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Corporate Social Responsibility and Financial Performance From Chinese Consumers Perspective: Application of Value Engineering Theory

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Abstract

Based on the perspective of consumers and the method of value engineering, this paper uses "CSR expectation deviate level" to measure corporate social responsibility, and discusses the influence of corporate social responsibility on financial performance and its action path. This paper collected the questionnaire survey data of 878 consumers and the panel data of 98 listed companies from 2009 to 2012. The empirical results show that: (1) Consumers pay more attention to products and services, charity, environmental protection and their responsibilities to employees, and less attention to their responsibilities to shareholders or creditors and partners; (2) Corporate social responsibility is negatively correlated with financial performance, and corporate marketing ability plays a moderating role in it. That is, the smaller the gap between the level of corporate social responsibility fulfilled by enterprises and consumers' expectations, the better the financial performance of enterprises, which also reminds enterprises that they need to rationally allocate corporate social responsibility resources and constantly cultivate their own marketing capabilities, so as to better meet the level of corporate social responsibility expected by consumers. The value engineering method quantifies consumers' value perception of corporate social responsibility, which has a certain practical guiding role. Of course, there are some limitations in this paper, and future research can further explore the potential impact mechanism.

Key words: Corporate Social Responsibility, CSR expectation deviate level, Financial Performance, Value Engineering, Consumers perception

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1. Introduction

Corporate social responsibility (CSR) is one of the important ways for organizations to gain competitive advantage by demonstrating good corporate behavior (Kamran, Pantamee, Patwary, Ghauri, Long, and Nga, 2021). With the intensification of competition, government regulation and expectations from various market forces, CSR has gradually become the focus of contemporary business practice (Khojastehpour and Shams, 2020; Thøgersen and Alfinito, 2020). After the 1960s, western developed countries began to pay attention to CSR, and in the 1980s, a wave of CSR was set off. Consumers gradually turned from focusing only on the quality of products to focusing on CSR in many aspects (Huang and Chen, 2015). Although the research in the field of CSR in China started late, interest entities such as government, enterprises and consumers have gradually paid a lot of attention. According to a preliminary consumer surveys on social responsibility of Chinese enterprises in 2006, more than 80% of respondents focus on corporate social responsibility (Jin and Li, 2006). However, this is in contradiction with the current situation that there are differences in the degree and form of domestic enterprises' social responsibility.

Consumers are the most important stakeholders of enterprises, which can promote enterprises to actively fulfill their corporate social responsibilities (Ye, Yang, and Mao, 2021). However, when enterprises lack social responsibility, it will reduce consumers' trust and be punished by the market (Zhang and Wang, 2022). For example, in 2021, Erke won consumers' appreciation for donating 50 million yuan of materials to the flood-stricken areas in Henan, and its sales increased steadily. In 2011, Shuanghui Group was boycotted due to the "Clenbuterol" incident, and its share price plummeted. It can be seen that consumers will give support to positive corporate social responsibility activities, while enterprises lacking social responsibility will take boycott measures. Therefore, in the research on CSR and financial performance, most scholars believe that the strong demand of consumers for CSR will positively affect the financial performance of enterprises (Li, Wang, and Qing, 2018; Ghanbarpour and Gustafsson, 2022). However, there are few studies to measure consumers' perceived value of CSR, which leads to the gap between theory and practice.

In consequence, it has important theoretical and practical significance to provide more operational social responsibility theory research results and practical approach, to help the enterprises make reasonable use of social responsibility resources and to obtain rewards from

them, which is exactly the research purpose of this paper.

1.1 Research on CSR in Marketing Field

1.1.1 Research centered on consumers behavior

In the research centered on consumers behavior, the existing research mainly focuses on consumers' positive reactions (such as purchase, satisfaction and loyalty) (Baskentli, Sen, Du, and Bhattacharya, 2019) and negative reactions (such as questioning product price increase) (Habel, Schons, Alavi, and Wieseke, 2016). For example, Wei, Kim, Miao, Behnke, and Almanza (2018) pointed out that a higher level of CSR will stimulate consumers' stronger willingness to buy and pay a premium. Ghanbarpour and Gustafsson (2022) pointed out that consumers' positive perception of CSR does not directly affect financial income, but it will affect financial income through customer satisfaction, and emphasized the importance of conveying corporate social responsibility activities to consumers. Lee and Haley (2020) pointed out that the age of consumers will affect their views on corporate social responsibility initiatives. Generally speaking, young consumers are more likely to respond positively to corporate social responsibility advertisements than older consumers. On the contrary, Nickerson, Lowe, Pattabhiramaiah and Sorescu (2022) pointed out that corporate social responsibility activities focusing on charity will damage sales.

1.1.2 Research centered on enterprise strategy.

In the research centered on enterprise strategy, the existing research mainly focuses on the relationship between corporate social responsibility and enterprise performance (Du, Bai, and Chen, 2019), shareholder wealth (Mishra and Modi, 2016), enterprise innovation (Broadstock, Matousek, Meyer, and Tzeremes, 2020) and enterprise employees (Schaefer, Terlutter, and Diehl, 2019). For example, Mishra and Modi (2016) pointed out that the relationship between CSR and stock return itself is not significant, and only when the complementary role of marketing ability and CSR is considered, it has a significant positive effect on stock return. Xiao, Yang, and Ling (2022) pointed out that CSR is positively related to green technology innovation. Liang and Liu (2022) pointed out that CSR can alleviate the financing constraints of enterprises, and then promote green technology innovation. Yan, Qi, Xie, and Gong (2022) pointed out that employees' perceived CSR is positively related to job prosperity. Pfajfar,

Shoham, Malecka, and Zalaznik (2022) pointed out that in order to maximize the quality of relationship marketing, CSR should be aimed at specific stakeholders, such as consumers and employees, rather than the whole society.

