

## Research on the Relationship between R&D Textual Disclosure and Profitability

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**Abstract.** This paper examines how profitability relates to corporate textual R&D disclosure decisions. Using the fixed-effects regression model, we conclude that the number of textual R&D disclosures is negatively correlated with the profitability of the firm. Companies with less profitability are more likely to publish more textual R&D disclosures to divert or confuse investors. In contrast, companies with better profitability will not publish too many textual R&D disclosures because there is no need to distract investors.

### Introduction

In a competitive market, investors will consider the competitiveness of enterprises from many aspects. The level of activity of Research and Development (The following abbreviated as R&D) investment activities can reflect the capabilities and potential strength of the company, and it can understand the core competitiveness of the company. However, the financial statements do not express the activity of such R&D investment activities. Therefore, investors must look at not only the profitability of corporate financial statements, but also the potential competitiveness of the company. The essence of R&D is actually investing money to get future profit or competitive advantage. Therefore, R&D can be said to be an investment behavior. This kind of investment behavior may not immediately show its value in the data, so it cannot be analyzed from the data alone.

However, the textual R&D information disclosure is very subjective, because the manager can adjust the content of the textual R&D disclosure according to the company's situation, and provide investors with more or less, fuzzy or clear information, so research on textual R&D disclosure is necessary.

Before 2007, China's accounting policy was to charge the R&D expenses and directly account for the current profits and losses. The new accounting standards, which were implemented after 2007, distinguish between research and development in R&D. The expenses incurred in the research are processed, and the expenditures incurred by the development can be capitalized under certain conditions. In the "New Accounting Standards", the expenditures of internal R&D projects should be divided into expenditures in the research phase and the development phase. Expenditure in the development phase can meet the specified five conditions and can be recognized as intangible assets. The original purpose of the guidelines was to meet the reliability and objectivity in accounting standards, but there is no clear and specific provision in these regulations. Basically, R&D expenditures are still dependent on managers, which further explain the textual R&D. The importance of disclosure. Moreover, there are no clear indicators and specific regulations in these regulations. Basically, R&D expenditures are still dependent on managers, which further illustrate the importance of textual R&D disclosure.

Asymmetry in R&D information can lead to increased actual costs for investors. The lack of a correct evaluation of the company's R&D will result in investors not being able to correctly estimate the long-term value of the company, which will lead to misjudgment of the company and make it



impossible for investors to adjust the stock price/ book value, increases the volatility of stock returns, which increases the input cost of investors.

The asymmetry of R&D information will also affect investors' confidence in corporate. In short, it is easy for investors to fully realize the development of the company's R&D field, and The Company's potential value is not reflected.

Many researchers have conducted research on R&D, profitability, and corporate valuation. Lev (2001); Kothari et al. (2002); Hand and Lev (2003); Guo et al. (2004); Jones (2007) Grandi et al. (2009); and Morricone and Oriani (2009) found that R&D affects expected profits, market performance, and future cash flows. Though R&D is also highly firm specific and is associated with higher information asymmetry and uncertainty. These studies agreed that managers may adjust textual R&D disclosures in the annual report based on the company's profitability, and that lower profitability is associated with higher information asymmetry, which will affect investors' decision making. These problems are particularly prominent in R&D companies because the nature of R&D activities and the accounting department make it more difficult to explain profitability.

Profitability is related to the number of textual R&D disclosures, and when the profitability is low, investors will increase the need for textual R&D disclosures, which are also related to the corporate context and the overall level of the market. For example, the length of time a company is listed, the market value of a company, etc., may have an impact on the company's textual research and development disclosure. When the market value of an enterprise is low, another focus is needed to divert the attention of investors, and when the market value of the enterprise is high, no textual R&D disclosure is needed to distract. Therefore, this paper considers that the number of textual R&D disclosures is negatively correlated with current earnings.

## **Research Design**

### **Variable Definition**

Number of textual R&D disclosures. So far, there is no relevant database in China to retrieve the number of textual R&D disclosures, such as keywords, key statements. So this paper uses the annual reports of each company to analyze the number of textual R&D disclosures. The statements in the annual report on R&D disclosure are manually extracted from the annual report and calculated manually. The measurement of the number of textual R&D disclosures is calculated by the number of disclosure statements describing the R&D in the company's annual report. In the annual report, a textual description of R&D is counted as number 1. However, there are many textual descriptions that describe the content of R&D. The part of the record is recorded, and the number of words in the textual development is described by dividing the part of the R&D by the number of words in the textual description of the sentence. Since the research object is the number of textual R&D disclosures, it is closely related to the company's R&D. Therefore, in the process of selecting the enterprise annual report, the companies with higher rankings and stronger enterprises are listed to sort out the data.

Profitability. This paper uses the logarithm of the main business income to measure the current profitability. The relevant income plays an important role in the market, which is an important performance indicator for investors. Income is also an important indicator of a company's profitability, and investors are also very interested in the data on the main business income. In addition, profitability is a visible measure of performance and is highly regarded by a large number of market participants and financial news.

