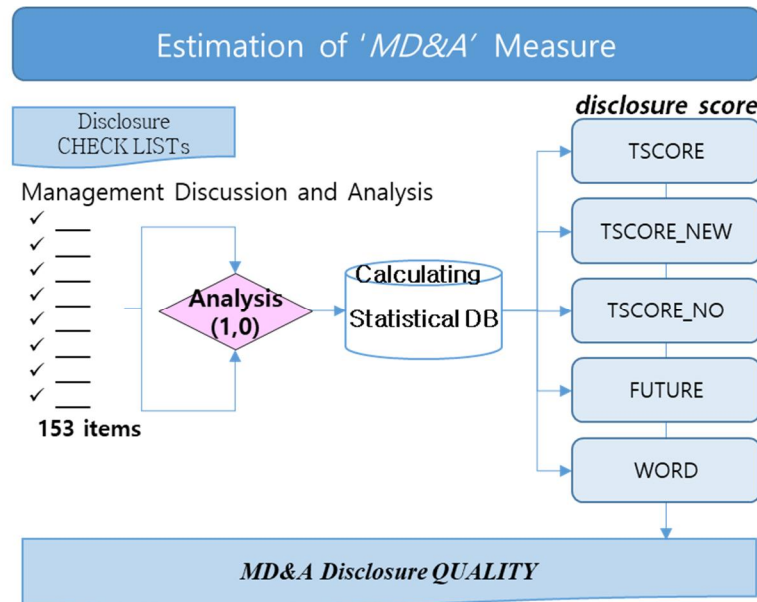


Figure 1. Framework for 'MD&A Disclosure Quality' estimation

Therefore, the measurement of MD&A Disclosure Quality is summarized as follows. First, we will establish a checklist for detailed disclosure items by benchmarking the "Guidelines for Preparing Management Opinion Statements" presented by the Financial Supervisory Service. The total number of checklists for detailed disclosure items is 153, and the score is given as 1 if the disclosure is made for each checklist, and 0 otherwise. The contents and scores of the 153 sub-items constituting the checklist are shown in Table 1 below.

Table 1. The MD&A Disclosure Quality Measurement

	Contents	checklist	score
PART 1)	Management diagnosis and analysis opinions of directors		
	1. Precautions for prediction information	4	4
	2. Summary and introduction	11	28
	3. Analysis of financial condition and operating results	76	75
	4. Liquidity, significant financing and spending of funds	13	19
	5. Matters concerning off-balance-sheet liabilities	8	12
	6. Matters on accounting for important accounting policies	3	3
	7. Environment and Employees	5	7
	8. Regulations on Regulations	2	2
	9. Matters related to derivatives and risk management policies	7	10
	10. etc	11	13
PART 2)	Other matters necessary for the protection of investors		
	11. Other matters necessary for the protection of investors	13	13
Total		153	186

Through this process, the total score of 153 items of MD&A was totaled to 186 points, and TSCORE was measured by converting it into one point. In addition, the other items are the same as TSCORE, but TSCORE_NEW is calculated by giving all the total scores of the items for the disclosure "Not applicable". In order to exclude subjectivity due to weighting, TSCORE_NON is measured in terms of one point only, without weighting on items requiring future and analytical explanations. In the meantime, considering the basic idea of MD&A disclosure that the future information and analytical information should be provided from management's viewpoint, rather than a simple numerical list of past financial statements, FUTURE is measured by the measurement of future related disclosures converted into full marks. Finally, WORD was measured by taking the natural logarithm of the total number of words published in MD&A.

<Table 2> summarizes the MD&A Disclosure Quality measured in various ways as above.

