Study on Environmental Disclosure Quality and Cost of Equity Capital
Li-ping SU and Xin-yue CHEN*
School of Economics & Management Inner Mongolia University of Science & Technology Baotou, Inner Mongolia P.R., China
*Corresponding author

Keywords: Environmental disclosure, Cost of equity capital, Chemical listed companies.

Abstract. This study examines the relationship between the quality of a firm’s environmental disclosure and cost of equity capital based on the sample of chemical listed companies. We measure environmental disclosure quality using a disclosure index consistent with the Global Reporting Initiative (GRI, 2006). In addition to overall disclosure quality, we consider the type (i.e., hard/soft) of the disclosure in our analysis by the multiple regression method. Our analyses provide evidence that environmental disclosure besides the soft and hard environmental disclosure is not significantly associated with the cost of equity capital.

Introduction
Nowadays the environmental pollution has become a livelihood issue. Environmental disclosure is imperative for the listed enterprises. Besides, environmental disclosure has an important policy background. However, the current environmental disclosure mainly is through mandatory means. Moreover, the environmental disclosure quality of the listed companies still needs to be improved. Simultaneously, enterprises with heavy polluting will cause a greater impact on the environment, and the chemical enterprises are mostly belonging to the heavy polluted enterprises. Therefore the chemical enterprises have a greater disclosure obligation.

We expect to find the relationship between the environmental disclosure and the firm value, which may help the enterprises to reveal the environmental information voluntarily, besides we choose the listed companies in the chemical industry. In a word, our study reexamines the relation between environmental disclosure quality (EDQ) and the cost of equity capital (COEC) based on the sample of chemical companies.

Literature Review and Development of Hypotheses

Literature Review
Our study builds on the prior and concurrent researches that present inconsistent results among the relation between them. For example, inconsistent with theory, Richardson and Welker (2001) document a significant positive association between CSR and the COEC for a sample of Canadian firms during the early 1990s.\textsuperscript{[1]} In contrast, Dhaliwal et al. (2011) find that firms with CSR performance superior to that of their industry peers enjoy a reduction in the COEC upon the initiation of standalone CSR reports.\textsuperscript{[2]} while Clarkson et al. (2013) fail to document a significant relation between EDQ and COEC but find that firms with higher EDQ report higher future return on assets.\textsuperscript{[3]}

Development of Hypotheses
The conclusions in this area are mixed. While studies consistently document that the relation might vary by the type of the disclosure (e.g., hard or soft)(e.g., Marlene Plumlee et al.).\textsuperscript{[4]} This leads to our hypotheses.

Hypothesis 1. EDQ is related to cost of equity capital.
Hypothesis 2. The association between EDQ and COEC differs by the type of disclosure.
Research Design

Variable Measurement

We use only one dependent variable in our analysis: \( R(\text{COEC}) \) is the implied cost of equity, calculated by using the PEG method.

\[
R = \sqrt{(\text{feps}_2 - \text{feps}_1)/p_0}
\]  

\( R \) is for COEC, \( \text{feps}_1 \) and \( \text{feps}_2 \) is the predicted earnings per share about the next two years, \( p_0 \) means price per share at the base period.

We form a series of related ED measures as the independent variables to test our hypotheses. To categorize and collect these data we use the index designed by and employed in Plumlee et al. (2015) (similar to the index used in Clarkson et al., 2013)(Table 1).[5] The measures are classified into two parts, HED (hard environmental disclosure) and SED (soft environmental disclosure). We complete the index using data hand-collected from firms’ environmental disclosures presented within a stand-alone report (frequently labeled a corporate environmental report or a Corporate annual report).