Sorting out the previous literature, (1) In the study of corporate social responsibility and consumers behavior, the response of corporate social responsibility to consumers behavior is mainly discussed from a micro perspective, and few studies have discussed the impact of corporate social responsibility perceived by consumers. (2) In the study of corporate social responsibility and strategy, the relationship between corporate social responsibility and corporate performance is mainly discussed. Therefore, this paper wants to know whether and how consumers' perceived corporate social responsibility has an impact on corporate performance.

1.2 Value engineering method

Value engineering (VE) requires the creation of necessary functions or quality through the lowest cost or consumption, and it is an activity to seek the best economic effect (Yang, 1981). Generally speaking, the higher the value, the better the product, the more necessary functions and the lower the total cost of obtaining the corresponding functions. Low-value products need value engineering improvement. The formula is shown as follows:

$$\text{Value } (V) = \frac{\text{Essential functions of an object } (F)}{\text{Life} - \text{cycle cost for obtaining these functions } (C)} \tag{1}$$

Function evaluation is a significant step of functional analysis and the central link in the whole value engineering activities, function evaluation coefficient method is adopted generally. The calculation of value coefficient with function evaluation coefficient method refers to quantitate function (F) and cost (C) according to the proportion. In other word, the proportion of total functionality becomes the function evaluation coefficient of this function, and the proportion of certain function cost in total function cost is cost evaluation coefficient. At this time, the formula of value coefficient is shown as follows:

$$V_i = \frac{F_i}{C_i} \tag{2}$$

In the above formula: V_i refers to the value coefficient of i function (or components); F_i refers to the function coefficient of i function (or components); C_i and refers to cost coefficient of i function (or components). According to the above formula, the function evaluation usually has the following three situations:

(1) When V_i=1, it indicates that C_i=F_i, namely the actual cost of function realization is consistent with function evaluation value of target cost, which is an ideal situation.

(2) When V_i<1, it shows that C_i>F_i, namely the actual cost of function realization is higher than function evaluation value, its cost should be decreased, and the value should be increased purposefully.

(3) When V_i>1, that is C_i<F_i, under such circumstance, it should inspect that whether the function evaluation value is proper, if Fi is too high, Fi value should be decreased; while if F*i* is reasonable, the reasons for low Ci should be checked. If the low function actual cost C*i* isn't caused by insufficiency of function, the function should be improved to meet the demand.

To sum up, the complete implementation steps of value engineering are as follows: (1) calculating the functional coefficient through functional scoring; (2) calculate the cost coefficient according to the cost situation; (3) calculating the value coefficient; (4) select the object of value engineering improvement; (5) give the improvement plan and implement it; (6) evaluate and analyze the implementation effect.

A product was selected as an example for actual operation in this paper, to illustrate it more veritably. It was assumed that this product had four parts, which had corresponding four functions (A_1, A_2, A_3, and A_4) respectively. The improvement object of value engineering would be selected, the specific practice was shown as follows:

(1) Calculation of functional importance coefficient

According to 0-1 scoring method in the forced decision method, the functions should be evaluated by 5-15 attended persons who were familiar with the products. In addition, they should also be scored through comparison and on the basis of importance degree, the most important one obtained one point, the less important one obtained 0 point, the same function cannot be scored through comparison. The score for functional importance given by one expert was shown in Table 1. Then, the scores of all the experts would be synthesized, to obtain the summary sheet in the following Table 2.

<Table 1> Score of An Expert on Function (Components)

Function	A_1	A_2	A_3	A_4	Total Score
A_1	−	1	1	0	2
A_2	0	−	1	0	1
A_3	0	0	−	0	0
A_4	1	1	1	−	3
Total	1	2	3	−	6

<Table 2> Scores of All Experts on Function (Components)

Function	1	2	3	4	5	6	7	Total Score	Average coefficient of functional importance
A_1	2	1	2	2	1	2	1	11	0.262
A_2	1	1	0	1	1	1	0	5	0.119
A_3	0	2	1	1	1	1	2	8	0.190
A_4	3	2	3	2	3	2	3	18	0.429
Total	6	6	6	6	6	6	6	42	1.0

0-4 scoring method could be adopted, to avoid the absolutization of 0-1 scoring method. In other word, when the comparison was carried out against two parts or functions, the scoring range was expanded to 0-4 points, to cover importance degree of each function during the whole product, and to obtain more detailed grade.

(2) Calculation of cost coefficient

Its method and steps were to calculate the cost- values of each parts respectively, then obtain the total cost through adding together; finally, the cost value of parts should be divided by total cost respectively, the specific method should be implemented as the following equation:

$$\text{Cost coefficient } C_i = \frac{\text{Cost value of function unit}}{\text{Total cost}} \tag{3}$$

(3) Calculation of value coefficient

The calculation formula of the value coefficient is as shown above. As can be seen from Table 3, the value coefficients of A_2 and A_3 are obviously less than 1, which is the object of value engineering improvement.

<Table 3> Value Coefficient

Function	Functional Importance Coefficient(F_i)	Cost(Yuan)	Cost Coefficient (C_i)	Value Coefficient (V_i)
A1	0.262	30	0.167	1.569
A2	0.119	40	0.222	0.536
A3	0.190	50	0.278	0.683
A4	0.429	60	0.333	1.288
Total	1.0	180	1.0	−

1.3 brief summary

The main research purposes of this paper are: (1) bringing consumer expectations into the study; (2) based on the value engineering method, a new variable "CSR expectation deviate level" is constructed to measure the level of corporate social responsibility and verify its impact on financial performance; (3) looking for boundary conditions; (4) based on the value engineering method, provide feasible improvements and solutions for enterprises.

The main ideas of applying value engineering to the study of corporate social responsibility in this paper are as follows: (1) From the perspective of consumers, we regard different dimensions of corporate social responsibility as different functions, regard consumers as scoring experts, and let consumers score functions, so as to understand the gap between the current situation of corporate social responsibility and consumers' expectations through quantitative methods; (2) A new variable "Corporate Social Responsibility Expectation Deviation Level" is constructed, and the calculation method of value coefficient is adopted. The value coefficient is equal to the function coefficient divided by the cost coefficient. In this paper, the function coefficient is obtained by reverse item processing, and the function coefficient remains unchanged. Therefore, the value coefficient measures the deviation level, and the greater the deviation level, the greater the gap between corporate social responsibility and consumer expectations.

