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Corporate social responsibility, the cost of equity capital and ownership structure: An analysis of Chinese listed firms

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Abstract

This study examines the effect of corporate social responsibility (CSR) towards primary stakeholders on the cost of equity capital in Chinese listed firms, and divides the sample into state-owned enterprises (SOEs) and non-state-owned enterprises (NSOEs) for comparison. We construct a set of CSR index systems to measure the quality of the CSR practices and use several approaches to estimate firms' *ex ante* cost of equity capital. The results show that firms with higher CSR scores have significantly lower cost of equity capital. In particular, we find that investments in improving CSR towards investors make the greatest contribution to reducing firms' equity financing costs, and the cost of capital effects of CSR is more significant in recessions than in economic booms. In addition, SOEs have better CSR and lower cost of equity capital than NSOEs, but the effect of CSR in reducing the cost of equity capital is greater for NSOEs than for SOEs. The findings suggest that CSR toward primary stakeholders can be profitable and beneficial to Chinese firms.

Keywords

Chinese listed firms, corporate social responsibility, cost of equity capital, financial performance, ownership structure, stakeholder theory

1. Introduction

The concept of corporate social responsibility (CSR) originated in the US in the early twentieth century; currently, the World Bank Council for Sustainable Development defines CSR as “the continuing commitment by business to behave ethically and contribute to economic

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development while improving the quality of life of the workforce and their families as well as of the local community and society at large". In the past few years, CSR has become one of the dominant themes in businesses worldwide. A recent survey by Lacy et al. (2010) finds that 93% of 766 chief executive officers (CEOs) worldwide believe that issues related to CSR are critical to the future success of their businesses; in particular, the economic downturn has led their corporations to align CSR more closely with core business. Another piece of evidence for the growing importance of CSR is the rapidly spreading Socially Responsible Investment (SRI) movement. Examples of CSR activities range from Gucci's charitable donations and investment in environmentally friendly products made of organic cotton, liquid wood or natural fuel (*Fortune*, 2012b), Sony's science and technology education program with the community in countries such as the US, the UK, Japan and China (*Fortune*, 2012a), to Dell's 'Children's Cancer Care' created to serve the healthcare of customers by providing multimillions of dollars and cloud technology.¹ In Australia too, companies such as BHP have been actively investing in various green development programs including 'green offices' in countries where their mining activities could have negative effects (Choi et al., 2010).

Although firms should make serious efforts to integrate CSR into various aspects of their businesses to contribute to sustainable development, the issue of whether SRI is value-increasing, decreasing, or neutral remains an open question. An increasing number of studies attempt to answer this question by concentrating on the ties between CSR and financial performance (Galbreath and Shum, 2012; Mahoney and Roberts, 2007; Perrini et al., 2011; Renneboog et al., 2008; Servaes and Tamayo, 2013). However, most of these studies focus on accounting-based or market-based measures of financial performance, whereas few studies examine the capital market participants' perceptions of CSR. The cost of equity capital, the expected rate of return on equity investment as well as the costs of raising and using equity capital, are key factors affecting firm value. Additionally, the cost of equity capital is closely related to CSR in several ways. First, the cost of equity capital is the required rate of return given the market's perception of a firm's riskiness. If CSR affects the perceived riskiness of a firm, then socially responsible firms should benefit from lower equity financing costs (Ghoul et al., 2011). Second, strong CSR and effective corporate governance can affect firms' cost of equity capital through a reduction in agency and information asymmetry problems (Chen et al., 2009). Third, the cost of equity, as the required rate of return on corporate investments, is a key input in firms' long-term investment decisions, and SRI is a type of long-term investment. Examining the relationship between CSR and the cost of equity can help CEOs understand the effect of SRI on firms' financing costs and has important implications for strategic planning. Therefore, it is necessary to understand the CSR-financial performance relationship by examining whether CSR performance affects firms' costs of equity capital.

A few previous studies examine capital market participants' perceptions of CSR. However, these studies focus only on one particular dimension of CSR such as the environment (Chava, 2010; Sharfman and Fernando, 2008) or on the perspective of creditors (Goss and Roberts, 2011). In addition, the studies are limited to Western countries whose institutional settings are quite different from emerging countries, including China (Ghoul et al., 2011). With the constant promotion of globalization, China and the world are getting closer. An increasing number of Chinese firms make overseas investments, such as Chinalco's and PetroChina's investments in Australian mineral enterprises. Meanwhile, multinational corporations constantly enter into the Chinese market. Due to the characteristics of China, CSR and the financing decisions of Chinese firms may be different from those seen in Western countries. Studies of Chinese firms can contribute to decision-making for multinational corporations and enhance the understanding of the Chinese market for Western scholars. The characteristics of China abound. For example, in China, all levels of government departments play a very important role in CSR and financing behavior

because China's legal system is inefficient (Wu, 2009). Chinese firms must identify the power and influence from different government departments to adopt effective methods for managing them. When the firms receive resources from the government, they also must allocate some of their resources to build relationships with the government (Jia and Zhang, 2010). Besides, China also differs from Western countries in its stage of economic development, culture, proportion of state-owned economy, etc. These factors produce differences in the awareness of CSR, market risk, and firm-level corporate governance between China and developed countries. Therefore, we cannot help but ask: does CSR affect the cost of equity capital for Chinese firms? Is the relationship between CSR and the cost of equity capital different for state-owned enterprises (SOEs) and non-state-owned enterprises (NSOEs), given the differences in the level of political interference that they experience and their historical mission?

In answering these questions, we examine the effect of CSR towards primary stakeholders on the cost of equity capital for a sample of Chinese A-share listed companies, dividing the sample into SOEs and NSOEs for comparison. To compute the firms' cost of equity capital, we follow an increasing number of studies in accounting and finance and use the *ex ante* cost of equity implied in analysts' earning forecasts and stock prices. To estimate CSR, we build an index system of CSR with respect to six stakeholder groups – investors, employees, customers, community, suppliers, and environment – on the basis of various global standards, local standards and previous studies, because there is no authoritative database on CSR available in China. The results show that firms with higher CSR scores exhibit lower costs of equity capital. We also find that investment in improving CSR towards investors makes the strongest contribution to reducing firms' cost of equity capital, and the effect of CSR on the cost of equity is more significant in recessions than in economic booms. In addition, SOEs demonstrate better CSR and lower costs of equity capital than NSOEs, although the effect of CSR in reducing the cost of equity capital is greater for NSOEs than for SOEs. Our results are robust for a battery of sensitivity tests, including alternative assumptions, additional controls for noise in analyst forecasts, and various approaches to address endogeneity. By providing empirical evidence from an emerging market, our findings support arguments in the literature that CSR enhances firms' value; and this study could also shed light on the future development of SRI in China.

The remainder of this paper is organized as follows. Section 2 presents the theoretical background and hypotheses development. Section 3 describes the sample and variables. Section 4 provides the empirical results of the relationship between CSR and the cost of equity capital. Section 5 presents robustness checks, and Section 6 concludes the paper.

2. Theoretical background and hypotheses development

2.1. CSR in China

CSR is predominantly considered to be a Western phenomenon because strong institutions, standards, and appeal systems are weak in the developing countries of Asia (KPMG, 2005). The term 'CSR' was introduced to China from the West as recently as the end of the 1990s. However, the majority of officials, entrepreneurs, and scholars in China adopted a wait-and-see approach toward CSR at that time, questioning the positive impact of CSR on firms' financial performance as well as worrying that CSR might be used as a non-tariff barrier to hamper Chinese exports (Shen and Cai, 2009). As a result of the ambiguous attitude towards CSR, effective measures were not taken to require firms to take responsibility for all stakeholders.

However, accompanying the advent of globalization and liberalization, the entry of multinational corporations into Asian markets, increasing consumer expectations towards business, and

the emergence of pressure groups, the case for CSR has become stronger in Asian countries including China (Mishra and Suar, 2010). Chinese corporations' previous short-sighted focus on profit produced negative effects, such as environmental pollution, a shortage of resources, and product quality problems, which seriously hampered the sustainable development of China's economy and its firms (Su and He, 2011). In recent years, China has realized the importance of CSR. High CSR not only benefits the sustainable development of society but also helps to upgrade the brand image, refinancing ability, and core competitiveness of corporations (Wang et al., 2011). CSR was excluded from formal regulations in China until the Shenzhen Stock Exchange, the State-Owned Assets Supervision and Administration Commission, and the Shanghai Stock Exchange promulgated guidelines for CSR in succession, and some industries also initiated their own standards for CSR. CSR in China demonstrates two important characteristics. First, the majority of firms' socially responsible behaviors are government-oriented because of the overwhelming impact of government on the Chinese economy. Second, economic responsibility should be regarded as the first social responsibility by firms because 'economic construction' is the central aim of the government and the state (Gao, 2009).

2.2. CSR and the cost of equity capital

CSR is a set of mechanisms through which all stakeholders can protect themselves against short-sighted behavior for profit. These mechanisms can reduce a firm's cost of equity in several ways. First, CSR initiatives may reduce risk. Several studies have examined the link between CSR and risk, following a recent line of research suggesting that idiosyncratic risk may be priced into financial markets and will be reflected in price premiums. These studies show that firms with better CSR have lower idiosyncratic risk (Lee and Faff, 2009) and higher market-to-book ratios (Galema et al., 2008), whereas socially irresponsible firms may face uncertain future explicit claims. For example, if a firm does not invest in product safety and sells an unsafe product, this decision will increase the risk of future litigation and, in turn, increase the firm's expected future cost (Waddock and Graves, 1997). Using a set of Canadian CSR risk measures, Boutin-Dufresne and Savaria (2004) find that firms demonstrating better CSR are associated with lower levels of idiosyncratic volatility. Because the cost of equity capital is the required rate of return given the market's perception of a firm's riskiness, the shareholders will require a higher rate of return when they invest in a firm with a higher risk. Therefore, if SRI leads to lower risk and improved financial performance, investors will associate more attractive investment conditions with socially responsible corporations.