Table 1. Environmental disclosure index.

| Indicator System |
|------------------|
| 1. Structure of management and government (5 points) |
| 1.1 Install position of environmental management (0-1) |
| 1.2 Senior executive in the corporate social responsibility Committee (0-1) |
| 1.3 Environmental clause with customer or a supplier (0-1) |
| 1.4 Implement of ISO14001 (0-1) |
| 1.5 Contact between the management salary and environmental management performance (0-1) |
| 2. Dependability (6 points) |
| 2.1 Supply the stand-alone report such as social responsibility report (0-1) |
| 2.2 Stand-alone report verified by the Independent mechanism (0-1) |
| 2.3 Environmental performance assessment for regular inspections (0-1) |
| 2.4 Environmental projects with independent institutional certificates (0-1) |
| 2.5 Environmental performance with the mechanism of external incentive (0-1) |
| 2.6 Participate in the specific environment-protect associations (0-1) |
| 3. Environmental performance indicators (72 points) |
| 3.1 Energy efficiency (0-6) |
| 3.2 Water efficiency (0-6) |
| 3.3 Performance of greenhouse gas reduction (0-6) |
| 3.4 Performance of other gas reduction (0-6) |
| 3.5 Environmental performance of waste water discharge (0-6) |
| 3.6 Environmental performance of solid waste discharge (0-6) |
| 3.7 Environmental indicators of noise, light pollution, radiation, dust and etc. (0-6) |
| 3.8 Environmental performance of the recycling and cleaning of the pollution or waste (0-6) |
| 3.9 Environmental performance of working environment and surrounding ecological environment. (0-6) |
| 3.10 Environmental performance of optimal utilization of resources.(0-6) |
| 3.11 Environmental impact of enterprise products (including services)(0-6) |
| 3.12 Performance of environmental laws (0-6) |
| 4. Environmental expenditure (4 points) |
| 4.1 Statement of payment of pollution charges(0-1) |
| 4.2 The saving cost caused by spontaneous environmental protection (0-1) |
| 4.3 Expenses of environment protection (0-1) |
| 4.4 Punishment expenditure involved the environment (0-1) |
| Total hard environment disclosure |
| 5. Outlook and strategic statement (8 points) |
| 5.1 Statement of CEO on environmental protection for enterprise stakeholders (0-1) | (continue on next page) |
| Table 1 (continued) |
| 5.2 Exposition of the environmental policies, values, ideas and principles (0-1) |
| 5.3 Statement on the improvement of the environment in the process of production or service(0-1) |
| 5.4 Statement of environmental risks (0-1) |
| 5.5 Statement of the enterprise's regular commitment to environmental inspection and assessment(0-1) |
| 5.6 Statement of the measurable targets environmental protection in the future (0-1) |
5.7 Statement of green development of enterprises (0-1)
5.8 Statement of the invention and application of the specific green innovation (0-1)

6. Environment status (11 points)
   6.1 Brief description of the environmental laws and regulations (0-1)
   6.2 Project under construction through the environmental assessment (0-1)
   6.3 Statement of participation in specific environmental protection organizations (0-1)
   6.4 Statement of environmental disputes, complaints and lawsuits (0-1)
   6.5 Brief introduction to the situation of "three wastes" (0-1)
   6.6 Statement of operation of environmental protection facilities (0-1)
   6.7 Brief introduction of the recycling of "three wastes" (0-1)
   6.8 Brief introduction of the work energy saving and emission reducing (0-1)
   6.9 Brief introduction of the effect of the characteristics of the industry on the environment (0-1)
   6.10 Brief introduction of the effect of the product on the environment (0-1)
   6.11 Brief introduction of the comparison with other enterprises (0-1)

7. Spontaneous environmental protection behavior (5 points)
   7.1 Training of environmental management for employees (0-1)
   7.2 The establishment and operation of the environmental risk management system (0-1)
   7.3 Internal of mechanism environmental assessment (0-1)
   7.4 Internal environmental verification (0-1)
   7.5 Participation in social activities related with environment (0-1)

Total soft environmental disclosure
Total environmental disclosure

Note: the index system adopts the same weight rating system (0-1), Each item in the environmental performance indicators scores according to the following six items (0-1): (1) specific performance data. (2) comparison the performance data with the plan target. (3) the forms of absolute and relative number. (4) resolvable description of performance data. (5) comparative analysis of the previous data. (6) comparative analysis of competitor.