Furthermore, the expectation deviation level of unilateral social responsibility and that of general social responsibility should be separated by us. Particularly, the expectation deviation level on unilateral social responsibility was targeted at unilateral content of social responsibility, for instance, the expectation deviation level of product service responsibility and the expectation deviation level of philanthropic responsibility. The deviation coefficient of the

above unilateral social responsibility could evaluate functional value coefficients calculated by V=F/C through value engineering function, its division value was 1. When V < 1, the smaller V means that the social responsibility of an enterprise is higher than consumers' expectations. When V > 1, the greater V means that the social responsibility of an enterprise is lower than consumers' expectations. However, the expectation deviation level of total social responsibility meant the sum of all unilateral content of social responsibilities, representing the overall expectation deviation level of CSR, which is recorded as TV, and its division value was not 1. The bigger the TV, the bigger the gap between the fulfillment of corporate social responsibility and consumers' expectations. In this paper, the impact of deviation level of general social responsibility would be studied, while the deviation level of unilateral social responsibility would be taken into consideration during improving case design. Therefore, in terms of the expectation deviation level of overall social responsibility, “the expectation deviation level of total social responsibility” would be applied to distinguish clearly. However, as for the expectation deviation level of certain aspect, it would be expressed integrating the social responsibility of this content, for instance, the expectation deviation level of philanthropic responsibility. See Table 4 for new concept description summary.

2. Research hypothesis

2.1 Expectation deviation level of general social responsibility and financial performance of enterprises

At present, most scholars at home and abroad support that the perceived value obtained by consumers from corporate social responsibility will positively affect financial performance (Ghanbarpour and Gustafsson, 2022). Mainly discussed from the following reasons:

First, if enterprises carry out social responsibility activities in areas that consumers attach importance to or are closely related to, then consumers' purchase intention will be significantly higher than that in unrelated areas (Tencati, Perrini, and Pogutz, 2004), thus affecting the financial performance of enterprises. For example, Avotra, Ye, Xu, Jiang, and Marcelline (2021) divide CSR into economic legal category, charity category and ethics category, and its research results show that when enterprises carry out charitable corporate social responsibility,

consumers have higher purchase intention.

Second, the personal characteristics of consumers will affect the positive output of CSR. The more recognized and trusted the content of CSR, the greater its positive output (Sen and Bhattacharya, 2001). For example, CSR will affect consumers' loyalty and reputation by enhancing their sense of identity with the organization (Vieira, Wolter, Araujo, and Frio, 2023).

Third, the higher the corporate social responsibility, the more likely it is to produce loyal consumers, who will not only buy the company's products or services at a "premium", but also recommend them to friends (Kim, Yin, and Lee, 2020), thus generating a positive word-of-mouth effect. It can be seen that when CSR expectation deviate level is lower, consumers are more likely to have purchasing behavior or premium purchasing behavior, which is conducive to improving the financial performance of enterprises. Therefore, the hypothesis is given:

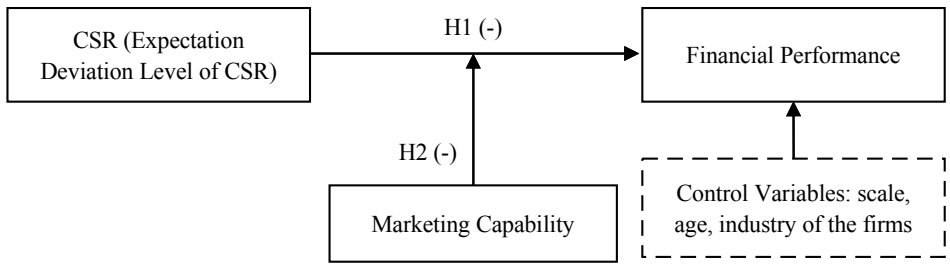
H1: Expectation deviation level of CSR was negatively correlated to financial performance of the enterprise.

2.2 Adjustment function of enterprise' s marketing capability

Enterprise's marketing ability is the integration of enterprises' market perception, customer demand and channel combination by using tangible and intangible resources, which helps enterprises to respond quickly to the market and gain competitive advantage (Day, 1994). In the dynamic market environment, marketing ability can transform enterprise assets into customer value, thus helping to enhance the competitive advantage of enterprises (Day, 2011).

Marketing ability includes pricing ability, distribution ability and marketing communication ability, etc (Kemper, Schilke, Reimann, Wang, and Brettel, 2013). Enterprises with strong marketing capabilities can deliver corporate news to consumers in a targeted manner and establish a responsible image. When consumers get positive perception from social responsibility activities, they will make positive attribution to other behaviors of enterprises (such as new product research and development), and then produce positive attitudes and behavioral intentions (Andreu, Casado-diaz, and Mattila, 2015; Gu and Ouyang, 2017), which will help improve the financial performance of enterprises.

However, when there is a gap between the level of corporate social responsibility undertaken



< Figure 1> Research Model

by enterprises and the level of corporate social responsibility expected by consumers, this gap will bring contradictions to consumers. Contradictory attitude will make it difficult for consumers to make purchase decisions (Lin and Yang, 2020).Because when the three components of attitude are not harmonious, emotion will occupy the main position and determine the behavior tendency, which will not only reduce the possibility of consumers buying products, but also reduce consumers' satisfaction and loyalty (Olsen, Wilcox, and Olsson, 2005). Therefore, the hypothesis is given:

H2: The marketing ability of enterprises has enhanced the negative correlation between the deviation level of total corporate social responsibility expectations and financial performance.