Second, CSR also reduces the cost of equity capital by reducing information asymmetry. The perfect market assumes that information is complete and that information processing is timely and accurate. However, in the real world, the market obviously cannot match these assumptions. Differences exist in the ways in which various types of people in the market receive information, including cost and time for information processing. Such information asymmetry increases the investment risk and affects the expected rate of return required by shareholders (Noe and Rebello, 1996). Dhaliwal et al. (2011) and Cho et al. (2012) show empirically that firms with better CSR tend to disclose more information because they seek to project a positive image as responsible corporate citizens to investors and other stakeholders. Clarkson et al. (2011) and Moroney et al. (2012) also suggest that firms with better environmental performance as well as firms with a higher pollution propensity will disclose more environmental information, which is a very useful means for reducing information asymmetry. With an increase in corporate transparency, liquidity, especially the depth of stock, will increase (Diamond and Verrecchia, 1991; Tannous et al., 2013), and

the estimation risk for investors will decrease (Coles et al., 1995), thereby reducing the marginal expected rate of return and the cost of equity capital (Cheng Chee Mun et al., 2011).

Third, socially conscious investors prefer not to include firms with low CSR in their investment portfolios. A high or low CSR score is not only a determinant of the sustainable development of firms, but also affects the interests of investors, including shareholders. Firms with better CSR can provide dedicated long-term investors with a positive signal, prompting the investors to believe that they will achieve the expected rate of return more easily when investing in these firms (Cox and Wicks, 2011). Heinkel et al. (2001) argue that exclusionary investing by environmentally conscious investors results in a scenario in which the stock of polluting firms is held only by neutral investors. As a result, polluting firms must offer neutral investors higher expected returns to compensate for the lack of risk-sharing. Using institutional investors as research subjects, Hong and Kacperczyk (2009) and Petersen and Vredenburg (2009) find that the majority of institutional investors prefer high CSR firms and that, compared to arbitrageurs, norm-constrained institutional investors include fewer 'sin' stocks, i.e. publicly listed firms operating in the alcohol, tobacco, and gaming industries, in their portfolios. Thus, high CSR can help firms obtain a wider range of investors.

Based on the aforementioned arguments, we acknowledge that CSR can reduce the cost of equity capital by reducing risk, increasing corporate transparency, and accommodating investors. Hence, we propose our first hypothesis as follows:

H1. CSR is negatively associated with the cost of equity capital in China.

2.3. Ownership, CSR and the cost of equity capital

Despite years of economic reform, the economic influence of the state remains significant, and there are a number of SOEs in nearly every society in the world. In contrast to SOEs in developed countries, SOEs in China are not only the means of government intervention in the economy, but also the means of government involvement in the economy (Huang and Yu, 2006). Political interference, which is an important institutional characteristic of China's capital market, plays a critical role in differentiating the rights and responsibilities of SOEs and NSOEs. For this reason, SOEs may differ in terms of CSR and the cost of equity compared to NSOEs (Zhang et al., 2010). However, the debate continues on which type of ownership will provide more assistance in improving CSR and the cost of equity.

With regard to CSR, in theory, SOEs should have higher CSR scores based on their multiple objectives. SOEs' targets are not only to achieve their own economic goals but also to connect these goals with other non-economic targets (Li and Xia, 2008). The following two forces are exerted on SOEs: (a) non-economic, for political or ideological considerations; and (b) economic, for pragmatic considerations (Ramanadham, 1991). As a result of the interaction between the two forces, SOEs are special organizations that have both economic and non-economic targets. The government, the largest shareholder of SOEs, is requested to achieve non-economic targets to obtain social stability, such as implementing a country's economic development, changing the unbalance of economic structure, stabilizing the fluctuation of business cycles, protecting the environment, and improving the employment rate or the fiscal condition of the region, which all help to improve CSR (Bai et al., 2006). Fan et al. (2007) show that, unlike NSOEs, whose purpose is to maximize profit, SOEs' requirements and standards for CSR are much higher and are enforced by the government. Given the higher impact of political interference on company targets, SOEs are no longer limited to the pursuit of economic benefits. Besides, the pressure from public concern on

CSR activities for SOEs is higher as well. In response to these, SOEs are expected to demonstrate better CSR. Hence:

H2a. SOEs demonstrate better CSR than NSOEs.

Some studies, however, suggest that NSOEs should have better CSR than SOEs because there is a stronger economic motivation and demand for CSR from NSOEs. Shi et al. (2006) show that SOEs in China are granted many privileges by the government, including the obtaining of credit, resource allocation, the realization of product value, etc. In addition, SOEs have monopolized some industries, such as telecommunications, railways, and oil. Therefore, because of the incomparable competitive advantage and the cost of CSR activities, SOEs have fewer incentives to fulfill social responsibility than NSOEs. As a result, SOEs may perform worse in CSR than NSOEs. Additionally, Zhang et al. (2009) and Li and Zhang (2010) suggest that the pressure of competing and keeping in touch with the government is greater for NSOEs, providing NSOEs with a stronger economic motive to promote corporate reputation and public relations through CSR. Therefore, NSOEs are expected to perform better in CSR than SOEs. Hence, we propose the following alternative hypothesis to H2a:

H2b. NSOEs demonstrate better CSR than SOEs.

With regard to the cost of equity capital, some studies propose that SOEs' cost of equity capital will be lower than that of NSOEs based on the more supportive policies and lower risks of SOEs. Lin et al. (1998) find that the government, as the shareholder of SOEs, provides special policy support, allowing SOEs to obtain capital more easily and often at a lower cost. For the cost of debt, SOEs typically have better access to low-cost capital from state-owned banks (the predominant source of capital in China) than NSOEs because state-owned banks often lend to SOEs for reasons (political, employment and tax) other than profitability (Wei and Wang, 1997). In contrast, banks' loan-granting decisions to NSOEs are based largely on financial rather than political considerations (Chen et al., 2011). For the cost of equity, Woolcock (1998) and Hitt et al. (2002) suggest that SOEs can obtain more social capital and have more financing channels because of their close relationship with the government. Thus, the cost of equity capital for SOEs should be lower than that for NSOEs because there are more investors available from which to choose.

Furthermore, SOEs have low bankruptcy risk because they are politically favored and supported by the government. The lower risk leads to a lower required rate of return and a lower cost of equity capital. Wang et al. (2008) propose that even if SOEs run into financial trouble, investors' immediate reaction is to look to the largest shareholder (i.e. the government) as the ultimate resort for compensation for their investment losses. The government performs the traditional role of 'deep pocket' for SOEs. In contrast to SOEs, Ralston et al. (2006) note that the risk of investing in NSOEs is higher because there is no similar organization that shares the risk. Investors who inject capital into NSOEs will require a higher rate of return considering the higher investment risk. Hence, we propose the following hypothesis:

H3a. SOEs have a lower cost of equity capital than NSOEs.

Nevertheless, some studies argue that the inefficiency of SOEs may produce a higher cost of equity capital. Faced with serious problems, including the unclear principle-agent relation, the free

rider problem, excessive social costs, and the lack of sufficient independence, Omran (2004) and Li and Xia (2008) suggest that SOEs are often inefficient, noting that it is challenging to make efficient use of the capital in SOEs. If investors believe that these problems will jeopardize the expected rate of return for investing in SOEs, they will require a higher rate of return. Examining the targets of SOEs, Bai et al. (2006) demonstrate that SOEs must take the goals of government into account when making business decisions, forcing investors into concessions when the goals of investors and the government are different. SOEs may not win the investors' favor if investors do not have the same ability to participate in the firm's decisions. Hence, we propose the following alternative hypothesis to H3a:

H3b. NSOEs have a lower cost of equity capital than SOEs.

According to the above discussion, we believe that differences exist between SOEs and NSOEs in CSR and the cost of equity capital. Owing to the support from the government, SOEs enjoy more extensive privileges and better credit from bank loans or any other method of debt financing than NSOEs. Additionally, SOEs have unique debt-financing channels such as enterprise bonds, which are issued only by SOEs. As a result, the relative importance of public equity financing, which is an alternative channel of financing, may vary with the type of ownership and, in turn, result in a different impact of CSR on the cost of equity. If H1 can be proven, CSR indeed plays a role in reducing the cost of equity capital, and the effects of CSR will be different between SOEs and NSOEs. Therefore, we propose the following hypothesis:

H4. The impact of CSR on the cost of equity capital is different for SOEs and NSOEs.

3. Sample and variables

3.1. Sample description

Considering that the Shanghai Stock Exchange has standardized and guided listed firms in fulfilling CSR only since 2008,² before which we cannot effectively observe the fulfillment of CSR, we select a sample for the period 2009–2011. To examine the relationship between CSR and the cost of equity financing, we begin by merging the following two data sources: financial data and industry affiliation data are provided by the China Stock Market & Accounting Research Database (CSMAR)³; CSR data are taken from annual reports, CSR reports, company websites, and other public sources to be discussed later. We use Gebhardt et al. (2001), Claus and Thomas (2001) and Easton (2004) to estimate the cost of equity, extracting data from the CSMAR summary file forecast for all firms that have positive one- and two-year-ahead consensus earnings forecasts and a positive long-term growth forecast.

We exclude firms that have missing cost of equity estimates, CSR scores, and control variables. In addition, we eliminate financial firms since they operate under different regulations and have different equity financing activities than industrial firms. To control for the effect of outliers, we Winsorize all the continuous variables at the top and bottom 1%. This procedure yields a final sample of 831 observations (271 firms in 2009, 269 firms in 2010, and 291 firms in 2011). Table 1 shows the sample composition by industry groups (defined by the National Bureau of Statistics of China)⁴, year, and ownership. The manufacturing, transportation, and real estate sectors dominate the sample, and SOEs represent a strong majority.

Table 1. Sample breakdown by industry, year, and ownership.