The article collects the data and materials.

We select the control variables: ROE, LEV and MB. Table 2 provides a detailed discussion of the variables included in our study. We do not choose the SIZE, because we find the size of chemical companies is basically identical. The control variables make a more accurate result for our research.

Table 2. Variable descriptions.

| Variable | Explanation |
|----------|-------------|
| R        | PEG method from equation (1) |
| ED       | Total scores according to the completed indicator system |
| HED      | Scores of hard environmental disclosures |
| SED      | Scores of soft environmental disclosures |
| ROE      | Return on income rate |
| LEV      | Debt to assets ratio |
| MB       | The total market value to the net assets ratio |

Note: the article collects the materials.

Regression Model

Our regression model focuses on the relation between EDQ and COEC. We employ the model detailed below, drawn from prior research (e.g., Clarkson et al., 2013):

\[ R = \alpha_0 + \alpha_1 ED + \alpha_2 \text{ROE} + \alpha_3 \text{LEV} + \alpha_4 \text{MB} + \varepsilon \]  (2)

We replace the ED with HED and SED to verify relations between the HED&SED and R. The equations are signed as (3) and (4).

\[ R = \alpha_0 + \alpha_1 \text{HED} + \alpha_2 \text{ROE} + \alpha_3 \text{LEV} + \alpha_4 \text{MB} + \varepsilon \]  (3)

\[ R = \alpha_0 + \alpha_1 \text{SED} + \alpha_2 \text{ROE} + \alpha_3 \text{LEV} + \alpha_4 \text{MB} + \varepsilon \]  (4)
Sample
The total number of chemical listed companies is 188, we exclude the special treated companies and the companies with incomplete data. Our study sample is 94. The data is hand-collected from Cninf and CSMAR.

Descriptive Analysis
Table 2 provides the descriptive analysis. We can conclude that the scores of environmental disclosure scores are quite low besides the HED and SED. The mean score of ED is only almost 6. Although the highest score is 23, the lowest is zero. The mean score of HED is 2.5 point lower than SHD. Moreover, we can find that the mean SED scores is more similar to the mean ED scores that means SHD is the main closure type in the chemical listed companies. The standard deviation of the Variables is quite low. The ROE, LEV and MB of the companies are concentrated, the LEV varies mostly, the highest is 71%, and the lowest is only 5%. The ROE is concentrate due to the sample of listed companies of chemical industry.

Table 3. Descriptive statistics.

| Variables | max  | min  | median | mean   | standard deviation |
|-----------|------|------|--------|--------|-------------------|
| R         | 0.167| 0.029| 0.084  | 0.086  | 0.031             |
| ED        | 21   | 0    | 5      | 5.862  | 5.09              |
| HED       | 11   | 0    | 1      | 1.766  | 2.60              |
| SED       | 13   | 0    | 4      | 4.117  | 3.25              |
| ROE       | 0.29 | 0.01 | 0.077  | 0.083  | 0.55              |
| LEV       | 0.71 | 0.05 | 0.291  | 0.312  | 1.70              |
| MB        | 22.21| 0.003| 4.116  | 4.860  | 3.12              |

Note: The data handled by EVIEWS.

Empirical Analysis
We use panel data in our analysis, which may result in residuals that are correlated across firms leading to bias in OLS standard errors (Petersen, 2009). Before the regression, data has no multiple linearity through the correlation test, which is the fundamental condition of the next regression analysis in our study.

Table 4 shows the regression results, The Adjusted R^2 is about 0.17 that means the method has general explanation ability. F statistics is passed by the level of 1%. The results separately examine the relationship between the ED (HED&SED) and COEC. There is no significant correlation between them. Moreover, the LEV also has no significant correlation with COEC. Lastly, the COEC has a positive correlation with the ROE but a negative correlation with the MB both by the level of 1%, which means that the higher ROE level, the higher cost of equity capital, and the higher MB level, the lower cost of equity capital.