The research model in this paper was shown in Figure 1:

3. METHODS

3.1 Variables definition and measurement

3.1.1 Content and index determination of CSR

The dimensions of corporate social responsibility can be divided according to "Normalism" and "Empiricism". "Normalism" refers to the CSR dimension derived from normativeness, which mainly includes environmental responsibility, charitable responsibility and product responsibility (Carroll, 1979; Mai, Kuang and Zhang, 2012; Qi, Li, and Shang, 2017). "Empiricism" refers to CSR-related issues summarized from practical experience, mainly

including the responsibility of enterprises to stakeholders (Turker, 2009; Qi, Li, and Shang, 2017). Therefore, combined with the scale developed by scholars in the past, this paper selects six dimensions of CSR, namely: products and services, charity, environmental protection, employees, shareholders and creditors and partners.

3.1.2 Measurement of the actual performance of CSR

Through the first questionnaire inquiry, we obtained four dimensions of CSR concerned by consumers, hence the CSR was evaluated in this paper from four aspects, the evaluation indexes mainly refer to the articles written by Kou Xiaoxuan (2012), Wen Subin and Fang Ruan (2008). It needed to indicate that the CSR indexes would be applied to the check computation of cost coefficient in value engineering, which was not the final independent variable. (1) Product and service responsibilities: measured by "R&D operating cost rate"; (2) Philanthropic responsibility: measured by "social endowment expenditure rate"; (3) Environmental protection responsibility: measured by "environmental cost expenditure rate"; (4) Responsibility to employees: measured by "employee profitability".

3.1.3 Measurement of enterprise' s marketing capability

Through data envelopment analysis (DEA), the effectiveness of using the MaxDEA5.0 software to analyze the conversion of marketing activity inputs (sales expenses, intangible assets, accounts receivable costs, and revenue growth rates) into marketing outputs (operation revenue) by enterprises. Meanwhile, the index of input-output observations as measuring enterprise’s marketing capability could be obtained (Nath, Nachiappan, and Ramanathan, 2010).

3.1.4 Financial performance

Return on assets (ROA) and return on equity (ROE) were adopted to be used as financial performance indicators (Luo, Kuang, and Shen, 2019).

3.2 Data collection and sample description

The data used in this paper consisted of two parts: Firstly, the relevant evaluation data of consumers on CSR was used to calculate the functional coefficient of enterprise social value in value engineering method; secondly, secondary data about the social responsibility fulfilled by

listed companies, which could be used to calculate cost coefficient of social responsibility fulfilled by companies and correlated variables for verifying model assumptions. The data of these two parts were collected with different method, of which consumers' data were obtained with questionnaire method, while the secondary data of listed companies were obtained from the published annual report. In condition of all factors, the seven industries consisting of real estate, petrochemical engineering, automobile manufacturing, textile and garment industry, pharmaceutical manufacturing, electronic manufacturing and food and beverage were selected for research.

3.2.1 Consumers' data collection and sample description

Based on the four dimensions of CSR obtained in the first round of questionnaire, consumers are asked to evaluate and score the four dimensions of CSR in a certain industry in the second round of questionnaire, and the score range is 1-5 points. 5 points means that dimension A_1 is much more important than dimension A_2. 4 points indicates that dimension A_1 is slightly more important than dimension A_2. 3 points represents dimension A_1 and dimension A_2 are of the same importance. 2 points means dimension A_1 is slightly less important than dimension A_2. 1 indicates that dimension A_1 is much less important than dimension A_2.

According to the research requirement of this paper, we prepared 7 sets of questionnaires for 7 industries, and each set of questionnaires was distributed in the same amount. In addition, the respondents were randomly assigned to each industry, to answer only one questionnaire. In the second survey, 980 questionnaires were distributed totally, 140 for each industry, and 938 were returned, including 878 effective questionnaires, so the efficiency could reach up to 93.60%. Specifically, the efficiency of questionnaire in each industry was more than 90%. The majority of interviewees were 21 to 30 years old (70.8%), of which the majority have bachelor's degree or above (99.5%), meanwhile, the proportion of women was slightly higher (61.7%).

3.2.2 CSR data collection and sample description

The sample was screened as the following principles: (1) the rejected enterprises with poor operation performance were labelled as ST, *ST, S*ST, SST and PT marks, and the listed companies that had been certified by a certified public accountant as having qualified opinion, refused to express opinions, adverse opinion and other auditing opinions; (2) the samples of listed companies with incomplete annual index data were removed; (3) According to 6σ

<Table 4> Basic Information of Listed Companies in Seven Industries

Items		Numbers	Proportion	Items		Numbers	Proportion
Nature of holding	State-owned	42	42.9%	Industries	Automobile	10	10.2%
	Non-state	56	57.1%		Petrochemical	46	46.9%
Enterprise age (Count to 2012)	≤5 years	3	3.1%		Textile and garment	5	5.1%
	6-10 years	11	11.2%		Electronics manufacturing	8	8.2%
	11-15 years	49	50.0%		Medicine manufacturing	14	14.3%
	16-20 years	29	29.6%		Food and beverage	12	12.2%
	＞20 years	6	6.1%		Real estate	3	3.1%
Listing board	Shenzhen motherboard	19	19.4%	Enterprise scale (in 2012)	≤20 billion yuan	28	28.6%
	Shanghai motherboard	38	38.8%		20-100 billion yuan	56	57.1%
	Small and medium-sized/ start-ups	41	41.8%		＞100 billion yuan	14	14.3%

principle, the samples with extreme value were deleted; (4) the small and medium enterprise board, and GEM samples that were listed after 2009 but had complete data were reserved, in order to ensure sample quantity. After screening on the basis of the above standard, we obtained panel data for four years of 98 companies from 2009 to 2012. All the data were derived from http//www.cninfo.com.cn, CSMAR and RESSET. The basic information of the samples of listed companies was shown in Table 4:

4. RESULTS

4.1 Data processing

4.1.1 Calculation of functional importance coefficient

Step one, the score of the second questionnaire was completed through reverse item processing (the scores of corresponding items in six questionnaires);

<Table 5> Consumers' Evaluation of the Importance of Corporate Social Responsibility in Seven Industries

Industries	Total score of product and service responsibility (S1)	Total score of philanthropic responsibility (S2)	Total score of environmental protection responsibility (S3)	Total score of responsibility to employees (S4)	Sum (TS)	Numbers of people who give the scores
Automobile	1007	459	750	688	2904	121
Petrochemical	857	498	885	640	2880	120
Textile and garment	864	483	838	719	2904	121
Electronics manufacturing	1143	467	704	758	3072	128
Medicine manufacturing	1189	428	751	680	3048	127
Food and beverage	1157	427	791	649	3024	128
Real estate	1170	556	761	705	3192	133

Step two, the scores of social responsibilities content of the same enterprise in each questionnaire after processing were added, to obtain the scores of respondents to the questionnaire (consumers) for the importance of CSR content; then the scores of each questionnaire and CSR content were also processed, to make a summary;

Step three, the questionnaire in each industry should be processed successively, to summarize the scores of each consumer on four aspects of CSR content, the total score was shown in Table 5.