Industry	<i>n</i>	%
Agriculture, forestry, fishery, and animal husbandry	11	1.324
Mining	39	4.693
Food products	11	1.324
Beverage	15	1.805
Textiles	19	2.286
Pulp and paper	12	1.444
Printing and publishing	9	1.083
Chemicals	42	5.054
Rubber and plastic products	9	1.083
Electronic equipment	31	3.73
Nonmetallic mining	14	1.685
Ferrous metals mining	23	2.768
Non-ferrous metals mining	37	4.452
Normal machinery	21	2.527
Special equipment	30	3.61
Transportation equipment	46	5.535
Electronic equipment	41	4.934
Pharmaceutical	55	6.619
Other manufacture	6	0.722
Electricity, heating, and gas	59	7.1
Construction	25	3.008
Transportation	79	9.507
Warehousing	5	0.602
Communication	22	2.647
Computer	20	2.407
Wholesale	3	0.361
Retail	19	2.286
Business services	19	2.286
Real estate	61	7.341
Communal facilities	10	1.203
Tourism	9	1.083
Almost nothing	29	3.49
Total	831	100
Year	<i>n</i>	%
2009	271	32.611
2010	269	32.371
2011	291	35.018
Total	831	100
Ownership	<i>n</i>	%
SOEs	662	79.66
NSOEs	169	20.34
Total	831	100

3.2. Regression variables

We start with the following cross-sectional regression model

$$R_{i,t} = \beta_0 + \beta_1 CSR_{i,t} + \sum_j \gamma_j CONTROL_{i,t} + \varepsilon_{i,t} \quad (1)$$

where R denotes the cost of equity capital, CSR stands for corporate social responsibility, $CONTROL$ denotes various control variables, β and γ are the coefficients of the variables, i and t are indices for firm and time, respectively, and $\varepsilon_{i,t}$ is an independent and identically distributed (iid) error term. A description of the variables is provided below.

3.2.1. The cost of equity capital. Earlier studies typically used *ex post* realized returns to measure the cost of equity. However, recent finance literature suggests that realized returns are poor proxies for the cost of equity (Fama and French, 1997). The *ex ante* cost of equity implied in analysts' earnings forecasts and stock prices may provide a better measure for the expected return, since it makes an explicit attempt to isolate the cost of capital effects from growth and cash flow effects (Hail and Leuz, 2006), and circumvents the failure of traditional asset pricing models to deliver an accurate estimate of the firm-level cost of equity capital (Pastor et al., 2008). Although previous studies propose various models to measure firms' implied cost of equity capital, it provides little guidance on the relative performance of these models. We therefore follow Dhaliwal et al. (2011) and estimate the cost of equity using three different models, i.e. those constructed by Claus and Thomas (2001) (R_{CT}), Gebhardt et al. (2001) (R_{GLS}), and Easton (2004) (R_{PEG}). The models are based on either the dividend discount model or the residual income model and differ in their assumptions of future growth patterns and forecasting horizons. Appendix 1 summarizes the data requirements and the implementation procedures for each model. To mitigate the possibility of spurious results associated with one particular model, we employ the arithmetical average of these three estimates as our estimated cost of equity, denoted as R_{AVG} . Table 3 below shows the descriptive statistics of the cost of equity capital.

3.2.2. Corporate social responsibility. There are several methods of estimating CSR, including the analysis of annual reports, reputation indices, toxics release inventories (TRI), generosity indices, questionnaires, and authoritative databases of CSR. However, the reputation index has always been criticized for its subjectivity (Fryxell and Wang, 1994), and TRI and the generosity index reflect only a few of the factors that constitute CSR (Walker, 2010). In addition, questionnaire respondents tend to be the internal staff of firms, who may have motives for magnifying the CSR of their own firms (Ruf et al., 2001). Measuring CSR on the basis of an admittedly authoritative database, i.e. KLD⁵, is most widely accepted because of the database's objectivity and comprehensiveness. In China, however, it is challenging to estimate CSR using this method because this type of authoritative database does not exist. The Shenzhen Stock Exchange and the Shanghai Stock Exchange promulgated guidelines for CSR of listing firms in 2006 and 2008, respectively, requiring the firms to disclose CSR information including environmental and social information. Since then, researchers can discern more about listing firms' CSR information that was not previously available. Based on the aforementioned arguments, we use a method based on a firm's disclosures to specify our proxy for CSR. The process is as follows.

First, we construct a set of CSR index systems. An index assessing CSR towards six stakeholder groups, including investors, employees, customers, community, suppliers, and environment, is developed after examining the issues covered under various global standards such as the KLD

database (Kinder et al., 2005), GRI guidelines (GRI, 2002), and relevant ISO standards. We also refer to local standards specified in the Chinese Companies Act, 2005⁶, the Shanghai Stock Exchange and the Shenzhen Stock Exchange guidelines, and pollution-prevention acts in China with respect to air, water, and noise. In addition, we also construct a CSR index based on Xu and Yang (2010), Mishra and Suar (2010) and Cheung et al. (2012). Table 2 shows the CSR index.⁷

Second, we provide a valuation of the CSR index for each firm. We give the index a score of 2 if the firm discloses relatively quantitative information or detailed evaluation criteria in the CSR report, annual report, or company website, whereas we give the index a score of 1 if the firm only shows a brief textual description, or a score of 0 when the firm discloses nothing. Then, according to the news about CSR on authoritative media (i.e. the people's net, Xinhua net)⁸, government websites, and other public sources, we adjust the score of the CSR index as appropriate. If a firm is the subject of negative news about CSR on the net, the score of the related index decreases by 1; if a firm has a major accident on CSR, the score of the related index decreases by 2.

Third, we determine the weight of each evaluation index. In previous studies, the analytical hierarchy process (AHP) has been widely applied to confirm the weight of the index; however, this process is often questioned for its subjectivity. In this paper, therefore, the entropy method is used to compute the weight of an index to avoid the influence of subjective evaluation (Buyukozkan, 2012). Appendix 2 shows the process.

Fourth, we estimate the CSR using the weighted average method. According to the score and weight of each index, for each firm we calculate a score for CSR towards investors (CSR_{IV}), employees (CSR_{EM}), customers (CSR_{CS}), suppliers (CSR_{SP}), community (CSR_{CM}), and environment (CSR_{EN}) with the weighted average method. We then sum the scores for CSR towards the six stakeholder groups to obtain an overall CSR score (CSR_T) as our CSR proxy. Table 3 provides the descriptive statistics of CSR by stakeholder.

3.2.3. Control variables. Previous studies have revealed several risk factors and firms' characteristics that affect the cost of equity, and these factors or characteristics must be controlled for so that a correct inference can be obtained. In our multivariate analysis, we follow previous studies in specifying controls shown to affect the cost of equity capital. These control variables include the following: market beta (BETA), estimated from a market model using daily stock returns data; size (SIZE), measured as the natural logarithm of total assets; liquidity (LIQUID), computed as the ratio of the number of shares traded in the year to the total shares outstanding at the end of the year; book-to-market ratio (BTM), measured as the ratio of the book value of equity to the market value of equity; leverage (LEV), computed as the ratio of total debt to total assets; risk-free rate of interest (RATE), measured as the Chinese Yuan one-year deposit rate; and ownership (GOV), measured as a dummy variable that equals 1 if it is a SOE, and 0 otherwise. In addition, we control for analyst forecast attributes in which we use both analyst forecast dispersion (LNDISP), measured as the log of the standard deviation of analyst estimates of earnings divided by the consensus forecast for earnings, and the long-term growth rate (LTG), computed as the difference between the mean two-year-ahead analyst consensus earnings per share (EPS) forecast and the mean one-year-ahead analyst consensus EPS forecast divided by the mean one-year-ahead analyst consensus EPS forecast. Particularly, as discussed above, considering the special economic system of China, Chinese government, which dominates the national economy, not only intervenes in, but is also directly involved in the economy. As a very important institutional characteristic of China's capital market, political interference is closely related to enterprise operation (Li and Zhang, 2010). Thus, we also control for the level of political interference for the province of the firm located in, measured as the political interference index (PI) from Fan et al. (2011), which reflects the degree of marketization; this index is lower with more political interference. Finally, we control for year and industry effects.

Table 2. Index of corporate social responsibility.

Dimension	Description
CSR investor	Constitutional reference for shareholders' participation in decision making and access to all relevant information Investor grievances handling policies Rules to strengthen auditor independence Regulatory mechanisms for prohibiting insider trading Completeness, timeliness, and authenticity of information disclosure Creates profits for shareholders and repays loans timely
CSR employee	Policies covering health and safety at work Policies for the training and development of employees Equal recruitment, development, and promotion opportunities for minorities, females, and disabled people Compensation of workers as per legally mandated minimum wage and insurance Policies towards prohibiting forced overtime Provision for formal worker representation in decision-making
CSR customer	Genuine goods at fair prices Consumer safety and health during use of products Refrain from providing false advertisements Policy/management systems for customer satisfaction Protect customers' personal information Commitment to industry research and development and innovation
CSR supplier	Operate in good faith, honor contracts Inspection of supplier facilities for health, safety, and environmental aspects Policy to restrict employees to ethical and friendly procurement Policy to pay in a timely fashion and receive competitive market prices from the supplier Provide all suppliers of products and services with a commitment to a future relationship Protect supplier's intellectual property
CSR community	Makes timely payment of taxes Increase job opportunities, reemploy lay-offs, provide jobs for the disabled Prohibits child labor and violation of human rights Code of conduct with regard to bribery, gift receipts, and corruption Supports public policies and practices to promote human development and social stability Helps community through charitable donations, and educational and cultural contributions Set up charity foundation Encourage employees to be volunteers
CSR environment	Explicit definition of environmental policy and long-term environmental plans Natural environment training for employees Policies for substitution of polluting materials and conservation of virgin materials Preference for green products in purchasing Selection of cleaner transportation methods Responsible disposal of waste and residues, and recovery and recycling systems Policies for preventing direct and indirect pollution of soil, water, and air Systems and techniques for producing environmentally safe products

Table 3. Descriptive statistics for variables.