Table 2. The MD&A Disclosure Quality Measurement

Five proxies	The method of measurement
TSCORE	<ul style="list-style-type: none"> ✓ The total sum of the points awarded to the firm for 153 items converted to 1point scale. ✓ The 2 or 3 weight on the items related to the forward-looking and interpretative disclosures.
TSCORE_NEW	<ul style="list-style-type: none"> ✓ The 0.5 weight on the specific item related to "Not Applicable". ✓ The total sum of the points awarded to the firm for 153 items converted to 1point scale. ✓ The 2 or 3 weight on the items related to the forward-looking and interpretative disclosures.
TSCORE_NO	<ul style="list-style-type: none"> ✓ The 1 weight on a specific item related to "Not Applicable". ✓ The total sum of the points awarded to the firm for 153 items converted to 1point scale. ✓ No weight on the items related to the forward-looking and interpretative disclosures.
FUTURE	<ul style="list-style-type: none"> ✓ The 0.5 weight on a specific item related to "Not Applicable". ✓ The total sum of the points awarded to the firm for the items related to the forward-looking and interpretative disclosures in the MD&A converted to 1point scale.
WORD	<ul style="list-style-type: none"> ✓ The 0.5 weight on the specific item related to "Not Applicable". ✓ The logarithm value of the number of the words. ✓ The quantitative proxy of the MD&A disclosure quality.

TSCORE, TSCORE_NEW, TSCORE_NON, and FUTURE correspond to the qualitative disclosure score measured through analysis of the MD&A disclosure, and the WORD measured by the number of words corresponds to the quantitative disclosure score[12].

4. Real-Time Calculation and Provided MD&A Disclosure Quality by Programming Technology

If TSCORE, TSCORE_NEW, TSCORE_NON, and FUTURE, which are measured by Lee et al.(2013)[12], are converted to the MD&A Disclosure Quality of in real-time by IT programming and are immediately provided to all investors. It is expected that the problem of information asymmetry among investors will be

solved at a meaningful level through the provision of appropriate disclosure information.

Figure 2 shows the outline of the real-time conversion algorithm by IT programming in this study. According to KDnuggets(www.kdnuggets.com), the most commonly used tool for data analysis in 2015 is R. R started with version 1.0 in 2000 under the leadership of Professor Rothschka and Robert Gentleman, professor at the University of Auckland, New Zealand, and the names of these two professors are the same as R, so they named the package R. R is applied to a real-time log analysis system, the module size is too large and separate program capability is required. Therefore, in this study, only the most used algorithms are selected for light weight and easy to use Library. The statistical prediction engine is integrated with the log analysis system, and is a model that performs prediction based on the values stored in the statistical database rather than directly using the original log.