Then, calculate the functional importance coefficient according to the following formula:

$$F_i = \frac{\text{Total scores of importance for certain aspect of CSR } Ai}{\text{The sum of total scores of importance of all aspects of CSR } TA} \quad (4)$$

In the above formula, i=1, 2, 3 and 4, which represented the content of four aspects of CSR. F1 represents the functional importance coefficient of product and service responsibility; F2 represents the functional importance coefficient of philanthropic responsibility; F3 represents the functional importance coefficient of environmental protection responsibility; F4 stands for the importance coefficient of employee responsibility function.

After calculating as the above formula, the functional importance coefficient of the content of four aspects in seven industries, namely F1, F2, F3 and F4 could be obtained, as shown in Table 6.

<Table 6> Functional Importance Coefficient of CSR in Seven Industries

Industries	F1	F2	F3	F4	Total
Automobile	0.347	0.158	0.258	0.237	1.0
Petrochemical	0.298	0.173	0.307	0.222	1.0
Textile and garment	0.297	0.166	0.289	0.248	1.0
Electronics manufacturing	0.372	0.152	0.229	0.247	1.0
Medicine manufacturing	0.390	0.140	0.246	0.223	1.0
Food and beverage	0.383	0.141	0.262	0.215	1.0
Real estate	0.367	0.174	0.238	0.221	1.0

4.1.2 Calculation of cost coefficient

The cost in this paper referred to the one that enterprises invested in fulfilling all aspects of social responsibility. Although the cost of all aspects couldn't be counted completely, it would also have better representation effect through calculation based on certain indexes. The indexes selected in this paper were shown in Table 7:

In view of different order of magnitudes of evaluation index for the content of all aspects of CSR, the cost coefficient calculated with actual index value directly couldn't reflect the importance that enterprises attached to a certain aspect of social responsibility (or cost investment). Hence, un-dimensioned of data in SPSS clustering analysis was used for reference in this paper for making indexes being dimensionless, the processing formula was as follows:

$$X_i = \frac{xi}{\delta i} \tag{5}$$

<Table 7> Cost Accounting Indicators and Calculation Methods of Different Aspects of Corporate Social Responsibility

Type of Social responsibility	Name of index	Calculating method
Product service responsibility	R&D-operating cost rate c1	(Operating costs+ R&D expenditures-employee compensation)/ operation revenue
Philanthropic responsibility	Social endowment expenditure rate c2	Social donation expenditures/ main business income
Environmental protection responsibility	Environmental cost expenditure rate c3	Environmental protection expenditures/Total revenue of main business
Responsibility to employees	Employee profitability c4	Cash paid to and for employees / Total revenue of main business

In the formula: was variable index after processing, referred to original variable index and referred to the standard deviation of the original variable index.

The indexes after non-dimensionalization were represented by c1, c2, c3 and c4, the cost coefficient was calculated as the following formula:

$$\text{Cost coefficient } Ci = \frac{\text{Functional unit cost value } ci}{\text{Total cost } \sum_{i=1}^{4} ci} \tag{6}$$

In the formula: i=1, 2, 3 and 4; the functional unit cost value ci meant the cost investment for fulfilling CSR of certain responsibility, which was represented by new variable index after standard deviation treatment; the total cost was the sum of new variable index (c1+c2+c3+c4).

Since the panel data was used in this paper, the cost coefficient per year should be calculated respectively, and the basic information of cost coefficient of sample enterprises was shown in Table 8:

4.1.3 Calculation of value coefficient

After calculating the functional importance coefficient of CSR and cost coefficient, the corresponding value coefficient of CSR could be calculated, namely “expected deviation coefficient of CSR” mentioned as above. Due to using panel data, the value coefficient per year was calculated, and the basic information was shown in Table 9, the formula used was as follows:

$$\text{Value coefficient } V_{\text{i}} = \frac{\text{Functional importance coefficient } Fi}{\text{Cost coefficient } Ci} \tag{7}$$

<Table 8> Basic Information of Cost Coefficient of Sample Enterprises

Years	Items	C1	C2	C3	C4
2009	mean value	0.356	0.059	0.066	0.519
	standard deviation	0.236	0.082	0.083	0.289
2010	mean value	0.354	0.059	0.071	0.516
	standard deviation	0.250	0.094	0.083	0.285
2011	mean value	0.420	0.055	0.071	0.456
	standard deviation	0.215	0.091	0.088	0.230
2012	mean value	0.355	0.070	0.078	0.497
	standard deviation	0.207	0.110	0.098	0.266

<Table 9> Basic Information of Value Coefficient of Content of 4 Aspects of CSR per Year

Years	Items	V1	V2	V3	V4
2009	mean value	1.597	31.679	32.171	0.946
	standard deviation	1.461	71.550	80.992	1.201
2010	mean value	1.604	66.131	27.682	0.875
	standard deviation	1.420	154.685	68.425	1.018
2011	mean value	1.157	67.367	25.103	0.875
	standard deviation	1.043	151.197	39.903	0.985
2012	mean value	1.413	39.663	31.580	0.839
	standard deviation	1.295	89.159	65.266	0.928

In the formula: i=1, 2, 3 and 4, which represented the four aspects of social responsibility respectively.