Control variables. In order to control the influence of other variable factors on the dependent variable, this paper sets five control variables in the multiple regression, in which the special cost mainly studies the enterprise R&D expenditure, and the R&D expenses are compared with the operating cost to represent the proportion of R&D expenditure in the enterprise; The number of years (AGE) is the number of years the company publishes R&D expenditures; SIZE measures the size of the company and is the logarithm of the value of the equity market. This paper uses the ratio of R&D expenditure to operating cost and the square of the number of years the company publishes



R&D expenditure ( $R\&D/OPX^2$  and  $AGE^2$ ) to control the nonlinear relationship. The basis for selecting these five control variables is that these five factors have a greater impact on the profitability of the dependent variable (main business income), and are also better collected in the annual report and database, and can also be facilitated in data collection.

### Data Source

This paper studies the textual R&D data of enterprises. From the beginning of data search, it is found that not all enterprises have textual R&D disclosures. Only some enterprises with strong strength and relatively demanding in R&D have textual R&D. Disclosure, so when selecting data, it mainly selected listed companies with R&D nature that rank higher in terms of corporate profitability. First of all, the preferred R&D enterprise data source is the listed company that participated in the market earlier, and the company's strength is that the R&D capability of the listed company is relatively high. Then, search for the company based on the company name on Juchao Information Online, and find the latest data of the financial annual report in the required enterprises. The annual report time is locked in the four years from 2014 to 2017, and the textuality is found in the company's annual report. Develop the disclosed statements, interpret the statements in detail, and judge whether they are duplicated and carefully recorded. Since the whole process was manually and manually completed, it took a long time. Finally, the four-year data of 800 listed companies were locked on the [cninfo.com.cn](http://cninfo.com.cn) for regression analysis.

Control variables and explanatory variables were obtained in the Wind database, and the name and age of the company (2014-2017) in the published R&D data were found in the Wind database. From the Wind database, we obtained data on R&D expenditure, equity market value, operating cost, corporate R&D disclosure period, and main business income of 800 companies in 2014-2017.

### Empirical Model

The independent variables of the model in this paper are profitability. The specific data is expressed by the main business income of the enterprise. The dependent variable is the number of R&D description statements in the textual R&D disclosure. The measurement method has been mentioned above. The model is built as follows:

$$LNR \& DDES_{it} = \beta_0 + \beta_1 INC_{it} + \beta_2 R \& D/OPX_{it} + \beta_3 R \& D/OPX_{it}^2 + \beta_4 SIZE_{it} + \beta_5 AGE_{it} + \beta_6 AGE_{it}^2 + \varepsilon_{it} \quad (1)$$

In this formula,  $R\&DDES$  is the number of sentences in the report regarding the textual description of R&D expenditure,  $INC$  main business income, logarithm processing;  $R\&D/OPX$  is the ratio of R&D expenditure to operating cost, and  $R\&D/OPX^2$  is R&D expenditure The ratio of the cost is squared,  $SIZE$  is the equity market value, and the logarithm is processed;  $AGE$  is the number of years of R&D expenditures published by the company's statements,  $AGE^2$  is the square of the number of years of R&D disclosures published by the company's statements, and it is the indicator of the enterprise  $t$  for the year. In this paper, the calculation of multiple variables and years is applicable to nonlinear models. Therefore, the regression model uses the panel model, which is the fixed effect model. The tool used to make the regression model is stata15.0, using three data tables for descriptive, correlation and regression analysis.

### Empirical Analysis

#### Descriptive Statistics

Table 1 is a descriptive statistics of each variable. From this table, the annual report of China's listed companies is not fully counted, but the annual report that has been found is calculated. Although there are unreported annual reports, the number is small and will not significantly affect the regression results of the data.



Table 1, Variable Descriptive Statistics

Variable	Obs	Mean	Median	Std. Dev.	Min	Max
R&DDES	800	3.212	3.219	0.621	0.693	5.081
LNINC	800	23.99	23.305	1.358	19.677	27.684
R&D/OPX	796	0.22	0.062	1.061	0.0001	13.148
LNSIZE	787	2.860	2.64	1.082	0.501	9.239
AGE	800	2.651	2.639	1.249	0	13.566

According to statistics, the average number of textual R&D disclosures of sample companies is 3.212, the minimum number of textual R&D disclosures is 0.693, and the highest number of textual R&D disclosures is 5.081. From the median perspective, 50% of sample companies have low R&D expenditures, at 3.219. In the main business income, the sample business's main business income averaged 23.399, the minimum main business income was 19.677, and the highest main business income was 27.684. From the standard deviation of 1.358, the main business among the sample enterprises the difference in business income is more obvious. From the median perspective, 50% of the company's main business income is greater than 23.305. In terms of R&D expenditure as a percentage of operating costs, the average R&D expenditure of sample companies accounted for 0.242 of operating costs, the minimum R&D expenditure was only 0.0001, and the highest R&D expenditure ratio was 13.148. From the median of R&D expenditure, the R&D expenditure ratio of most enterprises is relatively low, and the proportion of R&D expenditures of more than 50% of sample enterprises to operating costs is less than 0.062. In terms of equity market value, the average value of the sample enterprise equity market is 2.860, the lowest equity market value is 0.501, and the highest equity market price is 9.239, indicating that the equity market value of the sample enterprise has a large difference, from the median, more than 50. The market value of % corporate equity is higher than 2.694. In terms of the number of years of R&D disclosures published in corporate statements, the average number of years reached 2.651, the minimum number of years was 0, and the maximum was 13.566. From the median, 50% of the sample company reports published R&D disclosure years below 2.639.