Table 4. Regression results.

| C        | ED     | HED    | SED    | ROE    | LEV    | MB     | N   | Ad R^2 | F    |
|----------|--------|--------|--------|--------|--------|--------|-----|--------|------|
| (2)      | 0.0786*** (7.62) | 0.0007 (1.22) | 0.1537*** (2.83) | 0.0210 (1.15) | -0.0032*** (-3.13) | 94 | 0.1712 | 5.8029 |
| (3)      | 0.0777*** (7.63) | 0.0018 (1.57) | 0.1628*** (3.02) | 0.0218 (1.20) | -0.0031*** (-2.96) | 94 | 0.1801 | 6.1076 |
| (4)      | 0.0808*** (7.91) | 0.0006 (0.68) | 0.1530*** (2.78) | 0.0211 (1.15) | -0.0033*** (-3.25) | 94 | 0.1617 | 5.4861 |

Note: ***, ** and * respectively represent the significance of 1%, 5% and 10%, t value in the brackets.

Discussion
As shown in the table 3, the total scores of environmental disclosure are quite low and the hard environmental disclosure is lowest. The reasons are as follows. The chemical listed companies concentrate on the profit not the environment, the soft environmental disclosure is easier than the hard which is complex and probably problematic. Besides the relevant departments have no
compulsive demand on the environmental disclosure especially on the hard environmental disclosure.

We can analyze from the table 4. There is no significant correlation between the ED (HED and SED) and COEC. The result is different from the most literature which shows a negative relation. The reasons are probably that the heavy polluted enterprises are compelled to disclosure, while the cost of equity capital of these enterprises is high. Besides, it is related to the special domestic capital market. The domestic capital market has only over 20 years history, the institution construction is imperfect and the maturity of market is still not enough. And the practice of environmental disclosure of the listed companies is not abundant and the related institution needs to be promoted. The cognition and reconciliation of the market on the environmental disclosure of the listed companies are limited. The lack of authoritative data from the third party results in the negative interpretation. The participants in the Chinese capital market need to make their continuous efforts to improve the maturity of the capital market.

Summary

The environmental disclosure quality including the hard and soft environmental disclosure is quite low on the whole. But the scores vary among the chemical listed companies. The mean score of hard environmental disclosure is lower than the soft disclosure, and the standard deviation is smaller than the soft closure. The companies prefer the soft disclosure. Hard environment disclosure is still more sensitive to the listed companies. Many companies do not reveal the hard environmental disclosure in order to avoid the negative interpretation by the market.

The study on the chemical listed companies does not have the effect of cost of equity capital. It also can not examine the effect no matter through the total environmental disclosure or the divided environmental disclosure (soft and hard). Our result is not consistent with most prior research where the results are negative correlation between the environmental disclosure and the cost of equity capital. There are the reasons as follows. The index systems of environmental disclosure and the estimation methods of cost of equity capital probably are different.

References

[1] Richardson A J, Welker M. Social Disclosure, Financial Disclosure and the Cost of Equity Capital[J]. Accounting, Organizations and Society, 2001, 26,(7): 597-616.

[2] Dhaliwal, D., Li, O., Tsang, A., Yang, Y. Voluntary nonfinancial disclosure and the cost of equity capital: the initiation of corporate social responsibility reporting[J]. Accounting review, 2011, 86 (1): 59-72.

[3] Clarkson P M, Fang X, Li Y, et al. The Relevance of Environmental Disclosures: Are Such Disclosures Incrementally Informative?[J]. Journal of Accounting and Public Policy, 2013, 32(5): 410-431.

[4] Plumlee, Marlene A, Marshall, et al. The impact of voluntary environmental disclosure quality on firm value[J]. Academy of Management Proceedings. 2009: 1-6.

[5] Plumlee, M., Brown, D., Hayes, R. & Marshal, S. Voluntary Environmental Disclosure Quality and Firm Value: Further Evidence[J]. Journal of Accounting and Public Policy. 2015, (34): 336-361.

[6] Petersen, M. Estimating standard errors in finance panel data sets: comparing approaches. Review Finance Study[J], 2009, 22 (1): 435-480.