Variable	Mean	Median	Maximum	Minimum	Standard deviation
R _{AVG} (%)	7.038	6.015	53.285	1.519	4.426
R _{PEG} (%)	10.827	9.608	48.206	1.210	7.358
R _{GLS} (%)	4.971	3.238	41.907	0.718	3.389
R _{CT} (%)	5.325	4.378	43.135	0.747	4.039
CSR _T	0.976	0.930	2.371	0.244	0.285
CSR _{IV}	0.085	0.080	0.622	-0.465	0.075
CSR _{EM}	0.185	0.181	0.213	0.002	0.046
CSR _{CS}	0.176	0.170	0.393	0.000	0.073
CSR _{SP}	0.111	0.046	1.240	0.000	0.084
CSR _{CM}	0.282	0.378	0.651	0.186	0.076
CSR _{EN}	0.137	0.133	0.273	0.000	0.068
BETA	0.912	0.833	4.134	-2.566	0.631
SIZE	22.590	22.430	26.950	19.750	1.401
LEV	0.534	0.546	0.950	0.047	0.175
LIQUID	5.140	4.158	24.650	0.139	3.717
BTM	0.662	0.653	1.389	0.067	0.262
LTG	0.622	0.234	43.000	0.004	2.137
LNDISP	-0.520	-1.250	8.744	-6.840	2.052
RATE	0.026	0.023	0.033	0.023	0.005
PI	6.657	7.200	10.000	0.000	2.533

Table 3 provides the descriptive statistics of these variables including the cost of equity capital, CSR, and the control variables. With regard to the cost of equity estimates, we find that the average estimate across the three models is 7.038%. The ES model produces a higher average cost of equity (10.827%) than the GLS and CT models (4.971% and 5.325%, respectively). These figures are consistent with Dhaliwal et al. (2006), who show that the GLS model provides a lower bound and the ES model often provides an upper bound for the implied cost of equity estimates. With regard to CSR by stakeholder, the average score of CSR towards community is highest (0.282), whereas CSR towards investors depicts the lowest score (0.085). This result may be affected by the index and sample chosen. First, the majority of our sample enterprises are SOEs, which are confronted with a more severe problem of insider control based on the unclear proprietary nature of national assets, including the disappearing of national assets, damaging the interests of minority investors, and the non-payment of debts (Chen et al., 2010). In addition, most enterprises in China have highly concentrated ownership, with the controlling shareholder playing a crucial role in company resolutions. It is difficult to protect the interests of the minority investors when the controlling shareholder is in collusion with the CEO, who is appointed by the controlling shareholder; however, the indices to calculate CSR towards investors are focused on the minority investor. As a result, the average score of CSR towards investors is lowest in our study. This finding reflects the lack of legal regulations for protecting the interests of investors, especially the interests of minority shareholders in China.

4. Empirical results

4.1. Simple correlations

Table 4 provides the Pearson correlation coefficients between the cost of equity, CSR, and the control variables. The cost of equity (R_{AVG}) is negatively correlated with our CSR proxy (CSR_T),

Table 4. Correlations of variables.

	CSR _T	GOV	BETA	SIZE	LEV	LIQUID	BTM	LTG	LNDISP	RATE	PI
R _{AVG}	-0.196***	-0.060**	0.025*	-0.112***	0.134***	-0.141***	0.073**	0.210***	0.230***	0.161***	0.132***
CSR _T		0.148***	-0.038*	0.409***	0.059*	0.223***	-0.146***	-0.074**	-0.044	0.003	-0.005*
GOV			-0.058*	0.153***	0.015	-0.081**	0.192***	0.013	-0.059*	-0.018	-0.177***
BETA				-0.017*	-0.027*	-0.105**	-0.105***	0.004	0.063*	0.386***	0.055
SIZE					0.279***	0.437***	0.411***	-0.073**	0.04	0.102**	0.099**
LEV						-0.081**	0.424***	-0.039	-0.065*	0.02	0.069**
LIQUID							-0.343***	-0.144***	-0.068*	-0.418***	-0.200**
BTM								-0.026	0.033	0.344**	0.151**
LTG									0.226***	-0.067*	-0.032
LNDISP										-0.074*	0.035
RATE											0.074**

***Statistically significant at the 1% level; **statistically significant at the 5% level; *statistically significant at the 10% level.

Table 5. Comparison tests.

	Independent samples t-test SOEs – NSOEs		Mann-Whitney U test SOEs – NSOEs	
	t-statistic	Significance	Z statistic	Significance
R _{AVG}	-1.717	0.086	-1.757	0.079
R _{PEG}	-1.819	0.069	-1.603	0.079
R _{GLS}	-1.931	0.054	-2.043	0.041
R _{CT}	-1.423	0.156	-0.909	0.363
CSR _T	5.335	0.000	4.003	0.000
CSR _{IV}	0.118	0.906	2.309	0.021
CSR _{EM}	3.515	0.001	2.943	0.003
CSR _{CS}	2.77	0.006	2.056	0.040
CSR _{SP}	2.01	0.045	0.731	0.465
CSR _{CM}	3.487	0.001	3.26	0.001
CSR _{EN}	5.894	0.000	5.112	0.000
BETA	-1.683	0.093	-1.439	0.150
SIZE	5.4	0.000	3.992	0.000
LEV	0.504	0.614	0.964	0.335
LIQUID	-2.354	0.019	-2.864	0.004
BTM	5.637	0.000	5.511	0.000
LTG	0.375	0.708	0.643	0.520
LNDISP	-1.708	0.088	-2.397	0.017
PI	-5.256	0.000	-5.104	0.000

size (SIZE), ownership (GOV), and liquidity (LIQUID). In addition, R_{AVG} is positively correlated with the market beta (BETA), leverage (LEV), book-to-market ratio (BTM), long-term growth rate (LTG), analyst forecast dispersion (LNDISP), risk-free rate of interest (RATE), and political interference index (PI). Finally, we do not find high correlations between the explanatory variables, suggesting that multicollinearity is not a serious concern in our regressions.

4.2. Comparison tests

To compare the difference in variables between SOEs and NSOEs, we first analyse the data using mean comparison tests and nonparametric tests. Table 5 shows the results of the comparison tests. The cost of equity (R_{AVG}, R_{PEG}, R_{GLS}, and R_{CT}), market beta (BETA), liquidity (LIQUID), analyst forecast dispersion (LNDISP), and political interference index (PI) of SOEs are lower than those of NSOEs, whereas other variables of SOEs are higher than those of NSOEs. The results of the comparison tests confirm H2a and H3a, which assume that SOEs have higher CSR scores and lower equity financing costs than NSOEs. Due to the multiple objectives of SOEs, the requirements and standards for CSR are much higher for SOEs than for NSOEs (Jing and McDermott, 2013; Lin et al., 1998). These results suggest that the non-economic targets imposed on SOEs play an important part in fulfilling social responsibility. Although SOEs are inefficient, we also find that these enterprises still have a lower cost of equity financing because of the more resources they can obtain.

4.3. Univariate analysis

Our univariate analysis compares the mean and the median cost of equity capital (R_{AVG}) of firms with high and low CSR scores based on the median CSR value. Table 6 shows the results of this

Table 6. Univariate tests.

		<i>n</i>	R_{AVG}	R_{PEG}	R_{GLS}	R_{CT}
Panel A. Means						
$CSR_T \geq \text{mean}$	(1)	336	6.364	9.632	4.667	4.793
$CSR_T < \text{mean}$	(2)	495	7.496	11.638	5.163	5.687
Difference	(1)–(2)		–1.132	–2.006	–0.496	–0.894
t-statistic			–4.070***	–4.231***	–4.377**	–3.390***
Panel B. Medians						
$CSR_T \geq \text{median}$	(1)	416	6.367	9.751	4.578	4.772
$CSR_T < \text{median}$	(2)	415	7.712	11.906	5.350	5.880
Difference	(1)–(2)		–1.345	–2.155	–0.772	–1.108
Z statistic			–1.769**	–2.738***	–3.486***	–2.144**

***Statistically significant at the 1% level; **statistically significant at the 5% level.

analysis. The mean (median) equity premium of firms with a high CSR score is 6.364% (6.367%), whereas the premium is 7.496% (7.712%) for firms with a low CSR score. The results indicate that the mean (median) cost of equity capital for firms with a high CSR score is 113.2 (134.5) basis points lower than that for firms with a low CSR score, and the differences are significant at the 1% (5%) level. We find similar evidence when we examine the differences in means and medians using the three individual costs of equity estimates. These findings suggest that firms with better CSR have a significantly lower cost of equity capital.

4.4. Multivariate regression analysis

To examine whether CSR affects the cost of equity capital, we regress the cost of equity premium R_{AVG} on various CSR proxies and control variables. Additionally, we examine whether the relationship between CSR and the cost of equity changes with ownership and time. Table 7 reports our main results.

Our test variables in models 1–7 are the overall CSR score (CSR_T), the CSR score towards investors (CSR_{IV}), employees (CSR_{EM}), customers (CSR_{CS}), suppliers (CSR_{SP}), community (CSR_{CM}), and environment (CSR_{EN}), respectively. We find that the coefficient of each CSR proxy is negatively and statistically significant at the 1% level. In particular, the coefficient of CSR_{IV} is less than other CSR proxies, while the coefficient of CSR_{SP} is the highest. The results suggest that firms with better social responsibility have a significantly lower cost of equity capital and CSR towards investors plays the most important role in reducing the cost of equity capital. Additionally, CSR's cost of capital effect towards suppliers is smaller than that of CSR towards other stakeholder groups in China. Shareholders will require a higher rate of return when they invest in a firm with poor CSR towards investors, since the cost of equity capital is the expected rate of return on equity investment, and CSR towards investors is most closely related to shareholders. The findings are consistent with Chen et al. (2009), who show a firm with poor investor protection always has a high cost of equity financing. Although CSR towards suppliers is the most difficult for the public to observe, this factor may lead to the smallest cost of capital effect.