#### 4.2 regression analysis

Table 2 reports the regression results of the factors affecting the number of textual R&D disclosures. Before the regression, the Hausman test was performed on whether the model selected a fixed effect or a random effect. The test results show that the Hausman test value is 255.88, and the significance test is passed, indicating that the fixed effect model is better than the random effect model. In Table 3, stepwise regression is used to place the explanatory variables one by one in the model to obtain regression results. Model (1) is the regression result of the income from the main business, and the model (2) is the regression result of putting the main business income and R&D expenditure as the operating cost ratio, and the R&D expenditure as the operating cost ratio squared. The model (3) is the regression results of the main business income and R&D expenditure as the operating cost ratio, the R&D expenditure as the operating cost ratio squared, and the equity market value are included. The model (4) is the regression result of putting all explanatory variables into the model.



Table 2, Regression results of the factors affecting the number of textual R&amp;D disclosures

	Model (1)	Model (2)	Model (3)	Model (4)
LNINC	-0.228*** (-10.08)	-0.225*** (-9.51)	-0.151*** (-5.78)	-0.140*** (-5.46)
R&D/OPX		0.043 (0.51)	-0.099 (-1.16)	-0.143* (-1.69)
R&D/OPX <sup>2</sup>		-0.001 (-0.23)	0.007 (0.238)	0.009* (1.70)
LNSIZE			-0.092*** (-6.46)	-0.032* (-1.72)
R&DDES				0.014 (0.79)
AGE <sup>2</sup>				-0.021*** (-4.52)
Constant	8.557*** (16.14)	8.467*** (15.18)	7.017*** (11.81)	6.712*** (11.47)
Obs	800	796	783	783
R <sup>2</sup>	0.1451	0.1468	0.2083	0.2442
F-value	101.67***	34.06***	38.14***	31.12***

Note: \*\*\*, \*\*, and \* indicate significant levels at 1%, 5%, and 10%, respectively. The value of t is in parentheses.

From the R<sup>2</sup> and F values of the model (1)-model (4), R<sup>2</sup> is greater than 0.1, and the F values all pass the 1% significance test, indicating that the fit of the four models is good, and the regression results are overall Significant. However, R<sup>2</sup> of model (4) is 0.2442, which is higher than R<sup>2</sup> of other models. Therefore, model (4) has the best fitting degree, and the regression result of model (4) is selected to explain.

From the regression results of model (4), the regression coefficient of the main business income variable is -0.140, and it is significant at the level of 1%, indicating that the impact of the main business income on the number of textual R&D disclosures is significantly negative. The higher the main business income, the lower the R&D expenditure.

The regression coefficient of R&D expenditure as a percentage of operating cost is -0.143, and is significant at the level of 10%. At the same time, the regression coefficient of R&D expenditure as a percentage of the operating cost squared variable is 0.009, which is also significant at the 10% level, indicating that R&D The effect of expenditure on operating cost ratio on the number of textual R&D disclosures is a “U”-shaped curve relationship. The inflection point of the “U” curve is 7.944, that is, when the proportion of R&D expenditure to operating cost is less than 7.944, the higher the proportion of R&D expenditure to operating cost, the lower the number of textual R&D disclosures, and the R&D expenditure when the operating cost ratio is greater than 7.944. The higher the proportion of expenditure to operating costs, the higher the number of textual R&D disclosures.

The regression coefficient of the equity market value variable is -0.032, which is significant at the level of 10%, indicating that the impact of the equity market value on the number of textual R&D disclosures is significantly negative. The higher the equity market value, the lower the number of textual R&D disclosures.

The regression coefficient of the R&D disclosure year variable is 0.014, and the significance test is not passed. At the same time, the regression coefficient of the square of the R&D disclosure year is -0.021, which is significant at the level of 1%, indicating the impact of the number of R&D disclosure years on the number of textual R&D disclosures. It is an inverted “U” curve relationship. The inflection point of the inverted U-shaped curve is 0. Since the number of years of R&D disclosure is greater than 0, the larger the number of R&D disclosure years, the lower the number of textual R&D disclosures.



## Summary

R&D activities are an important source of company development and value, and an important consideration for investors investing in companies. This study provides a way for companies to respond to changes in current profitability by adjusting their textual R&D disclosures. Managers adjust textual R&D disclosures based on changing profitability and the changing information disclosure needs of investors. In addition, the paper finds that there is no evidence that managers in general will use this textual R&D disclosure to drive positive performance information.

In addition, the findings of this paper increase the market participants' understanding of the decision-making disclosure of corporate textual R&D. This is an important disclosure channel for communicating disclosures about corporate activities outside the company's financial statements. Although the findings in this paper may not be generalized to other areas, the unique characteristics of textual R&D disclosure are useful for filling market information and for investors' decisions.

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