According to Table 9, it could be seen that the value coefficient of employee responsibilities was positively correlated with expectation deviation level of social responsibility, which indicated the social responsibility fulfilled by enterprises approached the expectation of consumers, or the former exceeded the later. However, the expected deviation coefficient of philanthropic responsibility and environmental protection responsibility was relative high, showing that social responsibility level fulfilled by the enterprises was lower than consumers' expectations and attention to these two aspects.

4.2 Data analysis

4.2.1 Description of variable selection

(1) Dependent variable. Total return on assets (ROA) and return on equity (ROE) are selected to measure financial performance. Where ROA= (total profit + financial expenses)/total assets, and ROE= net profit/balance of shareholders' equity.

(2) Independent variables. The expectation deviation level of total social responsibility (TV) = V1+V2+V3+V4.

(3) Regulated variable. For the marketing capability which was regarded as moderator, the indexes of secondary data were adopted for calculation.

(4) Control variables. ①Enterprise age: calculate the age of the enterprise from 2009 to 2012; ② Enterprise nature: the value of state-owned holding is 1, otherwise it is 0; ③Time to market:

calculate the time to market from 2009 to 2012 respectively; ④Enterprise scale: measured by the total assets at the end of the period (in units of 1 billion); ⑤Listing plate: enterprise listing market plate, the main board market is assigned 1, and the growth enterprise market of small and medium-sized board is 0; ⑥Enterprise industry: the industry to which the enterprise belongs, and 6 dummy variables are set in 7 industries.

4.2.2 Regression of control variables

Luo and Bhattacharya (2006) was adopted in this paper, the regression of dependent variable and control variable was conducted firstly, then the non-standard residuals after regression should be preserved as substitute variable of dependent variable (ROA and ROE), to be used for regression of panel data. R-ROA and R-ROE were used in below for convenience. The regression results of control variables were shown in Table 10, its results showed that the control variables (including firm property, listing time, industry 3 and 4) had significant influence on dependent variables, meanwhile, this influence should be controlled and removed.

<Table 10> Regression Results of Control Variables

Variables	DV：ROA			DV：ROE		
	Regression coefficient	T-test Value	P Value	Regression coefficient	T-test Value	P Value
Age	-0.069	-1.145	0.253	0.002	0.028	0.978
Owner	-0.247**	-4.499	0.000	-0.177**	-3.132	0.002
Time	-0.345**	-3.412	0.001	-0.370**	-3.559	0.000
Size	0.050	0.937	0.349	0.076	1.386	0.167
Mtype	0.126	1.285	0.200	0.117	1.156	0.248
Industry1	-0.025	-0.423	0.672	-0.040	-0.655	0.513
Industry2	0.004	0.080	0.936	0.104*	1.909	0.057
Industry3	-0.188**	-3.403	0.001	-0.141**	-2.476	0.014
Industry4	-0.160**	-2.138	0.033	-0.180**	-2.332	0.020
Industry5	0.004	0.059	0.953	0.077	1.235	0.217
	0.240**	3.787	0.000	0.155**	2.373	0.018
	Adjust R^2=0.156, F=7.592			Adjust R^2=0.107, F=5.269		

Note: industry1-industry 6 denoted that 1 was dummy variables of electronics, real estate, textile and garment, chemical, automobile, food and beverage industries; *p<0.1, **p<0.05

<Table 11> Variables Annual Descriptive Statistics

Years	Items	ROA	ROE	R-ROA	R-ROE	TV	MC
2009	mean value	0.089	0.123	0.013	0.045	66.393	0.420
	standard deviation	0.084	0.188	0.074	0.171	110.345	0.278
2010	mean value	0.072	0.076	0.0002	-0.002	96.291	0.503
	standard deviation	0.060	0.214	0.056	0.207	166.064	0.303
2011	mean value	0.067	0.083	-0.0003	0.005	94.502	0.505
	standard deviation	0.048	0.073	0.048	0.074	163.544	0.296
2012	mean value	0.050	0.030	-0.013	-0.048	73.496	0.462
	standard deviation	0.075	0.180	0.069	0.173	116.900	0.269

4.2.3 Descriptive statistics of variables

Variable descriptive statistics would report annual mean and standard deviation of each variable, as shown in Table 11. Furthermore, four variables were stable during four years. On account of adopting overall regression of panel data, the annual relative coefficient of each variable was not reported.

Now, the correlation analysis on all annual data integration of variables was carried out respectively in this paper, the results were shown in Table 12. The correlation coefficient matrix showed that original dependent variable and substitution dependent variable had high significant positive correlation, indicating that the substitute variable had obvious effect on original dependent variable. However, independent variable, original dependent variable and substitution dependent variable had significant negative correlation relationship at 0.05 significance level. Besides, the possible regression effects were inspected preliminarily, which indicates that we should move into regression equation analysis.

<Table 12> Descriptive Statistics and Correlation Analysis of All Annual Variables

Variables	Mean Value	Standard deviation	ROA	ROE	R-ROA	R-ROE	TV	MC
ROA	0.070	0.069	1					
ROE	0.078	0.175	0.749**	1				
R-ROA	0.000	0.063	0.905**	0.674**	1			
R-ROE	0.000	0.166	0.680**	0.950**	0.710**	1		
TV	82.670	141.622	-0.272**	-0.260**	-0.230**	-0.224**	1	
MC	0.473	0.288	-0.053*	0.025*	0.040*	0.064*	0.046	1

Note: The average actual values of R-ROA and R-ROE were not equal to 0. Due to small value, it was equal to 0 after reserving five decimal places; the significance level (bilateral) was *p<0.1, **p<0.05; N=392.

4.2.4 Panel data regression and hypothesis testing

Before conducting data regression, the unit root test was implemented against major variables (TC, MC, ROA, ROE, R-ROA and R-ROE), the results showed that all variable data were stable, which could be used to regression directly.

In consider of the characteristics of panel data, model setup formal test and fixed/random effect test of variable (Hausman specification test) would be conducted before formal estimation, to avoid incorrect parameter estimation results.