Next, we examine whether the documented relationship between CSR and the cost of equity financing changes over time. Given economic development and increasing awareness of CSR among investors, we would expect this relationship to change over time. Accordingly, we partition the full sample period into three sub-periods by year. The results show that CSR_T loads negative

Table 7. Corporate social responsibility and the cost of equity capital.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	2009	2010	2011	SOEs	NSOEs
CSR _T	-2.138*** (-4.206)							-9.044*** (-5.957)	-1.294*** (-2.672)	-1.539*** (-3.412)	-2.166*** (-4.000)	-3.170*** (-2.233)
CSR _{IV}		-22.106*** (-13.558)										
CSR _{EM}			-8.594*** (-2.795)									
CSR _{CS}				-11.123*** (-5.804)								
CSR _{SP}					-6.033*** (-3.838)							
CSR _{CM}						-10.915*** (-4.756)						
CSR _{EN}							-6.827*** (-3.145)					
GOV	-0.585* (-1.719)	-0.718** (-2.322)	-0.668** (-1.958)	-0.623* (-1.793)	-0.708** (-2.088)	-0.691** (-2.047)	-0.572* (-1.665)	-0.927* (-1.591)	-0.370 (-0.981)	-0.511* (-1.721)		
BETA	0.508** (2.235)	0.534** (2.572)	0.494** (2.160)	0.407* (1.802)	0.547** (2.401)	0.383* (1.677)	0.525** (2.300)	1.538* (1.627)	0.495** (2.156)	0.309* (1.792)	0.627** (2.472)	0.248* (1.531)
SIZE	-0.409*** (-3.303)	-0.376*** (-3.463)	-0.473*** (-3.827)	-0.364*** (-2.984)	-0.510*** (-4.290)	-0.180 (-1.252)	-0.462*** (-3.747)	-0.240 (-0.835)	-0.273* (-1.847)	-0.625*** (-5.653)	-0.413*** (-3.115)	-0.354 (-1.104)

Table 7. (Continued)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	2009	2010	2011	SOEs	NSOEs
LEV	2.123** (2.556)	1.183* (1.553)	2.031** (2.426)	1.989** (2.416)	2.000** (2.400)	1.853** (2.230)	2.166*** (2.596)	2.822 (1.343)	0.599 (0.687)	1.096 (1.474)	1.480* (1.670)	6.554*** (3.050)
LIQUID	-0.124*** (-2.715)	-0.083** (-1.995)	-0.117** (-2.568)	-0.113** (-2.514)	-0.120*** (-2.628)	-0.109** (-2.418)	-0.121*** (-2.647)	-0.219** (-2.366)	-0.070* (-1.903)	-0.129** (-2.358)	-0.106** (-2.066)	-0.243*** (-2.697)
BTM	3.563*** (5.276)	3.023*** (4.891)	3.523*** (5.185)	3.352*** (5.004)	3.679*** (5.435)	3.532*** (5.245)	3.665*** (5.399)	4.065*** (2.101)	1.495** (2.026)	5.112*** (9.175)	3.638*** (4.803)	4.001*** (2.907)
LTG	0.321*** (5.139)	0.277*** (4.841)	0.327*** (5.205)	0.285*** (4.581)	0.330*** (5.278)	0.313*** (5.014)	0.333*** (5.311)	0.644*** (4.034)	0.055 (1.190)	1.091*** (4.928)	0.264*** (4.089)	1.372*** (5.395)
LNDISP	0.182*** (2.721)	0.202*** (3.324)	0.181*** (2.683)	0.214*** (3.239)	0.187*** (2.804)	0.202*** (3.043)	0.198*** (2.952)	0.105* (1.599)	0.401*** (5.036)	0.167** (2.467)	0.183** (2.399)	0.017 (0.136)
PI	0.112** (2.031)	0.104** (2.069)	0.111** (2.007)	0.122** (2.234)	0.107* (1.947)	0.109** (1.978)	0.115** (2.088)	0.182* (1.521)	0.149*** (2.769)	0.030 (1.061)	0.254*** (4.014)	-0.307*** (-3.044)
RATE	4.354*** (6.990)	3.196*** (5.549)	4.708*** (7.486)	4.573*** (7.426)	4.448*** (7.140)	4.446*** (7.171)	4.446*** (7.115)				3.964*** (5.590)	3.875*** (3.250)
INDUSTRY	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
YEAR	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes
Observations	831	831	831	831	831	831	831	271	269	291	662	169
Adjusted R ²	0.302	0.418	0.294	0.315	0.300	0.306	0.296	0.223	0.220	0.419	0.291	0.502

***Statistically significant at the 1% level; **statistically significant at the 5% level; *statistically significant at the 10% level.

and is statistically significant (at the 5% level or better) for all three years. In addition, the coefficient of CSR_T is much lower in 2009 (-9.044) than in the other two years (-1.294 and -1.539 , respectively). This result may stem from the subprime mortgage crisis. We consider that a high level of CSR can provide a positive signal to investors, which makes investors believe that they will achieve the expected rate of return more easily when they invest in firms demonstrating better CSR. A growing number of dedicated long-term investors use CSR as a key factor in investment decisions, as noted by Cox and Wicks (2011). While there is a slow down in China's economy, and investor confidence was weakened by the global financial crisis of 2008. Although the Chinese government initiated an economic stimulus package, its effect was not immediately noticeable because of the investment cycle. As a result, China did not really recover from the economic downturn and investors still lacked confidence in 2009. CSR may have played a more important role in investment decisions for the long-term interests of investors. These figures changed in 2010 as in that year China's economy began to look up. The results indicate that the cost of capital effects from CSR is more significant during a recession than during an economic boom.

In Table 7, we extend our analysis to examine whether the relationship between CSR and the cost of equity changes with ownership. The results show that the coefficient of CSR_T is negative and statistically significant (at the 5% level or better) both in SOEs and NSOEs, but the coefficient is lower in NSOEs (-3.170) than in SOEs (-2.166), suggesting that both SOEs and NSOEs demonstrating better social responsibility have a significantly lower cost of equity capital; however, the effect of CSR in reducing the cost of equity capital is greater for NSOEs than for SOEs. Consistent with H4, the results show strong evidence for different CSR effects on the cost of equity between SOEs and NSOEs. We interpret this result by combining the comparison tests as shown in Table 5. First, NSOEs have a much greater scope for reducing the cost of equity or improving social responsibility than SOEs, since NSOEs have lower CSR scores and higher equity financing costs at present. Second, the relative importance of public equity financing for NSOEs is more significant than for SOEs, which may be generated by the following: 1. Because the government acts as a deep pocket for SOEs, the credit of SOEs is always better; 2. Considering the special institutional environment, the state-owned financial institutions, which have a more critical attitude towards NSOEs than towards SOEs, play a dominant role in the financial market of China; 3. Some debt financing channels, e.g. enterprise bonds, can only be issued by SOEs. As a result, the owners of NSOEs may put more effort into attracting public investors. Improving CSR provides a very efficient means for these enterprises to lure investors and, in turn, reduce the cost of equity capital.

To better isolate the effect of CSR on the cost of equity capital, in each of the regressions in Table 7 we include a number of control variables, including market beta, size, book-to-market, liquidity, leverage, political interference, risk-free rate of interest (except regressions by year), ownership (except regressions by ownership), and two analyst forecast variables. The results show positive coefficients for market risk (BETA), leverage (LEV), book-to-market (BTM), the risk-free rate of interest (RATE), analyst forecast dispersion (LNDISP), and the long-term growth rate (LTG), and a negative coefficient for firm size (SIZE) and liquidity (LIQUID). In particular, the coefficient for political interference index (PI) is positive for the full sample and the SOEs sample; however, it is negative in the NSOEs sample. In other words, the more political interference, the lower cost of equity capital for SOEs, but the higher equity financing cost for NSOEs. This finding suggests that the government does indeed facilitate financing for SOEs by providing policy and resource support to promote the development of SOEs; in contrast, too much political interference cannot provide help but erects barriers to financing for NSOEs. On the whole, the majority of the coefficients are significant at the 10% level or better. Therefore, the significant relationship between

CSR and the cost of equity capital in Table 7 implies that the market prices a firm's CSR along with the other risk factors.

In summary, we draw the following conclusions. First, CSR can indeed reduce the cost of equity capital. Second, CSR towards investors make the greatest contribution to reducing firms' cost of equity capital. Third, SOEs have better CSR and a lower cost of equity capital than NSOEs, although the cost of capital effects of CSR is greater for NSOEs than for SOEs. Fourth, CSR can play a more significant role in recessions than in economic booms.

5. Robustness checks

5.1. Alternative model specifications

Above, we specify our dependent variable as the average cost of equity (R_{AVG}) based on three widely used implied cost of equity models to mitigate spurious results arising from the use of a single model. In this section, we examine whether our results in Table 7 are sensitive to using the individual cost of equity premiums. Additionally, we have developed a measure of firms' commitment to CSR; however, our CSR scores primarily depend on firms' disclosure and the measurement process may be insufficiently objective. It is hard to clarify whether the firm has really complied. Therefore, we also examine the robustness of our results by using Rankins (RKS)⁹ CSR ratings. RKS is an independent third-party organization providing research and consulting services to investors interested in integrating social responsibility features into their investment decisions. The CSR index of RKS is formulated according to the standard of GRI guidelines (GRI, 2002) and SA 8000 (SAI, 2001). Although RKS is not an authoritative organization, the scores and ranking of CSR provided by this firm are still accepted by many people in China. Table 8 reports the results of multivariate regression after replacing the dependent variable R_{AVG} with the individual risk premiums R_{GLS} , R_{CT} , and R_{PEG} , as well as replacing the independent variable CSR_T with the sub CSR_T which proxy for the CSR scores provided by RKS. We find the coefficient of CSR_T (or sub CSR_T) is negative and statistically significant (at the 5% level or better) and is still lower in NSOEs than in SOEs. Our findings reinforce our earlier evidence that CSR can reduce the cost of equity capital, and that the effect of CSR is more significant in NSOEs than in SOEs.