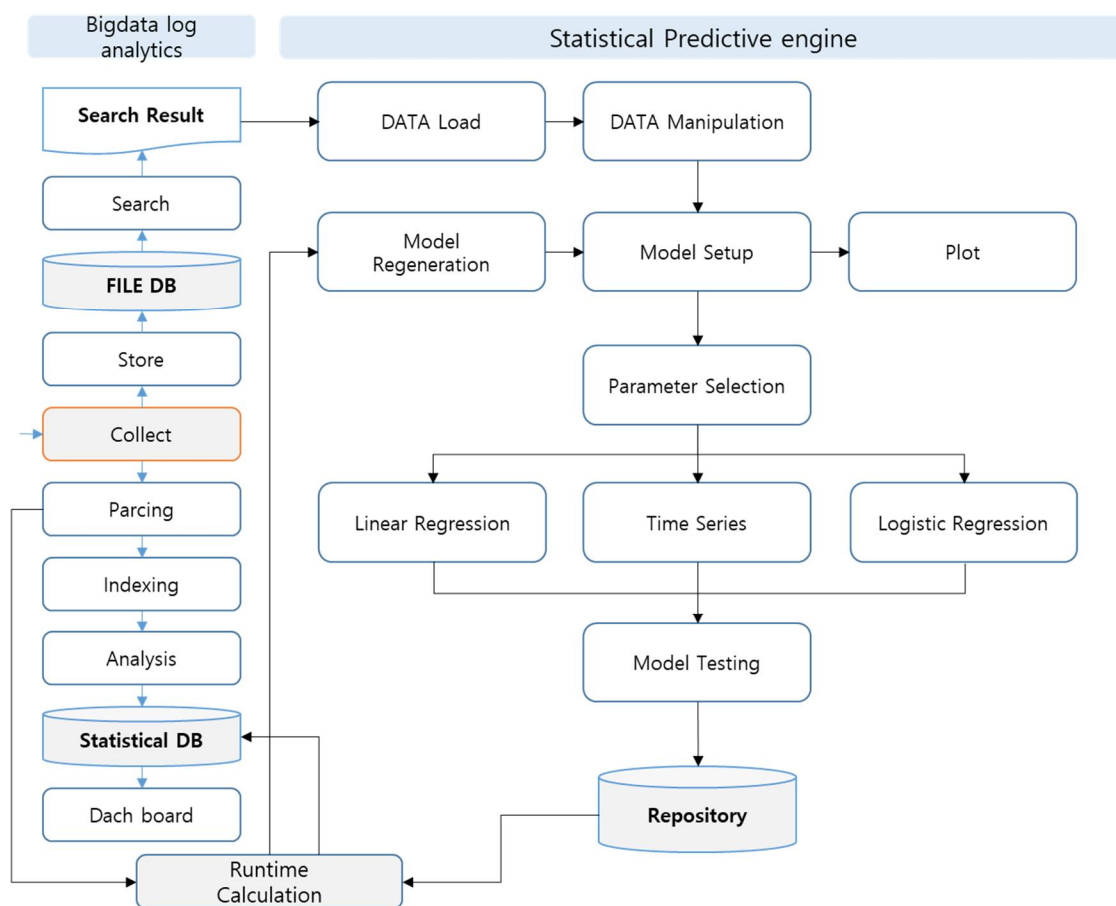


Figure 2. Detailed module configuration

First, the predictive analysis via the statistical DB is transmitted to the big data log analysis system through the statistical DB with the result of the predictive analysis by searching and extracting the big data source log. The 'Runtime Calculation' is the most important factor in real-time forecasting analysis. It uses the prediction model generated from big data log to calculate the predicted value of all logs in real-time and returns the result. The 'Data Load' extracts the log from the repository of the Big Data Log Analysis System and passes it to the statistical forecasting engine. The statistical forecasting engine generates and analyzes the predicted model using the log. The statistical prediction engine operates in a batch mode. The predicted model is generated by

extracting the necessary data from the original log stored in the big data log analysis system. The generated model is calculated using the 'Runtime Calculation' module And perform periodic non-real-time analysis together. Statistics and prediction algorithms use the most commonly used linear regression, time series analysis and logistic regression. Linear regression is a method of analyzing whether there is a causal relationship between two or more variables, and if so, how much of each variable affects the proportion. It can be used for predicting the causal factor if the causal factor can be predicted, or it can be used for outlier determination and outlier detection for the current collection value rather than prediction in the real-time analysis environment. Time Series Analysis is an analysis that grasps the characteristics of data and forecasts future values based on the data observed over time. Logistic regression is an analytical method used when the value to be estimated is dichotomous, such as True(False). Regression analysis is mainly used to analyze and predict continuous data.

Financial analysts rely on accounting information disclosed by most firms when estimating profits [10]. In other words, the accounting information disclosed by the firm affects the profit forecast of the financial analyst and the profit forecast of the financial analyst influences the economic decision of the external investor[14]. In the end, how well the information intermediaries, which are financial analysts, interpret and transmit the high-quality information provided by the company in real time is the key-factor that resolves the problem of information asymmetry between the company and external investors. Therefore, it is expected that the IT programming module proposed by this study will be an optimal module to solve this information asymmetry problem by real-time measurement of the quality of the company's MD&A disclosure and delivering it to external investors in real time. In addition, this study is expected to be a starting point for the follow-up study for the introduction and realization of related IT technology to implement the module.

5. Conclusion

The MD&A disclosure information has a very important influence on the information environment of the financial analyst. However, there were inherent limitations that were difficult to quantify or measure the MD&A disclosure quality.

This study presents the MD&A Disclosure Quality Measurement Model, which can be applied to the domestic business environment. We convert the MD&A Disclosure Quality into real-time MD&A disclosure data for the IT program and outline the algorithms that can be immediately provided to all investors.

It is important that the quality of MD&A disclosure proposed in this study is measured and predicted through real-time IT program module and delivered to external investors in real time to solve information asymmetry problem. It is expected that the quality measure of MD&A disclosure will contribute to solving the information asymmetry problem by presenting the statistical algorithm of IT program for investor's prediction and accurately forecasting real-time information.

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