For general panel model, F inspection introduced by Li Zinai (2000) was applied by domestic schoolers, of which panel model included the following three general model forms:

Form One: Intercept model with variable coefficient

$$Y_i = \alpha_i + X_i\beta_i + \mu_i \tag{8}$$

Form Two: Variable-intercept model with constant coefficient

$$Y_i = \alpha_i + X_i\beta + \mu_i \tag{9}$$

Form Three: Invariant parameter model

$$Y_i = \alpha + X_i\beta + \mu_i \tag{10}$$

Among them: was stochastic error term, all parameters, constants and residual terms were matrix vectors.

(1) Specification test and parameter estimation of main effect model

The results of Hausman specification test before formal and specific model estimation were shown in Table 13:

The results of Hausman specification test showed that fixed effect model should be used when R-ROA and R-ROE were used as dependent variables, hence, only fixed effect model was needed to be reported. On this basis, three types of panel model should be used respectively for inspection, to obtain corresponding residual sum of squares and calculating statistic value of F1

<Table 13> Hausman Specification Test of Main Effect Model

Items	R-ROA	R-ROE
Hausman Chi-Sq.	35.564	7.444
Hausman Prob.	0.000**	0.006**

Note : **p<0.05

<Table 14> Specification Test of Main Effect Model

Items	R-ROA	R-ROE	critical value (confidence level of 0.05)
S1	0.497	4.706	F1--F(97,194)=1.326 F2--F(194,194)=1.267
S2	0.728	6.854	
S3	1.514	10.773	
N	98	98	
T	4	4	
K	1	1	
F1	0.939	0.922	
F2	2.065	1.302	

and F2, the results of hypothesis testing were shown in Table 14. It could be seen from the data in table, F1 was less than critical value and F2 was greater than critical value when R-ROA and R-ROE were dependent variables, so the hypothesis H1 was established, the variable-intercept model with constant coefficient was required to be set up:

$$R - ROA_{it} = \alpha_i + \beta TV_{it} + \mu_{it} \quad (11)$$

$$R - ROE_{it} = \alpha_i + \beta TV_{it} + \mu_{it} \quad (12)$$

As for parameter estimation of main effect model, it should be considered that the cross-section data was much greater than the number of timing sequence, hence the cross-section weights (CSW) in generalized least squares (GLS) should be adopted for estimation. The results were shown in Table 15, which indicated that variable regression coefficient had significant

<Table 15> Parameter Estimation of Coefficient Panel Model with Variable Intercept and Invariant Coefficient of Main Effect

Variables	DV：R-ROA			DV：R-ROE		
	Regression coefficient	T-test Value	P Value	Regression coefficient	T-test Value	P Value
Fixed intercept C	0.022**	3.064	0.034	0.046**	3.064	0.002
TV	-0.0003**	-3.460	0.001	-0.001**	-4.565	0.000
Adjusted R Square	0.786			0.845		
F Statistics	15.680			22.686		
Test of model effect	FE			FE		
Estimation method	GLS(CSW)			GLS(CSW)		

Note：FE represent fixed effect；**p<0.05

<Table 16> Hausman Specification Test of Moderating Effect Model

Items	R-ROA	R-ROE
Hausman Chi-Sq.	12.296	6.417
Hausman Prob.	0.006**	0.093*

Note : *p<0.1, **p<0.05

explanation, thus the hypothesis H1 was proved.

(2) Specification test and parameter estimation of regulatory effect model

The regulatory effect could be verified through partial regression coefficient test of cross-multiply item of independent variable TV and moderator MV, the Hausman test results before formal concrete model estimation were shown in Table 16:

From Table 16, it can be seen that the model with R-ROA as the dependent variable is significant at the level of 0.05 significance, while the model with R-ROE as the dependent variable is significant at the level of 0.1 significance, so only fixed effect models need to be reported. Due to three variables of moderating effect model, the denominator degrees of freedom of F statistics NT-N (N+1) was 0, so the coefficients of three variables couldn't be set up or inspected. Meanwhile, the constraint test should be conducted by using term-wise variable analysis, namely the coefficient setting of independent variable TV (number of constraint variants K=1) was inspected firstly, then the coefficient setting of moderator and cross-multiply item was inspected (number of constraint variants K=2). The inspection results were shown in Table 17:

According to the comparison results in the above table, when the dependent variable was

<Table 17> Specification Test of Moderating Effect Model

Items	R-ROA		R-ROE		critical value (confidence level of 0.05)
Test Variable	TV	MC与TV*MC	TV	MC与TV*MC	
S1	0.456	0.217	4.457	2.017	When K=1, F1---F(97,194)=1.326 F2---F(194,194)=1.267
S2	0.693	0.693	6.410	6.410	
S3	1.513	1.513	10.680	10.680	
N	98	98	98	98	
T	4	4	4	4	When K=2, F1---F(194,97)=1.348 F2---F(291,97)=1.329
K	1	2	1	2	
F1	1.050	1.106	0.885	1.100	
F2	2.341	2.008	1.411	1.447	

R-ROA, K=1, namely when the coefficient setting of independent variable TV was inspected, F1<F (97, 194) =1.3262, F2>F (194, 194). The above results indicated that the hypothesis in form two could be accepted, while the hypothesis in form one and form three were denied, in other words, the moderating variable and the coefficient of cross-multiply item were invariant. Next, if K=2, namely when the coefficient setting of moderator variables and cross-multiply item were inspected, F1< (194, 97), while F2>F (291, 97), the results were the same as above. When dependent variable was R-ROE, the above conclusion was consistent. Hence, the fixed effect model could be set up as follows:

$$R - ROA_{it} = \alpha_i + \beta_1 TV_{it} + \beta_2 MC_{it} + \beta_3 TV_{it} * MC_{it} + \mu_{it} \quad (13)$$

$$R - ROE_{it} = \alpha_i + \beta_1 TV_{it} + \beta_2 MC_{it} + \beta_3 TV_{it} * MC_{it} + \mu_{it} \quad (14)$$

For moderating model, method of estimation of GLS (CSW) was still adopted, and the parameter estimation results were shown in Table 18. It could be found from the table that cross-multiply item of CSR value and marketing capability was also added into moderating model. In the two models with different dependent variables, the cross-multiply item of CSR value and marketing capability was significant in fixed effect model. The results of regression analysis supported and verified H2. In addition, adjusted R square value and F statistics of moderating effect model were good, which indicated the model had relative high explanatory power.