5.2. Endogeneity

Although we control for several important factors affecting the cost of equity capital, our evidence on the cost of capital effects of CSR may be driven by omitted variables that are correlated with both CSR and the cost of equity capital, such as firm-level corporate governance, institutional investors, executive pay, etc. (Chen et al., 2009; Dhaliwal et al., 2011; Reverte, 2012). Omitting these factors from our regressions may lead to a bias of unknown magnitude in CSR coefficients. Accordingly, to mitigate the potential omitted variable bias and improve the precision of our estimates, we add the following various firm-level variables related to corporate governance to our regression: the log of 1 plus the number of institutional investors (INST), the fraction of CEO compensation arising from a 1% increase in the stock price (CC), and the percentage share of the first major shareholder (SH). In addition, we employ the instrumental variables estimation method to ensure the robustness of our results to endogeneity. As instruments for CSR_T , we use the industry average CSR score and a dummy variable for whether the previous year's earning is negative. Table 9 reports the results. We find that the coefficients for these additional controls are statistically significant. Notably, the coefficient of CSR_T is negative and statistically significant at the 10%

Table 9. Robustness to endogeneity.

	VAR = INST			VAR = CC			VAR = SH			IVEM		
	Full sample SOEs	NSOEs	Full sample SOEs	Full sample SOEs	NSOEs	Full sample SOEs	Full sample SOEs	NSOEs	Full sample SOEs	Full sample SOEs	NSOEs	Full sample SOEs
CSR _T	-1.998*** (-3.951)	-1.919*** (-3.509)	-3.576*** (-2.554)	-2.192*** (-4.349)	-2.070*** (-3.808)	-3.538*** (-2.543)	-2.157*** (-4.277)	-2.135*** (-3.860)	-3.105*** (-2.215)	-2.695*** (-2.695)	-2.476*** (-2.483)	-6.353*** (-1.620)
GOV	-0.646** (-1.911)			-1.115*** (-3.069)			-0.932*** (-2.662)			-0.550** (-1.596)		
BETA	0.407** (1.791)	0.547*** (2.140)	0.346* (1.753)	0.550** (2.438)	0.649*** (2.558)	0.148 (0.324)	0.555** (2.456)	0.670*** (2.655)	0.208 (0.450)	0.502** (2.207)	0.629*** (2.479)	0.490 (0.832)
SIZE	-0.300*** (-2.376)	-0.335*** (-2.47)	-0.239 (-0.753)	-0.402*** (-3.272)	-0.429*** (-3.233)	-0.311 (-0.992)	-0.459*** (-3.714)	-0.461*** (-3.472)	-0.414* (-1.804)	-0.367*** (-2.620)	-0.390*** (-2.669)	-0.053 (-0.097)
LEV	1.974*** (2.392)	1.339* (1.511)	7.000*** (3.311)	2.130*** (2.587)	1.471* (1.662)	6.604*** (3.148)	2.284*** (2.768)	1.674* (1.896)	6.435*** (3.032)	2.108*** (2.535)	1.476* (1.665)	5.903*** (2.484)
LIQUID	-0.131*** (-2.908)	-0.111*** (-2.165)	-0.260*** (-2.929)	-0.119*** (-2.631)	-0.111*** (-2.157)	-0.227*** (-2.572)	-0.095*** (-2.065)	-0.078* (-1.594)	-0.216*** (-2.398)	-0.127*** (-2.774)	-0.108*** (-2.093)	-0.260*** (-2.744)
BTM	3.066*** (4.486)	3.299*** (4.277)	2.040** (2.177)	3.393*** (5.061)	3.611*** (4.773)	3.277** (2.399)	3.386*** (5.043)	3.449*** (4.568)	3.915*** (2.879)	3.557*** (5.264)	3.642*** (4.806)	3.952*** (2.822)
LTG	0.310*** (5.001)	0.259*** (4.015)	1.328*** (5.301)	0.325*** (5.246)	0.266*** (4.123)	1.375*** (5.536)	0.312*** (5.024)	0.255*** (3.964)	1.380*** (5.495)	0.319*** (5.090)	0.263*** (4.065)	1.345*** (5.142)
LNDISP	0.144*** (2.149)	0.156*** (2.021)	0.002 (0.067)	0.142*** (2.112)	0.178*** (2.327)	0.087 (0.688)	0.181*** (2.729)	0.185*** (2.443)	0.006 (1.047)	0.178*** (2.655)	0.180*** (2.338)	0.036 (0.279)
PI	0.083* (1.597)	0.225*** (3.481)	-0.296*** (-2.990)	0.140*** (2.541)	0.252*** (3.980)	-0.228** (-2.234)	0.117*** (2.147)	0.261*** (4.140)	-0.311*** (3.127)	0.112** (2.031)	0.255*** (4.023)	-0.314*** (-3.049)
RATE	4.090*** (6.575)	3.817*** (5.375)	3.477*** (2.951)	4.344*** (7.035)	3.972*** (5.610)	3.905*** (3.355)	4.258*** (6.884)	3.870*** (5.488)	3.727*** (3.162)	4.310*** (6.876)	3.937*** (5.522)	3.741*** (3.051)
VAR	-0.364*** (-3.697)	-0.250*** (-2.185)	-0.491*** (-2.687)	-16.250*** (-3.9164)	-30.370*** (-1.751)	-11.487*** (-2.948)	3.346*** (3.743)	3.183*** (3.087)	3.508*** (2.237)			
INDUSTRY	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
YEAR	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	831	662	169	831	662	169	831	662	169	831	662	169
Adjusted R ²	0.313	0.295	0.521	0.314	0.293	0.525	0.313	0.300	0.515	0.301	0.291	0.486

***Statistically significant at the 1% level; **statistically significant at the 5% level; *statistically significant at the 10% level.

level or better and is lower in NSOEs than in SOEs in all of the models, reinforcing our previous findings.

In addition, a firm's decision regarding whether to engage in CSR activities may not be independent of its cost of equity capital, the link may be reversed. Enhancing CSR performance can improve the firm's relationships with key stakeholders, leading to better financial performance. In contrast, better financial performance results in resource slack, which allows firms to increase their CSR performance, particularly when the CSR activities are appropriately directed toward stakeholder preferences (Choi et al., 2010; Waddock and Graves, 1997). To mitigate the issue of reverse causality, we estimate the following simultaneous equation system after controlling for endogeneity by employing a two-stage least squares (2SLS) regression analysis

$$CSR_{i,t} = \alpha_0 + \alpha_1 R_{i,t} + \alpha_2 CSR_{i,t-1} + \sum_j \lambda_j CONTROL1_{i,t} + \varepsilon_{1t} \quad (2)$$

$$R_{i,t} = \beta_0 + \beta_1 CSR_{i,t} + \beta_2 CSR_{i,t-1} + \sum_j \gamma_j CONTROL2_{i,t} + \varepsilon_{2t} \quad (3)$$

where CONTROL1 includes SIZE, LEV, GOV, PI, INST, CC, SH, ROE (defined as the net income divided by total equity), and Tobin's q (measured as the sum of market value of common equity, book value of preferred stock, book value of long-term debt and current liability, divided by book value of total assets). CONTROL2 includes SIZE, LEV, GOV, BETA, LIQUID, BTM, LTG, LNDISP, RATE, PI, INST, CC, and SH, α is the coefficients of the variables.

The results of 2SLS are shown in Table 10. We can find that CSR activities have a significant influence on reducing firms' equity financing costs, which in turn feeds back to more CSR activities. In addition, the coefficient of CSR_T is still lower in NSOEs than in SOEs. Thus, the results are still robustly controlling for endogeneity using a 2SLS specification.

5.3. Noise in analyst forecasts

An implicit assumption in the implied cost of capital approach is that the earnings forecast of analysts are unbiased estimates of the market expectations of future earnings. However, if analysts underestimate the effect of corporate governance on future earnings, then their forecasts will have an upward bias for firms with poor corporate governance ratings. The upwardly biased earnings will translate into an overstated estimate of the cost of equity, which may cause the potential variable bias (Kothari, 2001). We address this concern in two ways, and Table 11 reports our results. First, we explicitly control for forecast optimism bias (OBAIS), measured as the difference between realized earnings deflated by the June-end stock price and the one-year-ahead consensus earnings forecast, which lowers the more optimistic analyst forecasts. The results show that the coefficient of CSR_T is negative and significant at the 5% level or better after we include OBAIS and is lower in NSOEs than in SOEs. Furthermore, we also find OBAIS is negative and significant associated with the cost of equity capital. Second, we successively exclude the bottom 5%, 10%, 25%, and 50% of the observations in the OBAIS distribution (we exclude no more than 50% for the limited sample size of NSOEs). The results reported in Table 11 are consistent with our previous findings as well. Whereas we find the coefficient of CSR_T is negative but less significant after we exclude the bottom 50% of the observations in the OBAIS

Table 10. Two-stage least squares (2SLS) regressions.

	Equation 2			Equation 3		
	Full sample	SOEs	NSOEs	Full sample	SOEs	NSOEs
R _{AVG}	-0.011** (-2.456)	-0.012** (-2.277)	-0.017* (-1.768)			
CSR _T				-4.386* (-1.876)	-2.462* (-1.771)	-5.611** (-1.884)
Pre CSR _T	0.536*** (16.499)	0.532*** (14.684)	0.346*** (3.667)	-5.174*** (-3.339)	-3.813** (-1.999)	-7.213* (-1.786)
GOV	0.033* (1.688)			-1.131* (-2.650)		
SIZE	0.037*** (5.605)	0.036*** (4.868)	0.086*** (3.221)	-0.518*** (-2.625)	-0.516** (-2.572)	-0.438 (-0.901)
LEV	-0.290* (-1.621)	-0.322* (-1.784)	-0.791* (-1.869)	2.428** (2.272)	1.785* (1.793)	6.923** (2.562)
PI	-0.007** (-2.184)	-0.012*** (-2.897)	0.004 (1.460)	0.216*** (3.186)	0.341*** (4.439)	-0.163* (-1.787)
BETA				0.107 (1.515)	0.075 (1.257)	0.606 (0.969)
LIQUID				-0.045 (-0.796)	-0.036 (-0.638)	-0.011 (-0.087)
BTM				2.216*** (3.271)	2.549*** (2.955)	1.452* (1.783)
LTG				0.644*** (2.683)	0.543*** (5.373)	0.686*** (5.541)
LNDISP				0.244*** (3.302)	0.284*** (3.351)	0.025 (1.153)
RATE				1.194*** (3.453)	1.333** (2.497)	1.064 (0.983)
INST	0.011* (1.816)	0.005* (1.672)	0.012* (1.845)	-0.345** (-2.409)	-0.228* (-1.726)	-0.418* (-1.711)
CC	-0.301 (-1.231)	2.920*** (2.857)	-0.279 (-0.953)	-12.064*** (-3.000)	-12.234** (-2.007)	-6.324* (-1.619)
SH	0.001 (0.127)	0.011 (0.180)	-0.218* (-1.658)	3.741*** (3.298)	3.907*** (3.396)	3.615* (1.705)
ROE	0.485*** (6.776)	0.472*** (5.681)	0.732*** (3.864)			
Tobin's Q	-0.329* (-1.861)	-0.368* (-1.670)	-0.360* (-1.625)			
INDUSTRY	Yes	Yes	Yes	Yes	Yes	Yes
YEAR	Yes	Yes	Yes	Yes	Yes	Yes
Observations	786	629	157	786	629	157
Adjusted R ²	0.474	0.466	0.455	0.172	0.189	0.340

***Statistically significant at the 1% level; **statistically significant at the 5% level; *statistically significant at the 10% level.

distribution. Overall, the results in Table 11, by mitigating the noise in analyst forecasts, also corroborate our earlier findings that better CSR results in cheaper equity financing, and the effect of CSR is more significant in NSOEs than in SOEs.

Table 11. Robustness to analyst forecast optimism.

Forecast optimism bias more than jth percentile																		
VAR = OBAIS						j = 5%			j = 10%			j = 25%			j = 50%			
	Full sample	SOEs	NSOEs	Full sample	SOEs	NSOEs	Full sample	SOEs	NSOEs	Full sample	SOEs	NSOEs	Full sample	SOEs	NSOEs	Full sample	SOEs	NSOEs
CSR _t	-2.072*** (-4.084)	-2.008*** (-3.581)	-3.327*** (-2.435)	-1.688*** (-3.338)	-2.340*** (-4.080)	-3.377*** (-2.184)	-1.669*** (-3.180)	-1.616*** (2.967)	-3.718*** (-2.331)	-1.679*** (-2.855)	-1.588*** (-2.791)	-4.141*** (-2.286)	-1.110* (-1.958)	-1.241* (-1.774)	-3.546* (-1.853)			
GOV	-0.553* (-1.630)	-0.522* (-1.618)					-0.640* (-1.962)			-0.463* (-1.652)			-0.341 (-0.840)					
BETA	0.493** (2.173)	0.608** (2.401)	0.190 (0.423)	0.584*** (2.707)	0.679*** (2.592)	0.237 (0.487)	0.614*** (2.805)	0.749*** (3.155)	0.304 (0.609)	0.541*** (2.158)	0.735*** (2.649)	0.147 (0.280)	0.675*** (2.485)	0.789*** (2.716)	0.245 (0.437)			
SIZE	-0.407*** (-2.397)	-0.411*** (-3.105)	-0.444*** (-2.434)	-0.506*** (-4.262)	-0.401*** (-2.925)	-0.367* (-1.821)	-0.563*** (-4.578)	-0.583*** (-4.548)	-0.436* (-1.771)	-0.572*** (-4.026)	-0.591*** (-3.981)	-0.164 (-0.438)	-0.632*** (-3.895)	-0.594*** (-3.626)	-0.162 (-0.366)			
LEV	2.184*** (2.636)	1.508* (1.704)	8.126*** (3.848)	1.600** (2.002)	1.677* (1.809)	6.095*** (2.722)	1.179 (1.460)	0.600 (0.718)	5.836*** (2.522)	1.438 (1.552)	0.592 (0.611)	6.874*** (2.920)	1.805* (1.665)	0.707 (0.632)	4.452* (1.720)			
LIQUID	-0.115** (-2.533)	-0.099* (-1.922)	-0.222*** (-2.549)	-0.107*** (-2.478)	-0.103* (-1.932)	-0.256*** (-2.759)	-0.109** (-2.486)	-0.072* (-1.620)	-0.287*** (-2.850)	-0.117*** (-2.339)	-0.061 (-1.097)	-0.292*** (-2.795)	-0.125*** (-2.182)	-0.075 (-1.240)	-0.371*** (-3.010)			
BTM	3.499*** (5.194)	3.595*** (4.734)	3.356** (2.512)	3.786*** (5.916)	3.563*** (4.555)	4.299*** (2.998)	4.060*** (6.213)	4.085*** (5.758)	4.865*** (3.212)	4.167*** (5.613)	4.253*** (5.303)	3.083* (1.907)	4.442*** (5.191)	4.497*** (4.914)	4.763*** (2.704)			
LTG	0.326*** (5.233)	0.268*** (4.155)	1.292*** (5.259)	0.285*** (4.869)	0.273*** (4.140)	2.311*** (4.950)	0.284*** (4.904)	0.235*** (4.024)	1.323*** (4.880)	0.255*** (4.159)	0.223*** (3.621)	1.738*** (4.453)	0.235*** (4.188)	0.209*** (3.828)	1.669*** (4.482)			
LNDISP	0.222*** (3.238)	0.221*** (2.807)	0.117 (1.472)	0.161*** (2.544)	0.157*** (1.978)	0.026 (0.205)	0.164*** (2.593)	0.159*** (2.238)	0.028 (0.208)	0.172*** (2.503)	0.147* (1.908)	0.077 (0.526)	0.350*** (4.726)	0.255*** (3.119)	0.231* (1.534)			
PI	0.117** (2.139)	0.260*** (4.103)	-0.296*** (-3.055)	0.098* (1.870)	0.261*** (3.977)	-0.301*** (-2.885)	0.066* (1.645)	0.211*** (3.539)	-0.316*** (-2.927)	0.069* (1.577)	0.238*** (3.509)	-0.306*** (-2.589)	0.069* (1.703)	0.228*** (3.203)	-0.232* (-1.838)			
RATE	4.331*** (6.934)	3.923*** (5.541)	4.207*** (3.656)	4.239*** (7.163)	4.172*** (5.684)	3.789*** (3.095)	4.497*** (7.461)	4.115*** (6.133)	3.683*** (2.869)	4.619*** (6.684)	4.315*** (5.521)	3.235*** (2.384)	4.100*** (5.235)	4.288*** (5.010)	2.835** (1.838)			
OBAIS	-0.004*** (-2.476)	-0.003* (-1.919)	-0.024*** (-3.667)															
INDUSTRY	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
YEAR	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	831	662	169	789	629	161	748	596	153	624	497	127	415	332	84			
Adjusted R ²	0.306	0.294	0.539	0.315	0.295	0.476	0.325	0.329	0.475	0.311	0.319	0.483	0.384	0.404	0.571			

***Statistically significant at the 1% level; **statistically significant at the 5% level; *statistically significant at the 10% level.

Table 12. Robustness to alternative methodologies.

	Newey-West			Fama-MacBeth		
	Full sample	SOEs	NSOEs	Full sample	SOEs	NSOEs
CSR _T	-2.138*** (-2.764)	-2.126*** (-2.600)	-3.170* (-1.538)	-3.959* (-1.556)	-3.935* (-1.717)	-5.090** (-1.925)
GOV	-0.585* (-1.888)			-0.482* (-1.812)		
BETA	0.508*** (3.007)	0.627*** (3.423)	0.248 (0.788)	0.780** (2.041)	0.839** (2.013)	0.642 (0.838)
SIZE	-0.409** (-2.531)	-0.413** (-2.425)	-0.354* (-1.754)	-0.380*** (-3.080)	-0.334* (-1.813)	-0.579 (-1.058)
LEV	2.123** (2.189)	1.480 (1.502)	6.554** (2.367)	1.505** (2.235)	0.905* (1.808)	6.004** (1.892)
LIQUID	-0.124** (-2.458)	-0.106* (-1.916)	-0.243** (-2.260)	-0.139*** (-3.212)	-0.106* (-1.771)	-0.245** (-2.597)
BTM	3.563*** (5.978)	3.638*** (5.810)	4.001*** (3.115)	3.557*** (3.310)	3.386** (2.692)	5.988*** (4.052)
LTG	0.321* (1.804)	0.264* (1.640)	1.372*** (3.778)	0.597** (1.991)	0.533** (1.978)	0.790** (1.862)
LNDISP	0.182*** (2.717)	0.183*** (2.610)	0.018 (0.113)	0.194* (1.729)	0.179* (1.662)	0.097 (0.572)
PI	0.112* (1.792)	0.254*** (3.964)	-0.307*** (-2.726)	0.111** (2.030)	0.248*** (2.931)	-0.287*** (-3.359)
RATE	4.354*** (6.525)	3.964*** (5.292)	3.875*** (3.458)			
YEAR	Yes	Yes	Yes	No	No	No
INDUSTRY	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	831	662	169	831	662	169
Adjusted R ²	0.302	0.291	0.502	0.287	0.313	0.405

***Statistically significant at the 1% level, **statistically significant at the 5% level, *statistically significant at the 10% level.

5.4. Other tests

In order to control for serial and cross-sectional dependence, we examine the robustness of our results to alternative methodologies, including Newey-West and Fama-MacBeth methodologies. The results reported in Table 12 are consistent with our previous findings.

6. Conclusion

In this study, we examine the effect of CSR towards primary stakeholders on the *ex ante* cost of equity implied in stock prices and analysts' earnings forecasts for a sample of Chinese A-share listed companies, dividing the sample into SOEs and NSOEs for comparison. We find evidence that firms with higher CSR scores exhibit lower equity financing costs. In particular, CSR towards investors makes the greatest contribution to reducing firms' cost of equity capital. Furthermore, both the cost of capital effects of CSR and the cost of equity financing are higher in recessions than in economic booms. We also find that SOEs have better CSR scores and lower equity financing costs than those of NSOEs, whereas the effect of CSR in reducing the cost of equity capital is greater for NSOEs than for SOEs.