<Table 18> Parameter Estimation of Panel Model with Variable Intercept and Constant Coefficient for Adjustment Effect

Variables	DV : R-ROA			DV : R-ROE		
Parameter values	Regression coefficient	T-test Value	P Value	Regression coefficient	T-test Value	P Value
Fixed intercept C	0.036**	4.1896	0.000	0.059**	3.784	0.0002
TV	-0.0004**	-3.872	0.000	-0.001**	-5.121	0.000
MC	0.121**	7.252	0.000	0.227**	4.430	0.000
TV*MC	-0.002*	-1.862	0.064	-0.003**	-2.409	0.017
Adjusted R square	0.783			0.885		
F Statistics	15.079			31.012		
Test of model effect	FE			FE		
Estimation method	GLS(CSW)			GLS(CSW)		

Note: FE denoted fixed effect; *p<0.1, **p<0.05

5. CONCLUSIONS AND DISCUSSION

Through the above analysis, both hypothesis H1 and hypothesis H2 were verified, which indicated that new variable “expectation deviation level of CSR” constructed in this paper through value engineering had significant negative effect on firm performance. At the same time, the marketing ability of enterprises plays a regulatory role in the above relationship.

5.1 Theoretical Significance

This paper combines corporate social responsibility with value engineering, puts forward the concept and measurement method of "expectation deviation level of social responsibility", and quantitatively evaluates the gap between the current situation of corporate social responsibility and consumers' expectations. At the same time, the relationship between corporate social responsibility expectation deviation level and financial performance is verified through empirical research, which provides new tools and ideas for corporate social responsibility research.

5.2 Practical Significance

The basic starting point of value engineering lies in how enterprises can produce products that best meet the needs of customers at the least cost. Its purpose is to reduce the cost of optimization and improve the economic benefits of enterprises. Because consumers pay different attention to different aspects of corporate social responsibility, the application of value engineering to corporate social responsibility assessment helps managers to understand the gap between the current situation of corporate social responsibility and consumers' expectations, so as to make targeted use of CSR resources and carry out CSR activities, which has certain practical guiding significance.

A virtual corporation was taken as an example in this paper, to illustrate more visually and simply. We assumed that the firm had two units cost in the initial investment in the four aspects of social responsibility, and thereby the cost coefficient C and deviation coefficient of social responsibility expectation V=F/C could be calculated.

According to the principle, the product service quality with large expected deviation coefficient of CSR (V=1.488) was selected to be improved. The scheme 1 was proposed:

<Table 19> Comparison of Improvement Schemes of Value Engineering and Non-value Engineering

Items		Product service responsibility	Philanthropic responsibility	Environmental protection responsibility	Employee Responsibility	Total
Functional importance coefficient (F)		0.372	0.152	0.243	0.233	1.0
Initial investment of CSR		2	2	2	2	8
Cost coefficient of social responsibility (C)		0.25	0.25	0.25	0.25	1
Expected deviation coefficient of social responsibility (V)		1.488	0.608	0.972	0.932	4
Improvement program 1 of value engineering	Input	**2.5**	2	2	2	8.5
	C1	0.294	0.235	0.235	0.235	1
	V1	1.265	0.647	1.034	0.991	3.937
Improvement program 2 of value engineering	Input	2	**1.5**	2	2	7.5
	C2	0.267	0.200	0.267	0.267	1
	V2	1.393	0.760	0.910	0.873	3.936
Improvement program 3 of non-value engineering	Input	2	**2.5**	2	2	8.5
	C3	0.235	0.294	0.235	0.235	1
	V3	1.583	0.517	1.034	0.991	4.125
Improvement program 4 of non-value engineering	Input	**1.5**	2	2	2	7.5
	C4	0.200	0.267	0.267	0.267	1
	V4	1.860	0.569	0.910	0.873	4.212

Increasing the input in product and service quality, which was increased to 2.5 units from original 2 units. After calculation, the deviation coefficient of product service responsibility in scheme 1 was decreased, and the deviation coefficient of other three items became lager, while the deviation coefficient of CSR was decreased to 3.937. According to the main effect results, it could be considered that scheme 1 could improve the financial performance of firms more than original scheme.

Meanwhile, it could be found that if the deviation coefficient of philanthropic responsibility was smaller, it would indicate that the firm had invested excessive resources. Function and cost should be matched according to value engineering idea, hence scheme 2 was put forward: reducing the investment in charitable responsibility to 1.5 units from 2 units. It could be seen that scheme 2 could also improve the financial performance of firms more than the original plan.

In addition, we also designed the improved scheme 3 and scheme 4 of non-value engineering, to compare the improvement scheme of value engineering: in terms of the aspect of philanthropic responsibility that excessed the original expectation according to scheme 3, the investment should be increased continuously; while as for the aspect of philanthropic responsibility that was inferior to the original expectation according to scheme 4, the investment should be decreased continuously. The results displayed that both schemes could result in the increase of deviation coefficient of general social responsibility, indicating that this improvement was not superior to the original scheme, but reduced the return of social responsibility activities.

The above analysis results were shown in table 19.

5.3 Limitations and Future Research Prospects

Firstly, the stakeholders of firm also included shareholders, employees, governments and suppliers. From the perspective of these stakeholders, the conclusions drawn by making use of value engineering were required to be further explored.

Secondly, the cross-section data used in this paper were relatively stable evaluation within certain time, however, whether the importance evaluation of consumers on all aspects of CSR would be changed along with the time or due to certain social events, the further study was required to be discussed.

Thirdly, the marketing capability was regarded as moderator, while actually, the relationship between social responsibility and financial performance of firms might be influenced by industry differences, firm scale as well as firm property. Therefore, potential regulatory factors should be studied further in the future.

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