Our paper contributes to the literature in several ways. First, our paper represents an extension of the previous finance literature that generally shows a positive association between CSR and firm value. For example, previous studies focus on accounting-based or market-based measures of financial performance, whereas our research shows that improved CSR can enhance firm value by reducing the firm's *ex ante* cost of equity capital. Additionally, our work complements the studies by Sharfman and Fernando (2008), Chava (2010), Goss and Roberts (2011), and Ghoul et al. (2011), who also analyse the cost of capital implications of CSR by using a sample of Chinese firms and adopting a comprehensive approach that examines six dimensions of CSR. Our work contributes to the literature by separating the cost of equity from firm value and then examining the effect of CSR on the cost of equity in an emerging market.

Second, our paper also constructs a set of CSR index systems on the basis of Chinese culture and institutions. In the absence of an authoritative CSR database (i.e. KLD) in China, we construct a set of indices for assessing CSR towards six stakeholder groups on the basis of indigenous characteristics of China and use an entropy method that is relatively objective to determine the weight of the indices. This can provide a reference for the measurement of CSR in China.

Third, our work makes a quantitative comparison of the difference in CSR, the cost of equity, and the relation between CSR and financial performance between SOEs and NSOEs in China. Although numerous previous studies compare the efficiency, relation network, competitive edge, function, and other aspects of SOEs and NSOEs, few studies make a quantitative comparison of CSR between the two types of enterprises. We attempt to compare the difference in CSR, the price of equity financing, and the cost of capital effects of CSR between SOEs and NSOEs by using a quantitative analysis, which may provide empirical evidence for the diversified development of SOEs and NSOEs in China.

Fourth, our results may have implications for the development of firms. On the one hand, the managers of firms with low CSR, especially NSOEs, should consider increasing investments in CSR-related activities, particularly in the areas of investor protections. Additionally, CSR is an effective means of attracting investors during recessions. On the other hand, firms with high CSR should actively disclose information about their CSR activities to the public. These firms can attract more socially responsible investors by projecting their positive image as a responsible corporate citizen to investors and other stakeholders.

Several topics are worth pursuing in future research. First, it would worth expanding on the study of Goss and Roberts (2011) by examining whether CSR affects the cost of capital, including corporate debt pricing as well as equity pricing. Second, it would be interesting to use a sample of unlisted firms, whose requirements and standards of CSR and financing means are quite different from those of listed firms. Third, as has been noted by Levine and Zervos (1993), cross-country studies can be very useful; the present study can be extended internationally by using a global sample.

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Notes

1. See <http://www.dell.com/learn/us/en/uscorp1/corp-comm/childrens-cancer-care?c=us&l=en&s=corp&c=s=uscorp1>.
2. The Shanghai Stock Exchange issued guidelines for environmental information disclosure of listed firms in the Shanghai Stock Exchange (Shanghai Stock Exchange (2008)).

3. See <http://www.gtarsc.com/>.
4. See <http://www.stats.gov.cn/tjsj/tjbz/hyflbz/>.
5. KLD STATS is created and maintained by KLD Research & Analytics, Inc., which provides detailed CSR performance ratings for individual firms.
6. Chinese Companies Act, 2005 was amended in the 18th session of the Standing Committee of the 10th National People's Congress of the People's Republic of China in Oct 27, 2005, and it was put in execution in Jan 1, 2006. Compared to the Chinese Companies Act, 1993, it reduces the minimum amount of registered capital of a limited liability company, proposes the compromise authorized capital system for Chinese firms, revises the amount of the whole shareholders capital in cash, and so on. Chinese Companies Act, 2005 embodies the change from emphasizing capital credit from combining capital credit and assets credit.
7. We ensure the validity and reliability of the CSR index as follows. First, the index is constructed on the basis of previous studies and relevant standards; second, we repeatedly hold discussions with experts on the index; third, the process of constructing the index is objective. Based on related standards and studies, we initially constructed a CSR index system with 47 items. The 47 items were then given to 60 respondents (including experts working in the area of CSR and the managers of firms), who were asked to judge the importance of the items to assess the CSR of Chinese companies by questionnaire. The response descriptions for each item were given on a five-point scale ranging from "it is not important at all" (= 1) to "it is very important" (= 5). The results of the questionnaire showed that the set of items met the demand of validity; the convergent degree of the index toward six stakeholder groups was 62.5%, 57.1%, 57.1%, 71.4%, 55.6%, and 77.8%, respectively. The results showed the dividing of CSR was reasonable to a certain extent. In addition, the items in which the score for average importance was more than 3 had a percentage of 85.1%. On the basis of the importance and convergent degrees of items, we excluded the least important seven items after discussions with experts. We then tested the reliability of the questionnaire, showing that the inter-item alpha reliability of all the 40 items was high (Cronbach's alpha = 0.856). The final index of CSR contained 40 items as shown in Table 2.
8. See <http://www.people.com.cn/> and <http://www.xinhuanet.com/>.
9. See <http://www.rksratings.com/index.php/Index/Product/index>.

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Appendix I

An estimation of the cost of equity

To discussion purposes, we define the variables that are used in the following three models.

P_t = market price of a firm's common stock in year t .

B_t = book value per share at the beginning of year t .

$FEPS_{t+i}$ = forecast earnings per share for year $t + i$. Because we can only obtain the forecast data just before 2015 in the database, we assume FEPS of the next few years will grow according to the average of the compound growth rate over the years.

$POUT$ = forecast dividends payout ratio. We use a firm's historical three-year average dividends payout ratio to measure the forecasted dividend payout ratio.

R_f = yield on a 10-year Treasury note in June of year t .

1. R_{GLS} : Cost of equity estimated from the model of Gebhardt et al. (2001)

$$P_t = B_t + \sum_{i=1}^{11} \frac{FROE_{t+i} - R_{GLS}}{(1 + R_{GLS})^i} B_{t+i-1} + \frac{FROE_{t+12} - R_{GLS}}{R_{GLS} (1 + R_{GLS})^{11}} B_{t+11} \quad (4)$$

where $B_{t+i} = B_{t+i-1} + (1 - POUT) \times FEPS_{t+i}$.

$FROE_{t+i}$ = forecast return on equity for year $t + i$. For the first three years, $FROE_{t+i}$ is set equal to $FEPS_{t+i}/B_{t+i-1}$. Beyond the third year, FORE fades linearly to the industry median ROE by the twelfth year.

2. R_{CT} : cost of equity estimated from the model of Claus and Thomas (2001)

$$P_t = B_t + \sum_{i=1}^5 \frac{FEPS_{t+i} - R_{CT} \times B_{t+i-1}}{(1 + R_{CT})^i} + \frac{(FEPS_{t+5} - R_{CT} \times B_{t+4})(1 + g)}{(R_{CT} - g)(1 + R_{CT})^5} \quad (5)$$

where $B_{t+i} = B_{t+i-1} + (1 - POUT) \times FEPS_{t+i}$ and $g = R_f - 0.03$.

3. R_{PEG} : cost of equity estimated from the modified PEG ratio model of Easton (2004)

$$P_t = \frac{FEPS_{t+2} - FEPS_{t+1} + R_{PEG} \times FEPS_{t+1} \times POUT}{R_{PEG}^2} \quad (6)$$

This model defines abnormal earnings as current period earnings plus the earnings from the re-invested last period dividend less the normal expected earnings that are based on the last period earnings. The model then assumes that so-defined abnormal earnings persist in perpetuity. The explicit forecast horizon is set to two years, after which forecast abnormal earnings grow in perpetuity at a constant rate. The model requires positive one- and two-year-ahead earnings forecasts as well as a positive change in earnings forecast.

Appendix 2

Entropy method

First, we create a decision matrix. We assume the sample set is $M = M_1, M_2, \dots, M_m$, the index set is $C = C_1, C_2, \dots, C_n$, and the value in which sample i relative to index j is recorded as x_{ij} ($i = 1, 2, \dots, m; j = 1, 2, \dots, n$), then the decision matrix is

$$X = \begin{vmatrix} & C_1 & C_2 & \cdots & C_n \\ M_1 & x_{11} & x_{12} & \cdots & x_{1n} \\ M_2 & x_{21} & x_{22} & \cdots & x_{2n} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ M_m & x_{m1} & x_{m2} & \cdots & x_{mn} \end{vmatrix} \quad (7)$$

Second, we nondimensionalize the decision matrix. To eliminate the difference between index dimensions, we make the decision matrix dimensionless and then obtain the standardized matrix $V = (v_{ij})_{m \times n}$ where

$$v_{ij} = \frac{x_{ij} - \min(x_j)}{\max(x_j) - \min(x_j)} \quad (8)$$

$$v_{ij} = \frac{\max(x_j) - x_{ij}}{\max(x_j) - \min(x_j)} \quad (9)$$

where v_{ij} is the normalized value of x_{ij} , and $\max(x_j)$ and $\min(x_j)$ are the maximum and minimum of C_j , respectively. Equation (8) is used to calculate the normalized value of index in which the bigger the better, while equation (9) is used to calculate the index in which the smaller is the better.

Third, we estimate the characteristics specific gravity of M_i . The characteristics specific gravity is where M_i relative to C_j is

$$p_{ij} = \frac{v_{ij}}{\sum_{i=1}^m v_{ij}}$$

where $0 \leq v_{ij} \leq 1$ and $0 \leq p_{ij} \leq 1$.

Fourth, we calculate the entropy. Assuming the entropy of C_j is e_j , then we may obtain

$$e_j = -\frac{1}{\ln(m)} \sum_{i=1}^m p_{ij} \ln(p_{ij})$$

in which $p_{ij} \ln(p_{ij}) = 0$ when $p_{ij} = 0$ or $p_{ij} = 1$.

Fifth, we calculate the differences in the coefficient of the index. The differences coefficient of C_j is $d_j = 1 - e_j$. The higher is the value of d_j , the greater the amount of information provided by C_j , and the larger index weight given to C_j .

Sixth, we calculate the index entropy weight. The entropy weight of C_j is

$$w_j = \frac{d_j}{\sum_{k=1}^n d_k}, j = 1, 2, \dots, n$$